Environmental Impact Assessment of 132 KV Grid Station at Khanpur and its Feeding Transmission Line Project, District Chakwal

January 2023

Final Report

Project Procurement International (PPI)

Office # 26, Second Floor, Silver City Plaza, G-11 Markaz Islamabad
Telephone: 051 2363624; Cell: 0300 8540195;
E-mail: projectpi@gmail.com; Web: www.projectpi.pk

Report Disclaimer

PPI (the consultant) has prepared this document in accordance with the instructions of Islamabad Electric Supply Company (IESCO) for its sole and specific use. Any other person, company, or institution can't use this document or any information from it without prior permission of IESCO. If anyone uses any information contained herein (document) do so at their own risk.

Executive Summary

Title of the Project

This report presents the findings of "Environmental Impact Assessment (EIA) of 132 KV Grid Station at Khanpur and its Feeding Transmission Line Project Khanpur, Chakwal".

The EIA study aims at the identification of the possible environmental and social impacts of the proposed project on its immediate surroundings on both short and long-term basis, suggesting mitigation measures and identifying the responsible agencies to implement those measures.

Location of the Project

The proposed 132 KV Grid Station is located at Khanpur, District Chakwal. The transmission line will pass from unpopulated sections of Chak Baqir Shah, Chabbar Chak, Chak, Chak Kharak, Saigolabad, Ghanwal, Sohawa, Rabaal, Dheedwal, Shah Said Bullo, Boolay Hajiaal, Thirpal and Jaswal.

Outline of the Project

Islamabad Electric Supply Company (IESCO), the proponent of the project, intends to construct a new 132 KV Grid Station and 15 km feeding transmission line in Khanpur, Chakwal. Project Procurement International, an environmental and management consultancy firm is preparing this EIA report.

The main objective of the project is to increase the efficiency, reliability and quality of the electricity supply in Khanpur, Chakwal and other villages in the vicinity of the project area.

The Air Insulated Station (AIS) 132 KV Grid Station at Khanpur, Chakwal will be built on 40 kanal of land donated free of cost by the residents of Khanpur and the feeding 15 km Transmission Line will consist of 54 towers.

The total estimated cost of the project is Rs. 1,110 million and will be completed in 24 months (two years).

Analysis of Alternatives

a. No Project Option

The proposed project seeks to upgrade the secondary transmission and grid network of the IESCO system in Khanpur, Chakwal district and provide the much-needed relief to the existing over-loaded system. This will also help in reducing line losses and power breakdowns resulting in the reduction of financial loss to IESCO.

In case the proposed project is not undertaken, the IESCO system will not be able to cope with the increasing electricity demand in future, the existing system will remain over-loaded, line losses will also remain high, and the system reliability will progressively decrease, with increasing pressure on the system. The IESCO will also forego the opportunity of increasing its consumers as well as revenue associated with the system expansion.

In view of the above, the 'no project' option is not a preferred alternative.

b. Technical Alternatives

Route Alternative for Transmission Lines: The Grid Station Construction (GSC) Department along with Environment & Social Safeguard Department of IESCO after detailed survey has come up with the selected route. Firstly, two routes were proposed namely route 1 and route 2 and after checking all parameters route 2 was selected. The

parameters considered were, nearby settlements, frequency of mobility of people along the route, ecological environment and ease of access. After careful analysis of the above-mentioned parameters, the survey team has decided to lay the transmission line starting from Jaswal to the proposed grid station at Khanpur, Chakwal. Therefore, the selected route is the best possible option.

Type of Grid Station: There are two types; (i) Gas Insulated Station (GIS) and the (ii.) Air Insulated Station (AIS). GIS is a costly option whereas AIS is a conventional type. Therefore, AIS grid station is the preferred option.

Type of Circuit Breakers: Two types of circuit breakers are available; SF-6 circuit breakers for 132-KV and above, and vacuum circuit breakers for the 11-KV system which are very effective as compared to the old oil-type breakers. Hence modern circuit breakers are the preferred option for the proposed project.

Type of Transformer Oil: IESCO's technical specifications for the procurement of transformers clearly mention that the transformer oil should be Poly Chlorinated Biphenyl (PCB) free. Hence, all the equipment to be procured as part of this project would be PCB-free.

Transmission Line Towers: For 132-KV transmission lines, there are two possible tower options: single circuit vs. double circuit towers. The cost of the double circuit towers is slightly higher than the single circuit variants, however, in view of their expansion capacity, greater reliability, enabling transfer of more power over a particular distance, double-circuit towers are the preferred ones in this project.

Tower vs. Tubular Pole: The base of the transmission line towers is about $10m^2$, which can create a big problem in congested urban areas whereas, the tubular poles requires considerably less space. To this aspect, IESCO has been using tubular steel poles in urban areas and T/line towers in rural areas where there is no issue of space. The transmission line passes through purely rural areas and there is no issue of space; therefore, transmission line towers are the preferred option.

Environmental Baseline Conditions

a. Physical Environment

Physiographic and Geology: Chakwal District is in Potohar Plateau of the Punjab province covering an area of 6,525 sq.km. Lying at 33°40′ North latitude and 72°51′ East longitude, Chakwal is located at a 1-hour and 30 minutes' drive from the Capital of Pakistan Islamabad, and 3-hours and 30 minutes' drive from the heart of Punjab Lahore. The latitude/longitude coordinates of the grid station site are **32°53'53.97"N** and **73° 3'24.21"E**.

The Potohar Plateau has an uneven land and is gradually rising in elevation from 500 to 600 meters above the sea level and the highest point is 1,600 meters above mean sea level. The land gradually slopes towards the South.

Geological Setting and Soil Texture: Chakwal district borders the districts of Rawalpindi and Attock in the north, Jhelum in the east, Khushab in the south and Mianwali in the west. The total area of Chakwal district is 6,609 square kilometres.

The southern portion runs up into the Salt Range and includes the Chail peak, 3,701 feet (1,128 m) above the sea, and the highest point in the district. Between this and the Sohan river, which follows more or less the northern boundary, the country consists of what was once a fairly level plain.

Most of the soils in District Chakwal range from silt loam to loam with PH ranging from 7-9. The bulk density and hydraulic conductivity are 1.35 gm/cm and 16.6 cm/day respectively.

Climate: Chakwal lies in the subtropical region, and its climate is typical of the area, with the exception that it varies a little on the cooler side, owing to its elevation, from central Punjab. Winter temperatures normally range between 3° C and 25° C, and summer temperatures average between 15° C and 40° C and may go up to a maximum of 15° C. June is the warmest month of the year. The temperature in June averages 32.5 °C. January is the coldest month, with temperatures averaging 10.5 °C.

Water Resources: The main source of water at the project site and surroundings is ground water. Bore wells and tube wells are used to get water from ground.

b. Ecological Environment

The project site is located in Khanpur, Chakwal, along the bank of seasonal drainage Nullah. The nullah will be avoided during construction and operational phase. The project site had only bushes and grasses such as Baruwa grass. Barbary partridge and Quail were spotted at the site during field visit.

c. Socio-Economic and Cultural Environment

Population: Khanpur, Chakwal has an estimated population of 4,655 according to Census 2017. Most of the houses are well constructed. The average household size is 5-7.

Agriculture: According to Crop Reporting Service, Government of Punjab main crops produced are Wheat, Mustard, Grains, Sesame, Peanut and Tara Mira in Khanpur, Chakwal.

Public Health: Khanpur, Chakwal has both public and private medical Centers, including, one District Headquarter Hospital, 2 Tehsil headquarter Hospitals, 11 rural Health Centers, 64 Basic Health Units. For treatment at DHQ, people travel from their villages to Chakwal City.

Religious and Archaeological Sites: There exist no documented or known sites of archaeological, historical, cultural or religious significance at or in the immediate vicinity of the proposed site or its transmission line. By its nature, the project will not have any adverse impacts on existing archaeological sites, shrines, and religious sites in the surrounding areas.

Public Consultation

During this EIA process, consultations were held with the community living within the project area. Different aspects and impacts of the proposed project were highlighted regarding their impacts on the physical, biological, and socio-economic environment of the project area. Stakeholders concerns regarding various aspect, existing environment, and impacts of the project were noted in the EIA report.

Generally, the community within the project area is in favor of the project that it will enhance electricity supply in Khanpur, Chakwal district. However, the majority of the people were concerned about the aesthetic impacts of the grid station as well as of overbilling, power shutdown, continuous load shedding, and low voltage in the area.

People appreciated the project activities for up-gradation of the existing electricity system in Khanpur, Chakwal. According to their perception the project will also create employment opportunities for local people. They also argued that proper mitigation plans should be adopted to safeguard environment during the construction phase of the project. People also emphasized upon the abidance of local norms during the constructional and operational phase.

Meetings were held with the stakeholders such as IESCO and District Environment Office, Chakwal, University Academia (UET Taxila) and environmental practitioners (HSEQ Consultant). The opinions and concerns regarding the project were solicited.

Most stakeholders do acknowledge the need to increase the efficiency, reliability and quality of the electricity supply in Khanpur, Chakwal but equally they are concerned about environmental impacts.

Potential Impacts and Mitigation Measures

The EIA study has identified potential impacts that are likely to arise during design, construction and operational phases of the proposed Project. The EIA has examined in detail both the negative and positive impacts of the project.

a. Physical Impacts

Change of Land use: The location of the grid station of the proposed project is on barren land with limited infrastructure or agricultural activity. There is a seasonal drainage Nullah flowing along with the project site, in the southern side and agricultural land on the western side of the proposed project site.

While the route for the 15 km transmission line has been selected, keeping in view the current land of the areas through which it will pass. The land area under transmission lines will remain available for use as previously. However, the change in land use will be of permanent nature.

Soil Erosion, Degradation and Contamination: The soil-related issues include soil erosion, slope instability, steep slopes and soil contamination. Construction activities and vehicle operation in such areas can potentially cause soil erosion and landslides/ slope stability.

During the construction phase, the project site will experience an increase in traffic flow. Soil may also get contaminated as a result of fuel/oils/chemicals spillage and leakage from construction equipment and vehicles, and inappropriate waste (solid as well as liquid) disposal.

Air Quality Deterioration: Construction machinery and heavy vehicles will release windblown dust and smoke containing carbon monoxide (CO), sulfur dioxide (SO_2), oxides of nitrogen (NO_x), and particulate matter (PM). Furthermore, construction activities such as excavation, levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions

Noise Pollution: Due to the various construction activities, there will be short-term noise impacts in the immediate vicinity of the project site and also on workers.

Surface Water and Groundwater Contamination: The project activities that can contaminate soil may also contaminate the surface water and groundwater. All such impacts are temporary and of minor nature and will subside when the construction phase is over.

Stacking and Disposal of Construction and Solid Waste Material: Improper disposal of construction waste and solid waste from the campsite is likely to have an adverse effect on the aesthetic value of the area. The severity of such impact will depend upon the magnitude and type of construction waste.

Mitigation Measures

Change of Land use: Some negative environmental impacts related to the land use could be effectively minimized by making provisions for plantation of trees and landscaping of the surrounding areas of the project site.

Soil Erosion, Degradation and Contamination: Soil Erosion, Degradation and Contamination shall be minimized with proper site selection for the concrete foundation of poles and adopting Standard Operational Procedures (SOP's) of IESCO. To avoid soil contamination, vehicles and equipment will not be repaired in the field. For the domestic sewage from the construction camp and office, appropriate treatment and disposal system, such as a septic tank and soakage pit, will be constructed having adequate capacity.

The recyclable waste will be collected from the site and handed over to the recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste.

Construction camp will be located in a stable and flat area, requiring minimal removal of vegetation and land levelling. The contractor(s) will obtain approval from the IESCO and concerned government authorities for this purpose. Appropriate measures (such as, temporary embankments to protect excavated soil, stone pitching and placing gabions) will be taken to avoid soil erosion during the excavation of transmission line pole foundations.

The construction work for the transmission line route will not be undertaken during the rainy season. Solid waste from the contractor's camp will be disposed of in a manner that will not cause any type of soil contamination. The proper sewerage system is proposed for the grid station to mitigate the runoff of wastewater and rainwater. Proper photographic record will be maintained.

Air Quality: Construction machinery, generators and vehicles should be kept in good working condition and properly tuned, in order to minimize the exhaust emissions. Fugitive dust emissions will be minimized by spraying water on the soil, where required and appropriate. Ambient air quality analysis will be carried out at the grid station site once every three months during the construction phase.

Noise Pollution: The noisy work will be confined to normal working hours in the day time. There must be a restriction on the construction vehicles movement, during night-time.

Surface Water and Groundwater Contamination: There is a seasonal Nullah in the south side of the project site. The project activities that can contaminate soil may also contaminate the surface water and groundwater. These include:

a. Disposal of construction waste,
b. Solid waste disposal from construction camp,
c. Waste effluents disposal,
d. Equipment/vehicle maintenance,
e. Spillage/leakage of fuels, oils and chemicals.

Stacking and Disposal of Construction and Waste Material: Careful selection and management of the borrow areas will be carried out to avoid adverse impacts especially on the landscape. Construction waste material will be dumped at the proper site.

b. Ecological Environment

Impacts

Loss of Natural Vegetation: Land will have to be cleared for the grid station, transmission line poles and in some parts for RoW of transmission lines. No trees will need to be cut for construction of the grid station. Damage may take place to natural vegetation, during the transmission line patrolling and maintenance activities.

Damage to Wildlife: The proposed project activities may have adverse effects on the wildlife along the seasonal Nullah.

Mitigation Measures

Loss of Natural Vegetation: Clearing of natural vegetation will be minimized as far as possible during the transmission line works. Herbicides will not be used to clear vegetation along the transmission line route (or at other project locations). A complete record will be maintained for any tree cutting or trimming. A program will be developed for the tree plantation in order to compensate removal of the trees during the transmission line laying. IESCO will carry out plantation of approximately five trees against one cut tree of different local species to compensate the tree loss.

Damage to Wildlife: No night time activities will be carried out in the project site. The project staff will not be allowed to indulge in any hunting or trapping activities.

c. Socio-Economic Environment

Impacts

Public Health and Safety: Direct exposure to dust is likely to cause health-related impacts. Other issues include the health and safety of workers and site security.

Pressure on Local Infrastructure: During the construction stage, demand for basic amenities such as water, food, power, etc. for the construction labour along with the requirement of construction activities will put pressure on the existing infrastructure. However, the magnitude will be very low as the project duration is short and project activities will only be confined to the premises of the grid station site and transmission line route.

Social Impacts: The social impacts during the construction phase could result due to the influx of migrant workers and associated induced development etc.

Traffic congestion Issues: During the construction phase of the project, the movement of light and heavy vehicles to the proposed workplaces will occur.

Employment: The operation of the proposed project will accelerate the business activity in the area and will provide employment to locals.

Land Acquisition: The local community has donated a piece of land measuring 40 kanal at Khanpur, Chakwal for construction of Grid Station.

Impacts on Sites of Historical, Cultural, Archaeological or Religious Significance: During the construction phase of the project, particularly, excavation, such sites or artefacts may be discovered.

Mitigation Measures

Public Health and Safety: A comprehensive plan for the campsite, indicating safety measures e.g. fire-fighting equipment, safe storage of hazardous material, first aid, provision of PPE, security fencing and contingency measures in case of accidents, will be prepared. Liaison with the concerned authorities should be maintained.

Social Impacts: Local labour shall be hired, from the vicinity of the project area. In order to ensure that no child labour is employed at the project site or campsite a clause in this regard shall be made part of the agreement to be signed with the contractor.

Damage to Infrastructure: All damaged infrastructure will be restored to original or better condition and compensation will be paid as per the Telegraph Act, 1885.

Blocked Access: In the case of the blockage of the existing routes, alternate routes will be identified, in consultation with affected communities.

Impacts on Sites of Historical, Cultural, Archaeological or Religious Significance: There is no site within the project site, however in case of discovery of any sites or artefacts

of historical, cultural, archaeological or religious significance the provincial and federal archaeological departments will be notified immediately, and their advice will be sought before resumption of the construction activities at such sites.

Environmental Management and Monitoring Plan (EMMP)

The purpose of the Environmental Management and Monitoring Plan (EMMP) is to minimize the potential environmental impacts due to the project. The EMMP reflects the commitment of IESCO to safeguard the environment as well as the surrounding population. The EMMP provides a delivery mechanism to address the adverse environmental impacts, to enhance the project's benefits and to introduce standards of best practices to be adopted for all phases of the project.

The environmental budget set out for the construction phase of the project is **Rs. 3.9 million**.

Conclusion and Recommendations

On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during present EIA, it is concluded that the Khanpur, Chakwal Grid Station and its 132 KV feeding transmission line is likely to cause environmental impacts mainly during its construction phase. However, these impacts can be mitigated provided the proposed activities are carried out as mentioned in the report, and the mitigation measures included in this report are completely and effectively implemented.

The project will directly improve electricity supply to Khanpur and other villages in the vicinity of the project target area. There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

Table of Contents

1 Introduction 18
1.1 Project Background and Overview 18
1.2 Brief Description, Nature, Size and Location of the Project 18
1.3 Purpose of Report 18
1.4 The Proponent 18
1.5 Details of Consultant 21
1.6 Environmental Impact Assessment 21
1.7 IESCO (The Proponent) 22
1.8 Screening 26
1.9 Scoping of the Project 26
1.10 Approach and Methodology 27
1.11 Document Structure 29
1.12 Organization of the EIA Report 29
2. Policy, Legal and Administrative Framework 30
2.1 Introduction 30
2.2 National Environmental Policy, 2005 30
2.3 Laws and Regulations 30
2.4 Review of IEE and EIA Regulations, 2022 31
2.5 Punjab Environmental Quality Standards (PEQS) 32
2.6 Land Acquisition Act, 1894 37
2.7 The Telegraph Act, 1885 37
2.8 Institutional Set-Up 38
2.5 The implication of Legislations to the project 38
3 Project Description 39
3.1 Introduction 39
3.2 Type and Category of the Project 39
3.3 Objective of the Project 39
3.4 Project Location and Accessibility 39
3.5 Project Description 41
3.6 Project Components 41
3.7 Cost and Magnitude of Project 49
3.8 Project Activities Process Flow 50
3.9 Government Approval 53
3.10 Project Time Schedule 53
3.11 Alternatives considered and Reasons for Rejection 53
b. Transmission Line Route 54
b. Type of Circuit Breakers 54
c. Type of Transformer Oil 55
d. Type of Transmission Line Towers 55
3.12 Current Land Use of the Project Site 55
3.13 Vegetation Features of the Site 56

4 Description of the Environment 59
4.1 Introduction 59
4.2 Khanpur, Chakwal 59
4.3 Physical Environment 59
4.4 Ambient Air Quality Monitoring 63
4.5 Ecological Environment 65
4.6 Quality of Life Values/ Socio Cultural Environment of the Project Area 69
4.6.1 Villages in the Vicinity of Grid Station Site 69
4.6.2 Villages in the Vicinity of Transmission Line 71
5 Public Consultation 79
5.1 Objectives of Consultation 79
5.2 Methodology 79
5.3 Stakeholders Identification 80
5.4 Major Stakeholders Involved 80
5.5 Issues Discussed 80
5.6 Stakeholder's Consultations 80
5.7 Concerns Regarding the Project 84
6 Impact Assessment and Mitigation Measures 88
6.1 Introduction 88
6.2 Environmental Impacts Assessment Process 88
6.3 Design Phase Potential Impacts 91
6.4 Construction Phase Potential Impacts 93
6.5 Operational Phase Impacts 105
6.6 Socio-Economic Impacts Assessment and their Mitigation 107
6.7 Summary of Impacts and their Mitigation Measures 113
7 Environmental Management and Monitoring Plan 116
7.1 Purpose and Objectives of EMMP 116
7.2 Institutional Capacity 116
7.3 Organizational Structure, Role and Responsibilities 118
7.4 Environmental and Social Mitigation Plan 123
7.5 Solid Waste Management Plan 146
7.6 HSE Management Plan 146
7.7 Traffic Management and Construction Material Transportation Plan 148
7.8 Emergency Preparedness, Response and Site Evacuation Plan 149
7.9 Fire Fighting Plan 149
7.10 Plantation Plan 150
7.11 Environmental Monitoring Plan 152
7.12 Training Program 157
7.13 Communication and Documentation 160
7.14 Grievance Redressal Mechanism 160
7.15 Change Management 161
7.15.1 Category 'A' Change 161
7.15.2 Category 'B' Change 161

7.15.3 Category 'C' Change 162
7.16 Environmental Budget 162
7.17 Post Project Monitoring 162
8 Conclusion and Recommendations 163
8.1 Introduction 163
8.2 Conclusions 163
8.3 Recommendations 163
Annexure-1: List of Names, Qualification and Roles of EIA Team Members 166
Annexure-2: Terms of Reference 167
Annexure-3: References 168
Annexure-4: Glossary 169
Annexure-5: List of Persons and Stakeholders met during EIA 171
Annexure- 6: Socio-Economic Data Collection Questionnaire 173
Annexure-7: Ambient Air and Noise Quality Monitoring Results 187
Annexure-8: Flora and Fauna in the Project Area/Khanpur and surrounding, Chakwal 192

List of Tables

Table 1.1: Energy Generation, Sold & Per Capita Consumption – PEPCO 19
Table 1.2: Name and Addresses of Proponents Representative and Consultant..... 22
Table 1.3: IESCO'S Technical Profile..... 25
Table 1.4: List of Transmission Lines..... 25
Table 2.1: PEQS for Liquid Effluent Discharge..... 33
Table 2.2: PEQS for Gaseous Emission 34
Table 2.3: PEQS for Vehicular Emission 35
Table 2.4: PEQS for Drinking Water Quality..... 35
Table 2.5: PEQS for Ambient Air..... 36
Table 2.6: PEQS for Noise 37
Table 3.1: List of Equipment for 132 KV Grid Station at Khanpur, District Chakwal.... 41
Table 3.2: Transmission Line Equipment..... 45
Table 3.3: Estimated Cost of the Project..... 49
Table 4.1: Chemical Analysis of Ground water at the project site..... 61
Table 4.2: Mean Monthly Meteorological Representation of Chakwal..... 63
Table 4.3: Summary of Ambient Air Quality and Noise Results at the Project Site..... 65
Table 5.1: Categories of Stakeholders Interviewed in the Project Area..... 80
Table 5.2: Stakeholders Opinions/Concerns/Issues/Suggestions 82
Table 7.1: Role and Responsibility Chart for the Proposed Project..... 121
Table 7.2: Environmental and Social Mitigation Plan (ESMP) for the Project..... 124
Table 7.3: Estimated Cost for the Implementation of Environmental Monitoring Plan for Khanpur, Chakwal Grid Station Project..... 148
Table 7.4: Recommended Fruit Bearing Trees(local) to be Planted at the Project Site..... 150
Table 7.5: Recommended Plant Species to be Planted at the Project Site..... 151
Table 7.6: Tentative Cost of Equipment 151
Table 7.7: Maintenance Plan for first three months..... 152
Table 7.8: Environmental Monitoring Plan for 132 KV Grid Station at Khanpur and it's Transmission Line 154
Table 7.9: Estimated cost for the implementation of Environmental Monitoring Plan for 132 KV Grid Station and Transmission Line Project..... 156
Table 7.10: Framework for Environmental & Social Training Program..... 159
Table 7.11: Summary of Environmental Mitigation & Monitoring Cost 162
Table 8.1: Environmental Screening Matrix (mitigated) of 132 KV Grid Station at Khanpur and its Feeding Transmission Line..... 164

List of Figures

Figure 1.1: Map showing the area covered by IESCO 24
Figure 3.1: Location Map of the Project Site 40
Figure 3.2: Layout Plan of Khanpur, Chakwal Grid Station, Khanpur, Chakwal 44
Figure 3.3: Transmission Line Route from Jaswal to Khanpur, 132 KV Grid Station Chakwal 47
Figure 3.4: Transmission Line Route from Jaswal to Khanpur – 132 KV Grid Station Project 48
Figure 3.5: 132 KV Conventional Tower (Proposed) 56
Figure 3.6: 132 KV Korean Tubular Pole 56
Figure 3.7: Pictorial view of the Project Site 57
Figure 4.1: Pictorial Presentation of Floral Species at Project Area 68
Figure 4.2: Description of the Project Area 70
Figure 4.3: Villages in the Vicinity of Project Area 78
Figure 5.1: Pictorial Presentation of Public and Stakeholder Consultation 86
Figure 6.1: Environmental Screening Matrix (un-mitigated) of Khanpur, Chakwal Grid Station and its Transmission Line Project 89
Figure 7.1: Organizational Structure of IESCO 120
Figure 7.2: Flow Diagram of Solid Waste Management System 146

List of Abbreviation

AEBs	Area Electricity Boards
AES	Area Electricity Supply
AJK	Azad Jammu and Kashmir
AM	Assistant Manager
Amsl	Above Mean Sea Level
BOD	Biological Oxygen Demand
CEO	Chief Executive Officer
CED	Chief Engineer Development
CITES	Convention on International Trade in Endangered Species
COD	Chemical Oxygen Demand
DC	Deputy Commissioner
DCO	District Coordination Officer
DISCO	Distribution Company
EA	Environmental Assessment
EIA	Environmental Impact Assessment
ELR	Energy Loss Reduction
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESG	Environmental and Social Guidelines
ESI	Environmental and Social Inspector
E&SS	Environmental and Social Safeguard
FESCO	Faisalabad Electric Supply Company
GoAJK	Government of Azad Jammu and Kashmir
GDP	Gross Domestic Product
GENCO	Generating Company
GIS	Geographical Information System
GIS	Gas Insulated Substation
GoP	Government of Pakistan
GRM	Grievance Redressal Mechanism
GSC	Grid Station Construction (Department)
GSO	Grid Station Operation (Department)
GS	Grid Station
GT Road	Grand Trunk Road
Ha	Hectare
HEC	Heavy Electrical Complex
HSE	Health Safety and Environment
HT	High tension
ICT	Islamabad Capital Territory
IEE	Initial Environmental Examination
IESCO	Islamabad Electric Supply Company

LAA	Land Acquisition Act (of 1894)
LoS	Laws of Seas
LPG	Liquefied Petroleum Gas
LT	Low Tension
MEA	Multilateral Environmental Agreements
MEPCO	Multan Electric Power Company
M&E	Monitoring and Evaluation
NEQS	National Environmental Quality Standards
NGO	Non-Government Organization
NOx	Oxides of Nitrogen
NTDC	National Transmission and Dispatch Company
OP	Operational Policy
O&M	Operation and Maintenance
PAPs	Project Affected Persons
PEQS	Punjab Environmental Quality Standards
PCB	Poly Chlorinated Biphenyl
PD	Project Director
POF	Pakistan Ordnance Factory
PEPA	Pakistan Environmental Protection Act
PM	Particulate matter
POP	Persistent Organic Pollutants
P&DD	Planning and Development Department
RoW	Right of Way
RP	Resettlement Plan
RPR	Resettlement Policy Register
RPF	Resettlement Policy Framework
SCR	Social Complaint Register
SDO	Sub Divisional Officer
SE	Senior Engineer
STG	Secondary Transmission line and Grids
T/L	Transmission Line
ToR	Terms of Reference
TSW	Technical Services Wing
XEN	Executive Engineer
UNFCCC	United Nations Framework Convention on Climate Change
USEPA	United State Environmental Protection Agency
WAPDA	Water and Power Development Authority
WB	World Bank

List of Units

%	Percent (age)
^{o}C	Degree centigrade
cm	Centi meter
dB (A)	Decibel ('A' scale)
ft^2	Square foot
ft^3	Cubic foot
Km	Kilometer
Km/h	Kilometer/hour
m	Meter
m^2	Square meter
m3	Cubic meter
MT	Metric Ton
KM	Kilometer
KV	Kilo Volts
KWh	Kilo Watt hour (unit)
MAF	Million Acre Feet
MVA	Mega Volt Amperes
MW	Mega watts
ppb	Parts per billion
ppm	Parts per million
dB(A)	Decibels ('A' scale)

Unit	Conversion	Description
kanal	A kanal is equal to:0.125 acres (510 m^2)	A kanal is a unit of area, equivalent to 505.857 square meters or one-eighth of an acre. It is used in parts of northern India and in Pakistan.

1 Introduction

1.1 Project Background and Overview

Pakistan is considered as an energy-deficient country and per capita electricity generation has traditionally been low in recent years (581 KWh as against the World average of 2,657 KWh[1]). Much like the rest of the country, the areas under IESCO electricity supply network are facing a rapid increase in electricity consumption, owing to increasing population, urbanization, industrialization and increased per capita income in the recent decade. **Table 1.1** shows the increase in population, energy sold and per capita energy consumption changes that took place during 1981 – 2021 period.

In order to meet the increasing electricity demand per capita, the existing electricity network (Secondary Transmission and Grid System) of IESCO needs to be expanded.

The project will ensure supply of electricity to Khanpur and adjoining areas other benefits include load reduction on currently overloaded grid stations and transmission lines, and improvement in the voltage profile as well as the system reliability in District Chakwal.

1.2 Brief Description, Nature, Size and Location of the Project

Islamabad Electric Supply Company Limited intends to establish a 132 kV Grid Station and its feeding transmission line near Khanpur, Chakwal, District Chakwal. The grid station will be 132 KV Air Insulated Sub-station on 40 kanal of land along with a 15 km transmission line, providing an efficient and undisturbed supply of electricity to Khanpur, Chakwal.

In this report, the 132 KV Grid Station will be referred to as “Khanpur, Chakwal Grid Station”.

1.3 Purpose of Report

In order to comply with the regulatory requirement, IESCO had acquired the services of M/s Project Procurement International (PPI), an environmental consultancy firm, to carry out the Environmental Impact Assessment (EIA) of the project.

This report gives an overview of project description, potential environmental and social impacts, their mitigation measures, enlists environment management plan and environmental monitoring plan along with budgetary requirements.

1.4 The Proponent

IESCO is a public utility company, providing electricity to the Islamabad Capital Territory (ICT), northern districts of the Punjab Province (Rawalpindi, Attock, Chakwal and Jhelum) and southern areas of Azad Jammu and Kashmir (AJK).

The IESCO was registered in April 1998 under the Companies Ordinance 1984, Pakistan. Initially, it was working as one of the eight Area Electricity Boards (AEBs) of the Water and Power Development Authority (WAPDA). **Figure 1.1** shows the area/region covered by IESCO for electricity supply.

Table 1.1: Energy Generation, Sold & Per Capita Consumption – PEPCO

Fiscal Year	Population of PEPCO	Number of Customers	Computed Peak Demand PEPCO	System Input Energy (Purchased by CPPA-G)	Energy Sale (Consumption)	Per Capita System Input Energy	Per Capita Consumption	Units Per Consumer	
								System Input Energy (kWh)	Sale (kWh)
	(In Million)		(MW)	(MkWh)	(MkWh)	(kWh)	(kWh)		
1981	79.04	3,269,945	2,473	12,862	9,068	163	115	3,933	2,773
1982	87.54	3,588,250	2,846	14,378	10,288	164	118	4,007	2,867
1983	90.30	3,901,419	3,163	16,093	11,587	178	128	4,125	2,970
1984	92.96	4,231,536	3,295	17,655	12,762	190	137	4,172	3,016
1985	95.67	4,523,970	3,791	18,376	13,756	192	144	4,062	3,041
1986	98.41	4,876,787	3,933	20,656	15,504	210	158	4,236	3,179
1987	101.18	5,278,686	4,325	23,228	17,405	230	175	4,400	3,362
1988	103.99	5,779,623	5,031	27,002	20,702	260	199	4,672	3,582
1989	106.84	6,419,167	5,440	28,410	21,982	266	206	4,426	3,424
1990	109.71	6,870,679	5,680	30,809	24,121	281	220	4,484	3,511
1991	112.61	7,260,721	6,090	33,580	26,585	298	236	4,625	3,662
1992	115.54	7,736,241	6,532	37,143	29,267	321	253	4,801	3,783
1993	118.50	8,175,750	7,522	39,854	31,272	336	264	4,875	3,825
1994	121.48	8,592,042	8,067	41,289	32,131	340	264	4,805	3,400
1995	124.49	9,067,276	8,252	44,932	35,032	361	281	4,955	3,864
1996	127.51	9,481,731	8,278	47,434	36,925	372	290	5,003	3,894
1997	130.56	9,868,612	8,552	49,564	38,529	380	295	5,022	3,904
1998	124.14	10,217,072	8,877	52,192	39,422	420	318	5,108	3,858
1999	125.59	10,799,635	9,191	52,752	38,900	420	310	4,885	3,602
2000	128.55	11,584,657	9,289	54,672	40,910	425	318	4,719	3,531
2001	131.58	12,166,344	9,628	57,282	43,384	435	330	4,708	3,566
2002	134.65	12,678,022	10,099	59,545	45,204	442	336	4,697	3,566
2003	137.75	13,318,233	10,484	62,694	47,421	455	344	4,707	3,561
2004	140.89	14,091,338	11,078	67,697	51,492	480	365	4,804	3,654
2005	144.07	14,896,242	12,035	71,670	55,278	497	384	4,811	3,711
2006	147.29	15,911,161	13,212	80,404	62,405	546	424	5,053	3,922

2007	150.53	16,986,554	15,138	85,987	67,480	571	448	5,062	3,973
2008	153.82	17,955,366	16,838	84,584	66,539	550	433	4,711	3,706
2009	157.14	18,640,114	17,325	82,702	65,286	526	415	4,429	3,496
2010	160.39	19,582,224	17,847	87,115	68,878	543	429	4,449	3,517
2011	163.61	20,309,483	17,901	89,775	71,672	548	437	4,420	3,529
2012	166.83	21,046,611	18,280	88,987	71,368	532	427	4,228	3,391
2013	170.07	21,875,600	18,227	87,080	70,508	510	413	3,981	3,223
2014	173.33	22,587,870	19,966	93,777	76,543	539	440	4,152	3,389
2015	176.59	23,519,247	21,031	96,463	78,113	543	440	4,101	3,321
2016	179.85	24,516,699	22,559	100,871	81,737	557	452	4,114	3,334
2017	183.10	25,571,803	25,117	106,796	86,763	579	470	4,176	3,393
2018	184.50	27,016,545	26,031	120,062	97,197	645	522	4,444	3,598
2019	187.72	28,473,069	25,627	122,302	99,046	652	528	4,295	3,479
2020	190.89	29,957,422	25,622	122,451	98,407	641	516	4,088	3,285
2021	194.01	31,529,604	27,193	130,060	99,370	670	512	4,125	3,152

Source: *Power System Statistics 46th Edition-2022 (NTDC)*

1.5 Details of Consultant

Project Procurement International (PPI) is an environmental and management consultancy firm which is operating in the field of environment for the last 17 years. PPI has completed more than 200 environmental studies (EIA & IEEs) of different development projects. The list of team members and their qualification has been provided in **Annexure- 1**.

M/s Project Procurement International engaged a team of experts for conducting EIA study, which includes the following persons:

- Mr. Saadat Ali, Environmental Engineer
- Mr. Ali Abdullah, Environmental Engineer
- Ms. Javeria Iqbal, Environmental Scientist
- Ms. Sehrish Shoukat, Environmental Engineer
- Ms. Amna Saeed, Environmental Engineer

1.6 Environmental Impact Assessment

According to the Punjab Environmental Protection Act 1997, (Amended 2012), section 12 (1):

" No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof".

1.6.1 Purpose of the Report

The aims and objectives of the EIA of the purposed project are as follows:

- Identification of all significant potential impacts that may require detailed assessment,
- Identification and assessment of all potential major and minor impacts during pre-construction, construction and operational phases, conservation and sustainable use of natural resources,
- To assess the compliance status of the proposed activities with respect to the national environmental legislation,
- Propose mitigation measures to minimize, eliminate or to compensate the potential adverse impacts of the project that identified during the assessment, promotion of public awareness on environmental issues,
- To carry out a social assessment, identify potential impacts and suggest mitigation measures.
- To prepare an Environmental Management Plan, and;
- To prepare an EIA document.

The Terms of Reference have been provided in **Annexure-2**.

1.6.2 Contact Persons

In case of further details or information regarding this EIA report, please contact the proponent's representative or the consultant at the addresses provided below:

Table 1.2: Name and Addresses of Proponents Representative and Consultant

Proponent's Representative	Consultant
Mr. Mohammed Yasin Additional Director, Environment & Social Safeguard Unit Islamabad Electric Supply Company, Islamabad Tel: 051- 9252036 Email: iescopmu@hotmail.com	**Engr. Saadat Ali** Managing Director Project Procurement International (PPI) 26, Second Floor, Silver City Plaza, G-11 Markaz, Islamabad Tel: +92-51-2363624 Cell: +92-300-8540195 E-mail: projectpi@gmail.com Website: www.projectpi.pk

1.7 IESCO (The Proponent)

IESCO is a public utility company, providing electricity to the Islamabad Capital Territory (ICT), Northern districts of the Punjab Province (Rawalpindi, Attock, Chakwal and Jhelum) and southern area of Azad Jammu and Kashmir (AJK). IESCO was registered in April 1998 under the Companies Ordinance 1984, Pakistan. Initially, it was working as one of the eight Area Electricity Boards (AEBs) of the Water and Power Development Authority (WAPDA).

In 1958, WAPDA was established, having two wings: Water Wing and Power Wing. The Water Wing was (and still is) responsible for developing and managing large water reservoirs (Dam) and barrages to store water for country's agriculture demand and inter-like with all other sectors (social to industrial sector and production of hydroelectricity), while its Power Wing was a vertically integrated utility, responsible for generation, transmission and distribution of electricity throughout Pakistan (except for the City of Karachi, where the Karachi Electric Supply Company - KESC - performed a similar function).

Under its unbundling and restructuring program, WAPDA's Power Wing has been divided into nine distribution companies collectively called DISCOs, three generating companies collectively called GENCOs and a transmission company called National Transmission and Dispatch Company (NTDC). IESCO is one of the nine DISCOs. The areas of distribution of these DISCOs are:

- IESCO: Islamabad Electric Supply Company for Rawalpindi, Attock, Chakwal and Jhelum district of Northern Punjab and Southern area of Azad Jammu and Kashmir (AJK)
- PESCO: Peshawar Electric Supply Company providing utility for the entire Khyber Pakhtunkhwa Northern parts of AJK and Gilgit-Baltistan.
- MEPCO: Multan Electric Power Company for the area of Multan, Sahiwal, Khanewal, Pakpattan, Vehari, Rahim Yar Khan, Muzaffargarh, Dera Ghazi Khan, Layyah, Rajan Pur, Bahawalpur, Bahawalnagar and Lodhran districts.
- GEPCO: Gujranwala Electric Power Company for districts of Gujranwala, Sialkot, Mandi Bahauddin, Hafizabad, Narowal and Gujrat districts.
- LESCO: Lahore Electric Supply Company is responsible for Lahore, Kasur, Sheikhupura and Okara districts.
- FESCO: Faisalabad Electric Supply Company for Faisalabad, Sargodha, Khushab, Jhang, Toba Tek Singh, Bhalwal, Mianwali and Bhakkar districts.
- HESCO: Hyderabad Electric Supply Company for Hyderabad, Nawab Shah, Sanghar, Mirpur Khas, Umar Kot, Tharparkar, Badin and Thatta districts in Sindh Province.

- SEPCO: Sakkhar Electric Power Company is responsible for electricity supply to Jacobabad, Shikarpur, Ghotki, Larkan, Dadau Nowsheroferoz, Khairpur and Sakkhar districts of Sindh province.
- TESCO: Tribal Electric Supply Company is responsible for electricity supply to seven agencies and FRs that are situated along Afghanistan boundary. The seven agencies are, Kurram Agency, Orakzai Agency, Khyber Agency, North Waziristan Agency, South Waziristan Agency, Bajur Agency, Mohmand Agency. The Frontier Regions are FR Peshawar, FR Kohat, FR Bannu, FR Lakki, FR Dera Ismail Khan, FR Tank.
- QESCO: Quetta Electric Supply Company for the entire Balochistan Province, except Lasbela, which is covered by the KESC network.

1.7.1 IESCO Area

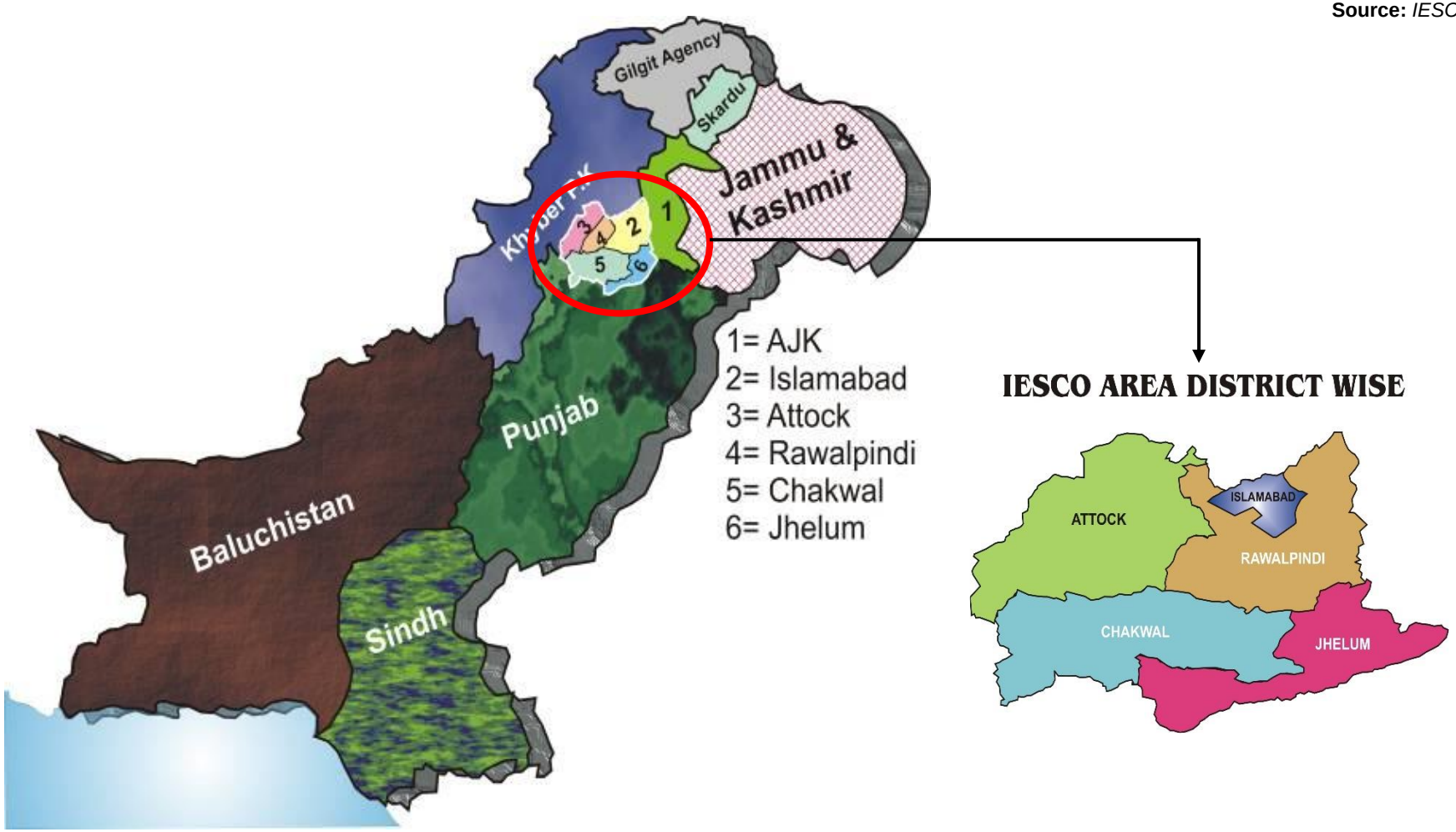
The area within the IESCO network comprises of the following distinct administrative units:

- Islamabad Capital Territory (ICT),
- Rawalpindi District,
- Jhelum District,
- Attock District, and
- Chakwal District
- Parts of AJK

Figure 1.1 shows the geographical network of IESCO.

Figure 1.1: Map showing the area covered by IESCO

Source: *IESCO*



1.7.2 Technical Data of IESCO

The key technical data of IESCO's system is provided in **Table 1.3.**

Table 1.3: IESCO'S Technical Profile

Description	Unit	Qty
Grid stations (Including NTDC)	Nos.	116
132 KV Grid stations	Nos.	88
33 KV Grid stations	Nos.	2
Customer Grid stations (IESCO Maintained)	Nos.	11
Customer Grid stations (Custom er Maintained)	Nos.	1
Customer Grid stations (Consumer Maintained)	Nos.	14
NTDC Grid stations	Nos.	5
Peak load demand – Recorded on 29-06-2022 (1500-1600 hrs)	MW	2,718
Power transformers (Numbers)	Nos.	274
Power transformers' installed capacity (MVA)	MVA	6,979
Transmission line	Km	3,869
HT lines	Km	27,084
LT lines	Km	28,234
11 KV feeders	Nos.	1,275
Distribution transformers	Nos.	54,305
Distribution transformation capacity	MVA	4,456

Source: *IESCO Company Profile, December 2022*

1.7.3 Existing Transmission Lines

The IESCO system comprises of the two 220-KV double circuits, seven 132-KV double circuits, thirteen 132-KV single circuit and four 66-KV single circuit transmission lines. A list of these transmission lines is provided in **Table 1.4**.

Table 1.4: List of Transmission Lines

No	Transmission Lines in IESCO's Region		
	Capacity	From	To
Double Circuit Transmission Lines			
1	220 KV Transmission Lines	Mangla	Burhan
		Tarbela	Burhan
2	132 KV Transmission Lines	Burhan	i) New Wah, ii) Zero pint, iii) Rawal & iv) AEC
		Mangla	AEC
		New Wah	Attock

No	Transmission Lines in IESCO's Region		
	Capacity	**From**	**To**
		Attock	HIT
		HIT	Fecto
		Old Rewat	New Rewat
Single Circuit Transmission Lines			
3	132 KV Transmission Lines	Burhan	i) KTM, ii) Bakra Mandi, iii) Rawat, iv) Dina, v) Gujar Khan, vi) Jhelum, vii) Sargodha, viii) Mangla (R), ix) Mangla, x) Faqirabad, xi) Kamra and xii) Sanjwal
		Bakra Mandi	Attock Refinery
		AEC	i) Kahuta and ii) Rewat
		Kahuta	i) Kahuta City and ii) Azad Pattan
		Gujar Khan	Jatli and Chakwal
		Q.A University	Murree
		New Wah	i) POF East, North and West, ii) Taxila Cement Factory, and iii) Tarbela R & NC.
		Taxila	Fecto Cement
		Mangla	i) Mirpur and Kotli, ii) Mangla (L), iii) Rajar iv) Kharian and iv) Old Rawat
		New Wah	i) Fateh Jang, ii) Pindi Gheb, iii) Kalar Kahar,

Source: *IESCO*

1.8 Screening

A 132 kV Grid Station and its feeding transmission line is being established in Khanpur, Chakwal, District Chakwal. The grid station will be 132 KV Air Insulated Sub-station on 40 kanal of land along with a 15 km transmission line, providing an efficient and undisturbed supply of electricity to Khanpur, Chakwal.

According to the Review of IEE and EIA Regulations, 2022:

"Transmission lines (11 KV & above) and Grid stations are in Energy projects of Schedule II, List of projects requiring an Environmental Impact Assessment."

The proposed project falls under the **category A** of **Schedule II** as per IEE/EIA regulations 2022 and requires an EIA to be conducted.

1.9 Scoping of the Project

A scoping exercise was undertaken to identify the potential issues that are to be considered in the environmental impact assessment. The scoping exercise included the following indispensable tasks:

Spatial and Temporal Boundaries of the Project: The Grid Station is located in Khanpur village, District Chakwal. The project site is located in rural area. The construction of a Grid Station will be carried out in two years, and the impacts of the construction phase of the Project will be short-term. Similarly, the magnitude of impacts will be localized.

The spatial and temporal boundary of the Project during the operational phase will be localized and medium-term.

Stakeholder Consultation: Stakeholder consultation sessions were undertaken to document the concerns of the local community and other stakeholders and to identify issues that may require additional assessment in order to address these concerns. Stakeholder consultation was conducted during the initial survey with the following objectives:

To inform the Stakeholders, Communities and Project Affected Persons about the Project

To gather feedback from the primary and secondary stakeholders of the Project

To identify relevant potential issues, including the socio-economic impacts of the Project and corresponding mitigation measures.

During the stakeholder consultation process for the Project, the following key aspects were highlighted by stakeholders:

Concern regarding abidance of ethical values and norms of the villagers

Solid waste management treatment and disposal plan

Concerns of the residents to be affected by the project (Project Affected Persons, if any)

High cost of electricity

Magnitude of impact: The magnitude of the impact will be localized as Major Issue.

1.10 Approach and Methodology

A kick-off meeting was held with the officials of Environment and Social Safeguard Section, IESCO to discuss and clarify issues, objectives, and scope of the study as well as the consultant's approach and methodology.

The following methodology was recommended for the purposed project:

- Review of governing legislation and statutory requirements,
- Description of the proposed project,
- Baseline environmental data collection,
- Stakeholder Consultations at various levels (institutional, NGOs, corporate sector and Grass root level i.e. affected peoples),
- Identification of potential environmental impacts,
- Evaluation of the significance of environmental impacts,
- Recommended mitigation measures and monitoring requirements,
- Development of Environmental Management and Monitoring Plan (EMMP); and
- Preparation of EIA report.

1.10.1 Secondary Data Collection

A detailed review of the literature was carried out with the focus primarily on existing environmental conditions in the project locations and impacts of such projects on the biotic and abiotic environment. The secondary data was collected for assessing the environmental conditions and trends for identifying the following:-

A) Physical Conditions: topography, geology, soils, surface and groundwater resources and climate.

B) Ecological Resources: flora and fauna, (particularly in respect of rare or endangered species), protected areas or other areas of significant environmental importance.

C) Human and Economic Development: settlements, socio-economic conditions, infrastructure and land use.

D) Heritage Aspects: sites of cultural, archaeological or historical significance.

IESCO provided all the available relevant documents for review and clear understanding of the project activities.

The list of documents reviewed for the EIA study is provided in **Annexure-3** and the glossary is provided in **Annexure-4**.

1.10.2 Field Visits and Base Line Data Collection

The consultant visited the project site for the collection of baseline data. The Rapid Social Appraisal method was applied to discover the facts (empirically verifiable observations or verifying the old facts) of the prevailing socio-economic and cultural conditions of the project area.

The data of flora and fauna of the project site was obtained during field visits. Meetings were held with expert Environmentalists from public and private institutions/organizations.

1.10.3 Pubic Consultation

Roadside discussions were organized with the communities living in Khanpur, Saigolabad, Rabaal, Dheedwal, Shah Said Bullo, Sohawa and Boolay Hajiaal, which are either in immediate vicinity of the proposed grid station site or transmission line. Meetings were held with the stakeholders such as IESCO, District Environment Office, Chakwal, University Academia (UET Taxila), Environmental Practitioners, and their opinions and concerns regarding the project were solicited.

Annexure-5 gives a list of persons and stakeholders met during EIA study and the questionnaires are also provided in **Annexure-6**.

1.10.4 Review of Legal and Administrative Framework

A review on all existing environmental legislative and administrative framework like relevant policies, rules, regulations, guidelines and standards of national, international and provincial and local levels were compiled and their implication on the project activities was identified.

1.10.5 Identification and evaluation of Impacts

The environmental impacts are broadly classified as physical, biological and socio-cultural, and then each broad category has been evaluated against its significance in terms of its severity and likelihood of its occurrence. The significance of the impacts has been assessed in terms of the effects on the natural ecosystem, level of public concern and conformity with legislative or statutory requirements The potential impacts thus predicated are further divided/categorized based on their duration (short and long term), reversibility, likelihood, consequence (minor, moderate or major) and significance (Low, medium or high). The aim of this task was to assess all associated risks with these impacts.

1.10.6 Identification of Mitigation Measures

The objective of identification of mitigation measures is i) to identify practices, technologies or activities that would prevent or minimize all significant environmental impacts and ii) propose physical and procedural controls to ensure that mitigation is effective. Based on the impact evaluation performed, changes or improved practices have been suggested, to prevent (where practical), and control unacceptable adverse impacts resulting from normal or extreme events.

1.10.7 Development of Environmental Management and Monitoring Plan (EMMP)

An Environmental Management and Monitoring Plan (EMMP) has been developed for effective implementation of the recommended mitigation measures of negative impacts during pre-construction, construction and operation phase. The EMMP also lays down procedures to be followed during the operation of the project and identifies the roles and responsibilities of all concerned personnel, including reporting in the operational phase.

1.10.8 Submission and Review of Draft Report

The consultant has submitted one hard and soft copy of the draft report to IESCO for their review. The objective was to give them an opportunity to review the findings of the study. Ambiguities regarding this study were clarified, and suggestions/ recommendations voiced for inclusion were added in the final report.

1.10.9 Final Report

The consultant reviewed the feedback obtained from the IESCO and all the comments were incorporated in the draft report likewise. Two hard and soft copies of the final report were then submitted to IESCO.

1.11 Document Structure

The Environmental Impact Assessment study report presents findings and compiles all information into one document that includes the introduction of the project; policy, legal and administrative framework; project description; analysis of alternatives; existing environment, public consultation and communities concerns regarding the project, and Environmental Management and Monitoring Plan (EMMP).

1.12 Organization of the EIA Report

This report has been structured in the following manner:

Chapter 1 (*Introduction*) provides an overall introduction to the project and impact assessment methodology.

Chapter 2 (*Legal Framework)* describes the regulatory framework of Pakistan on the environment and its implications on the project.

Chapter 3 *(Project Description)* provides the description of the proposed project, its layout plan and associated activities, raw material details and utility requirement.

Chapter 4 *(Description of the Environment*) provides a description of the micro-environment and macro-environment of the proposed project site. This chapter describes the physical, ecological and socio-economic resources land of the project area and surroundings.

Chapter 5 *(Public Consultation)* this chapter describes details of discussions held with primary and secondary stakeholders.

Chapter 6 *(Impact Assessment and Mitigation Measures)* details the potential environmental and social impacts of the proposed project on the different features of the micro and macro-environment using the matrix method.

Chapter 7 *(Environmental Monitoring & Management Plan)* explains the mitigation measures proposed for the project in order to minimize the impacts to acceptable limits. It also describes the implementation of mitigation measures on ground and monitoring of environmental parameters against likely environmental impacts.

Chapter 8 *(Conclusion and Recommendation)* summarizes the report and presents its conclusions.

2. Policy, Legal and Administrative Framework

2.1 Introduction

Pakistan being a signatory of multilateral international treaties has a comprehensive set of environmental legislation covering multiple environmental issues facing Pakistan like pollution of freshwater bodies and coastal water, air pollution, deforestation, loss of biodiversity, lack of proper waste management and climate changes. The basic policy and legislative framework along with detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation for the protection of the environment and overall biodiversity are in place.

The compliance status of the construction of Khanpur, Chakwal Grid Station and transmission line was reviewed with reference to the legislation and existing legal framework on the environment in Pakistan and International level as described henceforth.

2.2 National Environmental Policy, 2005

The National Environment Policy (NEP) aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development. In NEP, the further sectorial guidelines, Energy Efficiency and Renewable directly related to building energy code for newly constructed buildings were introduced.

The NEP provides an overreaching with a framework for addressing the Environmental issues facing Pakistan, pollution of freshwater bodies and coastal waters, air pollution, lack of proper waste management, deforestation, loss of biodiversity, desertification, natural disasters and climate change. It also provides directions for addressing the cross-sectored issues as well the underline causes of Environmental degradation and meeting international obligations.

The NEP, while recognizing the goals and objectives of National Conservation Strategy, National Environmental Plan and other existing environment-related national policies, strategies and action plans provides broad guidelines to the Federal Government., Provincial Government, Federally Administered Territories and local Government for addressing environmental concerns and ensuring effective management of their environmental resources.

2.3 Laws and Regulations

Pakistan has several laws and regulations regarding the conservation and protection of the environment. However, the enactment of comprehensive legislation on the environment, in the form of an act of parliament, is a relatively new phenomenon. Most of the existing laws on environmental issues were enforced over an extended period of time and are context-specific. The laws relevant to the developmental projects are briefly reviewed below.

2.3.1 Punjab Environmental Protection Act, 1997 (Amended 2012)

After 18th Constitutional Amendment in the Constitution of Pakistan, the Federal Ministry of Environment has been dissolved, and the subject of the environment has been handed over to provinces. EPA Punjab has formulated its own act. The major content of the act is same as of Pakistan Environmental Protection Act (PEPA), 1997. Minor amendments/changes have been made viz.

- The Name of Act has been changed into "Punjab Environmental Protection (Amendment) Act, 2012".
- For the words "Federal Government", wherever occurring, the word "Government" shall be substituted.

- For the words “Federal Agency”, wherever occurring, the words “Provincial Agency” shall be substituted; and
- For the word “National”, wherever occurs, the word “Punjab” shall be substituted.

All the other clauses, sub-clauses, sections and sub-sections are almost the same.

The Punjab Environmental Protection Act, 1997 (Amended 2012) is the basic legislative tool empowering the Punjab government to frame regulations for the protection of the environment. The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste.

The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the Punjab Environmental Quality Standards (PEQS) specified by the Punjab Environmental Protection Agency (Punjab EPA) has been prohibited under the Act, and penalties have been prescribed for those contravening the provisions of the Act.

The requirement for environmental assessment is laid out in Section 12 (1) of the Act. Under this section, “no proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof”.

Section 12(6) of the Act states that this provision is applicable only to such categories of projects as Punjab Environmental Protection Agency (Review of IEE and EIA Regulations), 2012.

2.4 Review of IEE and EIA Regulations, 2022

Punjab Environmental Protection Agency (Review of IEE and EIA Regulations), 2022 (the Regulations) prepared by the Punjab Environmental Protection Agency under the powers conferred upon it by the Act, provide the necessary details on preparation, submission and review of the IEE and the EIA. Categorization of projects for IEE and EIA is one of the main components of the Regulations.

Projects have been classified on the basis of the expected degree of adverse environmental impacts. Project types listed in Schedule-I are designated as potentially less damaging to the environment and those listed in Schedule-II as having potentially serious adverse effects. Schedule-I projects require an IEE to be conducted, provided they are not located in environmentally sensitive areas. For the Schedule-II projects, conducting an EIA is necessary. Salient features of the regulation, relevant to the project are listed below:

- Categories of projects requiring IEE and EIA are issued through two schedules attached to the Regulations.
- A fee, depending on the cost of the project, has been imposed for review of EIA and IEE.
- The submittal is to be accompanied by an application in prescribed format included as schedule V of the Regulations.
- The EPA Punjab is bound to conduct preliminary scrutiny and reply within 10 days of submittal of the report a) confirming completeness, b) asking for additional information, or c) requiring additional studies.

- The EPA Punjab is required to make every effort to complete the review process for IEE within 30 days and of the EIA within 45 days of the issue of the confirmation of completeness.
- EPA Punjab accords their approval subject to following 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 approval conditions and requirements of the IEE/ EIA.
- An EMP is required to be submitted with the request for obtaining confirmation of compliance.
- The EPA Punjab are required to issue a confirmation of compliance within 15 days of receipt of the request and complete documentation.
- The IEE/EIA approval will be valid for three years from the date of the accord.
- A monitoring report is required to be submitted to the EPA Punjab after completion of construction, followed by annual monitoring reports during operations.

The project falls in Schedule-II of the regulations. Hence, this type of project needs an EIA to be conducted.

2.5 Punjab Environmental Quality Standards (PEQS)

The PEQS, promulgated under the PEPA 1997 (Amended 2012), specify the following standards:

The maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources.

- For power plants operating on oil and coal:
- Maximum allowable emission of Sulphur dioxide,
- The maximum allowable increment in the concentration of sulfur dioxide in the ambient air,
- The maximum allowable concentration of nitrogen oxides in ambient air, and
- Maximum allowable emission of nitrogen oxide for steam generators as a function of heat input.
- The maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment and sea (three separate sets of numbers).

The PEQS for liquid effluents discharged to inland waters, gaseous emission from industrial sources and emissions from motor vehicles are provided as on the following website. Website: http://epd.punjab.gov.pk/rules_regulations

The Punjab Environmental Quality Standards (PEQS) specify the following standards:

- The maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged into inland waters, sewage treatment facilities, and the sea (three separate sets of numbers).
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources.

- Maximum allowable concentration of pollutants (02 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.
- Maximum allowable noise levels from vehicles.
- Ambient Noise and Air Quality Standards.

These standards also apply to the gaseous emissions and liquid effluents generated by the generator, process waste etc. The standards for vehicles will apply during the construction as well as operation phase of the project. Standards for air quality have not been prescribed as yet.

2.5.1 PEQS for Liquid Effluent

The Punjab Environmental Quality Standards (PEQS) for the discharge of effluent from industry are presented in **Table 2.1**.

Table 2.1: PEQS for Liquid Effluent Discharge

Parameters	Into Inland Waters	Into Sewage Treatment
Tempereture	=<3°C	=<3°C
pH Value	6-9	6-9
Biological Oxygen Demand $(BOD)_5$ at 20°C	80	250
Chemical Oxygen Demand (COD)	150	400
Total Suspended Solids (TSS)	200	400
Total Dissolved Solids (TDS)	3500	3500
Grease and Oil	10	10
Phenolic Compounds (as phenol)	0.1	0.3
Chlorides (as Cl')	1000	1000
Fluoride (as F')	10	10
Cyanide (CN') total	1.0	1.0
An-ionic Detergents (as MBAs)	2.0	20
Sulphate (SO'')	600	1000
Sulphide (S^{2-})	1.0	1.0
Ammonia (NH^3)	40	40
Pesticides	0.15	0.15
Cadmium (Cd)	0.1	0.1
Chromium (trivalent and hexavalent)	1.0	1.0
Copper (Cu)	1.0	1.0
Lead (Ni)	0.5	0.5
Mercury (Hg)	0.01	0.01
Selenium (Se)	0.5	0.5
Nickel (Ni)	1.0	1.0
Silver (Ag)	1.0	1.0
Total Toxic Metals	2.0	2.0
Zinc (Zn)	5.0	5.0
Arsenic (As)	1.0	1.0
Barium (Ba)	1.5	1.5

Parameters	Into Inland Waters	Into Sewage Treatment
Iron (Fe)	8.0	8.0
Manganese (Mn)	1.5	1.5
Boron (B)	6.0	6.0
Chlorine (Cl_2)	1.0	1.0

Source: *PEQS, Punjab Environmental Protection Agency*

2.5.2 PEQS for Gaseous Emission

The Punjab Environmental Quality Standards (PEQS) for permissible limits of gaseous emission from industry are presented in **Table 2.2**.

Table 2.2: PEQS for Gaseous Emission

Parameter	Source of Emission	Standard
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number
Particulate Matter	Boilers and Furnaces:	
	Oil Fired	300
	Coal-Fired	500
	Cement Kilns	300
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500
Hydrogen Chloride	Any	400
Chlorine	Any	150
Hydrogen Fluoride	Any	150
Hydrogen Sulphide	Any	10
Sulphur Oxides	Sulfuric Acid/sulphonic Acid Plants	5000
	Other Plants except power plants operating an oil and coal	1700
Carbon Monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200

Parameter	Source of Emission	Standard
Oxides of Nitrogen	Nitric Acid Manufacturing Unit	3000
	Other plants except for power plants operating on oil or coal:	
	Gas-fired	400
	Oil fired	600
	Coal-fired	1200

Source: *PEQS, Punjab Environmental Protection Agency*

2.5.3 PEQS for Vehicular Emission

The Punjab Environmental Quality Standards (PEQS) for permissible limits of exhaust emissions from vehicles are presented in **Table 2.3.**

Table 2.3: PEQS for Vehicular Emission

Parameters	Standards (Maximum permissible limits)	Measuring Method
Smoke	40% or 2 on the Ringleman Scale During engine acceleration mode	To be compared with Ringleman chart at a distance of 6 meters or more
Carbon Monoxide	6%	Under idling conditions: non-dispersive infrared detection through the gas analyzer.
Noise	85 dB (A)	A sound meter at 7.5 meters from the source

Source: *PEQS, Punjab Environmental Protection Agency*

2.5.4 PEQS for Drinking Water, 2010

The Punjab Environmental Quality Standards (PEQS) for drinking water quality, 2016 are presented in **Table 2.4**.

Table 2.4: PEQS for Drinking Water Quality

Parameter	Standard values	WHO guidelines
Biological		
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample.	Must not be detectable in any 100 ml sample.
Treated water is entering the distribution system (E. Coli or Thermo-tolerant Coliform and total Coliform bacteria)	Must not be detectable in any 100 ml sample.	Must not be detectable in any 100 ml sample.
Treated water in the distribution system (E. Coli or Thermo-tolerant Coliform and total Coliform bacteria)	Must not be detectable in any 100 ml sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Must not be detectable in any 100 ml sample. In the case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.
Physical		
Color	≤ 15 TCU	≤ 15 TCU
Taste	Non-acceptable	Non-acceptable

Parameter	Standard values	WHO guidelines
Odour	Non-acceptable	Non-acceptable
Turbidity	< 5 NTU	< 5 NTU
Total hardness	< 500 mg/L	---
TDS	<1000	<1000
pH	6.5- 8.5	6.5- 8.5
Chemical		
Essential Organic	mg/Litre	mg/Litre
0Alminium	≤ 0.2	0.2
Antimony	≤ 0.005	0.02
Arsenic	≤ 0.05	0.01
Barium	0.7	0.7
Boron	0.3	0.3
Cadmium	0.01	0.003
Chloride	≤ 250	250
Chromium	≤ 0.05	0.05
Copper	2	2
Toxic Inorganic		mg/Litre
Cyanide	≤ 0.05	0.07
Flouride	≤ 1.5	1.5
Lead	≤ 0.05	0.01
Mangnese	≤ 0.5	0.5
Mercury	≤ 0.001	0.001
Nickel	≤ 0.02	0.02
Nitrate	≤ 50	50
Nitrite	≤ 3	3
Zinc	5	3
Pesticides mg/L		PSQCA No.4639-2004.page No 4 Table No. 3serial No. 20-58
Phenolic Compounds		<0.002
Polynuclear aromatic hydrocarbons		0.01
Radioactive		
Alpha emitters bq/L	0.1	0.1
Beta emitters	1	1

Source: *PEQS, Punjab Environmental Protection Agency*

2.5.5 PEQS for Ambient Air and Noise

The Punjab Environmental Quality Standards (PEQS) for Ambient Air and Noise, 2016 are presented in **Table 2.5** and **2.6.**

Table 2.5: PEQS for Ambient Air

Pollutants	Time Weighted Average		Concentration in Ambient Air (ug/m^3)
Sulfur Dioxide (SO_2)	Annual 24 hrs**	Average*	80 120
Oxides of Nitrogen gas (NO)	Annual 24 hrs**	Average*	40 40
Oxides of Nitrogen gas (NO_2)	Annual 24 hrs**	Average*	40 80
Ozone (O_3)	1 hour		130

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)
Suspended Particulate Matter (SPM)	Annual Average*	360
	24 hrs**	500
Respirable Particulate Matter (PM_{10})	Annual Average*	120
	24 hrs**	150
Respirable Particulate Matter ($PM_{2.5}$)	Annual Average*	15
	24 hrs**	35
	1 hr	15
Lead (Pb)	Annual Average*	1
	24 hrs**	1.5
Carbon monoxide (CO)	8 hrs	5 mg/m^3
	1 hr	10 mg/m^3

*** Annual Arithmetic mean of minimum 1040 measurements in a year taken twice a week 24 hourly at a uniform interval*
** 24 hourly /8 hourly values should be met 98 % of the year, 2 % of the time, it may exceed.*
***Source**: PEQS, Punjab Environmental Protection Agency*

Table 2.6: PEQS for Noise

Category of Area/ Zone	Limits in dB(A) Leq	
	Daytime	Night time
Residential area	55	45
Commercial area	65	55
Industrial area	75	65
Silence area	50	45

***Source:** PEQS, Punjab Environmental Protection Agency*

2.6 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the de-facto policy governing land acquisition and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions.

2.7 The Telegraph Act, 1885

The Telegraph Act ensures the compensation of damages to infrastructure and other property during the construction of any development project. The compensation of damages must be paid to the people affected within a fixed period. Any person not willing to follow the rules and regulations provided by this act shall be deemed to have committed an offence under section 188 of Pakistan Penal Code.

If any dispute arises as to the persons entitled to receive compensation, or as to the proportions in which the persons interested are entitled to share in it, the telegraph authority

may pay into the Court of the District Judge such amount as he deems sufficient or, where all the disputing parties have in writing admitted the amount tendered to be sufficient or the amount has been determined under sub-section (3), that amount; and the District Judge, after giving notice to the parties and hearing such of them as desired to be heard, shall determine the persons entitled to receive the compensation or, as the case may be, the proportions in which the persons interested are entitled to share in it. Every determination of a dispute by a District Judge under sub-section (3) or sub-section (4) shall be final:

Provided that nothing in this sub-section shall affect the right of any person to recover by suit the whole or any part of any compensation paid by the telegraph authority, from the person who has received the same.

2.8 Institutional Set-Up

The apex environmental body in the country is the Pakistan Environmental Protection Council (PEPC), presided by the Chief Executive of the Country. Other bodies include the Pakistan Environmental Protection Agency (Pak-EPA), provincial EPAs (for four provinces, AJK and Gilgit-Baltistan), and environmental tribunals.

The EPAs were first established under the 1983 Environmental Protection Ordinance; the PEPA 1997 further strengthened their powers. The EPAs have been empowered to receive and review the environmental assessment reports (IEEs and EIAs) of the proposed projects and provide their approval (or otherwise).

The construction of 132 KV Grid Station at Khanpur and its Transmission Line is located in District Chakwal. Therefore, the EIA report will be submitted to the Punjab Environmental Protection Agency, Lahore for obtaining environmental approval for the project.

2.5 The implication of Legislations to the project

Islamabad Electric Supply Company, being the proponent of the project will ensure that construction and operational phases of the project be carried out in accordance with the EIA report and Environmental Management Plan is effectively implemented.

The project will be subjected to four basic provisions relating to pollution control under the Punjab Environmental Protection Act, 1997 (Amended 2012), as contained in section 11, 13, 14 and 15 as follows:

- Section 11, prohibits discharge or emission of any effluent or waste or air pollutant or noise in excess of the PEQS, or the established ambient standards for air, water or land.
- Section 13, prohibits hazardous wastes.
- Section 14, prohibits the handling of hazardous substance except under a license or in accordance with the provision of any local law or international agreement.
- Section 15, prohibits the operation of motor vehicles for each air pollutant or noise is being emitted in excess of the PEQS or the established ambient standard.

3 Project Description

3.1 Introduction

This Chapter provides a description of various components of the proposed project and their salient features, location, and phases.

3.2 Type and Category of the Project

According to the Punjab Environmental Protection Act (Amended), 2012, section 12 (1)

"No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Provincial Environmental Protection Agencies, as the case may be, or, where the project is likely to cause an adverse environmental effects an environmental impact assessment, and has obtained from the Government Agency approval in respect thereof."

According to the Review of IEE and EIA Regulations, 2022:

"Transmission lines (11 KV & above) and Grid stations are in Energy projects of Schedule II, List of projects requiring an Environmental Impact Assessment."

The proposed project falls under the **category A** of **Schedule II** as per IEE/EIA regulations 2000 and requires an EIA to be conducted.

3.3 Objective of the Project

The overarching objective of the proposed project is to increase the efficiency, reliability and quality of the electricity supply in Khanpur and surrounding areas in District Chakwal.

3.4 Project Location and Accessibility

The proposed 132 KV Grid Station is located on Unmetalled Road linked with Khanpur Road. The Khanpur Road is further connected to Jhelum Chakwal Road 2.6 km (South).

The transmission line originates from Chakwal-Choa Saidan Shah Transmission Line (near Jaswal) and passes alongside Shah Said Bullo, Dheedwal, Rabaal, Saigolabad, Chak Kharak and Khanpur. The entirety of the grid station and its feeding transmission line is located in district Chakwal.

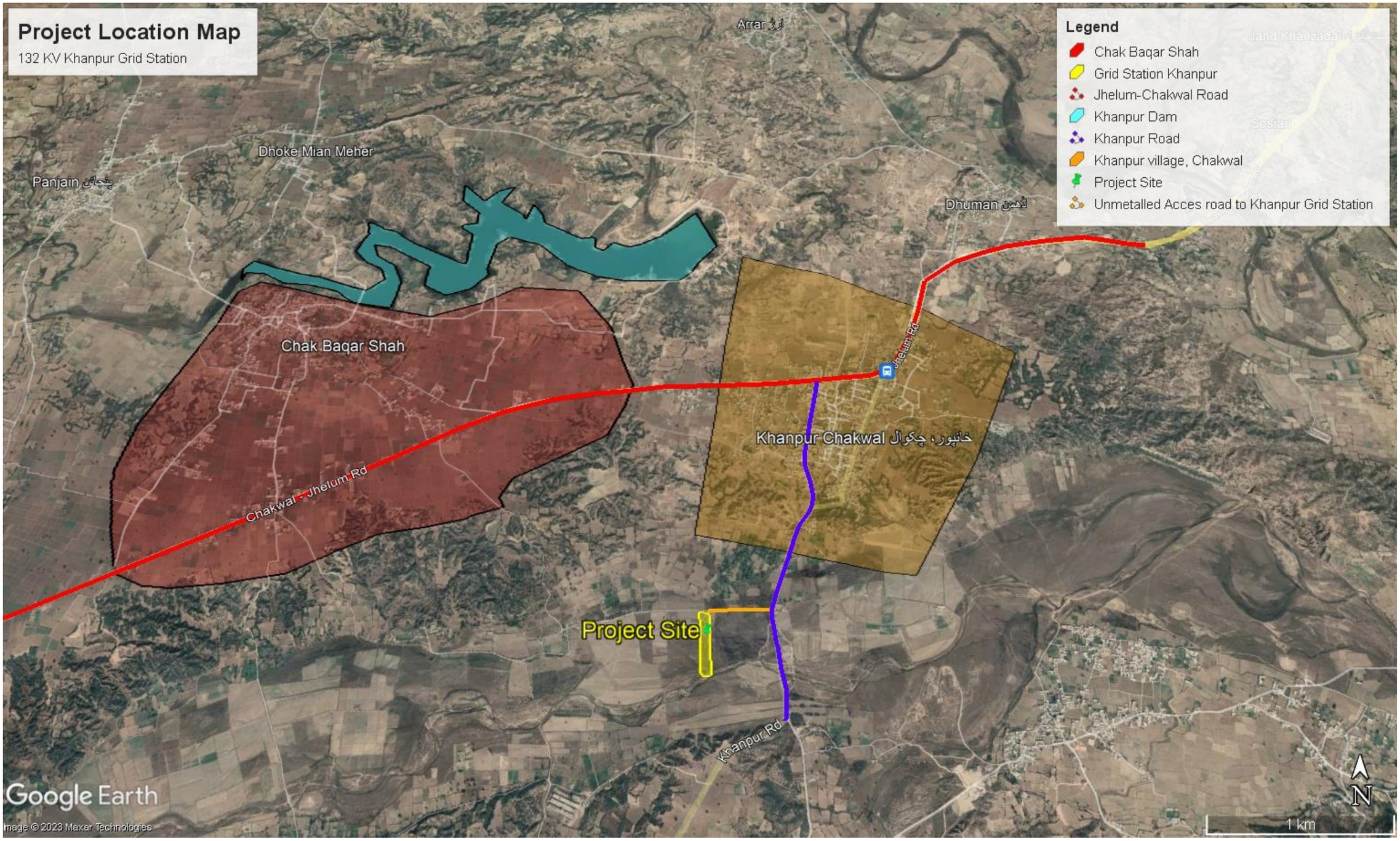
The latitude/longitude coordinates of the grid station site are as follows:

32°53'53.97"N and **73° 3'24.21"E**

The surrounding areas near the project site of 132 KV Grid Station are as follows and shown in **Figure 3.1**:

- **East:** Barren land (50 m) + Khanpur road (750 m)
- **West:** Open Fields (200 m) + Jhelum Chakwal Road (2600 m)
- **North:** Barren Land (30 m) + Khanpur Road (130 m)
- **North East:** Khanpur Village (1000 m)
- **South:** Barren Land (20 m) + Seasonal drainage nullah (230 m)

Figure 3.1: Location Map of the Project Site



3.5 Project Description

To satisfy the load requirement of Khanpur and nearby areas and to reduce the transmission losses, IESCO has planned to establish a 132 KV Grid Station and its Feeding Transmission Line.

The proposed 132 KV Grid station will be spread over 40 Kanal. The 132 KV Grid will comprise of the office and residential area, parks and recreational facilities.

The 132 KV Grid Station will be AIS system, with Transformer Capacity of 02 x 20 MVA Power Transformer, Transformer Bay x 4.0, Capacitor Bay x 2.0 and Line bay x 3.0.

The allied transmission line is 15 km in length comprising of a total of 54 towers. The Line will be connected to Chakwal-Choa Saidan Shah Transmission Line at T-OFF in Jaswal area.

Basic infrastructure facilities include civil work foundations for installation of equipment, control room buildings & other associated residential & non-residential buildings and cable trenches etc.

3.6 Project Components

3.6.1 Grid Station

The list of equipment for Khanpur, Chakwal Grid Station is listed below in **Table 3.1.**

Table 3.1: List of Equipment for 132 KV Grid Station at Khanpur, District Chakwal

Sr. No	Description of Material	Qty	Unit
1	20/26 MVA 132/11.5 KV Power Transformer along with all allied accessories	2	No
2	132 KV Circuit Breaker with SSS along with allied accessories & Termination Connectors	4	Set
3	132 KV Transformer C.T with SSS along with allied accessories & Termination Connectors Ratio 200:100:5/5A	6	No
4	132 KV Line C.T with SSS along with allied accessories & Termination Connectors Ratio 1200:600:300:5/5A	6	No
5	132 KV PT With SSS along with allied accessories & Termination Connectors	3	No
6	132KV Bus Isolator with SSS with allied accessories & Termination Connectors	5	Set
7	132KV Line Isolator with SSS with allied accessories & Termination Connectors	2	Set
8	132KV Lightening Arrester with SSS with allied & Termination Connectors accessories	6	No
9	11KV Lightning Arrestor with allied accessories	6	No
10	11 KV Post Insulator with clamps	6	No
11	132KV Column	6	No

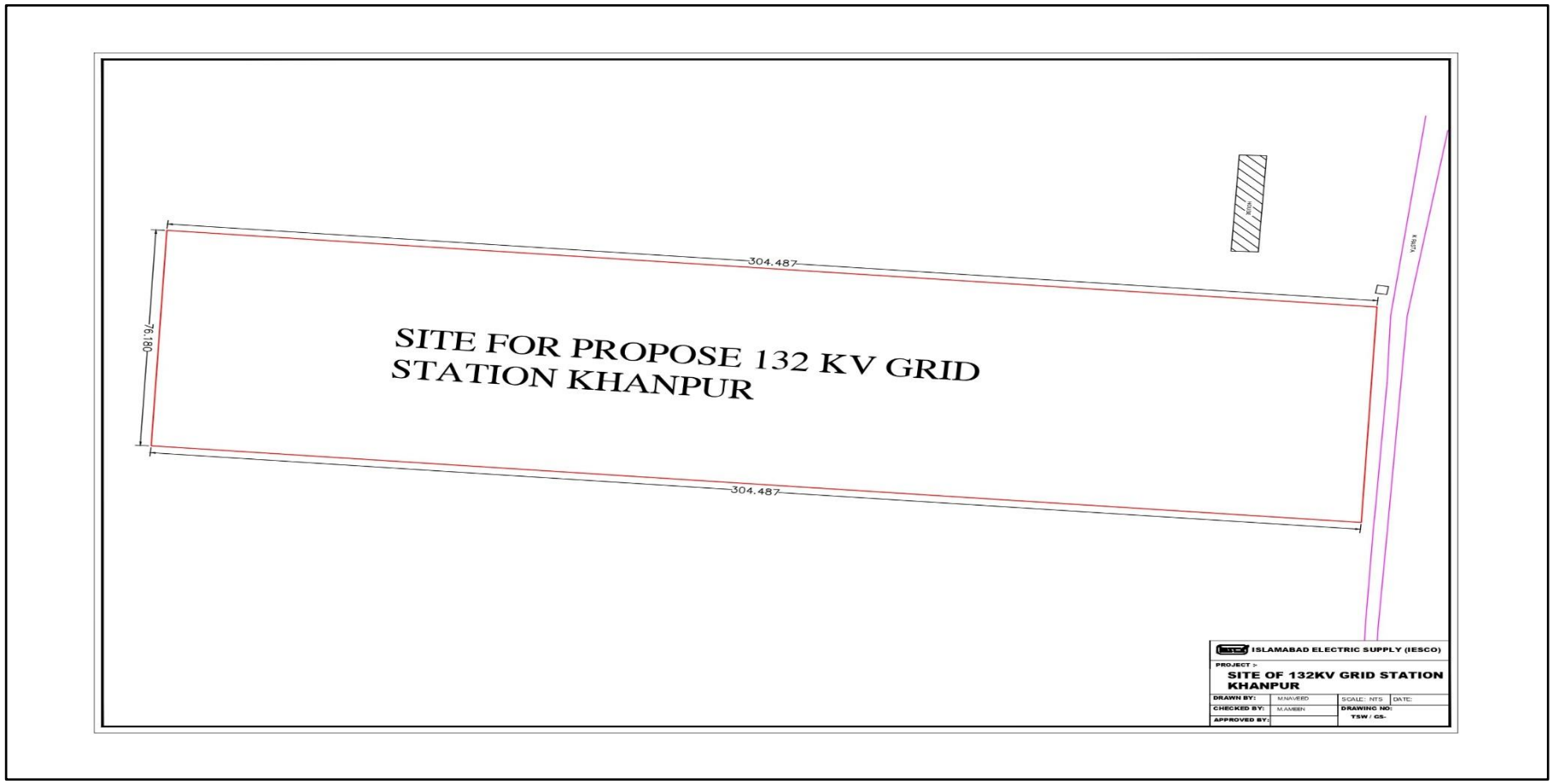
12	132KV Beam	4	No
13	132KV Earth Mast	1	No
14	11KV Bus Bar Structure	2	No
15	Control Panel CP-30	2	No
16	Control Panel CP-50	2	No
17	Relay Panel RP-3	2	No
18	Relay Panel RP-4	2	No
19	Connector Type TMRH.	6	No
20	Connector Type TM63A.	30	No.
21	Connector Type TMHH.	15	No
22	Connector Type 90B75F	6	No
23	Connector Type 90BH30.	6	No.
24	AC/DC Station Aux Panel	1	No
25	11KV Incoming Panel 25KA	2	No
26	11KV Outgoing Panel 25 KA	16	No
27	11KV Bus Bar Coupler	1	No
28	Pad-Mounted Auxiliary Transformer 100 KVA	1	No
29	Earthing Platform	9	No
30	110 Volt Battery Bank a/w allied accessories	1	Set
31	110 Volt Battery Charger	1	No
32	Earth Rod 16mm dia 3Mtr Long	65	No
33	Cartridge Type A	250	No
34	Cartridge Type B	100	No
35	Cartridge Type C	75	No
36	Mould for Type A	2	No
37	Mould for Type B	2	No
38	Mould for Type C	2	No
39	Holding Clamps for Moulds	3	No
40	String Tension Assembly for Conductor 600mm	6	Set
41	Tension Assembly for Earth wire 9 mm	20	No
42	Earth wire 9mm	300	Mtr
43	Aluminium Conductor 600 mm	650	Mtr
44	Grounding Conductor 95 mm	2500	Mtr
45	Disc Insulator 100 KN	54	No
46	All: Pipe 75mm dia 4Mtr long	6	No
47	Power Cable 1000 MCM	2400	Mtr
48	Indoor Termination Kits for 1000 MCM	30	Set

49	Outdoor Termination Kits for 1000 MCM	30	Set
50	Control Cable 4x2.5 mm	2200	Mtr
51	Control Cable 8x2.5 mm	1800	Mtr
52	Control Cable 16x2.5 mm	1800	Mtr
53	Control Cable size 4x6 mm	2500	Mtr
54	Power Cable 4/0 AWG	80	Mtr
55	Outdoor Termination Kits for 4/0 AWG	1	Set
56	Indoor Termination Kits for 4/0 AWG	2	Set
57	L.T Power Cable 2/core.	275	Mtr
58	L.T Power Cable 4/0 core.	150	Mtr
59	11 KV Capacitor Control Panel	2	No
60	11 KV Capacitor 200 KVAR	72	No
61	11 KV Capacitor Rack with Structure along with all allied accessories Complete Set	6	No
62	Neutral CTs	2	No
63	LT service Box	3	No
64	Earthing Unit	10	No
65	lamp 125 watt	22	No
66	Shade for mercury lamp	22	No
67	Holder 3 pin type	22	No
68	Tubular pole type A	22	No
69	Tubular pole type B	6	No
70	19/.083 4 Core Cable	120	Mtr.

Source: *IESCO*

The layout plan of the 132 KV Grid Station at Khanpur is shown in **Figure 3.2**.

Figure 3.2: Layout Plan of Khanpur, Chakwal Grid Station, Khanpur, Chakwal



3.6.2 Transmission Line

The proposed transmission line length is 15 km. There will be the installation of 54 towers on the line. The distance between towers is determined as per standards of IESCO. The range usually varies from 60m – 300m depending upon the site conditions.

The route of the transmission line is the most appropriate route to connect the proposed grid station at Khanpur, Chakwal.

The Grid Station Construction (GSC) Department along with Environment and Social Safeguard Section (E&SS) of IESCO has marked the route alignment of a transmission line after careful consideration of the land use, ecological environment and nearby settlements along the route. The route alignment has limited vegetation cover; no trees will be cut down to make way for the transmission line. Furthermore, the transmission line mostly passes through barren land as almost 7km area of the transmission line is barren land.

In addition, there is a thin vegetation cover in between Chak Kharak and Rabaal area but to avoid cutting of trees, the transmission line will be passed aside from vegetation cover.

Width of Right of Way (RoW)

The width of RoW for T/L has been considered to be 8.8m, i.e. 4.4 m on either side from the centre of transmission line and the area will be 70.56 m^2 (i.e. 8.4m x 8.4m) in case of tower spot.

Table 3.2: Transmission Line Equipment

Sr. No	DESCRIPTION OF MATERIAL	QTY:	UNIT
1	132KV TOWER		
	➢ ZM-1	45	NO.
	➢ ZM-30	17	NO.
2	220KV TOWER		
	➢ EA	3	NO.
	➢ ED	2	NO.
	➢ EG	1	NO.
3	GROUNDING SET.	65	SET.
4	DISC INSULATOR		
	a. 80 KN	2328	NO.
	b. 100 KN	3006	NO.
5	CONDUCTOR		
	RAIL	109.423	KM
6	HARDWARE FOR RAIL CONDUCTOR		
	SUSPENSION FITTING FOR RAIL	288	SET
	TENSION FITTING FOR RAIL	372	SET

	MID SPAN JOINT FOR RAIL	60	NO.
	STOCK BRIDGE DAMPER FOR RAIL	948	NO.
	REPAIR SLEEVE	40	NO.
	EARTH WIRE (9mm)	18.237	KM
7	EARTH WIRE HARDWARE		
	SUSPENSION FITTING	48	SET
	TENSION FITTING	62	SET
	MID SPAN JOINT	20	NO.
8	STOCK BRIDGE DAMPER	158	NO.

Figure 3.3 shows the overall route of the Transmission Line whereas **Figure 3.4** shows the detailed route.

Figure 3.3: Transmission Line Route from Jaswal to Khanpur, 132 KV Grid Station Chakwal

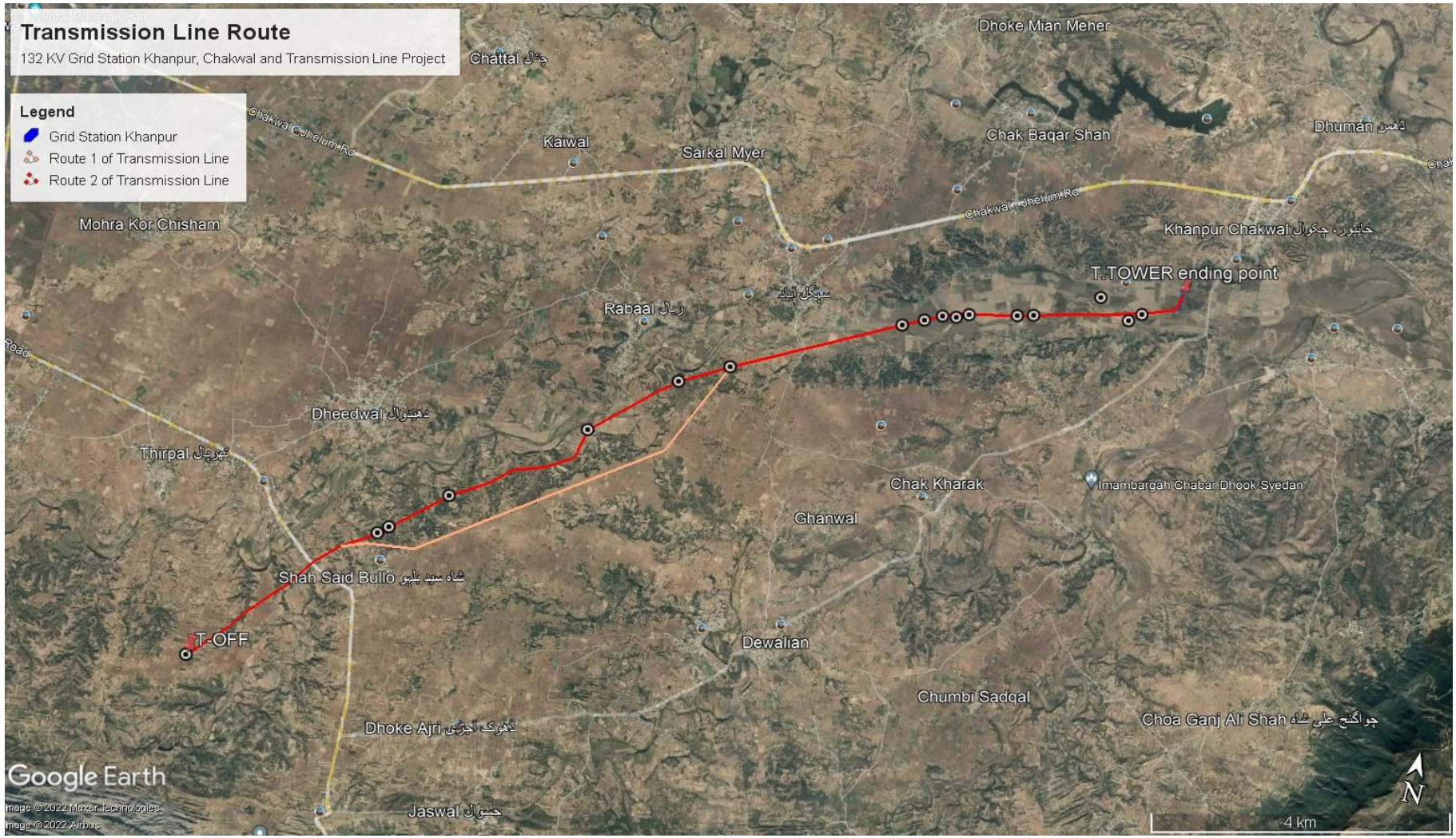
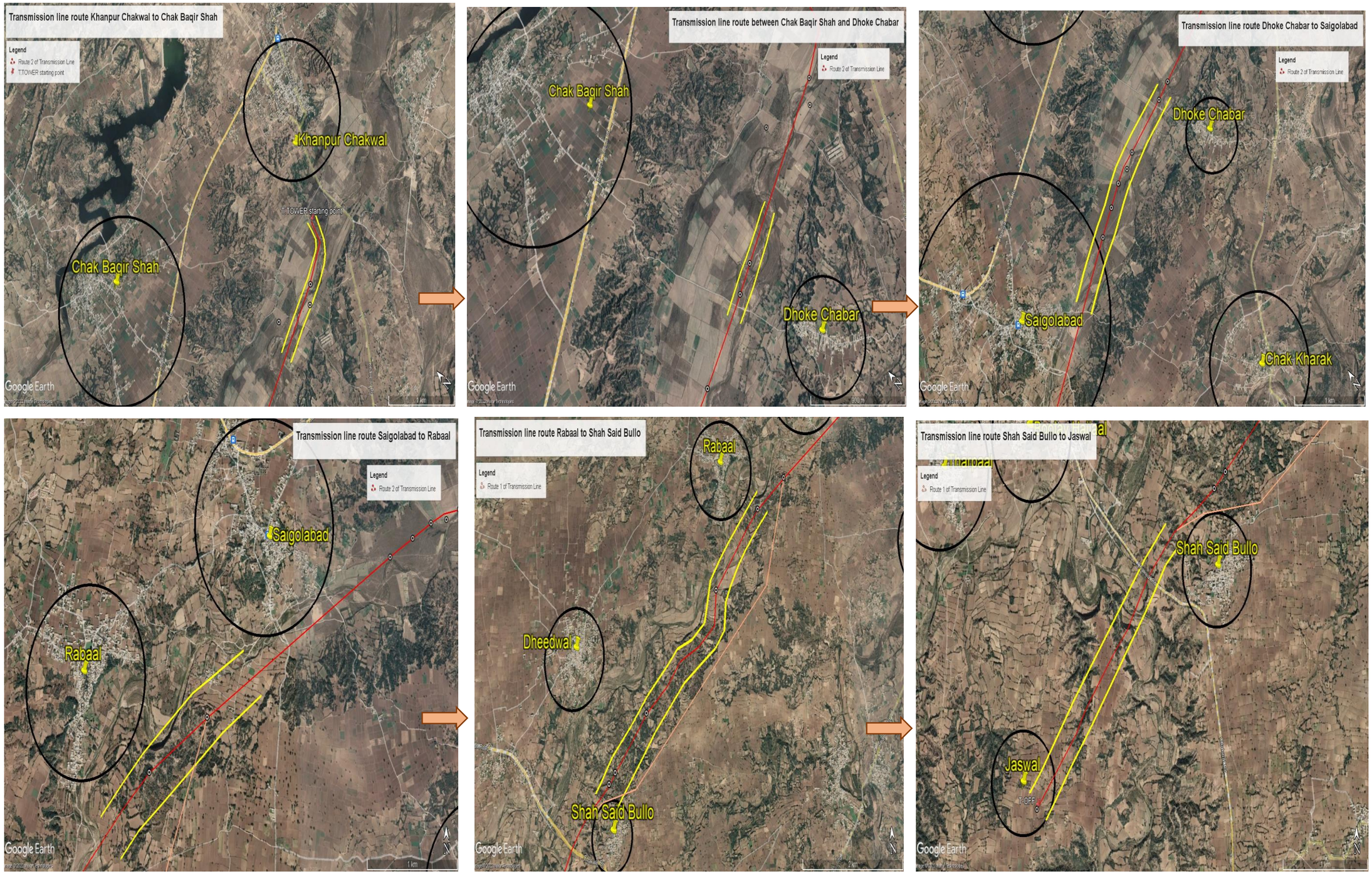


Figure 3.4: Transmission Line Route from Jaswal to Khanpur – 132 KV Grid Station Project



3.7 Cost and Magnitude of Project

The estimated cost of the proposed project is PKR**.** 1,110 million. The breakup of the cost estimates is provided below in **Table 3.3**.

Table 3.3: Estimated Cost of the Project

No.	Project Component	Tentative Cost in Rs (Millions)
1.	**New Grid Station at Khanpur, Chakwal, Khanpur, Chakwal**	
1.1	Transformer Capacity 02 x 20 MVA Power Transformer Transformer Bay 04 No. Line Bay 02 No. Line Bay 01 No. Capacitor Bay 02 No. Cost of electrical and installation Cost of civil works including contractor bid Departmental charges as 26%	660 million
2.	**New Transmission line**	
2.1	Length line 15 km Number of poles 65 Conductor Rail Cost of electrical equipment and installation Cost of civil works including contractor bid Departmental charges @ 26%	450 million
Total Estimated Cost of the Project (Million in PKR)		**1,110**

Source: *IESCO, 2022*

3.8 Project Activities Process Flow

3.8.1 Land Acquisition for Grid Station and Transmission Line

Land for Grid Station

The people of Khanpur, Chakwal have donated 40 kanal land on voluntary basis to IESCO for the construction of grid station. No displacement due to the allocation of this land for the grid station project will occur.

Land for Transmission Line

Government of Punjab in consultation with GSC department of IESCO, has allocated a fixed route from Jaswal to the proposed Khanpur, Chakwal Grid Station. The firstly proposed route for the transmission line was altered to avoid passing through agricultural land or living areas as much as possible. The communities living along the transmission line have been taken into confidence and will be paid as per The Telegraph Act, 1885.

Since the land for transmission line is mostly barren therefore, there is no issue of resettlement of the community due to the project. The compensation for the damage of infrastructure, crops, trees, etc. will be paid within one month of the damage caused due to the construction activities along the transmission line.

3.8.2 Construction Phase

A: Construction of New Grid station

The sequence of the activities which are carried out for the establishment of a new grid station is provided below:

- First of all, the location where the new grid station is to be established is identified. This is carried out based on the load on the existing feeders, load on the nearby existing grid stations, the trend of the load growth and future outlook of the area.
- After identification of the required location, availability of the land is determined. Usually, three candidate sites are identified at this stage. In order to make a final selection, a committee of concerned departments (usually GSO, GSC, planning, TSW, E&SS and operation) is constituted. The committee after thorough inspection finalizes the site for purposed grid station establishment.
- After taking over the land, the site is surveyed, and its contour plan is developed. Soil survey and geotechnical investigation are also carried out at this stage.

- The counter-plan and result of the above-mentioned investigations are sent to design department, which then prepares the detailed design of the grid station, including the civil design, construction drawings, and general layout plan along with equipment detail.
- Once the civil design is available, estimates are prepared, and approvals obtained from concern authority.
- Subsequent to the above, tendering and contract awarding is carried out for civil construction.
- Parallel to the civil works, the grid station equipment's (transformers, breakers, isolators, control panels, feeder and allied equipments) are obtained from the central stores.
- The equipment is handed over to GSC Department, who installs them once the civil works are completed.
- Once the installation is completed, the system will be tested jointly by the GSO and GSC Division.
- After the testing, the grid station is commissioned and put into operation.

The contractor will engage a staff of 50 persons. The estimated demand for water supply will be 10,000 gallons during the peak construction period and the contractor camp will generate a maximum of 0.25 tons of solid waste. In view of the extent of the works under the proposed project, IESCO's GSC directorate officials will work as supervision engineers, in order to ensure the quality of the construction, installation, and testing work.

B: Construction of New Transmission Line

The sequence of activities which are carried out for the laying of transmission lines and 11KV feeder are as follow:

- First of all, a reconnaissance site visit is carried out by the GSC Department in order to determine feasible routes for the transmission line.
- The fixed route marked on the map and sent to the Design Department.
- The Design Department approves the route.
- The GSC carries out detailed survey (plain tabling as well as profiling) of the approved route.
- The results of the detailed survey are sent to the Design Department.
- The Design Department prepares a detailed design.
- Material is procured after tendering.
- Tendering for the construction works is carried out and contract awarded.
- After the award of contract, the contractor mobilizes and establishes a camp/site office usually within the boundary of existing grid stations (depending on the availability of space).
- Construction activities are started by demarcating the pole locations. Temporary Right of Way (RoW) is required along the transmission line route to carry out the construction activities. Additional temporary RoW is required for the route to access the transmission line corridor/tower locations during the construction phase.
- Subsequent to the above, excavation for tower foundation is carried using appropriate machinery, such as excavator etc. In the hilly/rocky areas, blasting is also sometimes

needed for excavation. Once the excavation is complete, construction of the tower foundation is taken in hand and after that erection of tower is carried out followed by stringing of conductor and accessories (e.g. insulators, etc.) installation.

- After the completion of installation activities described above, testing is carried out. After that the line is commissioned and put into operation.

3.8.3 Restoration and Rehabilitation after completion of Project

The operation and maintenance (O&M) activities of grid stations and transmission lines are briefly described below.

A: Operation Activities

The grid stations are managed round the clock and important parameters (such as voltage, load and power factor) are monitored. Daily log sheets are filled, recording the key data. Any non-compliance is recorded and concerned departments are informed for taking remedial measures.

B: Scheduled Maintenance

- Checking/testing of transformers (discussed below)
- Testing of breakers
- Testing of the protection system
- Transmission line patrolling
- Washing/replacement of insulators
- Emergency Maintenance
- Locating the fault
- Carrying out repairs or replacements, as needed
- Restoring the system to the normal operating conditions.

Maintenance Procedure of Transformers

Power Transformer Repairs: The minor repairs for the power transformers are carried out at the grid stations. However, for the major repairs, the transformers are transported to HEC, Taxila.

Distribution Transformer Repairs*:* No field repair is allowed for the distribution transformers. If the transformers are damaged within two years of their delivery, they are returned to the suppliers. If damaged after this period, the transformers are sent to the Distribution Transformer IESCO Reclamation Workshop at Attock, Rajjar and Jhelum.

Transformer Oil Testing Procedure

The dielectric strength of the transformer oil filled in the power transformers is tested every year at the gird stations. For this purpose, a simple device called the oil testing set is used. The oil sample is taken out of the transformer and test performed. A record is maintained for these yearly tests. No action is taken if the test results are within the prescribed limits. However, if the dielectric strength of the transformer oil is found to be less than the allowable limits, the oil is replaced.

After every five years, more comprehensive testing is carried out for the transformer oil. Three oil samples are taken from each transformer and sent to the WAPDA's High Voltage and Research Laboratory in Faisalabad. At the Laboratory, the following tests are usually carried out:

- Flashpoint
- Viscosity
- Moisture
- Gas contents
- Dielectric strength

Transformer Oil Disposal Procedure

The transformer oil is mostly recycled in the transformer workshops. The unusable waste oil is disposed of through contractors. WAPDA procedures include a list of approved firms for the disposal of the used transformer oil. Assessment of the waste disposal practices in the transformer maintenance workshops was not included in the scope of the present study. The information given here is partly based upon the anecdotal sources.

3.9 Government Approval

Presently, the project is in the planning phase. However, all the required government approvals have been acquired by IESCO.

3.10 Project Time Schedule

The construction of 132 KV Grid Station and its Feeding Transmission Line will be completed in a period of 24 months (Two Years).

3.11 Alternatives considered and Reasons for Rejection

3.11.1 No Project Option

The electricity demand has been increasing during the past several years, and this trend is expected to continue as a result of the on-going economic uplift in the country. The key factors, increasing power demand include increasing population, rapid urbanization, industrialization, improvement in per capita income and village electrification.

In order to match the increasing trend in the power demand, regular investments in various segments of the power network - generation, transmission, and distribution is vitally important. Otherwise, the gap between the supply and demand will keep on increasing in future.

The proposed project seeks to upgrade the secondary transmission and grid network of the IESCO system in Khanpur, Chakwal District. The establishment of new grid station will provide the much-needed relief to the existing over-loaded system, while also accommodating additional load in future. The new grid station will also reduce the line losses and power breakdowns, thus also resulting in the reduction of financial loss of IESCO.

In case the proposed project is not undertaken, the IESCO system will not be able to cope with the increasing demand in future, the existing system will remain over-loaded, line losses will also remain high, and the system reliability will progressively decrease, with increasing pressure on the system. The Utility will also forego the opportunity of increasing its consumers as well as revenue associated with the system expansion.

In view of the above, the 'no project' option is not a preferred alternative.

3.11.2 Site Alternatives

a. Site for Khanpur, Chakwal Grid Station

The locals of Khanpur have allocated a piece of land measuring 40 Kanals in Khanpur, Chakwal for the construction of grid station and its feeding transmission line.

The proposed project site has no vegetation, except for a few shrubs. A seasonal nullah passes along the south of the project site at a distance of 230 m.

b. Transmission Line Route

A reconnaissance site visit was carried out by the GSC Department in order to determine feasible routes for the transmission line. During initial screening two routes were selected named in the figures as route 1 and route 2.

The route 1 selected for transmission line was later rejected and route 2 was selected as route 1 was passing through agricultural lands even where that could be avoided specifically from Rabaal till Dheedwal. Thus, in order to cause minimum disturbance to flora fauna and local communities by the transmission line, route 2 was selected. Basic considerations including land use, ecological environment and nearby settlements were taken in account while selecting the route for the transmission line. Damages along the route have been discussed in section **3.6.2.**

3.11.3 Technical Alternatives

a. Type of Grid Station

Generally, two types of grid station designs are available, these are:

- Gas-insulated
- Air Insulated (Conventional)

Gas Insulated Grid Station: The Gas Insulated Stations (GIS) employs a very compact design, and most of the equipment is fully enclosed and gas-insulated. This allows the entire system to be placed indoors in considerably small space compared to the conventional design. However, the cost of this grid station is several times higher than the conventional one.

Air Insulated / Conventional Grid Stations: The air-insulated grid stations have open yards for transformers and their accessories, and the control panels and feeder panels are placed indoors.

In view of the fact that the cost of Gas Insulated Station is higher. Hence, the conventional grid station design is the preferred option for the proposed project.

b. Type of Circuit Breakers

Generally, three types of circuit breakers designs are available, these are:

- Oil-filled circuit breakers
- SF-6 circuit breakers
- Vacuum circuit breakers

Traditionally, oil-filled circuit breakers used to be installed at the 132-KV and 11-KV levels. The environmental aspects of the oil-filled circuit breakers essentially pertain to the soil and water contamination caused by the possible oil leakage.

However, now SF-6 circuit breakers are available for 132-KV and above, and vacuum circuit breakers are available for the 11-KV system. These breakers have very effective arc-

quenching characteristics, compared to the old oil-type breakers. Therefore, these modern circuit breakers are the preferred option for the proposed project.

c. Type of Transformer Oil

Traditionally, transformer oil - meant for providing insulation and cooling of the transformer windings - used to contain polychlorinated biphenyls (PCB), a man-made chemical known for its excellent dielectric properties. However, this chemical was then found to be highly toxic, and more importantly, chemically very stable. Hence this chemical would not decompose or disintegrate naturally. Due to this property of PCB, it was included in a group of chemicals collectively known as persistent organic pollutants (POPs).

The manufacture and procurement of PCBs containing transformers are banned in Pakistan since 2002. However, the old transformers which already exist in the power distribution system may have PCBs contaminated oil. IESCO has disposed of 78,000 liters of PCB contaminated oil in collaboration with MOCC and UNDP. The UNDP collected, transported and incinerated the PCB contaminated oil in Bestway Cement Factory, Chakwal in an environmental friendly manner. In replacement the UNDP provided 79000 liters of PCB free oil to IESCO in 2020-2021.

IESCO's specifications for the procurement of transformers clearly mention that the transformer oil should be PCB-free. The equipment purchased as part of this project would be PCB-free.

d. Type of Transmission Line Towers

Single Circuit vs. Double Circuit

For the 132-KV transmission line, there are two possible options for the type of the towers: single circuit and double circuit. The single circuit towers are designed for one circuit of the transmission line only, and there is no room for the second circuit in the future. On the other hand, using the double circuit towers provides the future expansion capacity on the same towers. The cost of the double circuit towers is slightly higher than the single circuit variants, however, in view of their expansion capacity, greater reliability, enabling transfer of more power over a particular distance, double-circuit towers are the preferred ones in this project.

Tower vs. Tubular Pole

The base of the transmission line towers is about 10m^2, and finding this much space in congested urban areas may be a problem. For such applications, WAPDA/IESCO has been using tubular steel poles which require considerably less space. Since the current project is in a rural area, therefore there is no issue of space, which is why, the conventional towers will be preferred. **Figure 3.6** & **3.7** show typical tower and Korean tubular pole respectively. The environmental and socio-economic aspect of the tubular pole includes a smaller footprint, compared to the conventional tower.

The transmission line route is along seasonal drainage nullah, barren land and agricultural fields and mostly and away from settlements. Therefore, for this transmission line, the preferred option would be to use the tower poles as there is no issue of space for the tower base, which is 10 sq-meters.

3.12 Current Land Use of the Project Site

The 132 KV Grid Station project site is on communal barren land with very limited infrastructure or agricultural activities currently going on.

The transmission line passes along seasonal drainage nullah, except for a few parts of agricultural lands in Saigolabad, Rabaal and Thirpal. No human habitat or considerable vegetation are present along the ROW. However, there is seasonal drainage flowing parallel to the transmission line route.

3.13 Vegetation Features of the Site

The proposed project consists of two main components, the grid station and its feeding transmission line. The site for the construction of grid station consists of only few shrubs.

The type of vegetation varies along the route of the transmission line. Starting from Jaswal, where the first tower will be installed there is agricultural land in all directions.

Furthermore, the transmission line passes along Seasonal drainage nullah for the most part, there is no major vegetation in the vicinity. The route also passes through agricultural land from Thirpal up to Saigolabad with barren land in between these areas. No trees will be cut down along the route.

Figure 3.5: 132 KV Conventional Tower (Proposed)

Figure 3.6: 132 KV Korean Tubular Pole

Figure 3.7: Pictorial view of the Project Site

Exhibit 1: Access Road to Project site via Khanpur Road

Exhibit 2: Grid Station Project Site

Exhibit 3: View of the Project Site

Exhibit 4: Access to Project Site from Khanpur Road

Exhibit 5: A view of Khanpur village access road

Exhibit 6: View of Choa Saidan Shah Road

Exhibit 7: Flora nearby project site

Exhibit 8: Domestic Goats in nearby settlement (Grid Station)

Exhibit 9: Transmission Line Route area near Saigolabad

Exhibit 10: Agricultural land in the vicinity of TL Route

Exhibit 11: Flora in the vicinity of the project site

Exhibit 7: Tube Well in the vicinity of the Project site

4 Description of the Environment

4.1 Introduction

This Chapter describes the existing environmental and socio-economic conditions of the project area. The project site is 40 Kanals for Grid Station and the 15 km transmission line. The project area is the area falling within 2-3 km radius of the Project Site.

4.2 Khanpur, Chakwal

Chakwal District is in Potohar Plateau of the Punjab province covering an area of 6525 sq.km. Lying at 33°40′ North latitude and 72°51′ East longitude, Chakwal is located at a 1-hour and 30 minutes' drive from the Capital of Pakistan Islamabad, and 3-hours and 30 minutes' drive from the heart of Punjab Lahore. Chakwal district is bordered by Khushab to its south, Jhelum to its east, Rawalpindi to its north east, Mianwali to its west and Attock to its north west.

In 1985, the district was established from portions of Jhelum and Attock. It is known for providing a large number of soldiers to the British and later to the Pakistan armed forces due to which it is also known as the Military Valley. Katas Raj Temple, Swaik Lake, Chinji National Park and Kallar Kahar are some of the famous sites located in Chakwal District. Its population is 1,495,982 according to 2017 census.

During British rule, Chakwal was a tehsil of Jhelum district. It contained the towns of Chakwal and Bhaun and 248 villages. The predominantly Muslim population supported Muslim League and Pakistan Movement. After the independence of Pakistan in 1947, the minority Hindus and Sikhs migrated to India while the Muslims refugees from India settled down in the Chakwal District.

Chakwal city is district headquarter of Chakwal. It is also the administrative centre of Chakwal tehsil (a subdivision of the district). The Chakwal district is divided into five tehsils, namely, Kallar kahar, Choa Saidan Shah, Talagang, Lawa and Chakwal. The city of Chakwal itself is divided into five Union Councils: and Chakwal district is divided into 68 union councils. Khanpur is a village located south-east of Chakwal city in District Chakwal.

4.3 Physical Environment

4.3.1 The Topography

The topography of the project area is totally flat with mild slope from North to South. It is located 90 kilometres south-east of the federal capital, Islamabad and 270 kilometres from the provincial capital, Lahore. The soil of the area is fertile. The soil in the project area is rich alluvial loam.

Geographically placed in the Salt Range and the Potohar Plateau, the physical features of Chakwal are typical of the region. The south and southeast is mountainous and rocky, covered with scrub forest, interspaced with flat-lying plains; the north and northeast consist of softly undulating plains, with patches of rocky areas, known as Khaddar in the local dialect, ravines and gorges, and some desert areas.

Chakwal is mainly a Barani area. There are no irrigation canals or rivers. The only major rivulets and seasonal channels that run through Chakwal are the Soan and the Soj Nullah. A number of small dams have been constructed in the district through which some irrigation takes place. There are some stormwater channels, which are most active during the rainy season.

The project site is flat land with a seasonal passing 230 meters south of the project site.

4.3.2 Geology and Soil Texture

Chakwal district borders the districts of Rawalpindi and Attock in the north, Jhelum in the east, Khushab in the south and Mianwali in the west. The total area of Chakwal district is 6,609 square kilometres, which is equivalent to 1,652,443 acres (6,687.20 km2).

The southern portion runs up into the Salt Range and includes the Chail peak, 3,701 feet (1,128 m) above the sea, and the highest point in the district. Between this and the Sohan river, which follows more or less the northern boundary, the country consists of what was once a fairly level plain, sloping down from 2,000 feet (610 m) at the foot of the hills to 1,400 feet (430 m) in the neighbourhood of the Sohan; the surface is now much cut up by ravines and is very difficult to travel over.

Most of the soils in District Chakwal range from silt loam to loam with PH ranging from 7-9. The bulk density and hydraulic conductivity are 1.35 3 gm/cm and 16.6 cm/day respectively.

4.3.3 Hydrogeology

The quantity of water in the city is low, and aquifer - sub-soil water level is too deep, making installation of hand pumps or shallow pumps not practicable. There are very few hand pumps. The water found in most of the places is chemically hard. There are very few sweet (soft) water wells either in homes or in and around the city, which is not enough to provide even drinking water to the residents.

The subsoil consists of cohesive clay mixed with gravels & broken rock fragments. No alluvial deposits seem to occur except for some small strips created by natural hill torrents flowing for centuries. No aquifers are available in the subsoil except for some confined layers bearing water in small quantities, recharged by precipitation. Such water dries out with continuous pumping. The water table depth in the city varies from 40 to 60m due to undulating topography itself.

4.3.4 Seismicity

According to the seismic zoning map of Pakistan, the Project Area lies in Zone 2B on the intensity scale, i.e. minor Probabilistic seismic hazard having a peak horizontal ground acceleration of 0.16 to a 0.24g assessment recently carried out for Chakwal area as part of the revision of Seismic Provisions of the Building Code.

4.3.5 Surface Water

Chakwal is a water deficit area and transmission of water from outside the city is very costly. Hence it is difficult to meet the criteria of maximum day demand due to the high cost of pumping against gravity

The quantity of water in the city is low, and sub-soil level is too deep. The water supply scheme started with the construction of Dhok Talian and Khokhar Zer small dams in 1972. The rainwater is collected in these cement reservoirs 27 kilometres away from Chakwal, pumped to village Waryamal where it is treated and then supplied in the city. But people still prefer to buy sweet well water for drinking at the rate of two rupees per 18-liter can. Or women fetch water in large containers on their head. The pressure in supply lines is never enough. People have installed motor pumps in their homes to suck water to fill their own containers when supply is opened at different timings. Hawaiians still are living under strict water discipline permanently.

At present, the area is under water stress conditions due to low rainfall and extensive deforestation. There are a number of famous lakes like Kallar Kahar, Uchali, Khabeki and Jhallar having problems of water quality and storage area. The only major rivulets and seasonal channels that run through Chakwal are the Soan and the Soj Nullah. There are some stormwater channels, which are most active during the rainy season.

A small number of small dams have been constructed in the district, which irrigate a small acreage of cultivated land through water channels are Khokhar zer dam, Surrlah dam, Dhurnal dam, Ghurab dam, Wallana dam, Nikka dam, Bughtal dam, Dhoke Qutb Din dam, Kot Raja dam, Pira Fathial dam and Khanpur Dam.

4.3.6 Ground Water

Groundwater table in Chakwal lies in the range of 40 to 60m. Groundwater use in district Chakwal is of fundamental importance to meet the rapidly expanding drinking and agricultural water requirements. The main factors contributing to groundwater recharge in Chakwal are rainfall, evapotranspiration and geology. Due to the semi-arid climatic conditions of the area, this resource is almost the only key to economic development.

There are a number of dug wells in the area where water is getting stored during the rainy season. Sources and processes of recharge in humid areas are different compared with semi-arid areas. Due to the main source of available water in the area, the potential groundwater recharge estimation could be a good exercise to visualize the amount of rainwater entering the ground. The average potential recharge estimated is 60% of the rainfall of 148 mm. Potential recharge values were higher for an area having grassland type vegetation and low for an area covering shrubs and thick vegetation.

The main source of water at the project site and surroundings is ground water. Bore wells and tube wells are used to get water from ground. A chemical analysis test of the ground water in the project site was conducted. The samples of ground water were collected on 7th December 2022 and were received by the SEAL on 8th Dec 2022 for analysis. The analysis revealed that all the values were within the permissible limits. Total coliforms as well as fecal coliforms were not detected in the groundwater.

Table 4.1: Chemical Analysis of Ground water at the project site

Sr. No.	Parameter	Method/Equipment	Unit	Result	PEQS
1	pH	APHA 4500-W B	--	7.54	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA2540 C	mg/1	587	1000
3	Chloride	4500- APHA er B	mg/1	127.96	250
4	Fluoride	APHA 4500-F D	mg/1	0.43	1.5
5	Taste	APHA 2120 B	Object. /unobj.	Unobject.	Unobject.
6	Odour	APHA2120 B	Object. /unobj.	Unobject.	Unobject.
7	Colour	APHA 2120 B	TCU	0.5	15
8	Nitrate (as NO3-)	APHA 4500-NO3-E	mg/1	BDL	50

9	Nitrite (as No2·)	APHA 4500-Noi-B	mg/1	BDL	3
10	Lead	APHA-PbB	mg/1	0.01	0.05
11	Total Hardness as CaCO3	APHA2340 C	mg/1	338.52	500
12	Turbidity	APHA2130 B	NTU	1.32	5
13	Zinc	APHA 3500-Zn B	mg/1	0.82	3
14	Aluminum	APHA 3111 D	mg/1	0.18	0.2
15	Chromium	APHA 3500-Cr B	mg/1	0.012	0.050
16	Cadmium	APHA 3500-Cd D	mg/1	BDL	0.01
17	Copper	APHA 3500-Cu C	mg/1	0.07	2
18	Boron	APHA 4500-B C	mg/1	0.014	0.300
19	Barium	APHA3111 B	mg/I	0.021	0.700
20	Antimony	Af'HA 3114,C	mg/1	0.006	0.020
21	Arsenic	APHA3114C	mg/1	0.063	0.050
2?	Cyanide	APHA 4500-Cn D	mg/1	0.012	0.05
23	Mercury	APHA 3112	mg/1	BDL	0.001
24	Nickei	APHA 3111 B	mg/1	0.005	0.020
25	Residual Chlorine	APHA 4500-Ch	mg/I	0.35	0.2 - 0.5
·26	Total Coliform	· -APHA 9222 B	Number/l00ml	0	0/100 ml
27	Thermo Coliform	APHA9222 B	Number/100ml	0	0/100 ml
28	E.coli	APHA9222 C	Number/100ml	0	0/100 ml

4.3.7 Climate

Chakwal lies in the subtropical region, and its climate is typical of the area, with the exception that it varies a little on the cooler side, owing to its elevation, from central Punjab. Winter temperatures normally range between 3° C and 25° C, and summer temperatures average between 15° C and 40° C and may go up to a maximum of 15° C. June is the warmest month of the year. The temperature in June averages 32.5 °C. January is the coldest month, with temperatures averaging 10.5 °C.

Chakwal lies within the monsoon range, and apart from occasional rainfall, there are two rainy seasons: the first, caused by the monsoon winds originating from the Bay of Bengal, begins from 15th of July and continues up to around the 15th of September; the second, caused by Mediterranean winds lies in the last two weeks of December and the first two

weeks of January. The driest month is November, with 7 mm of rain. Most of the precipitation here falls in August, averaging 133 mm.[1]

Table 4.2: Mean Monthly Meteorological Representation of Chakwal

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Avg. Temperature °C (°F)	10.4 °C	12.9 °C	18.1 °C	24 °C	29.5 °C	31.5 °C	29.4 °C	28.1 °C	26.9 °C	23.5 °C	17 °C	12.2 °C
Min. Temperature °C (°F)	5.1 °C	7.3 °C	11.9°C	17.2 °C	22.3° C	25.3 °C	25°C	24.3° C	22.4 °C	18.1°C	11.5 °C	6.7 °C
Max. Temperature °C	16.5°C	18.8 °C	24.2°C	30.4 °C	36 °C	37.1 °C	33.°C	32.2C	31.6 °C	29.3°C	23.3 °C	18.8 °C
Precipitation / Rainfall mm (in)	40 (1)	76 (2)	85 (3)	66 (2)	30 (1)	64 (2)	184 (7)	179 (7)	84 (3)	31 (1)	23 (0)	22 (0)

Source: climate-data.org

Table 4.2 shows the temperature and rainfall patterns of Chakwal in 2021 for all months. There is a difference of 126 mm of precipitation between the driest and wettest months. Throughout the year, temperatures vary by 21.1 °C.

4.4 Ambient Air Quality Monitoring

The ambient air quality monitoring was conducted for Punjab Environmental Quality Standards (PEQS) for Sulphur oxides (SOx), Oxide of Nitrogen (NOx), Respirable Particulate Matter (as PM10) and Carbon Monoxide (CO) during 24 hours at the project site.

The noise level monitoring was conducted for 24 hours at the project site of Khanpur, Chakwal Grid Station.

The ambient air quality and noise monitoring were carried out by Punjab EPD approved laboratory of SEAL, Lahore.

Ambient Air Quality Monitoring

Sulphur oxide (SO_x): Sulphur dioxide (SO_2) is a colourless, poisonous gas with a strong odour and mostly present in Coal and petroleum containing Sulphur compounds.

The 24h average concentration of SO_x at the monitoring site was 44.5 µg/m^3 which is in compliance with the PEQS (120 µg/m^3) of Pakistan.

The SO_x concentration levels are well below the PEQS limits at the project site as there is no industrial activity or heavy traffic near project site or in surroundings.

Nitrogen oxide (NOx): Nitric oxide (nitrogen oxide, nitrogen monoxide) is a molecular, chemical compound with a chemical formula of NO. One of several oxides of

[1] https://en.climate-data.org/location/1308/

nitrogen, it is a colourless gas under standard conditions. It is also produced naturally by the extremely high air temperatures produced along the path of lightning in thunderstorms.

Nitric oxide should not be confused with nitrous oxide (N_2O), anaesthetic, or with nitrogen dioxide (NO_2), brown toxic gas and a major air pollutant, the latter being a product to which nitric oxide is rapidly oxidized in air.

Nitrogen dioxide (NO_2) is a light brown gas that can become an important component of urban haze. It is likely that oxides of nitrogen are the second most abundant atmospheric contaminants in many cities, ranking next to Sulphur dioxide; while in rural settlements, the concentration of NO_2 is low as compared to the urban settlements.

Nitrogen oxides usually enter the air as a result of high-temperature combustion processes, such as those occurring in automobiles and power plants.

The primary sources of nitrogen oxides (NO_X) are motor vehicles and thermal power generation. The averaged (24h) concentration of NOx (29.4 µg/m^3) remained in compliance with PEQS (80 µg/m^3) at the ambient air quality monitoring site**.**

NOx concentration levels are within the PEQS limits and well below the maximum permissible limits as per Punjab Environmental Quality Standards. There are no such industries releasing gaseous emissions near the project site and vehicular emissions are negligible as well.

Particulate Matter: Particulate matter (PM) is a solid matter from smoke, dust, fly ash, or condensing vapours that can remain suspended in the air for a long period of time. PM_{10} means the particulate matter is having an aerodynamic diameter of 10 micrometres while $PM_{2.5}$ means the particulate matter is having an aerodynamic diameter of 2.5 micrometres or less. Particulates include an array of atmospheric materials, carbon-based matter such as soot, ashes, windblown dirt, sand, soil dust, metals, and plant matter such as pollens. The composition of particulate matter varies with the place, season and weather conditions.

Fine PM can be sulfates, nitrates, organic matter (organic carbon compounds), elemental carbon (soot), and soil dust (crustal materials). The averaged (24h) concentration of PM_{10} (128.8 µg/m^3) remained in compliance with PEQS (8250µg/m^3) at the ambient air quality monitoring site**.**

PM_{10} concentration levels are within the PEQS limits and well below the maximum permissible limits as per Punjab Environmental Quality Standards.

Carbon monoxide (CO): Carbon monoxide is an odourless, colourless and highly poisonous gas that has its major origin in the incomplete combustion of carbonaceous materials. Although industrial processes contribute to CO pollution levels, however, the principal source of CO is automobiles.

The averaged concentrations of CO at the project site were found to be 3.97 mg/m^3 which is within the PEQS (i.e., 10 mg/m^3).

The SO_2, NO_x, $PM_{10,}$ and CO concentrations meet the PEQS limits.

4.4.1 Noise Level Monitoring

Ambient noise levels were also continuously recorded at the project site for 24 hours. The sound pressure level (dB) were frequency weighted on A-curve (dB (A)) and time-weighted (dB (A) L_{eq}) on an hourly basis.

The 24 hour monitoring period for noise with a one-hour interval is divided into two periods, i.e. daytime hours and nighttime hours. The project site is located in a rural area and nearest population is atleast 800 meters away.

The noise level data for daytime was 55.63 dB(A) and 44.65 dB (A) at night time. The average sound level was noted as 52.5 dB for the 24 hours period. The Noise level measured at the project site was within the PEQs limits that is 65 dB(A) for the day and 55 dB(A) for the night.

Conclusion of ambient air quality and noise level monitoring

The ambient air quality monitoring was carried out for 24h from December 7, 2022, to December 8, 2022.

The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure-7**.

The SO_x, NO_x, PM_{10}, CO concentrations meets the PEQS limits. A summary of ambient air quality and noise levels results are given in **Table 4.3** below:

Table 4.3: Summary of Ambient Air Quality and Noise Results at the Project Site

Parameter	Averaging Time		PEQS	Unit	Concentration at the Project Site
Sulphur Oxides (Sox)	24 h		120	µg/m^3	44.5
Nitric Oxides (NOx)	24 h		40	µg/m^3	29.4
Particulate Matter (PM_{10})	24 h		150	µg/m^3	128.8
Carbon monoxide (CO)	24 h		5	mg/m3	3.97
Noise	Day-time	6:00AM - 10:00PM	55	dB(A)	55.6
	Night-time	11:00 PM- 6:00AM	45		44.6

4.5 Ecological Environment

The project area falls in the Northern Punjab Province of Pakistan and comprising mostly the agricultural lands along with scrub forests and wild strips of wild vegetation upon wastelands and the margins of the agricultural fields. These areas are rich in biodiversity due to the presence of multiple habitats including scrub forests, seasonal & permanent streams having various types of vegetation and seasonal wetlands/ponds.

4.5.1 Habitat

The project area is quite rich in bird species, including Black partridges, and grey partridges. In addition, some of the areas are also known as a habitat for raptors /birds of prey particularly during the winter season. Like other areas of Punjab, the breeding season of this region is the month of March-April while shooting season during winter is from November till the start of February.

The wildlife of these areas includes Black partridge and Grey partridge. Among mammals, the presence of Black-naped hare, Indian crested porcupine, Asiatic jackal and Indian wild boar was recorded.

4.5.2 Seasonal/permanent stream beds/Wetlands

The other important habitats recorded in the form of seasonal as well as permanent streams, mostly dry stream beds which take the rainwater from watersheds to low lying plains of the project area. The water accumulation sites were having grasses and sedges including Acacia modesta, Ziziphus nummularia, Saccharum spontaneum, Typha latifolia, Phragmites karka, Schoenoplectus littoralis etc. Typha latifolia was also found in and along the water ponds. Bushes of different plant species were also observed along the Seasonal drainage nullah stream.

4.5.3 Agricultural Lands and Human Settlements

Another important, major and established component of the study area is occupied by agricultural fields and human settlements. Although, the land holdings are small in the province, however, in district of Chakwal, big land holding was also observed by some of the landlords. The old buildings, houses and agricultural fields are planted with fruit and ornamental trees. In most of the areas, agriculture is rain-fed (barani), and some small patches are irrigated from tube wells. In cultivated crops, Wheat, Oilseed crops and fodders were observed.

The agriculture fields and human settlements are not very rich in avifauna. Mostly those species are recorded that have adopted the human inhabitation and depend upon agricultural produce or domestic waste. The crop patterns and harvesting seasons also influence the distribution of birds. The birds noted in agriculture areas are a Grey partridge, Common Mena, House crow, House sparrow, Collared dove, Little brown dove and Red-vented Bulbul. The trees planted on margins of agriculture fields provide shelter and roosting places to the birds including raptors which were recorded during field visits.

4.5.4 Flora

Dominant Species

In the study area, vegetation is dominated by Acacia modesta, Ficus religiosa, Melia Azedarach and Dalbergia sissoo.

These trees were also observed along the margins of agricultural fields. In the agricultural fields around the proposed project site, wheat and fodder crops were cultivated. Mustard crop was also grown in large area in the vicinity of the transmission line.

Rare or Endemic Species

No endemic or rare plant species were recorded during the field visit. All species have a wide range of distribution in other ecological zones of the country, especially at other locations of Punjab province in general and in similar habitats of target district in particular.

A complete list of Vegetation observed/reported in the project area along with their status and international recognition can be seen in **Annexure-8.**

Fauna

The species which exist in various areas of Chakwal district are: Grey partridge which are found all over the district, especially in areas, which are sparsely populated, Black partridge found along the seasonal channels and water holes in the bellas throughout the district, Chakore mostly found in dry rocky areas in the district especially in the Choa Saidan Shah

area, See partridge are found at a number places in the district in the dry rocky area especially in the Kallar Kahar mountain belt leading into subdivision Talagang.[2]

Birds

There are a total of 121 avian species have been recorded from project areas during all field visits. Out of total recorded species, 89 are resident of Punjab and 32 are migratory species. As far as, their abundance is concerned, 69 species are common, 34 are abundant, 12 are less common, and six are rare species.

Out of the total 121 recorded avian species, 19 species are protected under the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974 (Amended 1991), three are on IUCN Red list, four are covered by CMS, whereas 17 are listed on CITES appendices. A complete list of bird species observed/reported in the project area along with their status and international recognition can be seen in **Annexure-8**.

Mammals

There are 24 mammalian species have been recorded from project areas. Out of these 7 are protected under the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974 (Amended 1991), two species are on IUCN Red List, and seven are listed on CITES appendices due to demand for international trade. A complete list of the mammalian species observed/reported in the project area along with their status of recognition can be seen in **Annexure-8**.

Reptiles

There are a total of 20 reptiles in the project area/Chakwal. So out of these 20 species, 10 belong to lizards and the same number of snake species. Out of total recorded species, 9 are protected under the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974 (Amended 1991), while 6 are listed in CITES appendices. A complete list of the reptilian species observed/reported in the project area along with their status and international recognition can be seen in **Annexure-8**.

Species of Concern/Species of Interest

From the observations of current project sites, none of the wildlife species including birds, mammals and reptiles may be categorized as species of concern. The game birds like Black partridge, and Grey partridge, may be considered as species of interest for shooting during the winter season.

Protected Areas/National Sanctuaries

There are no of sanctuaries including Balkassar Bear Sanctuary, established in 2010 by Fakhar Abbas of WSPA (now known as World Animal Protection), is an animal sanctuary in Balkassar, Chakwal District, Punjab, Pakistan. The sanctuary provides a retirement and rehabilitation home, and veterinary care for rescued bears from bear-baiting events. It houses the endangered species of Asian black bears and Himalayan brown bears. Balkassar Bear Sanctuary also has ornithology and herpetology research stations. In Chakwal several areas of land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. There are no protected areas near the proposed site.

[2] http://www.pakbs.org/pjbot/PDFs/41(2)/PJB41(2)529.pdf

Figure 4.1: Pictorial Presentation of Floral Species at Project Area

Exhibit 1: Wild grass vegetation at project site

Exhibit 2: fields in vicinity of transmission line

Exhibit 3: Shesham tree at project site

Exhibit 4: Eucalyptus tree along TL route

Exhibit 5: Phulai in vicinity of project site

Exhibit 6: Dhrek trees nearby project area

The proposed transmission line will pass along the Seasonal drainage nullah.

- **Protected Areas and Reserved Forest**

The dominant floral species are Phulai (Acacia modesta), Kikar (Acacia nilotica), bhekarh (Adhatoda vasica), Lantana camara, Sukh Chain (Pongamia pinnata) and Ber (Zizyphus nummularia), Bhang (Cannabis sativa), Kana (Saccharum munja) and Cymbopogon jwarancusa.

List of Flora and Avi-Fauna has been provided in **Annexure-8.**

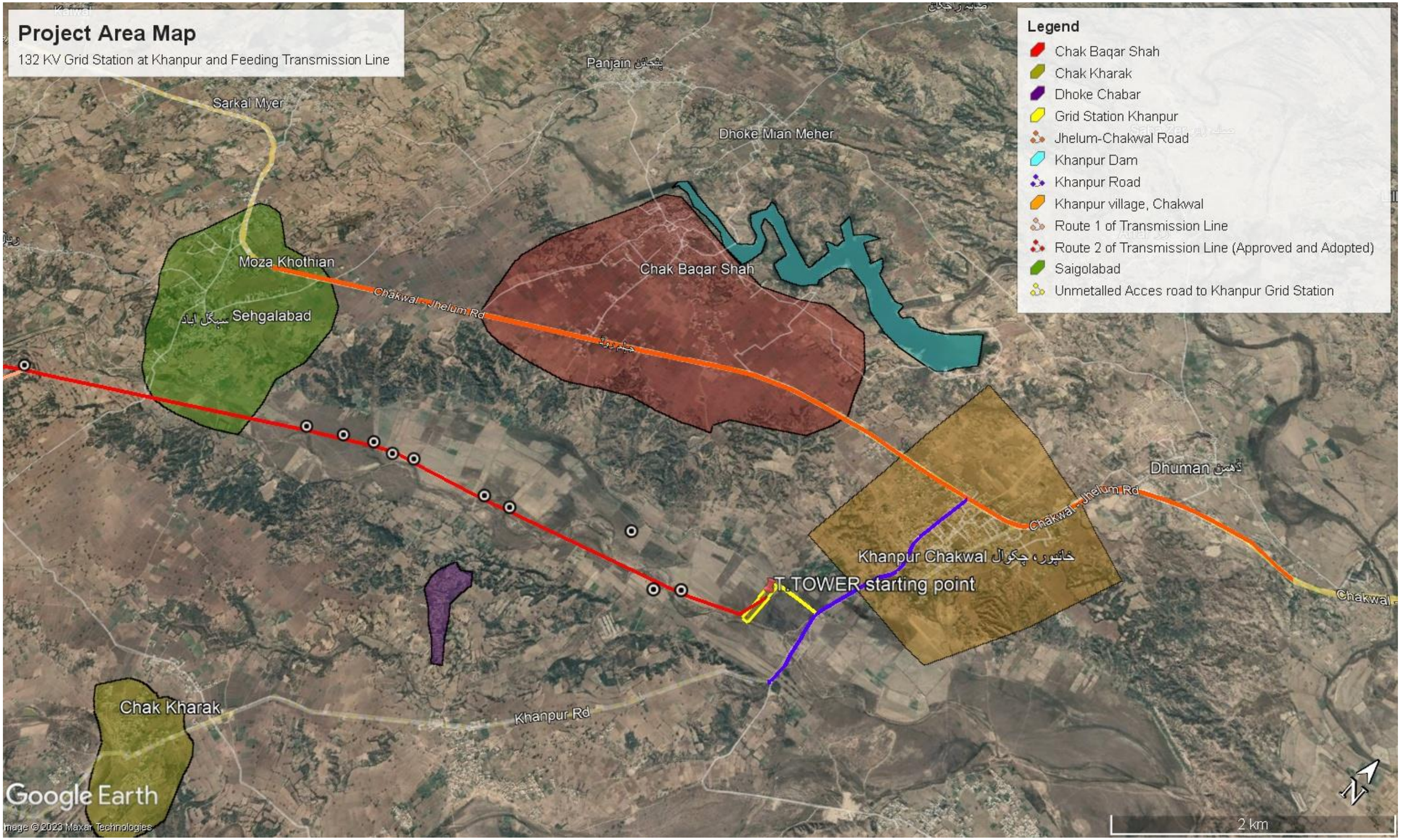
4.6 Quality of Life Values/ Socio Cultural Environment of the Project Area

Following are the details of the present socio-cultural and socio-economic conditions of the localities around the project site. These are the localities which may get direct positive or negative impacts from the construction of Khanpur, Chakwal Grid Station.

4.6.1 Villages in the Vicinity of Grid Station Site

Several villages are located along the project corridor. These villages were visited to establish village profile. **Figure 4.10** shows the description of the project site. The details are elaborated as below:

Figure 4.2: Description of the Project Area



a. Khanpur, District Chakwal

Location: It is located around 23 kilometres from Chakwal, the district capital, and about 42 kilometres from the M2 motorway. It runs parallel to Sohawa-Chakwal Road and via Dhok Talian Link Road, links Choa Road to Sohawa-Chakwal Road. Populated towards the north-east of the grid station site, the village is where the project site is located. The village is located 500 m from the project site.

Demographics: Khanpur village is home to an estimated population of 4,655 inhabitants; comprising of 775 households, living in Pakka and Semi-pakka houses with good construction with an average household size of 6.

Ethnic Structure: The ethnic structure of Khanpur village is diversified with casts of Raja, Mirza and Malik.

Agriculture: Khanpur village has sufficient agricultural land and fertile enough to support the growth of crops like Wheat, Pulses, Maize, Bajara and Jawar. Due to the unavailability of a proper irrigation system, the people here depend on groundwater for agricultural purposes.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 170-200m.

Livestock and poultry Development: People of Khanpur villages like any other village of Chakwal, prefer to keep buffaloes and goats. Few of the people are associated with poultry and dairy farming as well.

Transport/Communication: The village is located besides Chakwal-Jhelum Road connecting the village to Chakwal city and nearby villages. The road is well constructed, providing the residents' easy access to public transportation.

Education: Educational facilities include 01 government college for girls and 01 Madrassa and 03 Mosque as institutional facilities; which are also benefiting the students from nearby villages.

Health Care: There are no government or private medical facilities available in the village. One family health clinic provides limited medical services to the villagers. People travel to Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells privately.

Employment: A decent part of the population is in government jobs and the people living in the village are mostly associated with agriculture and a few are affiliated with business.

Cultural Heritage: The population of Khanpur village is Muslim by faith. There are three mosques, one madrassa and a graveyard. No archaeologically significant site was found during the field visit.

Other Facilities: The village offers limited facilities for its inhabitants. Electricity, mobile phones service are some of the facilities available here with no supply of natural gas.

4.6.2 Villages in the Vicinity of Transmission Line

a. Chak Baqir Shah

Location: Chak Baqir Shah is located 2.0 km to the north-west of the Khanpur, Chakwal grid station site and 1.9 km to the west of transmission line route.

Demographics: The population of Chak Baqir Shah is around 4,853 people with 800 households and average household size of 6 persons. The houses are well constructed with pakka and semi pakka structures.

Ethnic Structure: The people of Chak Baqir Shah belong to the casts of Gujjar and Rajpoot with two common languages, i.e., Urdu and Punjabi.

Agriculture: The land composition in the village is quite similar and bear the same type of crops and fruit trees and vegetables. The main crops grown are Wheat, Pulses, Maize, Bajara and Jawar.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 170-200 m.

Livestock and poultry Development: People in these villages like any other village of Chakwal, prefer to keep buffaloes and goats as livestock.

Transport/Communication: The village is connected to Chakwal-Jhelum Road through 3 Katcha link roads.

Education: Educational facilities include 04 mosques and a private school. Students from neighbouring villages are also facilitated here.

Health Care: There are no government medical facilities available in the village, except for a family welfare centre and a private hospital with limited facilities. People travel to Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population is associated with agricultural activities, a few are overseas employees and a fair part of the population is into small businesses, private and government jobs in the cities.

Cultural Heritage: Islam is the religion followed by every member of the village. There is one Jamia mosque and no archaeologically significant sites were found.

Other Facilities: Electricity, mobile phones service are some of the facilities available here with no access to banks and supply of natural gas.

b. Dhoke Chabar

Location: Dhoke Chabar is located 2.4 km to the south-west of the Khanpur, Chakwal grid station site and 0.53 km to the south of the transmission line route.

Demographics: Dhoke Chabar comprises of 50 households with an estimated population of 300 people and an average household size of 6. Most of the houses are semi pakka.

Ethnic Structure: The major casts of Dhoke Chabar village are Bhatti and Rajput. Punjabi is the local language and Urdu is also spoken fluently.

Agriculture: The land here is fertile and the main crops grown are Wheat, Pulses, Maize, Bajara and Jawar. Potato, raddish and white turnip are widely grown vegetables.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 150-180m.

Livestock and poultry Development: People in this village like any other village of Chakwal, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: The village has access to Chakwal-Jhelum Road through unmetalled Dhoke Chabar road. Private transport is the common means of public transport to access the main routes.

Education: A government primary school and a mosque are providing educational facilities.

Health Care: There are no government or private medical facilities available in the village. People travel to Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population is associated with agricultural activities, a few are overseas employees, and some are into small businesses while very few travels to cities for private and government jobs.

Cultural Heritage: Islam is the religion followed by every member of the village. There is one mosque, a graveyard and no archaeologically significant sites were found.

Other Facilities: Electricity, mobile phones service, are some of the facilities available here with no access to banks and supply of natural gas.

c. Saigolabad (Moza Khotian)

Location: The village is located approximately 4.3 km to the west of the Khanpur, Chakwal grid station site and to the north of the transmission line route.

Demographics: The population of the village is 7000 people with a total household number of 1100 and an average household size of 6 persons. Most of the houses are constructed with good material with pakka and semi pakka structures.

Ethnic Structure: The major clans here, are Arain, Gujjar and Malik. Punjabi is the local language and Urdu is also spoken commonly.

Agriculture: The land here is fertile and the main crops grown are Wheat, Pulses, Maize, Bajara and Jawar. Potato, radish and white turnip are widely grown vegetables.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 170-200 m.

Livestock and poultry Development: People in the village, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: Chakwal-Jhelum Road is in direct contact with the village connected via various small unmetalled link roads. Rickshaws and Suzukis are the common means of public transport to access the main routes.

Education: Educational facilities include 01 Government Girls High School for girls and 01 for boys and 03 Mosques.

Health Care: There is one Basic Healthcare Unit facility available in the village. One private medical facility is also available.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Some part of the population is associated with agricultural activities, a few are overseas employees, and some are into small businesses while few travel to cities for private and government jobs.

Cultural Heritage: Islam is the religion followed by every member of the village. There are three mosques, a graveyard and no archaeologically significant sites were found.

Other Facilities: Electricity, mobile phones service, post office and police station are some of the facilities available here. UBL and Allied Bank ATMs are available in the village.

d. Chak Kharak

Location: Chak Kharak is located 4.4 km to the south-west of the Khanpur, Chakwal grid station and 2.2 to the south of the transmission line route.

Demographics: Chak Kharak has an estimated population of 1188 people with almost 220 households and average household size of 5 persons. Most of the houses are constructed with good material with pakka and semi pakka structures.

Ethnic Structure: The major casts of Chak Kharak are Rajput and Arain. Punjabi is the local language and Urdu is also spoken by everyone.

Agriculture: The land here is fertile and the main crops grown are Wheat, Pulses, Maize, Bajara and Jawar.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 150-180m.

Livestock and poultry Development: People in these villages like any other village of Khanpur, Chakwal, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: The village has access to the main GT Road through Khanpur Road. Rickshaw is the common means of public transport to access the main routes.

Education: A Mosque for religious education is present in the village while no government or private school is there.

Health Care: There are no government or private medical facilities available in the village. People travel to Saigolabad or Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population is associated with agricultural activities, a few are overseas employees, and some are into small businesses while very few travels to cities for private and government jobs.

Cultural Heritage: Islam is the religion followed by every member of the village. There is one mosque, and no archaeologically significant sites were found.

Other Facilities: Electricity, mobile phones service facilities are available here with no access to banks and supply of natural gas.

e. Rabaal and Ghanwal

Location: Rabaal and Ghanwal are located at 7.24 and 6.5 km to the north-west and south-west of the Khanpur, Chakwal grid station site respectively.

Demographics: The combined estimated population of 4000 people and an average household size of 6-7. Most of the houses are constructed with good material with pakka and semi pakka structures.

Ethnic Structure: The major casts of villages are Malik, Jut, Gujjar and Arain. Punjabi is the local language and Urdu is also spoken commonly.

Agriculture: The land here is fertile and the main crops grown are Wheat, Pulses, Maize, Bajara and Jawar. Radish, potato, spinach and white turnip are widely grown vegetables.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 170-200m.

Livestock and poultry Development: People in these villages like any other village of

Chakwal, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: The villages have access to the main GT Road through linked unmetalled roads. Rickshaw is the common means of public transport to access the main routes.

Education: 02 mosques serve the purpose of Islamic education.

Health Care: There are no private medical facilities available in the village, except for a family healthcare medical facility. People travel to Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population are in government or private jobs.

Cultural Heritage: Islam is the religion followed by every member of the village. There is one mosque and no archaeologically significant sites were found.

Other Facilities: Electricity, mobile phones service facilities are available here with no access to banks and supply of natural gas.

f. Dheedwal and Shah Said Bullo

Location: Dheedwal and Shah Said Bullo are located at 11.5 and 11.8 km to the north-west and south-west of the Khanpur, Chakwal grid station site respectively.

Demographics: The combined estimated population of 3200 people and an average household size of 6-7. Most of the houses are constructed with good material with pakka and semi pakka structures.

Ethnic Structure: The major casts of villages are Malik, Gujjar and Arain. Punjabi is the local language and Urdu is also spoken commonly.

Agriculture: The land here is fertile and the main crops grown are Wheat, Pulses, Maize, Bajara and Jawar. Radish, potato, spinach and white turnip are widely grown vegetables.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 170-200m.

Livestock and poultry Development: People in these villages like any other village of Chakwal, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: The villages have access to the main GT Road through linked unmetalled roads. Rickshaw is the common means of public transport to access the main routes.

Education: 03 mosques in Dheedwal and 01 in Shah Said Bullo serve the purpose of Islamic education.

Health Care: There are no government or private medical facilities available in the village. People travel to Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population is in agriculture and government or private jobs.

Cultural Heritage: Islam is the religion followed by every member of the village. The famous shrine of Hazrat Shah Said Bullo is also present in the village.

g. Boolay Hajiaal and Thirpal

Location: Boolay Hajiaal and Thirpal are located at 12.7 and 14.5 km to the north-west of the Khanpur, Chakwal grid station site and 1.3 and 2.1 km away from the nearest transmission line pathway respectively.

Demographics: The combined estimated population of 3900 people and an average household size of 6-7. The houses are constructed with good material with pakka and semi pakka structures.

Ethnic Structure: The major casts of villages are Arain and Jutt. Punjabi is the local language and Urdu is also spoken commonly.

Agriculture: The land here is fertile and the main crops grown are Wheat, Bajara and Jawar. Spinach and tomatoes are widely grown vegetables.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 150-170m.

Livestock and poultry Development: People in these villages like any other village of Chakwal, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: The villages have access to the main Chakwal GT Road through linked unmetalled roads. Rickshaw and private vehicles are the common means of public transport to access the main routes.

Education: 01 mosques in Boolay Hajiaal and 01 in Thirpal serve the purpose of Islamic education. There is one government primary school and one private school in Thirpal to seek education.

Health Care: There are no government or private medical facilities available in the village. People travel to Chakwal city or Saigolabad to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population is in agriculture and government or private jobs.

h. Jaswal

Location: Jaswal is located to the west of main GT Road and 14.7 km to the south-west of the Khanpur, Chakwal grid station site and has the starting point of the new transmission line.

Demographics: Jaswal comprises 400 households with an estimated population of 2500 people and an average household size of 6 persons. Most of the houses are Pakka and a few are with semi pakka structures. The houses are situated far away from the transmission line's starting point.

Ethnic Structure: The major casts of Jaswal village are Malik and Arain. Punjabi and Urdu are the languages spoken here.

Agriculture: The land here is fertile and the main crops grown are Wheat, Maize, Bajara and Jawar.

Irrigation: There is no network of irrigation channels in the village. People have dug their own tube wells in their lands to feed their agricultural land. The depth of the water table here is between 170-200m.

Livestock and poultry Development: People in these villages like any other village of Chakwal, prefer to keep Buffaloes and Goats as livestock.

Transport/Communication: The village has access to the main Chakwal GT Road through unmetalled road. Rickshaw is the common means of public transport to access the main routes.

Education: no educational institution is present in the village.

Health Care: There are no private medical facilities available in the village but a government hospital with providing medical facilities is present here. People travel to Khanpur, Chakwal city to avail the medical facilities.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells on their own.

Employment: Most part of the population is associated with agricultural activities, a few are overseas employees, and some are into small businesses while some travel to cities for private and government jobs.

Cultural Heritage: Islam is the religion followed by every member of the village. There is one mosque and no archaeologically significant sites were found.

Other Facilities: Electricity, mobile phones service are some of the facilities available here with no access to banks and supply of natural gas.

Figure 4.3: Villages in the Vicinity of Project Area

Exhibit 4.1: Chak Kharak to the South-west of Project Site

Exhibit 4.2: Dhoke Chabar to North-west the project site

Exhibit 4.3: Saigolabad, along the transmission line

Exhibit 4.4: Rabaal village along the transmission line

Exhibit 4.5: A bank in Saigolabad

Exhibit 4.6: Sohawa village along the transmission line

5 Public Consultation

Public consultation plays a vital role in studying the effects of any development project on stakeholders and in its successful implementation and execution. It affords an opportunity to exchange knowledge with those who as members of the society are concerned with the Project, immediately or remotely. Referring particularly to a project related to environmental assessment, the involvement of the public is all the more essential, as it leads to better and more acceptable decision-making.

The overall objective of the consultation with the stakeholders is to help verify the environmental and social issues, besides technical ones, that have been presumed to arise and to identify those who are not known or are unique to the Project. In fact, discourse with many who have thoroughly observed the site conditions in the pre- developmental phase, goes a long way in updating the knowledge and understanding

The construction of 132 KV Grid Station and its feeding Transmission Line from Khanpur till Jaswal area , will create both positive and negatives impacts in and around the project site that may affect the local people and other stakeholders both directly and indirectly. The EIA team has done a detailed survey to find such impacts but it was necessary to involve all the stakeholders at the EIA stage.

Stakeholders concerns regarding various aspects, existing environment, and impacts of the project were pointed out and added to this EIA report.

5.1 Objectives of Consultation

Public consultation plays a vital role in studying the effects of the project on the stakeholders and in the successful implementation and execution of the proposed projects. Public involvement is a compulsory feature of environmental impact assessment, which leads to better and more acceptable decision-making. The overall objective of the consultation with stakeholders is to verify the environmental and social issues that have been presumed to arise and to identify those which are not known or are unique to the project.

The important general objectives of the consultation process are:

- Providing key project information to the stakeholders, and to solicit their views on the project's potential or perceived impacts,
- Identification of potential problems and needs,
- To devise the way for collaborative problem solving,
- Develop and maintain communication links between the project proponents and stakeholders, providing opportunities to the public to influence the project design in a positive manner, and
- Ensure that views and concerns of the stakeholders are incorporated into the project design and implementation with the objectives of reducing or offsetting negative impacts and enhancing benefits of the proposed project.

5.2 Methodology

The consultant carried out public consultations with the stakeholder of multidimensional background at various locations around the proposed Project site of the grid station as well as the transmission line route. The stake holder's consultation during this phase of the work targeted the project area's, Govt. offices, shops, stores, etc. near the Project area site as well as the route of the transmission line.

Potential stakeholders for consultation and participation were identified and initial discussions revealed that the land has been gifted by the locals for the gird station site hence no land related issues will arise. People living in direct area of impact, household women, students, government and private employees, Environment Department, IESCO employees and local shopkeepers etc in the project vicinity were made a part of the consultation.

Appraising the targeted stakeholders initially for the purpose of consultation and working out a schedule for holding regular consultation meetings;

5.3 Stakeholders Identification

Identification of the stakeholders of the proposed project plays a crucial role in the development and also assists in quantifying the role of different stakeholders involved. Impacts identified by the stakeholders are measured through matrix method and mitigation measures are proposed accordingly.

Residential area and cultivable land is lying in the impact area of the project and thus the residents of the nearby villages are the stakeholders of the proposed project. The stakeholders that are likely to be influenced are people/ institutions of Khanpur which are in the vicinity of the site for grid station while the transmission line passes along Chabbar Chak, Chak Baqir Shah, Chak Kharak, Saigolabad, Ghanwal, Rabaal, Dheedwal, Shah Said Bullo, Boolay Hajiaal, Thirpal and Jaswal. It is noteworthy to mention that the transmission line route is passing quite away from residents/population nearly throughout its route.

5.4 Major Stakeholders Involved

The stakeholders contacted during the survey belonged to different categories of people as shown in **Table 5.1**.

Table 5.1: Categories of Stakeholders Interviewed in the Project Area

No.	Stakeholder Category
1	Local People (living in the vicinity of grid station / transmission line)
2	Government Organizations (IESCO)
3	Environment & Social Experts (Public and Private Institutes/Academia)
4	Grass-root stakeholder discussions

5.5 Issues Discussed

Following issues were discussed during the stakeholder consultation:

- Overall activities of the project and their possible impacts;
- Possible impacts on nearby communities, natural vegetation, flora and fauna;
- Possible mitigation measures;
- Beneficial factors and involvement opportunities of the local people in the set of activities of Project; and
- Management of traffic during the construction and operational phase of the project.

5.6 Stakeholder's Consultations

There are two types of stakeholders, i.e. primary and secondary stakeholders. The primary stakeholders are the initial stakeholders, such as affected persons, the general public

including women living in villages in the vicinity of the project area. Accordingly, the consultations were made with all primary stakeholders for sharing the information regarding the project components, i.e. construction of new grid station, spotting of towers and installation of transmission line and community feedback regarding the project. However, the consultative meetings were also held with the secondary stakeholders including the officials/ staff involved in planning& design, and management.

Meetings with major stakeholders were organized to discuss project-specific issues and their potential impacts on the local and regional environment. In these meetings, stakeholders were informed about the salient features of the project, its location, and its activities. Stakeholders consulted and their valuable suggestions and comments are described below:

Table 5.2: Stakeholders Opinions/Concerns/Issues/Suggestions

Designation	Location	Opinions/Concerns/Issues/Suggestions
Responsible Department		
Mr Ishtiaq, SDO	IESCO Chakwal	▪ The project is a part of an effective strategy to offer a dependable power supply to the population residing in the project region. IESCO will work tirelessly to make the project as environmentally friendly and sustainable as feasible. ▪ It would be prohibited for the general public to enter the grid station site. The transmission line routing was chosen after taking into account crucial elements such land usage, the surrounding ecosystem, and local settlements. ▪ As the grid station is rather far from the area of public activities, there will be limited impact to the general people living close to the project location.
Proponent's Environment Management Team		
Mr. Sher Afzal, Additional Deputy Director Environment and Social Safeguard Section	IESCO, Islamabad	▪ IESCO has dedicated Environmental & Social Safeguard Section established that ensures all the construction and operational phase of the project is carried out in an environmentally friendly manner. ▪ Once the construction phase starts, IESCO will periodically conduct Quarterly Environmental Monitoring Report which will entail all the mitigation measures being applied at the project site and its result. ▪ Overall, the transmission line route and location of Grid Station are away from the public and are located in an secluded environment.
Environmental Practitioners		
Dr. Irshad Ahmad	HSEQ Consultant, Rawalpindi	The project's design should include for a buffer zone surrounding the location of the grid station. In the buffer zone, native plants should be planted The necessity for this project is obvious when you consider the line losses brought on by inefficiency. It is well demonstrated by the fact that the villagers have given the land free of cost. Construction work should be done in a way that causes the least amount of disruption to the local flora and animals.
The Responsible Authority		

Designation	Location	Opinions/Concerns/Issues/Suggestions
Mr Arbaz, Environmental Inspector, District Environmental Office, Chakwal	Telephonic	▪ The proposed project falls in Schedule II of the Review of IEE and EIA Regulation 2022. Therefore, the proponent needs to carry out EIA of the project to assess the environmental impacts of the project. ▪ The EIA report when submitted will be reviewed and Site Inspection Report will be prepared by the District Environment Office to assess the site suitability of the project. ▪ The proponent must ensure construction and operational phase of the project are carried out in environmentally friendly manner.
Environmental Academia		
Mr Baber Abbas, Lecturer, UET Taxila	Telephonic	▪ Considering the line losses that occur due to inefficiency this project is much needed. ▪ Indigenous trees should be part of the plantation plan. Trees that have properties to have air quality improving properties need be planted. ▪ Construction should be carried out in such a way that there is minimum disturbance to surrounding flora and fauna of the area. ▪ A buffer zone (10 ft.) around the site of grid station should be incorporated in the design of the project. Indigenous plants should be planted in the buffer zone.

5.6.1 Public Consultation

The roadside discussions were held with the communities living in the vicinity of Grid Station site as well as along the transmission line route, i-e (Chabbar Chak, Chak Baqir Shah, Chak Kharak, Saigolabad, Ghanwal, Rabaal, Dheedwal, Shah Said Bullo, Boolay Hajiaal, Thirpal and Jaswal).

30% of the respondents were illiterate, 16% of respondents had primary, 28% were middle and the rest of the 26% were from secondary level up to master's level.

A summary of discussions held along with comments and suggestions are as follow:

- The need for electricity is rising daily due to continuously growing population.
- The majority of homes have electric equipment such televisions, refrigerators, fans, lights, irons, electric rods, and water pumps.
- The neighborhood will benefit greatly from the project's execution since the grid station will reduce the likelihood of future energy failures and improve system dependability.
- The area will profit from the upgraded system since the current electricity's quality will be improved.
- People promoted the idea of up-gradation of the existing electrical system, as they would be able to get a reliable supply of electricity and start their own business. This will also create employment opportunities for local people.
- Frequent load shedding and low voltage/ voltage fluctuation problems during the whole year, especially in summers and at night times.
- People complained that utility bills for electricity are very high as compared to consumption. Since the voltage is low in Summers, they are unable to utilize the low voltage electricity.
- Proper mitigation plans should be adopted for this project.
- Work should be completed within the scheduled time
- In order to reduce the chances of risks associated with electricity accidents, IESCO should take into consideration that the electricity distribution networks and lines are away from houses and populated areas.
- It is foreseen that the proposed project will improve their living standards.
- Boundary wall should be constructed around the grid station area to make it safe from external disturbance.
- The grid station site should be declared as No Go Area for the general public.

5.7 Concerns Regarding the Project

Based on the consultations with the affected persons and the general public, the following major concerns/ feedback were highlighted.

- About half of the total required unskilled/ semi-skilled labour should be taken from the local population. This opportunity will help to increase the household income of the local population of the project area.
- Local women work in agriculture fields, their routine activities should not be disturbed due to the construction activities.

- RoW clearance for installation of towers and transmission line should be minimal at best possible extent.
- The cost of electricity is very high and hence unaffordable for people living in rural areas as people in rural areas mostly have low income.

Figure 5.1: Pictorial Presentation of Public and Stakeholder Consultation

Consultation with the SDO, IESCO office Khanpur, Chakwal

Consultation with the shopkeeper in Khanpur, Chakwal (T/L Route)

Exhibit 5.1: Public Consultation in Khanpur, Chakwal

Exhibit 5.2: Public consultation in Chabbar Chak, Chakwal (T/L Route)

Exhibit 5.3: Public Consultation in Chak Baqir Shah, Khanpur, Chakwal (T/L Route)

Exhibit 5.4: Public Consultation in Sohawa village, Chakwal (T/L Route)

Exhibit 5.5: Public Consultation in Rabaal, Chakwal

Exhibit 5.6: Public Consultation in Saigolabad

Public Consultation in Choa Ganj Ali, Khanpur, Chakwal

Public Roadside Consultation on T/L route, Dheedwal, Chakwal

Public Consultation on a Dhoke in Khanpur, Chakwal

Roadside consultation in Thirpal (T/L route)

6 Impact Assessment and Mitigation Measures

6.1 Introduction

This Chapter provides;

a. Screening of the potential environmental and social impacts of the proposed project to assess the significance of the potential impacts of the project on the physical, biological and social environment of the project area, and

b. Propose mitigation measures to minimize if not eliminating the potentially adverse impacts.

Assessment of impacts depends on the nature and magnitude of the activity being undertaken and also on the type of pollution control measures that are envisaged as a part of the project proposal.

6.2 Environmental Impacts Assessment Process

This section provides the environmental impacts assessment process that was employed during the present EIA study.

6.2.1 Potential Impacts

Under this EIA study, the potential impacts that are likely to arise during design, construction and operational phases of the proposed project were identified. The potential impacts thus predicted were characterized as follows:

- High negative (adverse) impact,
- Low negative impact,
- Insignificant impact,
- No impact.
- Low positive impact, and
- High positive (beneficial) impact.

6.2.2 Impact Characterization

Once the potentially adverse impacts were identified as discussed above, these impacts were characterized. Various aspects of the impact characterization included:

- Nature (direct/indirect)
- Duration of impact (short term, medium term, long term)
- Geographical extent (local, regional)
- Timing (project phase: before, during and after construction)
- Reversibility of impact (reversible/irreversible)
- Likelihood of the impact (certain, likely, unlikely, rare)
- Impact consequence severity (severe, moderate, mild)
- Significance of impact (high, medium, low).

Figure 6.1: Environmental Screening Matrix (un-mitigated) of Khanpur, Chakwal Grid Station and its Transmission Line Project

	Physical Aspects					Biological Aspects		Socio-Economic Aspects								
	Soil Issues	Air Quality	Surface Water	Ground Water	Water Consumption	Natural Vegetation	Wildlife	Noise and vibration	Safety Hazard	Pressure on local Infrastructure	Public Health and Nuisance	Aesthetic Value	Gender Issues	Employment	Cultural Issues	Agriculture Loss
Design Phase																
Site Selection for Grid Station	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	+2	0	N
Route Selection for Transmission Lines	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	+2	0	N
Equipment Selection	N	N	-1	-1	N	N	N	-1	-1	N	N	N	N	+2	N	N
Land Acquisition	N	N	N	N	N	N	N	N	N	N	N	0	N	N	N	N
Construction Phase																
Contractor's Mobilization	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	+1	-1	-1
Site Preparation	-1	-1	-2	-2	-1	-2	-2	-1	-1	-1	-1	-1	-1	+1	-1	-1
Contractor's Camp	-1	0	-1	-1	-2	-2	-2	-1	-1	-1	-1	-1	0	0	-1	-1
Construction/civil work	-1	-1	-1	-1	-1	-2	-1	-2	-1	-1	-1	0	0	+1	0	-1
Construction Materials Supply	-1	-2	-2	-1	0	-1	-1	-2	-1	-1	0	0	0	+1	0	0
Solid Waste Disposal	-1	0	-1	0	0	0	0	0	-1	N	0	N	N	N	N	N

	Physical Aspects					**Biological Aspects**		**Socio-Economic Aspects**								
	Soil Issues	**Air Quality**	**Surface Water**	**Ground Water**	**Water Consumption**	**Natural Vegetation**	**Wildlife**	**Noise and vibration**	**Safety Hazard**	**Pressure on local Infrastructure**	**Public Health and Nuisance**	**Aesthetic Value**	**Gender Issues**	**Employment**	**Cultural Issues**	**Agriculture Loss**
Liquid Waste Disposal	-1	0	-1	-1	0	0	0	0	-1	N	0	N	N	N	N	N
Demobilization of Contractor	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	+1	-1	-1
Operation Phase																
Operation of Facility	-1	-1	-1	-1	0	0	0	-1	0	-1	-1	N	N	+1	+2	N
Solid Waste Disposal in grid station	-1	N	-1	0	0	N	0	N	-1	N	-1	N	N	+1	N	N
Effluents Disposal	-1	N	-1	0	0	N	0	N	-1	N	-1	N	N	+1	N	N
PCB contaminated Transformer Oils	-1	N	-1	-1	N	N	N	N	-2	N	-2	N	N	N	N	N
O & M of Grid Station	-2	N	-2	-2	-1	0	0	N	-2	N	-1	N	N	N	N	N

6.2.3 Identification of Mitigation Measures

Subsequent to the impact characterization, appropriate mitigation measures were identified, in order to minimize if not completely eliminate the adverse impacts associated with project activities. Finally, the residual impacts were identified. The negative impacts predicted in this manner were the 'unmitigated' impacts.

Appropriate mitigation measures were recommended as part of this EIA, thus reducing the likelihood of occurrence and severity of the potentially adverse impacts. The negative impacts identified through this process are discussed below.

6.3 Design Phase Potential Impacts

The decisions made at the design phase of any project can be quite far-reaching. For the proposed project, the aspects which can be significant with respect to the environmental impacts include:

- Site selection for grid stations
- Route selection for transmission lines
- Type of equipment.

The design phase activities can potentially cause the following environmental impacts:

- Electromagnetic Field near Transmission Line may cause effects on human health.
- Land-use change
- Soil and water contamination
- Loss of floral and faunal resources

These concerns and the measures to avoid/minimize them are discussed below.

6.3.1 Electromagnetic Field (EMF) near Transmission Line may cause severe effects on human health

Electric overhead lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect.

Exposure to electric and magnetic fields caused by transmission lines has been studied since the late 1970s. These fields occur whenever electricity is used. A magnetic field is created when electric current flows through any device including the electric wiring in a home. Every day we are exposed to many sources of EMF from vacuum cleaners, microwaves, computers, and fluorescent lights.

Electric and magnetic fields do induce voltage and currents in the human body but even directly beneath a high voltage transmission line, the induced currents are too small compared to the threshold for producing electrical effects in the human body.

The World Health Organization (WHO) has also concluded that the evidence from scientific research does not confirm the existence of any health consequences from exposure to the low level of EMF. Every day the human body is exposed to various sources of EMF and the induced levels of currents are too small to produce health effects.

The research to date has uncovered only weak and inconsistent associations between exposures and human health. To date the research has not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease. The magnetic fields produced by electricity do not have the energy necessary to break chemical bonds and cause DNA mutations.

Magnetic fields can be measured with a gauss meter. The magnitude of the magnetic field is related to current flow and line voltage. A 345-kV line will have a higher magnetic field than a 69-kV line. Furthermore, the magnetic fields quickly dissipate with distance from the transmission line.

The strength of both electric and magnetic fields is a function of the voltage, distance from the conductors to the ground and the lateral distance from the line to the receptor. However, the EMF decreases very rapidly with distance from the source and there should be no potential health risks for people living outside the 30 m (98 ft.) wide way leave the corridor.

A common method to reduce EMF is to bring the lines closer together. This causes the fields created by each of the three conductors to interfere with each other and produce a reduced total magnetic field. Magnetic fields generated by double-circuit lines are less than those generated by single-circuit lines because the magnetic fields interact and produce a lower total magnetic field. In addition, double-circuit poles are often taller resulting in less of a magnetic field at ground level.

The proposed transmission line from origin to the proposed Grid Station at Khanpur, Chakwal is 15 km.

The map of transmission line route has been provided in **Figure 3.4**. A total of 54 towers will be erected on the transmission line.

Mitigation Measures

No part of the feeding transmission line passes through any residential area and the transmission line will consist of the tower which is taller resulting less of a magnetic field at ground level. The height of the towers will be 85 ft.

6.3.2 Change of Land use

The proposed grid station site is on barren communal land. While the route for the 15 km transmission line has been selected, keeping in view the current land of the areas through which it will pass. There will be no change to land use because for the most part of it, the transmission line passes along Seasonal drainage nullah and non-cultivable land, except for the agricultural lands at some places. The Transmission Line Towers are in the range of 60 m to 300m and which will only occupy 10 sq-m of area.

No major change in the RoWs of transmission lines is expected as all area under transmission line will remain underuse as previously. However, the land space under a transmission line tower usually remains un-occupied and barren.

The change in land use will be of a permanent nature.

Mitigation Measures

The negative environmental impacts related to the land-use change could be effectively minimized by making provisions for plantation of trees and landscaping of the surrounding areas. The land sliding can be mitigated by construction of terracing near the poles, constructing checks and retaining wall in the mountainous area and the areas along the Seasonal drainage nullah to protect the poles from being damaged in monsoon season due to flooding.

6.3.3 Loss of Trees

The project site of the grid station has no trees of significance except some bushes and grasses and no trees will be cut down along the transmission line route as well. Though there is no major cutting of trees observed for construction of this project but still, IESCO has a tree plantation plan which will be implemented towards the end of the construction phase.

No trees are to be cut at the grid station site or along the transmission line.

Mitigation Measures

- IESCO should keep a close liaison with concerned department and use special high elevation towers to avoid tree cutting in the Transmission line route.
- IESCO has agreed to work on a plantation plan and plant around 450 trees of different local species in the project area to compensate the loss of vegetation and trees that would be cut down at the grid station site and along the transmission line.
- A complete record will be maintained for any tree cutting or trimming.

6.3.4 Soil Erosion and Degradation

The other soil-related issues include, slope un-stability, steep slopes, poor site selection and soil contamination, Land erosion may lead to loss of soil fertility and loss of biodiversity, eroded material causes the siltation of the water bodies etc.

Mitigation Measures

The soil erosion and degradation impact can be minimized by adopting Standard Operational Procedures (SOP's) of IESCO.

6.4 Construction Phase Potential Impacts

The construction phase will be by far the most significant part of the proposed project with respect to environmental considerations, since most of the impacts are likely to take place during this period. The construction activities can potentially cause the following environmental impacts:

- Physical Environment
  - Soil erosion, degradation, contamination soil mixing and compaction
  - Air quality deterioration
  - Water contamination and consumption
- Biological Environment
- Loss of/damage to the natural vegetation of the area
- Loss of/damage to the wildlife of the area.

These impacts and their respective mitigation measures are discussed below.

6.4.1 Soil Erosion, Degradation and Contamination

The soil-related issues include soil erosion, slope stability, and soil contamination.

A: Soil erosion and degradation:

Soil erosion is likely to take place in the mountainous areas caused by land clearing for construction camps, grid stations and transmission line towers; the subsequent construction activities; and the vehicular traffic on unpaved roads. Since the site for the new grid station is located in plain area, the possibility of soil erosion is minimized.

Construction activities and vehicle operation in such areas can potentially cause soil erosion and landslides. Land erosion may lead to loss of soil fertility and loss of biodiversity and eroded materials causes the siltation of water bodies etc.

B: Soil Contamination:

Soil may be contaminated as a result of fuel/oils/chemicals spillage and leakage, and inappropriate waste (solid as well as liquid) disposal. Soil contamination can in turn contaminate the drinking water sources also, thus, negatively impacting the nearby settlements vegetation, fauna and livestock. This unmitigated impact is likely to take place at all project locations especially near settlements.

The unmitigated impacts related to soil erosion and contaminations are characterized below.

Nature:	Direct
Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible in long run
Likelihood:	Likely
Consequence:	Moderate
Impact significance:	Medium to high

Mitigation Measures

A: Slope Degradation:

The following mitigation measures can be applied to minimize the impact of the project on the topography during the construction phase.

- The excavation of earth fills to be limited to approximate depth of 50 m to 100 m.
- Low embankments will be protected from erosion by planting indigenous grasses that can flourish under relatively dry conditions.
- High embankments i.e. over 2 meters will be protected by construction stone pitching or riprap across the embankments.
- Ditches or burrow pits that cannot be fully rehabilitated will be landscaped to minimize erosion and to avoid creating hazards for people.

B: Soil Erosion:

The following are recommended mitigation measures for soil erosion;

- Cut and fill at the proposed grid station site will be carefully designed, and ideally should balance. The extracted soil/material will be used to fill and level the grid area towards the Seasonal drainage nullah's tributary.
- Construction camp will be in a stable and flat area, requiring minimal removal of vegetation and levelling. The contractor(s) will obtain approval from the IESCO, for this purpose.
- Embankments and excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken per the design (e.g., stone pitching).
- Vehicular traffic on unpaved roads will be avoided as far as possible. Operation of vehicles and machinery close to the water bodies will be minimized.
- Appropriate measures will be taken to avoid soil erosion during the excavation of transmission line tower foundations, particularly in areas where electricity poles are near seasonal drainage nullah and where the route passes through agricultural land. These include temporary embankments to protect excavated soil, stone pitching and placing gabions. The surplus soil will be disposed as stated above.

- After the completion of pole foundation particularly on the above-mentioned slopes, additional stone pitching around the foundation will be carried out, where required, to avoid any subsequent soil erosion/land sliding. Post-construction monitoring of such sites will be carried out to detect early signs of any soil erosion/land sliding.
- The construction work will not be undertaken during the rainy season.
- After the completion of the construction works, the transmission line route, campsite and other construction sites will be completely restored. No debris, surplus construction material or any garbage should be left behind.
- Photographic record will be maintained for pre-project, during-construction and post-construction condition of the site (grid station and transmission line).

C: Soil Contamination:

The following are recommended mitigation measures for soil contamination;

- Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.
- For the domestic sewage from the construction camp and office, appropriate treatment and disposal system, such as septic tank with soakage pit, will be constructed having adequate capacity.
- The contractor(s) will submit to the IESCO the plans for the camp layout and waste disposal system and obtain approval.
- Waste oils will be collected in drums and sold to the recycling contractor.
- The inert recyclable waste from the site (such as cardboard, drums, broken/used parts, etc.) will be sold to recycling contractor.
- The hazardous waste will be kept separate and handled according to the nature of the waste.
- Domestic solid waste from the contractor's camp will be disposed off in a manner that will not cause any type of soil contamination. The waste disposal plan submitted by the contractor(s) will also address the solid waste issue.

Residual Impacts

Appropriate construction practices and management actions as listed above will greatly minimize the soil erosion and contamination. The significance of the residual impacts is therefore expected to be 'low'. The environmental monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.4.2 Air Quality Deterioration

Construction machinery and project vehicles will release exhaust emissions, containing carbon monoxide (CO), sulfur dioxide (SO_2), oxides of nitrogen (NO_x), and particulate matter (PM). These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such as excavation, levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions. Noxious vapours from oils, glues, thinners, paints, treated woods, plastics, cleaners and other hazardous chemicals that are widely used on construction sites, also contribute to air pollution.

The unmitigated impacts related to air quality deterioration are characterized below.

Nature:	Direct
Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Minor
Impact significance:	Medium

Mitigation Measures

The following mitigation measures will minimize the emissions and their impacts:

- Air quality analysis of the site will be conducted before mobilization of the construction crew, in order to establish baseline data of the ambient air quality.
- Construction machinery, generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate.
- There will be no unnecessary mobility of the project vehicles and if unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions on unmetalled access road.

Residual Impacts

The above measures will reduce the magnitude of the adverse impacts of the project on the ambient air quality, but will not eliminate them completely. However since the settlements are away from the project site, the significance of the residual impacts on the air quality is expected to be low.

The environmental monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.4.3 Noise Pollution and vibration

Noise is perceived as one of the most undesirable consequences of construction activity. Though the level of discomfort caused by noise is subjective, the most commonly reported impacts of increased noise levels are interference in oral communication and disturbance in sleep, headache, fatigue etc.

Due to the various construction activities, there will be short-term noise impacts in the immediate vicinity of the project site and also on workers. The construction activities include:

- Operation of DG sets, concreting and mixing,
- Excavation for foundations with driller,
- Construction plant and heavy vehicle movement.

Since the project site include mostly open areas, the impact of noise pollution is perceived to be minimum. The unmitigated impacts related to noise pollution are characterized below.

Nature:	Direct

Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Minor
Impact significance:	low

Mitigation Measures

Mitigation measures mentioned below will be adopted to minimize the noise impacts on the community. Noise abatement measures will achieve 55 dB(A) to 45 dB(A) during Day and night times respectively according to WB environmental guidelines for communities. These measures include, but are not limited to the following:

- A careful approach will be adopted to minimize the noise and vibration impacts. The construction machinery and trucks used in the project needs to be properly tuned and serviced to avoid undue noise hazards.
- Selection of up to date and well-maintained plant or equipment with reduced noise levels, ensured by suitable in-built damping.
- Use of heavy machinery will be restricted at night, except for any emergency, for which the contractor will take prior approval.
- Confining excessively noisy work to normal working hours in the day, as far as possible.
- Heavy machinery like percussion hammers and drills will not be used during night without prior approval of the client.
- Contractor will comply with submitted work schedule. Keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures.
- Low vibration level machinery will be used, and a system of regular maintenance and repairs needs to be employed.

Residual Impact

With the implementation of above mitigation measures, the residual noise and vibration impact will be “very low”.

6.4.4 Surface Water and Groundwater Contamination

The project activities that can contaminate soil may also contaminate the surface water and groundwater. These include:

- Disposal of construction waste,
- Solid waste disposal from construction camp,
- Waste effluents disposal,
- Equipment/vehicle maintenance,
- Spillage/leakage of fuels, oils and chemicals.

In addition, vehicles and construction machinery operation near water bodies can potentially contaminate the surface water. There is a manual hand pump installed at the project site, which is the only source of water available as of now.

The only surface water body near the project site is the seasonal drainage nullah.

These impacts will be encountered at all of the site during the construction phase of the project.

The unmitigated impacts of the proposed construction activities on the water quality of the area are characterized below.

Nature:	Direct and indirect
Duration:	Short to medium term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Major
Impact significance:	High

Mitigation Measures

The mitigation measures recommended to forestall soil contamination will also prevent water surface and groundwater contamination. Additional mitigation measures are given below.

- The groundwater quality analysis of the grid station site will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the water quality at this location.
- Groundwater quality analysis will be carried out three times at the project site; before mobilization of construction crew, during construction phase and after the completion of the project.

Residual Measures

If the recommended mitigation measures are effectively employed, the project activities are unlikely to contaminate the water resources of the area in any significant manner. The residual impacts of the project on the water quality will therefore be negligible. The environmental monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.4.5 Water Consumption and Availability

Water consumption during the construction phase (camp operation and construction activities) can reduce the water availability, particularly in water-scarce areas.

Heavy vehicles and machinery movement near groundwater wells can potentially damage them.

The above-unmitigated impacts related to water consumption and availability are characterized as follows.

Nature:	Direct and indirect
Duration:	Short term

Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Moderate
Impact significance:	Medium.

Mitigation Measures

- Astute planning will be employed to conserve water at the construction site and camp. Water will be procured in a manner that least affects the local communities. Wastewater recycling will be carried out for water sprinkling and gardening purposes.
- The contractor(s) will submit daily water consumption rate to IESCO.
- Extreme care will be taken when working close to wells and watercourses; crossing of heavy machinery and vehicles will be allowed only if this is safe. Any damage caused by the project activities should be repaired.

Residual Measures

Despite the above measures, the water availability may be hampered during the construction phase. The significance of this impact is expected to be from low to medium.

6.4.6 Loss of Natural Vegetation

The site selected/identified for the grid station has no vegetation cover except for a few shrubs and grass. Moreover, the transmission line passes through areas of diverse geography having variety of natural vegetation, but no trees will be cut down along the transmission line. These include:

- Clearing of all vegetation at the grid station site and in an area of 10sq-meters at the pole foundations of the transmission line towers, in order to construct the pole foundations for this segment.
- Cutting of the trees and loss of natural vegetation (Only Shrubs in this case) can lead to loss of biodiversity, soil erosion and associated impacts. The aesthetic value of the area may also be negatively impacted as a result of removing the vegetation, but it will be in an area of 10sq-meters

Some other impacts envisaged are:

For clearing the vegetation under the transmission lines, chemical herbicides are also sometimes used. Indiscriminate usage of this method can cause significant loss of biodiversity. Construction crew can also indulge in tree/shrub cutting to obtain fuelwood.

The unmitigated impacts of the proposed activities on the floral resources of the area are characterized below.

Nature:	Direct
Duration:	Medium to long term
Geo extent:	Local
Reversibility:	Reversible in medium to long term
Likelihood:	Possibly
Consequence:	Low

Impact significance: Low

Mitigation Measures

The following mitigation measures will minimize negative impacts on the floral resource of the area:

- Clearing of natural vegetation will be minimized as far as possible during the transmission line works.
- Herbicides will not be used to clear vegetation along the transmission line route (or at other project locations).
- It will be ensured to reach the transmission line poles location without developing any new tracks. The existing tracks will be used to transport equipment, material and personnel, except for a few poles having no access in the hilly areas. Vehicles will not be operated off-track in this area.
- For the transmission line route, vegetation clearing plan will be prepared and submitted to IESCO for approval. A complete record will be maintained for any tree cutting or trimming. The record will include: the number, species, type, size, age, condition and photograph of the trees to be cut/trimmed.
- Indigenous tree species will be selected for plantation in consultation with Forest Department; in particular, Eucalyptus trees will not be used in any case.
- The construction crew will be provided with LPG for cooking (and heating, if required). Use of fuelwood will not be allowed.
- Tree plantation plan has been discussed in Chapter 7 which will be implemented at Khanpur, Chakwal Grid Station. Indigenous tree species will be selected for plantation.

Residual Impact

The impacts of most parts of the project activities on the natural vegetation will not be significant to start with. Re-plantation takes time, and mortality is also an issue. The trimming of trees will be a permanent impact without any remediation/mitigation. With the help of the proposed mitigation measures described above, these impacts will decrease considerably. However these impacts cannot be completely mitigated, and there will be some residual impacts of this component of the proposed project on the vegetation of the area. The significance of these residual impacts is expected to be “low”.

The significance of residual impact for this section will be “low”.

The environmental monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.4.7 Damage to Wildlife

The possible impacts of the proposed project on the wildlife resources are mostly associated with the damage to the natural vegetation.

Damage to the vegetation and other construction activities can potentially cause disturbance to the wildlife of the area, causing them to leave the area or move to other areas. In addition, the construction crew can also indulge in hunting and/or harassing of wildlife when the electricity poles will be erected.

The unmitigated impacts of the proposed activities on the faunal resources of the area are characterized below.

Nature: Direct

Duration:	Medium to long term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Possibly
Consequence:	Moderate
Impact significance:	Medium.

Mitigation Measures

- Measures to protect and rehabilitate floral resources of the area discussed in section above will also protect the wildlife resources of the area.
- No nighttime activities will be carried out in this area. Work in this area should be carried out in coordination with the Wildlife Department.
- Vehicle movement will be limited to the existing tracks in the above area.
- The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.
- Garbage will not be left in the open places.
- The project staff will not be allowed to indulge in any hunting or trapping activities.

Residual Impact

Despite the above mitigation measures, there will be some residual impacts of the project on the faunal resources of the area. However, these impacts will be of temporary nature and are mostly reversible; hence their significance is expected to be low to medium.

6.4.8 Pressure on Local resources / Infrastructure

During the construction stage, demand for basic amenities such as water and power for the construction labour along with the requirement of construction activities will put pressure on the existing resources and infrastructure. Considering the nature and the magnitude of the project, impact shall be short term and high in magnitude and are limited to construction phase only.

The unmitigated impacts related to pressure on local infrastructure are characterized below.

Nature:	Direct
Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Minor
Impact significance:	Medium

Mitigation Measures

IESCO and its contractors, will engage skilled and unskilled personnel during construction activities (where required and possible) from the local communities of each project site to reduce the pressure on local infrastructure.

Residual Measures

Despite the above measures, the pressure on local infrastructure may be hampered during the construction phase. The significance of this impact is expected to be from low to negligible.

6.4.9 Impact of Stacking and Disposal of Construction and Waste Material

Improper stacking and disposal of construction waste is likely to adversely affect the aesthetic value of the project area. The severity of such impact will depend upon the magnitude and type of construction waste and can be minimized by exercising proper waste disposal mechanisms.

During the grid station and transmission lines construction / erection phase this impact is very likely.

The unmitigated impacts related to staking and disposal of construction and waste material are characterized below:

Nature:	Direct
Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Minor
Impact significance:	High

Mitigation Measures

- Stacking of construction materials will be confined to the project site only and suitable enclosure will be provided, hence no impacts on surrounding areas are envisaged.
- To avoid waste, reduce, reuse and recycle policy shall be adopted.
- Construction waste material dumping at proper site. Contractor(s) must remove all construction waste and dispose that properly.
- Re-plantation and landscaping of disposal sites consistent with acceptable aesthetic values for the surrounding landscape.

6.4.10 Public Health and Safety

During construction activities, the public health is of major concern. At the project sites, the working staff and visitors may encounter physical injuries and psychological, physiological and infectious diseases due to unsafe working practices, exposure to dust and chemicals, improper waste disposal, improper hygiene and sanitation. This impact will be of concern at the project site.

Project activities that have potential impact on public health are:

- Environmental conditions created by the project which may lead to physical injuries or deterioration in health of people passing by and living in the vicinity of the construction activities. (e.g. un-safe working condition, trespassing during execution work, dust emissions etc.).
- Increased incidence of communicable and vector-borne diseases attributable to construction activities represents a potentially serious health threat to project personnel and people in the vicinity.

- Construction activities may result in an increased movement of heavy vehicles for the transport of construction materials and equipment increases the risk of traffic-related accidents and injuries to workers and local communities.
- Risks may arise from potential contact with hazardous materials, buildings that are under construction or excavations and structures which may pose falling and entrapment hazards.
- Potential for increased incidence of communicable diseases such as sexually transmitted (STDs), HIV/AIDS, Hepatitis etc. during the construction phase due to labour mobility.

The unmitigated impacts related to public health and safety is characterized below.

Nature:	Direct
Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Major
Impact significance:	High

Mitigation Measures

The mitigation measures during the construction phase will include:

- Obligatory insurance against accidents for workers.
- The contractors should provide proper occupation health and safety training before starting the construction activities.
- Provision of first aid box at all the project/ campsite and provision of first aid training to specified work staff to counter emergency situations.
- Contractor(s) shall inform IESCO about safety measures taken by them (HSE plan) including firefighting equipment's placed, safe storage of hazardous material, availability of first aid, security fencing and contingency measures in case of accidents.
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure on health risks for labours.
- IESCO shall ensure that each contractor has provided proper PPEs to the workers and that the PPEs are properly utilized during the work.
- Protection devices will be provided to the workers operating in the vicinity of high noise generating machines.
- Provision of adequate sanitation, washing, cooking, and dormitory facilities to workers.
- Provision of protective clothing for labourers handling hazardous material e.g., hard hats, adequate footwear for bituminous pavement works etc.
- IESCO and its contractors shall follow the IESCO safety code.

- Timely public notification on planned construction work.
- The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of traffic safety procedures/ defensive driving.
- IESCO Engineers/ contractors should implement risk management strategies to protect the community from physical, chemical, or other hazards associated with the project site under construction and decommissioning.
- Risk management strategies may include:
  - Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high-risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the visitors.
  - Removing hazardous conditions on construction site that cannot be controlled effectively with site access restrictions, such as covering openings to small confined spaces, or locked storage of hazardous materials.
- To prevent communicable diseases, the contractor's staff will be restricted from un-necessary mobility in the communities. IESCO shall also arrange awareness regarding the communicable diseases and STDs.
- Initiatives to involve a combination of behavioural and environmental modifications in the workers to address social and environmental aspects that can potentially have impact on the local communities.

6.4.11 Traffic Issues

During construction phase of the proposed project, there will be movement of light and heavy vehicles to the proposed grid station and transmission line route. The unmitigated impacts related to traffic issues are characterized below.

Nature:	Direct
Duration:	Short term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Minor
Impact significance:	Medium

Mitigation Measure

Following measures will be taken to mitigate the impacts due to interruption of traffic anticipated during the construction period:

- Coordinated planning of traffic diversions in accordance with the construction program with advance warning to the affected residents and road users.
- Provision of appropriate signage at work site and roads where necessary.
- The movement of contractors' vehicles and transportation of construction material shall be planned in such a way that it does not coincide with heavy traffic time i.e. office and school timings.
- Provision of appropriate signage at work site and roads where necessary.

6.5 Operational Phase Impacts

The O&M activities of the electricity network are environmentally begin by nature, and result in very few impacts, which are listed below.

- Contamination of soil and water as a result of inappropriate waste disposal at the grid stations (domestic solid waste, sewage, repair and maintenance waste, waste oils and chemicals, etc.)
- Contamination of soil and water as a result of leakage of transformer oil.
- Damage to natural vegetation and wildlife during the transmission line patrolling and maintenance activities

6.5.1 Soil and Water Contamination

The O&M activities of the grid station generate several types of wastes, which can cause soil and water contamination. These are listed below.

- Domestic solid waste from the grid station.
- Sewage from the grid station.
- Wastes from the repair and maintenance activities (discarded equipment and parts, packing materials, used oils and chemicals, cotton rags and the likes).

In addition, leakage and spillage of transformer oil can contaminate soil, surface water and eventually, groundwater.

These impacts can potentially occur at the entire grid station included in the proposed project. These unmitigated impacts related to soil and water contamination are characterized below.

Nature:	Direct and indirect
Duration:	Short to medium term
Geo extent:	Local
Reversibility:	Reversible
Likelihood:	Likely
Consequence:	Major
Impact significance:	High

Mitigation Measures

The following mitigation measures will greatly minimize, if not prevent, the impacts of the proposed project's O&M activities on the soil and water resources of the area:

- The grid station will have appropriate solid waste collection and disposal arrangement. The domestic solid waste will be brought to a collection point and will be disposed of at designated municipal disposal site by the contractor.
- The grid stations will have appropriate sewage handling system. The grid stations sewage collection system will be connected to the Municipality operated sewerage system, if available. Otherwise, grid stations will have their own septic tanks and soakage pits.
- Waste oils and chemicals will be disposed in accordance with their respective Material Safety Data Sheet (MSDS). MSDS will be made available at the grid stations and maintenance workshops.

- Non-toxic recyclable waste (such as cardboard) will be given away for recycling.
- Toxic waste will be stored separately; such areas will be marked and incinerated at an appropriate double chamber incinerator.
- Grid stations will have channels and drainage pits to collect any leaked oil from the transformers in the grid stations. This oil will be sent back to the workshop for recycling.

Residual Impact

With the help of the mitigation measures described above, the O&M activities will not have any significant impact on the soil or water resources of the area.

6.5.2 Impacts on Biological Resources

The grid station O&M activities will not have any interaction with the biological resources of the project area. However, the transmission line maintenance activities, particularly along the drainage Nullah and agricultural land, can potentially damage natural vegetation and habitat. The tall trees under the transmission line will need to be trimmed, in order to avoid any short-circuiting, sparking and/or damage to the conductor.

The potential impacts of the O&M activities on the wildlife resources of the area are essentially of two types: damage to the habitat as a result of loss of vegetation; and direct disturbance/threat to the wildlife species as a result of human presence, equipment/vehicle operation and noise. These unmitigated impacts related to biological resources are characterized below.

Nature:	Direct and indirect
Duration:	Medium to long term
Geo extent:	Local
Reversibility:	Mostly Reversible (at least in medium to long term)
Likelihood:	Possibly
Consequence:	Moderate
Impact significance:	Medium

Mitigation Measures

The following mitigation measures will greatly minimize, if not prevent, the impacts of the proposed project's O&M activities on the biological resources of the area:

- IESCO will use special towers and pass the conductor above the trees, particularly under the forested segment, in order to maintain a safe clearance between the trees/branches and the transmission line. This will prevent the electrocution hazard for the people passing by; and wildlife, while also avoids any forest fires that can be caused by the sparking between the live transmission line and tree branches.
- Herbicides will not be used to clear/control vegetation under the transmission line.
- The nighttime maintenance works will be avoided as far as possible.

Residual Impact

With the help of the mitigation measures described above, the O&M activities are not expected to have any significant impact on the biological resources of the area.

6.5.3 Maintenance of Plantation

IESCO will hire manpower to carry out and sustain the plantation plan. The trees (Sheesham, Dhrek, fruit-bearing trees) planted within the 40 kanal land, proposed for the grid station, will be properly fed with water and other nutrients required throughout their initial growth period. In addition, there would be recreational activities and parks for children, which will have lawns, green patches and flowering plants as well to enhance the aesthetics of the site.

It is to be noted that, no trees would be cut down at the grid station site and no trees will be cut along the transmission line route.

6.5.4 Employment

The operation of the proposed project will accelerate the business activity in the project area and will provide employment to locals that will have positive impact on the local economy thereby improving the quality of life in the project area.

6.6 Socio-Economic Impacts Assessment and their Mitigation

The social screening checklist was used to identify the key social issues associated with the proposed project and type of mitigation measures required to address them.

Screening of the socio-economic impacts of the proposed project was carried out during the EIA, using the framework and the social screening checklist provided by IESCO in TORs**.** Much like the environmental concerns, the socio-economic impacts were also characterized using the same method.

6.6.1 Design Phase Considerations

Much like the environmental considerations during the design of the proposed project discussed in **Section 7.3**, the following aspects of the project can have bearing on its socio-economic performance:

- Site selection for grid stations
- Route selection for transmission lines
- Tower-type selection.

6.6.2 Construction Phase Impacts

Much like the environmental impacts described in Section 7.4, most of the socio-economic concerns will also arise during the construction phase of the proposed project.

The key socioeconomic concerns of the construction phase as identified with the help of the screening process are as follows:

- Land acquisition for transmission line route
- Damage to infrastructure
- Blocked access
- Noise and vibration
- Safety hazard
- Public health
- Gender issues
- Impacts on archaeological, cultural, historical or religious significance.

6.6.3 Land Acquisition

The residents of Khanpur have given free of cost a piece of land measuring 40 Kanals at Khanpur, Chakwal, District Khanpur, Chakwal to IESCO for construction of the Grid Station and fixed corridor for 132 KV Feeding Transmission Line. The IESCO has already obtained possession of the land.

The unmitigated impacts related to the land acquisition and damaged crops are characterized as 'moderate'.

Mitigation Measures

The following mitigation measures are proposed to avoid potential losses due to land acquisition:

- IESCO should obtain formal allotment letter from concerned authorities for the allocation of land at Khanpur, Chakwal, District Khanpur, Chakwal.
- Operation of project vehicles and construction machinery outside the RoW will be avoided. Attempts will be made to use existing katcha tracks to access the transmission line corridor/pole locations. Damage to flora will be compensated by implementation of the plantation plan.

Residual Impacts

The residual impacts associated with the acquisition of land are therefore expected to be low.

The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.6.4 Damage to Infrastructure

The construction of grid station and laying of transmission lines do not require removal of any existing infrastructure. However, there could be some inadvertent damage to the roads and other structures during the construction activities and associated vehicular traffic.

The infrastructure may be damaged at all of the project sites, particularly along the transmission line corridor and access route.

The unmitigated impacts related to the damaged infrastructure are characterized as 'medium'

Mitigation Measures

- All damaged infrastructure will be restored to original or better condition.

Residual Impact

Following the implementation of the above-recommended measure, there will be negligible level of residual impact.

The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.6.5 Noise and Vibration

The construction activities and project vehicle movement at the project site can cause noise and vibration. The grid station site and all the transmission line tower locations are away from the communities, hence issues related to noise and vibration are not expected to arise.

The unmitigated impacts related to the noise and vibrations are characterized as 'medium'.

Mitigation Measures

- Vehicle speeds will be kept low, and horns will not be used.
- Vehicles will have exhaust silencers to minimize noise generation.
- Nighttime traffic will be avoided within the project area.
- Movement of all project vehicles and personnel will be restricted to within work areas, to avoid noise disturbance.
- Working hours for construction activities will be limited to between 8 am and 6 pm.
- Grievance redressal mechanism will be put in place to address the community complaints.

Residual Impact

With the implementation of above measures, the significance of the residual noise impacts will be low.

The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.6.6 Safety Hazards

The construction activities will involve operation of heavy construction machinery, vehicular traffic, excavation and filling operations. These activities may pose some safety hazards to the people passing by and living in the immediate vicinity. The fuel storage at the campsites may also pose safety hazards for the surrounding population. During the testing and commissioning of the grid station and transmission line, the people moving nearby will be exposed to the electrocution risk. The unmitigated impacts related to the safety hazards are characterized as 'high'.

Mitigation Measures

- The construction site will have protective fencing to avoid any unauthorized entry.
- The project drivers will be trained for defensive driving skills
- Vehicular speeds within the project area will be kept low to minimize safety hazards.
- Camp site will be selected with IESCO's approval**.**
- Firefighting equipment will be made available at the camp.
- The camp staff will be provided firefighting training.
- All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel.
- Liaison with the concerned authorities will be maintained before commencing the testing commissioning of the system. Protective fencing will be used where appropriate/possible.
- Warning signs will be used at the appropriate locations.

Residual Impact

There will be a low level of residual impact of safety hazards associated with the vehicular traffic. The safety hazard issue with the construction activities will be negligible. The safety hazard during the testing and commissioning of the system will be from “low to medium”.

The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impact.

6.6.7 Public Health Issues

The public health concerns to be addressed during the design phase of the proposed project have been discussed earlier. There will be some similar concerns during the construction phase as well, primarily associated with the operation of the construction camp.

The public health issues can potentially arise at all of the project sites, particularly the grid stations and campsites.

The unmitigated impacts related to the public health are characterized as 'high'.

Mitigation Measures

The following mitigation measures will minimize the public health concerns during the construction phase of the project:

- The construction camp will have septic tank with soaking pit of adequate size.
- Camps should be at least 500 m from any groundwater wells used by the residents.
- The construction camp will have appropriate solid waste disposal mechanism.
- The construction camp and site office will be provided with first-aid kits.
- The construction crew will be provided awareness for the transmissible diseases (such as HIV/AIDS, hepatitis B and C).

Residual Impacts

With the help of the above measures, the public health concerns during the project construction phase can be reasonably addressed. The significance of the residual impacts is therefore expected to be “negligible”.

The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.6.8 Gender Issues

The project works to be carried out within or near the rural communities may cause disturbance to the women. Similarly, the construction camp operation and vehicular traffic may also cause some hindrance to women mobility. In particular, these issues can potentially arise at the locations nearby the grid station.

The unmitigated impacts related to the gender issues are characterized as 'medium'.

Mitigation Measures

- Campsite for construction will be decided in consultation with IESCO and concerned government authorities.
- The people living near to the construction site will be informed and consulted before commencing works inside or near the communities.
- Strict code of conduct will be maintained by the construction crew. Local norms will be respected.

Residual Impact

Despite the implementation of the above mitigation measures, there will be a low to moderate level of residual impact associated with the gender issues.

The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.

6.6.9 Child Labor

Although the use of child labour is not prevalent in the construction works such as those involved in the proposed project, however, the provisions of the Child Labor Act will still be made part of the construction contracts, in order to ensure that no child labour is employed at the project site or campsite.

6.6.10 Impacts on Sites of Historical, Cultural, Archaeological or Religious Significance

No sites of Historical, Cultural, Archaeological or Religious significance are known to exist at or in the immediate vicinity of the project site that is known at this stage. However, during the construction works of the project, particularly, excavation, such sites or artefacts may be discovered.

The unmitigated impacts on the sites of historical, cultural, archaeological or religious significance are characterized as 'medium'.

Mitigation Measures

- In case of discovery of any sites or artifacts of historical, cultural, archaeological or religious significance, the work will be stopped at that site.
- The federal archaeological department will be notified immediately, and their advice will be sought before resumption of the construction activities at such site.

6.6.11 Operational Phase

Much like the environmental issues associated with the O&M activities; there are very few socio-economic concerns which are expected during the operational phase of the proposed project. These concerns are listed below.

- Safety hazards
- Public health
- Loss of agriculture.

6.6.12 Safety Hazard

The grid station, transmission line will pose electrocution risk to the IESCO staff as well as the people living in the immediate vicinity of the grid station and transmission line route.

Mitigation Measures

Design aspects of this issue have been discussed earlier, which will forestall major causes of electrocution. Additional measures are provided below.

- IESCO's O&M staff will be provided with essential protective gears and equipment.
- IESCO's O&M staff will be provided safety training. Refresher courses will be arranged on regular basis.
- Firefighting equipment will be made available at the grid stations.
- The Emergency Response Plan (ERP) will be made available for the grid station. Its salient points will be displayed at prominent places within the grid station. The O&M staff will be given training on the ERP. The Environmental and Social Safeguard Section (E&SS), will review the ERP and with respect to the environmental and social

considerations, and recommend changes if needed. The ERP will include procedure to inform the nearby communities in case of fire in the grid station.

- Appropriate signage on safety precautions will be installed at the key locations.
- IESCO SOPs will be followed and work will be carried out in line with IESCO Safety Code.
- The trees under the transmission lines will be regularly trimmed in order to maintain 8 m clearance.

Residual Impacts

Despite the implementation of the above measures, there will be some residual safety hazards associated with the operation of the system. The significance of this impact is expected to be “medium”.

6.6.13 Public Health Issues

There are the following three distinct types of public health concerns associated with the operation of the proposed project:

- Inappropriate solid waste and sewage disposal from grid station.
- Electromagnetic (EM) radiation caused by the high-tension transmission lines.

Mitigation Measures

- The concerns associated with the waste disposal and transformer oil leakage and their mitigation measures have been adequately discussed and addressed in above few sections. All these measures need to be adopted to avoid public health issues.
- Studies have shown that there is a weak evidence of health risk associated with the exposure to power-frequency fields. However, since the proposed transmission line route has been selected to ensure maximum clearance from nearby settlements, there will not be any significant risk of EM radiation exposure.

During the repair and maintenance activities on the transmission lines, the nearby crops can potentially be damaged.

Mitigation Measures

The following mitigation measures will address the concerns associated with the loss of agriculture during the O&M phase of the project:

- Damage to the crops will be avoided during the transmission line patrolling.
- Any damage during repair and maintenance activities will be compensated.
- Liaison with the nearby communities will be maintained in this regard.
- The grievance redressal mechanism will be maintained on continuous basis.

Residual Impacts

With the help of the above mitigation measures, the concerns associated with the loss of agriculture will be reasonably addressed and there will be negligible residual impacts.

6.6.14 Agricultural loss

During the repair and maintenance activities on the transmission lines, the nearby crops can potentially be damaged.

Mitigation Measures

The following mitigation measures will address the concerns associated with the loss of agriculture during the O&M phase of the project:

- Damage to the crops will be avoided during the transmission line patrolling.
- Any damage during repair and maintenance activities will be compensated.

Residual Impacts

With the help of the above mitigation measures, the concerns associated with the loss of agriculture will be reasonably addressed and there will be negligible residual impacts.

6.7 Summary of Impacts and their Mitigation Measures

Impact	Mitigation Measures
Design Phase Impacts	
Electromagnetic Field near Transmission Line	▪ Electric overhead lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. ▪ Electric and magnetic fields do induce voltage and currents in the human body but even directly beneath a high voltage transmission line, the induced currents are too small compared to the threshold for producing electrical effects in the human body.
Change of Land Use	▪ The proposed grid station site is on a barren communal land. While the route for the 15 km transmission line has been selected, keeping in view the current land of the areas through which it will pass. ▪ No major change in the RoWs of transmission lines is expected as all area under transmission line will remain underuse as previously. However, the land space under transmission line tower usually remains un-occupied and barren. ▪ The negative environmental impacts related to the land-use change could be effectively minimized by making provisions for plantation of trees and landscaping of the surrounding areas. The land sliding can be mitigated by construction of terracing near the poles, constructing checks and retaining wall in the mountainous area and the areas along the drainage nullah to protect the poles from being damaged in monsoon season due to flooding.
Construction Phase Impacts	
Soil Erosion, Degradation and Contamination	▪ Soil may be contaminated as a result of fuel/oils/chemicals spillage and leakage, and inappropriate waste (solid as well as liquid) disposal. ▪ The excavation of earth fills to be limited to approximate depth of 50 m to 100 m. ▪ High embankments i.e. over 2 meters will be protected by construction stone pitching or riprap across the embankments. ▪ Embankments and excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken per the design (e.g. stone pitching). ▪ The construction work will not be undertaken during the rainy season.

Impact	Mitigation Measures
Air Quality Deterioration	▪ Air quality analysis of the site will be conducted before mobilization of the construction crew, in order to establish baseline data of the ambient air quality. ▪ Construction machinery, generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions. ▪ There will be no unnecessary mobility of the project vehicles and if unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.
Contamination of Surface and Ground Water	▪ The groundwater quality analysis of the grid station site will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the water quality at this location. ▪ Groundwater quality analysis will be carried out three times at the project site; before mobilization of construction crew, during construction phase and after the completion of the project.
Loss of Natural Vegetation	▪ Clearing of natural vegetation will be minimized as far as possible during the transmission line works. ▪ Herbicides will not be used to clear vegetation along the transmission line route (or at other project locations). ▪ It will be ensured to reach the transmission line poles location without developing any new tracks. The existing tracks will be used to transport equipment, material and personnel, except for a few poles having no access in the hilly areas. Vehicles will not be operated off-track in this area. ▪ Indigenous tree species will be selected for plantation in consultation with Forest Department. The construction crew will be provided with LPG for cooking (and heating, if required). Use of fuelwood will not be allowed
Operational Phase Impacts	
Soil and Water Contamination	▪ The grid station will have appropriate solid waste collection and disposal arrangement. The domestic solid waste will be brought to a collection point and will be disposed of at designated municipal disposal site by the contractor. ▪ The grid stations will have appropriate sewage handling system. The grid stations sewage collection system will be connected to the Municipality operated sewerage system, if available. Otherwise, grid stations will have their own septic tanks and soakage pits. ▪ Waste oils and chemicals will be disposed in accordance with their respective Material Safety Data Sheet (MSDS). MSDS will be made available at the grid stations and maintenance workshops.
Impacts on Biological Resources	▪ IESCO will use special towers and pass the conductor above the trees, particularly under the forested segment, in order to maintain a safe clearance between the trees/branches and the transmission line. This will prevent the electrocution hazard for the people passing by; and wildlife, while also avoids any forest fires that can be caused by the sparking between the live transmission line and tree branches.
Socio-Economic Impacts	

Impact	Mitigation Measures
Land Acquisition	▪ IESCO should obtain formal allotment letter from concerned authorities for the allocation of land at Khanpur, Chakwal, District Chakwal. ▪ Operation of project vehicles and construction machinery outside the RoW will be avoided. Attempts will be made to use existing katcha tracks to access the transmission line corridor/pole locations. Damage to flora will be compensated by implementation of the plantation plan.
Damage to Infrastructure	▪ All damaged infrastructure will be restored to original or better condition. ▪ The social monitoring will ensure compliance to the above mitigation measures and their adequacy, as well as significance of the residual impacts.
Public Health Issues	▪ The construction camp will have septic tank with soaking pit of adequate size. ▪ Camps should be at least 500 m from any groundwater wells used by the residents. ▪ The construction camp will have appropriate solid waste disposal mechanism. ▪ The construction camp and site office will be provided with first-aid kits.
Agricultural Loss	▪ Damage to the crops will be avoided during the transmission line patrolling. ▪ Any damage during repair and maintenance activities will be compensated.

7 Environmental Management and Monitoring Plan

This Chapter presents the implementation mechanism for the environmental and social mitigation measures identified during the present EIA study. The EMMP reflects the commitment of the proponent (IESCO) to safeguard the environment as well as the surrounding population during the execution of proposed project.

7.1 Purpose and Objectives of EMMP

This Environmental Management and Monitoring Plan (EMMP) provides the delivery mechanism to address the adverse environmental as well as social impacts of the proposed project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all project works.

The primary objectives of the EMMP are to:

- To facilitate the implementation of the earlier identified mitigation measures,
- To develop a proper monitoring mechanism and identify requisite monitoring parameters to confirm effectiveness of the proposed mitigation measures,
- To ensure the complete implementation of all mitigation measures and ensure the effectiveness of the mitigation measures.
- To define the responsibilities of the project proponent IESCO, Project engineers and contractors, and provide a means of effectively communicating environmental issues among them,
- To provide a mechanism for taking timely action in the face of unanticipated environmental or social situations, and;
- Identify environmental as well as social training requirements at various levels.

7.2 Institutional Capacity

The overall responsibility for compliance with the environmental management plan rests with the project proponents i.e. IESCO.

IESCO has already established a Project Management Unit (PMU) with Environmental and Social Safeguard section (E&SS) within its Organization, as its part to handle the environmental and socio-economic matters during the proposed project, other future projects as well as its routine operations. The E&SS will provide advisory services to the project and other IESCO departments/division/directorate. Currently, the E&SS has one Additional Deputy Director Environment and one Additional Deputy Director Social Impact under the supervision of an Additional Director, Environmental and Social Safeguard (E&SS). The strength can be increased in future as required.

7.2.1 Pre-Construction Phase

Approvals

Islamabad Electrical Supply Company Limited (IESCO) will obtain all the relevant clearances and necessary approvals required by the Government of Pakistan prior to commencing the project activities, including obtaining No Objection Certificate (NOC) from the Punjab-EPD.

Change Management

Following the approval of the EIA, if any aspect of the operation or requirements of the EIA needs to be changed, IESCO will categorize the change in accordance with the EMMP and take appropriate measures thereon.

Contractual Provisions

Adherence to the requirements of the EIA and EMMP in terms of environmental mitigation will be required from all project contractors and thus EMMP will form part of their contractors with Islamabad Electrical Supply Company Limited (IESCO).

7.2.2 Construction Phase

The organizational roles and responsibilities are summarized below:

IESCO

The overall responsibility for compliance with the environmental management plan rests with the project proponents (IESCO).

Environmental and Social Safeguard (E&SS) Section/Unit

The E&SS unit will provide overall supervision and advisory services during the construction phase of the project. The E&SS unit will supervise the IESCO's environmental monitors (discussed below) and will also advise GSC, TSW Planning, GSO Directorates and other IESCO departments on environmental and social matters during the project.

Engineers, Contractors/Sub Contractors

The contractor(s) will be responsible for the construction activities of the project. The contractor(s) will be responsible for the complete implementation of the EMMP and the mitigation measures detailed in the EMMP and EIA. The contractor(s) will also be subjected to certain liabilities under the environmental laws of the country, and under its contract with IESCO.

The GSC directorate of IESCO will monitor the contractors and ensure implementation of the EMMP and EIA.

Other essential features of the institutional arrangement proposed for the project are:

- IESCO will appoint Environmental and Social Inspectors/Officers (ESIs/ESOs) for overseeing and monitoring the entire implementation of the EMMP and EIA.
- The EMMP as well as environmental management requirements and specifications will be included in all contracts of IESCO and its contractors/consultants.
- Each contractor will be required to appoint a dedicated field Environmental and Social Monitor (ESM) at the project site.
- All activities related to project will be defined located and in documented form.
- IESCO, through the E&SS unit, will cooperate with regulatory agencies (such as the Punjab EPD) and other stakeholders who may want to send their own teams to monitor the project activities and IESCO will facilitate them during their visits.

Punjab-EPD

The Environmental Protection Department, Government of Punjab, will periodically visit the project site to monitor the compliance of environmental protection measures detailed in the EIA report.

7.2.3 Operation Phase

During the operation phase of the proposed project, environmental and socioeconomic management will become a routine function, as an integral part of the O&M activities. The E&SS unit will be the focal point for all matters relating to environmental and socioeconomic issues during the routine operations of the Organization. The E&SS unit will advise various departments within IESCO for environmental and socioeconomic issues. The E&SS unit will develop an environmental and socio-economic management system for the Company, defining roles and responsibilities of various departments and their respective staff.

7.3 Organizational Structure, Role and Responsibilities

This section describes the organizational structure required for managing the environmental as well as social aspects of the proposed project. Also defined in this section are the roles and responsibilities of the various role-players during the project. The **Figure 7.1** shows the Management structure of IESCO.

7.3.1 Primary Responsibilities

The primary responsibilities for the environmental performance of the project proponents Islamabad Electrical Supply Company limited (IESCO), the engineering consultant section, and the contractors will be assumed by their respective highest-ranking officers during the project.

- The General Manager (Development) of the proponents will be responsible for the company's compliance with the EIA and EMMP throughout the project
- The GSC Directorate and E&SS section PMU will be responsible for the project's compliance with the EIA and EMMP throughout the project.
- The Additional Deputy Director Environment/Social Impact, IESCO will have to monitor project activities in the project area.
- The GC & T&G Divisions (or the Supervision Consultant, if IESCO chooses to employ one) will be responsible for ensuring that the contractors adhere to the quality requirements and other commitments including implementation of the EMMP and EIA.
- The contractor(s) will be responsible for the implementation of the EMMP during field execution in the project area and will report to the GSC directorate and E&SS unit.
- The E&SS unit will coordinate with relevant government departments (Punjab EPD) and other stakeholders.
- They should keep a record of all non-conformance observed and report these along with actions to the IESCO management for further action.
- They will also have to report any impacts anticipated along with their recommendations for further action.

7.3.2 Field Management and Quality Control

- Carrying out construction activities in an environmentally and socially sound manner during the construction phase will be the responsibility of the site managers of the contractor(s).
- The GSC's Site Incharge (or RE, if the Supervision Consultant is employed) will be responsible for the environmental and social soundness of all construction activities.

- The Engineering Consultant section, the Project Engineer will be responsible to ensure the overall environmental soundness of all construction activities. He will ensure the implementation of the EMMP.

7.3.3 On-the-job Supervision and Monitoring

- The ESM of each contractor will be responsible for the implementation of the EMMP during construction works. He will also be responsible for communication with and the training of their respective construction and camp crews in all aspects of the EMMP.
- The ESI/ESO of GSC directorate, IESCO will ensure implementation of the EMMP in the field is being carried out by the contractor(s). He will also coordinate with the PD, the contractor's project management and ESM of each contractor. ESI will be part of IESCO's site organization.
- If any monitoring teams from government departments or from NGOs visit the field during the field activities, the ESI will be responsible for coordinating their visits.

The responsibilities of various role-players are summarized in **Table 7.1**.

Figure 7.1: Organizational Structure of IESCO

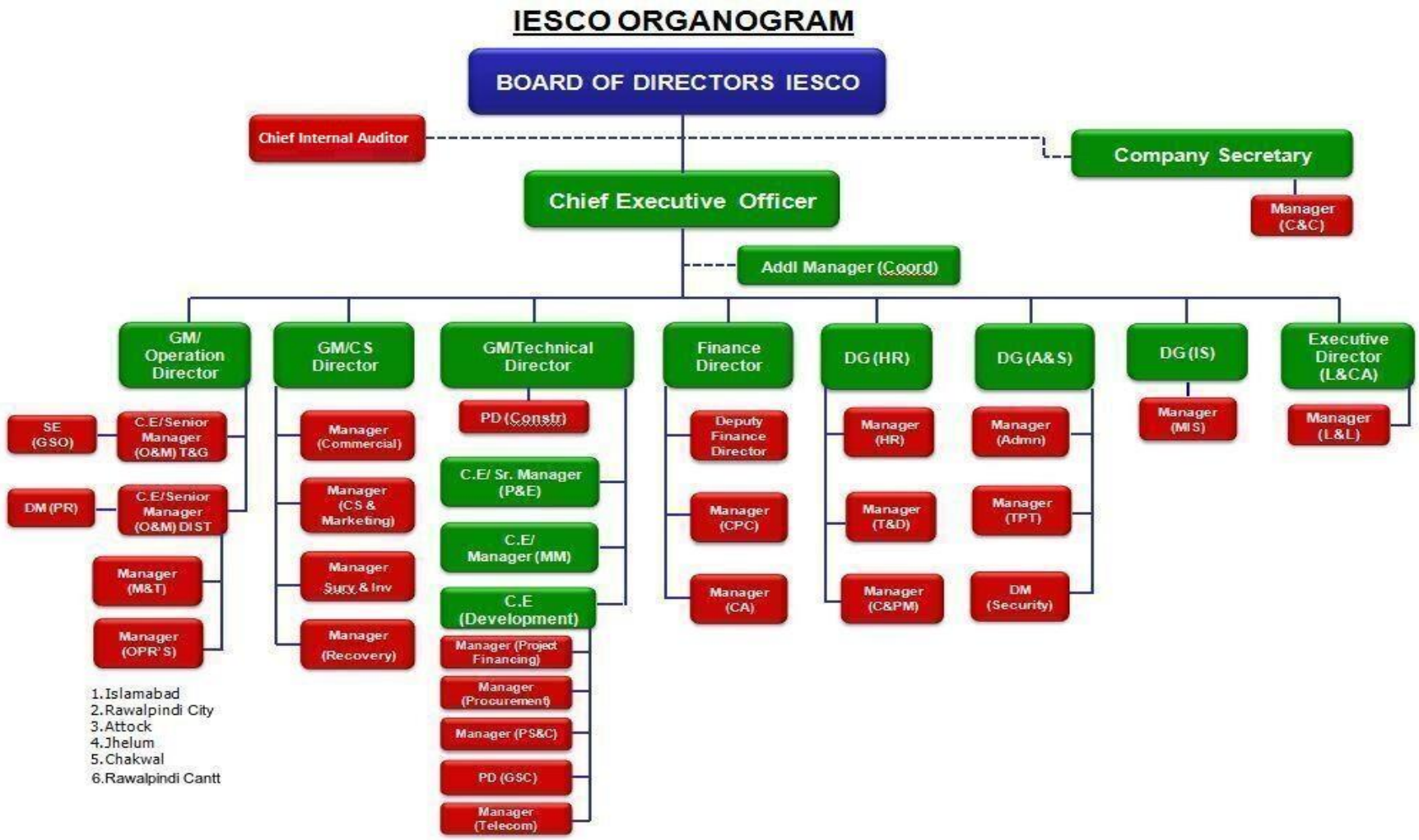


Table 7.1: Role and Responsibility Chart for the Proposed Project

No.	Department/ Division/ Cell	Role	Responsibility
1	IESCO	Chief Executive Officer (CEO)	The CEO is the supreme authority in the organization All kind of decision will be taken by him or any person on his behalf
2	GM/Chief Engineer (Development)	GM/Chief Engineer/ Head of PMU	Fulfil IESCO's obligations as laid out various project documents. Ensure that the construction is carried out within the agreed timeframe according to satisfactory HSE and technical standards.
3	GSC, IESCO	Project Director	Responsible for overall construction work Facilitate field management of contractors; Report regularly to the Chief Engineer (Development).
4	GC Division (XEN office), T&G Division (XEN office),	Deputy Director Grid Station Construction	Responsible for the grid construction works Ensure that the entire project is conducted in an environment and social friendly manner. Facilitate field management of contractors; Report regularly to the Project Director.
		Deputy Director Transmission Lines Construction	Responsible for the T/L works Ensure that the entire project is conducted in an environment and social friendly manner. Facilitate field management of contractors; Report regularly to the Project Director.
		Deputy Director Civil Works	Responsible for the civil works Ensure that the entire project is conducted in an environment and social friendly manner. Facilitate field management of contractors; Report regularly to the Project Director.
5	Environmental and Social Safeguard Section (E&SS) / ESI	Additional Director E&SS	Advise GSC and other IESCO departments on matters relating to environment and social aspects of the project. Responsible for overall environmental issues regarding to the project Advice and support Environment and Social Impact officer for the implementation of EIA and EMMP. Report regularly to the Chief Engineer (Development).
		Additional Deputy Director Environment &	Responsible for the implementation of EMMP in the field, Coordinate with other level of GSC Division, Take proper action on non-compliance, Also provide training to GSC staff,

No.	Department/ Division/ Cell	Role	Responsibility
		Additional Deputy Director Social Impact	Advice and support ESI for the implementation of EIA and EMMP. Report regularly to the Additional Director Environment.
6	Contractors related to all works i-e grid station construction, T/L and Civil works	Site Manager/ Engineer	Manage construction activities, manage construction crew, camp crew and other site personnel, in an environmentally responsible manner, Liaise with GSC's Project Manager, and; Liaise with GSC's Site Incharge.

7.4 Environmental and Social Mitigation Plan

The purpose of the Environmental and Social Mitigation Plan (ESMP) is to minimize the potential environmental and social impacts due to the proposed project. The ESMP reflects the commitment of the proponent to safeguard the physical, ecological and socio-economic environment as well as the surrounding population. The ESMP lists all the potential effects of each activity of the project and their associated mitigation measures identified in the EIA. For each project activity, the following information is presented in the plan:

- A listing of the potential impact associated with that project activity,
- A comprehensive listing of mitigation measures (actions),
- The person(s) responsible for ensuring the full implementation of the action,
- The person(s) responsible for monitoring the action,
- The timing of the implementation of the action to ensure that the objectives of mitigation are fully met.

The mitigation plan for the construction and operational phase of the proposed project is presented in **Table 7.2**.

It should be emphasized that the mitigation measures will have to be translated into environmental as well as social requirements and specifications to be made part of the contracts for the construction activities, with legal binding.

Table 7.2: Environmental and Social Mitigation Plan (ESMP) for the Project

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
A. Design and Pre-construction Phase					
Change of Land Use					
Land Use Change	Land use and cutting of Natural Vegetation	Careful selection of land for grid station and T/lines, Soil characteristics must be considered, High fertile land to be avoided. Avoid obvious scars and blemishes on the landscape;	Pre-construction Phase	GSC Division	PD GSC IESCO
Loss of Natural Vegetation					
Loss of Natural Vegetation	Cutting of trees	Re-plantation plan should be considered in design phase The landscaping of burrow areas and disposal sites consistent with acceptable aesthetic values for the surrounding landscape.	Pre-construction Phase	Design Engineer & GSC Division	PD GSC IESCO
Shifting of Utilities					
Basic Utilities Shifting	Existing Utilities	The existing utilities should be rehabilitated before construction to avoid any inconvenience to the residents of the project area or provide them with alternative arrangement during the construction period.	Pre-construction Phase	GSC Division	PD GSC IESCO
Impact on Archaeological Property					
Significant Property	Cultural, aesthetic, archaeological sites	No Cultural, aesthetic, archaeological sites fall in RoW of transmission lines, In the event of such finding, the Contractor has the duty to secure the site against any intrusion until the archaeological expert will decide on further action.	Pre-construction Phase	Design Engineer & GSC Division	PD GSC IESCO
Waste Management Plan					

Activities and Actions	**Issue/ Component**	**Proposed Mitigation Measures**	**Timeframe**	**Institutional Responsibility**	
				Implementation	**Supervision**
Waste Management Plan	Waste Disposal	Implement waste management plan that identifies and characterizes every waste arising associated with proposed activities and which identifies the procedures for collection, handling & disposal of each waste.	Prior to site clearance	Design Engineer & GSC Division	PD GSC IESCO

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Non-Routine Events					
Non-routine events and accidental releases	Mock drills and records of the same	Plan to be drawn up, considering likely emergencies and steps required to prevent/limit consequences. Follow the SCR Plan.	Prior to site clearance	Design Engineer & GSC Division	Project Director (GSC) IESCO
Land Acquisition Issues					
Grid Station Construction	Land Acquisition	The land for grid station has been allocated by Government of Punjab to IESCO free of charge.	Pre-construction Phase	GSC Division	PD GSC IESCO
Transmission Lines Construction	Land Acquisition	The route of transmission line has been allocated by Government of Punjab to IESCO free of charge.	Pre-construction Phase	GSC Division	PD GSC IESCO
B. Construction Phase					
B1. Construction Camp Site Selection Issue					
Site selection	Acceptability to public/owner; interferences	Contractor need obtain necessary permission for camp site from the relevant authorities The construction camp will preferably be established in the nearby grid stations. Construction camp will be located in a stable and flat area, requiring minimal removal of vegetation and levelling. Constrictors shall prepare a waste disposal plan for camp site and submit to ESI for his approval. ESI's approval will be obtained for camp location.	A selection stage for Camp Site	GSC Division/Contractor	Additional Deputy Director Environment And Social Safeguard Section (E&SS)
Site clearing and preparation, and re-installation	Loss of vegetation and assets on the selected land, and	All efforts during the design stage should be made to minimize the removal of existing macro-plants at camp site Contractor will provide plan for removal & rehabilitation of site upon completion	While establishing Camp Site	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
works after contract completion	dissatisfaction on rehabilitation measures after completion	Photographical and botanical inventory of vegetation before clearing the site Compensatory plantation to be scheduled when construction works near end; for each tree removed 10 new shall be planted			
Contractor Mobilization and Demobilization	Soil Erosion and Contamination	Vehicular traffic on unpaved roads will be avoided as for as possible. Operation of vehicles and machinery close to the water bodies will be minimized. Vehicles and equipment will not be repaired on the site. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.	During Construction Phase	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS
Sanitation & waste disposal facilities at camp	Soil and water contamination, Health risks to workforce and public if not properly managed	The sewage system for such camp will be properly designed i.e., septic tank with soakage pit to receive all sanitary wastewater. Sewage treatment facility will be designed and located to ensure that no water pollution takes place. Lined wash areas will be constructed within the campsite or at site approved by the ESI, for the receipt of wash waters from construction machinery. For the domestic sewage, appropriate treatment and disposal system will be constructed having adequate capacity. Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination.	Throughout operation of work camp	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		The inert recyclable waste from the site (such as cardboard, drums, broken/used parts etc.) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste. Waste oil will be collected in drums and sold to the recycling contractors. Contractor will prepare a waste disposal plan and submit to ESI for his approval.			
Work safety and hygienic conditions	Health risks if work conditions provide unsafe and/or unfavourable work conditions	Obligatory insurance against accidents to work labours Providing basic First Aid training to specified work staff, and basic medical service and supplies to workers Layout plan for camp site, to be approved by the ESI indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents; Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labours, Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines, Provision of adequate sanitation, washing, cooking. and dormitory facilities including light up to satisfaction approved by the ESI, Proper maintenance of facilities for workers will be monitored by ESM, Regular pest control measures at the campsite.	At establishment of camp site	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Protective fencing to be installed around the camp to avoid any accidents. Firefighting equipment will be made available at the camp. The camp staff will be provided firefighting training. All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel.			
Campsite location	Public Health	Camps will be at least 500 m from any groundwater wells used by the community. The construction crew will be provided awareness for the transmissible diseases (such as HIV/AIDS, hepatitis B and C).	Throughout construction period	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS
Campsite security	Security hazards and related conflicts in the project area.	Proper storage and fencing/locking of storage rooms containing hazardous material Employment of guard for storage rooms. Provision of adequate security against sabotage petrol pilfering and theft.	Throughout construction period	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS
Generation of construction waste material	Contamination of soil from construction wastes and quarry materials	All waste will be disposed off as desired and the site will be restored back to its original conditions before handing over. Non-bituminous wastes from construction crew activities will be dumped in sites approved by the ESI, in line with the legal prescriptions for dump sites, and covered with a layer of the conserved topsoil. Bituminous wastes, if produced will be disposed off in an identified dumping site approved by ESI.	Throughout construction period	GSC Division/Contractor	ADDITIONAL DEPUTY DIRECTOR, E & SS
Movement of vehicles in the construction site	Soil compaction and alteration of percolation	Construction vehicles, machinery and equipment will move, or be stationed in the designated RoW, to avoid unnecessary compaction of soil.	Throughout construction period	GSC Division/Contractor	ADDITIONAL DEPUTY

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
and along the haulage routes	and vegetation pattern; Damage to properties and utilities	Damages will be instantly repaired and/or compensated at Contractor's obligation Water and soil quality will be monitored as envisaged in the Environmental Monitoring Plan			DIRECTOR, E & SS
Movement, maintenance and fuelling of construction vehicles	Contamination of soil and groundwater from fuel and lubricants	Construction vehicles and equipment will be properly maintained and refuelled in such a way that oil/diesel spillage does not contaminate the soil. Fuel storage and refuelling sites will be kept away from drainage channels. Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. Unusable debris shall be dumped in nearest landfill sites if available, on other hand then on an approved designated site by IESCO, or local administration. Operation of vehicles close to the water channels; water reservoirs will be minimized. Waste oil and oil-soaked cotton/cloth shall be sold off to authorized vendors Water quality will be monitored as envisaged in the Environmental Monitoring Plan as discussed in chapter 8. Slopes of embankment leading to water bodies will be modified and screened so that contaminants do not enter the water bodies,	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Waste material disposal sites	Contamination of soil/water and impact on	Dismantling of existing formation is not considered, instead, bituminous layers will be used as sub-base for topping up If spoil material develops, pits will be used after examination on possible soil and water contamination risks.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
	landscape value	Spoils will then be covered with sandy conglomerates.			
Soil related Issues					
Contractor Mobilization and Demobilization	Soil Erosion and Contamination	Vehicular traffic on unpaved roads will be avoided as for as possible. Operation of vehicles and machinery close to the water channels, water reservoir will be minimized. Vehicles and equipment will not be repaired on the site. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction Camp Establishment and Operation	Soil Erosion Contamination	Land clearing, levelling and grading will be minimized, and carried out in a manner to minimize soil erosion. All temporary structures will be demolished, land levelled and re-contoured to the original condition or better.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work for grid station and tower installation.	Loss of top fertile soil.	The excavation of earth fills to be limited to approximate depth of 50 m to 100 m. Low embankments should be protected from erosion by planting indigenous grasses that can flourish under relatively dry conditions. High embankments i.e. over 2 meters should be protected by construction stone pitching or riprap across the embankments. Ditches or burrow pits that cannot be fully rehabilitated should be landscaped to minimize erosion and avoid creating hazards for people.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Construction work for grid station and tower installation.	Soil erosion	Cut and fill at the proposed grid station sites will be carefully designed, and ideally should balance each other. The surplus soil, if any, will be disposed at places approved by IESCO. Such sites will be selected after surveying the area and ensuring that soil deposition will not have any significant impacts, such as loss of productive land, blocked access, natural vegetation and disturbance to drainage Appropriate measures will be taken to avoid soil erosion during the excavation of transmission line poles foundations within the area. These include temporary embankments to protect excavated soil, stone pitching and placing gabions. The surplus soil will be disposed as stated above. After the completion of tower foundations particularly on the above-mentioned slopes, additional stone pitching around the foundation will be carried out, where required, to avoid any subsequent soil erosion/land sliding. Post-construction monitoring of such sites will be carried out to detect early signs of any soil erosion/land sliding. The construction works for transmission line route will not be undertaken during the rainy season. After the completion of the construction work, the transmission line route, campsites and other construction sites will be completely restored. No debris, surplus construction material or any garbage will be left behind. Photographic record will be maintained for pre-project, during-construction and post-construction condition of the sites (grid station, transmission line route, camp and access roads).	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work for grid station and	Soil contamination	Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.	Throughout construction period	GSC Division/Contractor	ADDITIONAL DEPUTY

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
tower installation.	due to leakage, spoilage etc.	For the domestic sewage from the construction camp and office, appropriate treatment and disposal system, such as septic tanks and soaking pits, will be constructed having adequate capacity. The contractor(s) will submit the plans for the camp layout and waste disposal system to the IESCO and obtain approval. As stated above, the camp will preferably be established inside the near the grid station site. Waste oils will be collected in drums and sold to the recycling contractors. Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination. The waste disposal plan submitted by the contractor(s) will also address the solid waste.			DIRECTOR, E & SS
Soil and Burrow Material, Cut and Fill					
Construction work for grid station and tower installation	Borrow pit land lease agreement	The Contractor must obtain any necessary permission for burrow pits from the competent authorities.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Water-related Issues					
Use of water for construction and consumption	Conflict with local water demand	The contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected. For construction purposes, water shall be drawn from surface water bodies on priority and as available.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Construction work for grid station, civil works and T/L	Surface water contamination	For the domestic sewage, appropriate treatment and disposal system will be constructed having adequate capacity. Waste oils will be collected in drums and sold to the recycling contractors. The inert recyclable waste from the site (such as cardboard, drums, broken/used parts, etc.) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste. Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work for grid station, civil works and T/L	Water Consumption	Water will be obtained from the source approved by the ESI. Astute planning will be employed to conserve water at the construction sites and camp. Water will be procured in manner that least affects the local communities. Wastewater recycling will be carried out for sprinkling and gardening purposes.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Waste Disposal Issues					
Spillage of liquid wastes	Risk of polluting surface and groundwater from liquid waste spillage, drainage and runoff from construction sites	Application of good engineering and construction practices. The contractor should ensure that construction debris do not find their way into streams which may get clogged. Work on riverbanks will be kept to a minimum, and retaining walls be constructed. To maintain surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structure along urban settlements. If spillage occurs, it will be disposed off in an identified dumping site approved by ESI.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Contractor will prepare a waste disposal plan and submit to ESI for his approval.			
Disposal of Solid waste		Proper and safe waste disposal designated site by ESI or ESM, Contractor will prepare a waste disposal plan and submit to ESI for his approval.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Air Quality related Issues					
Vehicular movement and running of machineries	Emission from construction vehicles and machinery, causing public health risks, nuisance and other impacts on the biophysical environment	The diversion road will be regularly water-sprayed to minimize the dust generation: Schedules will be adjusted to actual needs, determined by the ESI. Vehicle trips to be minimize to the extent possible All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the PEQS. All equipment is operated within specified design parameters. Air quality parameters will be monitored at determined sites and schedule determined by the ESI. Ambient air quality within the premises of camp site and grid station should be monitored.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Transportation of materials, and other construction activities that create dust and emissions	Dust and emissions from machines causing health risk to operators; Impacts on biophysical environment	Vehicles delivering loose and fine materials, like sand and fine aggregates, should be covered by sheets to reduce spills on existing road. Ambient air quality monitoring is carried out in accordance with the EMMP. If monitored parameters are above prescribed PEQS limits, suitable control measures must be taken. Any dry, dusty materials stored in sealed containers or prevented from blowing. Compaction of soil during various construction activities.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work for grid station, civil works and T/L	Air Quality Deterioration	Vehicular traffic on unpaved roads will be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir will be minimized. Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Noise, Vibration Dust Related Issues					
Construction work for grid station, civil works and T/L	Noise due to construction activities, vehicular movement etc.	Vehicles will have exhaust mufflers (silencers) to minimize noise generation. Nighttime traffic will be avoided near the communities. Local population will be taken in confidence if such work is unavoidable. Vehicular traffic through the communities will be avoided as far as possible. Vehicle speeds will be kept low, and horns will not be used while passing through or near the community.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Running of construction machinery	Noise from vehicles, other machinery and equipment	List of all noise-generating machinery onsite along with age to be prepared. Equipment to be maintained in good working order The plant and equipment used for construction will strictly conform to noise standards specified in the PEQS. Vehicles and equipment used will be fitted as applicable, with silencers and properly maintained. Work at night be minimized In urban settlements construction activities will be restricted to be carried out between 6 am and 8 p.m. Implement good working practices (equipment selection and siting) to minimize noise and also reduce its impacts on human health (earmuffs, safe distances, and enclosures). No machinery running when not required Acoustic mufflers/enclosures to be provided in large engines In accordance with the Environmental Monitoring Plan noise measurements will be carried out at locations and schedule specified to ensure the effectiveness of mitigation measures. Vehicle trips to be minimized to the extent possible All equipment operated within specified design parameters. The noise level will not exceed the permissible limit both during day and night times	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Vehicular movement	Traffic congestion and accidents	The movement of vehicles caring construction material should be restricted during daytime to reduce traffic load and inconvenience to the local people.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Vehicular movement	Safety Hazards	Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic. Project drivers will be trained on defensive driving. Vehicle speeds near/ within the communities will be kept low, to avoid safety hazard and dust emissions.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work for grid station, civil works and T/L	Vibration due to construction activities, vehicular movement etc.	Selection of up to date and well-maintained plant or equipment with reduce noise levels ensured by suitable in-built damping techniques or appropriate muffing devices. Confining excessively noisy work to normal working hours in the day, as far as possible. Providing the construction workers with suitable hearing protection like earmuffs and training them in their use. Preferably, restricting construction vehicles movement during nighttime. Heavy machinery like percussion hammers and drills should not be used during nighttime without prior approval of the client. Contractors should comply with submitted work schedule. Keeping noisy operations away from sensitive points; Implement regular maintenance and repairs; and employ strict implementation of operation procedures. Noise barriers in sensitive areas (in front of schools, hospitals, university, mosques).	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work for grid station, civil works and T/L	Dust due to construction activities, vehicular movement etc.	Roads and path should be regularly sprayed with water during dry weather. All excavation work should be sprinkled with water.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Construction workers should be provided with masks for protection against the inhalation of dust. Vehicle speed in the project area should be prescribed and controlled accordingly.			
Fauna and Flora Resources Issues					
Construction work for grid station, civil works and T/L	Loss of Vegetation	Clearing of natural vegetation will be minimized as far as possible during the transmission line works. For the transmission line route, a tree cutting plan will be prepared and submitted to IESCO for approval. A complete record will be maintained for any tree cutting or trimming. The record will include: the number, species, type, size, age, condition and photograph of the trees to be cut/trimmed. Indigenous tree species will be selected for plantation; in particular, Eucalyptus trees will not be used in any case. Cleaning natural vegetation will be avoided as far as possible. The camp will be established in a natural clearing, outside forested areas. Complete record will be maintained for any tree cutting. The construction crew will be provided. With LPG as cooking (and heating, if required) fuel. Use of fuelwood will not be allowed. No herbicide will be used to clear vegetation	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Construction work and illegal hunting by worker	Damage the habitat and, danger to wildlife,	Measures to protect and rehabilitate floral resources of the area discussed in section above will also protect the wildlife resources of the area.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
	disturbance of ecosystem	Blasting will not be carried out while working . No nighttime activities will be carried out in this area. The works in this area will be carried out in coordination with the Forest and Wildlife departments. Vehicle movement will be limited to the existing tracks in the above area. The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area. Garbage will not be left in the open places. The project staff will not be allowed to indulge in any hunting or trapping activities.			
Health and Safety of Workers					
Hygiene related issues during construction phase		Obligatory insurance of workers against accidents. Providing basic medical training to specified work staff and basic medical service and supplies to workers. Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing and contingency measures in case of accidents. Work safety measures and good workmanship practices are to be followed by the contractor to ensure on health risks for labourers. Protection devices should be provided to the workers operating in the vicinity of high noise generating machines. Provision of adequate sanitation, washing, cooking, and dormitory facilities to workers.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Provision of protective clothing for labours handling hazardous material e.g. hard hats, adequate footwear for bituminous pavement works etc. Adequate signage, lightning devices, barriers and person with the flags during construction to manage traffic at construction sites. Timely public notification on planned construction works.			
Social and Gender Issues					
Construction work for grid station, civil works and T/L	Social and Gender Issues	Construction crew will avoid entering the villages and settlements. Local social norms and practices will be respected. No child labour will be employed. Road signage will be fixed at appropriate locations to reduce safety hazards associated with project-related vehicular traffic. Project drivers will be trained on defensive driving. Vehicle speeds near/within the community will be kept low, to avoid safety hazard and dust emissions. The communities near the transmission line route will be informed about the construction activities. Protective fencing will be installed where required. Before commencing the testing commissioning of the system, the nearby community will be informed. Protective fencing will be used where appropriate/possible.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, Social Safeguard Section

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Construction work for grid station, civil works and T/L	Blocked Access	In case of the blockage of the existing routes, alternate routes will be identified in consultation with affected communities.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Socio-Economic Issues					
Construction work for grid station, civil works and T/L	Loss of Agriculture	Temporary RoW has been allocated by Government of Punjab to IESCO.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Sites of Historical, Cultural, Archeological or Religious Significance					
Construction work for grid station, civil works and T/L	Sites of Historical, Cultural, Archeological or Religious Significance	Construction activities will be carried out after consultation with the nearby/relevant community. In case of discovery of any sites or artifacts of historical, cultural, archaeological or religious significance, the work will be stopped at that site. The provincial and federal archaeological departments will be notified immediately, and their advice will be sought before resumption of the construction activities at such sites.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Aesthetic Value					
	Aesthetic Value	Transmission lines and feeders will be constructed after astute planning, in order to avoid dense concentration of electrical lines. Tree plantation will be carried inside and at the periphery of the grid stations, without compromising the safety aspects (i.e., required clearances will be maintained). For this purpose, provisions will be made in the site layout of the grid stations.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Damage to Infrastructure					

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Construction work for grid station, civil works and T/L	Damage to Infrastructure	Avoid damaging the local infrastructure, If any infrastructure will be damaged by the project activity, then it will be recorded. All damaged infrastructure will be restored to original or better condition after construction activities.	Throughout construction period	GSC Division/Contractor	Additional Deputy Director, E & SS
Operational Phase					
Water-related Issues					
Drainage of water from grid station runoff into water bodies	Water pollution from rainwater containing hazardous substances, congestion of drainage structures near settlements.	Water quality monitoring will be carried out during operation phase at schedule approved by ESI. If monitored parameters are above the prescribed limit, suitable control measures will be taken. Ensure proper cleaning scheme for keeping drainage structures clear of debris and blockage.	Throughout Operational period	GSC Division/Contractor	Additional Deputy Director, E & SS
Accidents in grid station	Contamination from spills due to traffic and accidents	The spills at the accident sites will be cleared immediately and disposed off properly.	Throughout Operational	GSC Division/Contractor	Additional Deputy Director, E & SS
Wastewater	Wastewater Discharge	No untreated discharge to be made to surface water, groundwater or soil. Take care in disposal of wastewater generated such that soil and groundwater resources are protected	Throughout operational period	GSC Division/Contractor	Additional Deputy Director, E & SS
Grid station colony	Water Consumption	Water will be obtained from the source approved by the ESI. Astute planning will be employed to conserve water at the construction sites and camp. Water will be procured in manner that least affects the local communities. Wastewater	Throughout Operational period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		recycling will be carried out for sprinkling and gardening purposes.			
Ambient Air Quality					
Air Contamination	Indoor air contamination	Contaminants such as CO, CO_2, and VOCs to be reduced by providing adequate ventilation.	Throughout Operational	GSC Division/Contractor	Additional Deputy Director, E & SS
C3. Maintenance of Plantation					
Grid station Plantation	Maintenance of Flora	Monitoring of survival of trees at the rate of 75 % should be done in the first year of the operation phase and suitable mitigation measures should be taken to protect the trees Efforts will be made for proper maintenance of planted trees to maintain greenery and aesthetics The saplings planted in the project area against the trees cut should be properly maintained throughout their initial growth period in terms of water requirements and necessary nutrients.	Throughout Operational period	GSC Division/Contractor	Additional Deputy Director, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
C4. Emergency Measures					
Emergency measure	Emergency preparedness such as fire fighting	Fire protection and safety measures to take care of fire and explosion hazards, to be assessed and steps taken for their prevention.	Throughout Operational period	GSC Division/Contractor	Additional Deputy Director, E & SS

7.5 Solid Waste Management Plan

Construction Phase: Several solid waste bins will be placed at site camp for the collection of solid waste.

IESCO will collaborate with the local solid waste management authority for collection, transportation and disposal of solid waste generated by Khanpur, Chakwal Grid Station Project.

Empty chemical drums, iron cuttings, etc. will be collected separately at the project site within an area marked as "Scrap Yard". After suitable time frame, scrap will be sold to recycling contractor.

The construction waste generated will be recycled to the extent possible. Open burning of solid waste will not be allowed. The waste will be transported to the nearest waste disposal site, allocated by the government of Punjab.

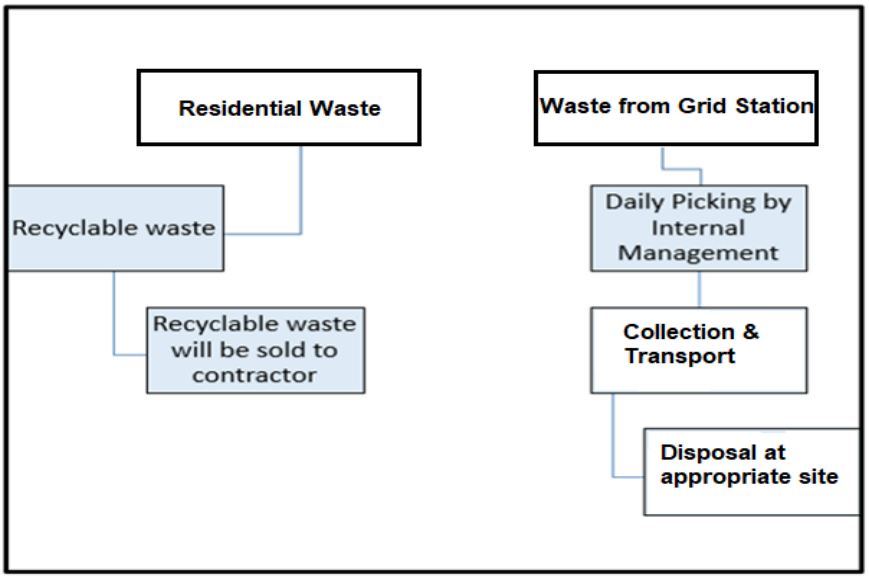
Operational Phase: IESCO will contract with a waste management company for collection, transportation and disposal of solid waste generated by IESCO Project.

The internal collection of waste will be carried out by IESCO Management. The waste will be collected daily and stored at a designated site, from where, the solid waste management company/ collection crew will take the waste. The solid waste will be segregated into three categories.

- Recyclable and reusable
- Remaining

The solid waste will be temporarily stored in the colour coding bins placed outside the building premises at a designed place.

Figure 7.2: Flow Diagram of Solid Waste Management System



7.6 HSE Management Plan

- Health Safety and Environment (HSE) induction/orientation will be provided to all workforce at the project site.

- Assembly point will be established for the gathering of workforce regarding daily HSE Toolbox Talk at the project site.
- HSE Toolbox Meeting will be held by HSE Manager on a weekly basis.
- Special education sessions will be conducted properly at the site.
- Daily walkthrough will be conducted at the project site.
- All the Mandatory PPE's (Safety Helmet, Safety Jacket, Safety Shoes, Coverall, Full body Harness, Safety Goggles, Earplug, Earmuff, Dust mask/Special, Safety Gloves, Masks etc.).
- Proper and safe scaffolding will be provided at the site for safe work at height.
- All the heavy machinery will be inspected properly at the site.
- All Cranes and lifting gears will be inspected/checked on regular basis.
- Inspection & Tagging system will be maintained at the project site.
- Safety signage will be provided at the project site.
- Fire posts will be established at the project site at easy approach location.
- Waste will be maintained properly.
- HSE Signboard will be installed at the project site for an Emergency response.
- Rest area & smoking zones will be established at the site.
- Regular First Aid Center along with all required medicines 24/7 will be available at the project site.
- Paramedic (dispensers) will be deployed at first-aid post for day & night shift
- Emergency response contact numbers will be displayed at campsite i-e, police, fire brigade and ambulance service.
- In-house training will be conducted at the project site.

The contractor will develop his HSE policy, roles and responsibilities of HSE Manager and staff. It also provides information about HSE objectives, Personal Protective Equipment (PPE's) to be used at the site, first aid training and communication and documentation regarding HSE.

- First Aid Boxes: First aid boxes will be provided at all active construction sites to cope up the emergency situations. Usually, a typical first aid box mainly contains antibiotics, basic medicines, cotton, bandages, sunny plast, healing balms, pyodine, spirit, pain killer, etc.
- PPEs: Site Engineer and HSE Manager will be responsible for providing PPEs to all workers.
- Safety Signs: Relevant safety signboards will be displayed on the worksites and labour camps to make aware / train workers about safety rules. Mainly safety signs include signs of speed limits, electric spark, etc.
- TBTs: Tool Box Talks (TBTs) will be delivered on a regular basis and when a new team of workers start a new activity like shuttering, steel fixing, steel cutting, steel bending, scaffolding, concrete pouring, mechanical works, electrical works, etc. at sites to promote safety culture.
- Water Sprinkling: Dust pollution will be controlled with water sprinkling and minimizes the risk of adverse impacts of dust on workers and surrounding areas. Water sprinkling will be carried out regularly to minimize dust pollution and avoiding creating slush.

- Barricading: The contractor will put up barricade tape at all the active work sites. Hard barricading (scaffolding pipes) will be used to cover exposed areas where excavation is more than 10 feet. Training: Safety training will be delivered by HSE Manager to achieve its objectives. Trainings will be conducted for capacity building of employees / workers / labour / sub-contractors to make them well effective to respond in any kind of emergency.

The breakup cost for the safety of workers is described in **Table 7.3.**

Table 7.3: Estimated Cost for the Implementation of Environmental Monitoring Plan for Khanpur, Chakwal Grid Station Project

Sr No	Item	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Personal Protective Equipment (A)				
1	Dust Masks	2800	10	28,000
2	Safety Shoes	100	2000	200,000
3	Gloves	1500	200	300,000
4	First Aid Box	1	3000	3,000
5	Ear Plugs	100	50	50,000
6	Safety Helmets	100	1000	100,000
7	Safety Jackets (Hi Vis)	100	500	50,000
Others (B)				
8	Provision of Dust Bins	15	1000	15,000
9	Warning Tape	25	500	12,500
10	Safety Cones	10	1000	10,000
11	Safety Sign Boards	20	1500	30,000
12	Raincoat	50	1000	50,000
			Total (A + B)	**848,500**

- Time Required for Construction Period = 24 Months
- Number of Labor Required for Construction = 50
- Personal Protective Equipment PPEs
- Dust Musk: 1 Dust Mask to be used in a week by each labourer
- Safety Shoes: 1 Safety shoe for six months for each labourer
- Gloves 2 pairs of gloves for each labourer for a month
- First Aid Box 1 first aid box for every 50 labourers'
- Ear Plug 1 set of earplug to be used for 1 month for each labourer
- Safety Helmet 1 safety helmet for each labourer for 12 months
- Safety Jackets 2 safety Jackets (Hi-Vis) for each labourer for 12 months
- Dust Bin: Rough estimate
- Water Sprinkling the whole construction period
- Rain Cost: 1 Raincoat for each labourer

7.7 Traffic Management and Construction Material Transportation Plan

- All the contractor's construction material will be transported to the project site via GT Road and then Chakwal-Jhelum road.
- 15 km/h speed limited should be maintained at the project site.
- All the light vehicles like cars, jeep etc. should be parked in a designated area.

- Speed breakers will be followed properly.
- All the experienced and license holders (drivers & operators) will be hired for transportation.
- All the heavy machinery will be checked properly and inspected on a regular basis.
- Speed limit signboards must be installed at the project site.
- All the (headlights, backlights, Indicator etc.) will be checked and maintained regularly.
- All the warning lights, reverse back alarms will be maintained properly.
- All the routes within the project site will be marked and designated properly.

7.8 Emergency Preparedness, Response and Site Evacuation Plan

- The Contractor will always be ready for response in any kind of emergency at the project site.
- Special assembly points will be established at the project site (offices & site).
- The emergency siren will be installed at assembly points.
- Contact numbers of emergency response team will be circulated at the project site.
- Close coordination will be carried out with 1122 in the case of any serious injury/accident.
- Close coordination will be carried out with all law enforcement agencies (police) in case of an aggressive mob of people in the shape of any kind of protest.
- Emergency response drill will be carried out once in a month for provision of awareness to the workforce at the project site.
- First Aid Boxes will be available at project site around the clock.
- All the new entrants will be oriented by HSE Manager regarding the required awareness towards the hazardous and risky situation and control.
- The entire workforce will be provided with the all mandatory PPEs for the risk-free environment.
- Special in-house training (TBT) will be conducted by HSE Manager regarding the awareness towards any emergency condition and control.
- Proper water sprinkling will be carried out at service road along with the project site for dust control to avoid any hazardous and risky situation which can be a cause of transport emergency.

7.9 Fire Fighting Plan

The campsite will be equipped with fire extinguishers as well as communication equipment for contacting the appropriate emergency response teams.

At all the campsites should be equipt with emergency alarms. Persons will be nominated to ring the emergency alarm in case of any emergency or any emergency risk.

All the camp residents will be trained and well communicated how to respond to the emergency alarm and reach assembly point immediately. Workers will be trained to respond an emergency alarm as discussed below:

- If the alarm rings for 20 seconds, only once, then it is less severe emergency;
- If it rings for 20 seconds thrice after intervals, then it is medium to severe high emergency, but it can be much severe; and

- If it rings for 60 seconds or more continuously, then the emergency is most severe so, everyone should respond to it immediately, evacuate the workplace and move towards the assembly point.

Proper evacuation routes will be designated, nominated and well communicated to all. All the workers will be trained to follow the evacuation routes and reach the assembly point in case of an emergency.

7.10 Plantation Plan

In order to improve the environment and aesthetical essence of the project site; a plantation plan is being recommended. According to the plantation plan, 450 mature plants having 4-5 feet height and 1.0 to 1.5 inches stem diameter will be planted along eastern, northern, western boundaries and designated areas inside the premises of the Khanpur, Chakwal grid station.

The practice of plantation of mature plants will be an effective compensation against the expected damages to the existing vegetation.

The IESCO will have the provision of staff and budget for the implementation of plantation plan.

The plantation of recommended indigenous species will be planted in pits at spacing 7ft x 7ft. The recommendations about the new plantations are based upon the calculations that these will not be less than hundred times than the cut trees during the developmental phase; as the total number of trees cut during the whole process of this project will be three Kikar trees, shrubs and vegetation at some places. The loss of vegetation along the transmission line route will be compensated as per The Telegraph Act 1885.

The plantation plan consists of trees, shrubs and indoor plant which are recommended.

Trees (20 ft. and above): Trees comprising of shady, flowering, fruit trees have been recommended for plantation along eastern, northern and western boundaries as well as green and parking areas of Khanpur, Chakwal grid station.

The project area is sub-tropical scrub forest ecosystem. Predominantly occupied by Kau, Phulai, Ber, Sheesham and Sanatha trees and shrub species. However, following are some tree species recommended which suits to the project area.

Table 7.4: Recommended Fruit Bearing Trees(local) to be Planted at the Project Site

Sr.#	Local Name of Plant	Scientific Name
1	Lemon	*Citrus X Limon*
2	Orange	*Citrus X sinensis*
3	Ber	*Zizyphus maurishiana*
4	Guava	*Psidium guajava*
5	Mulberry	*Moris alba*

Table 7.5: Recommended Plant Species to be Planted at the Project Site

Sr.#	Local Name of Plant	Scientific Name	Taxonomy / Family	Total Saplings to be planted
1	Chir Pine	*Pinus roxburghii*	Pinaceae	Lump-Sum
2	Kikar	*Acacia nilotica*	Fabaceae or Papilionoideae	
3	Ber	*Zizyphus maurishiana*	Rhamnaceae.	
4	Mulberry	*Moris alba*	Moraceae	
5	Shisham	*Dalbargia sissoo*	Fabaceae	
6	Neem	*Azadirachta indica*	Meliaceae	
7	Semal	*Bombax ceiba*	Bombacaceae	
8	Kachnar	*Bauhinia varigata*	Fabaceae	
9	Siris	*Albizia lebbek*	Mimosaceae	
10	Alstonia	*Alstonia scholaris*	Apocynaceae	

Plantation Plan Cost

The cost of plantation includes the cost of equipment, labour, and plants purchase and maintenance cost for first three months of plantation. The total estimated cost of implementation of plantation plan is Rs.350,000.

The tentative cost of equipment for is given below in **Table 7.5** and maintenance plan for three month is given in **Table 7.6**

Table 7.6: Tentative Cost of Equipment

Sr. #	Description	Qty.	At Rate (PKR)	Cost in PKR
1	Grub hoe (earth digging tool) and others	Lump-sum	Lump-sum	50,000
2	Cost of Plantation on bare slopes	Lump-sum	50 per plant	250,000
3	Maintenance Cost	Lump-sum	Lump-sum	50,000
	Grand Total Cost			**350,000**

Table 7.7: Maintenance Plan for first three months

Sr. #	Description		February	March	April
1	Layout/ pits formation/clearing site				
2	Planting of Saplings				
3	Weeding/maintenance	3 months			

The in charge of the Grid Station will be responsible for the care of planted trees. A gardener will be hired on temporary/daily basis to take care of the planted trees.

7.11 Environmental Monitoring Plan

The Environmental Monitoring Plan (EMP) will ensure that mitigation measures are being implemented and that these are effective to provide a delivery mechanism to address the adverse environmental impacts of the proposed project during its execution and operation phases of the project.

The Monitoring plan will be a monitoring tool for the mitigation measures to be implemented during the different phases of project. The primary objectives of the EMP are to:

- Ensure that the mitigation measures included in the EIA are being implemented completely,
- Ensure the effectiveness of the mitigation measures in minimizing the project's impacts on social and environmental resources.
- Timely identification of any undue/ unanticipated adverse impact, so that a remedial action is taken

The IESCO will make necessary arrangements to monitor the key environmental parameters during the construction and operational phase against the standard parameters, It will include

- The number of trees cut as part of the development works,
- Quantity of water used,
- Monitoring of water quality in project area and sites respectively,
- Air quality monitoring in project area,
- Record of waste produced, record of waste disposal, and;
- Project-related vehicular traffic.

The key responsibilities are;

- The Additional Director E&SS, IESCO will make necessary arrangements to monitor the key environmental parameters during the construction and operation phases.
- The Additional Deputy Director Environment/Social Impact, IESCO will have to monitor project activities in the project area.
- They should keep a record of all non-conformance observed and report these along with actions to the IESCO management for further action.

- They will also have to report any impacts anticipated along with his recommendations for further action.

To achieve above mentioned objectives the following monitoring program will be implemented. An Environmental Monitoring Plan is provided in **Table 7.8**, at the end of this chapter.

Table 7.8: Environmental Monitoring Plan for 132 KV Grid Station at Khanpur and it's Transmission Line

Environmental Component	Project Stages	Parameters	Locations	Frequency	Standards	Implementation	Supervision	Documentation
Water Quality	Construction	pH, BOD, COD, TDS, TSS, DO, NH_x, coliforms hardness, nitrate, hydrocarbon, Pb	Seasonal streams near to grid stations and IESCO's staff colony.	Quarterly	WHO and PEQS	Contractor/ESM	E&SS, IESCO	Completed record of sampling and Analysis
Noise Levels	Construction	dB (A)	At construction sites, campsite and densely populated area	Twice in 8 hours at selected sites at 1 m, 7.5 m, 15 m, and 50 m from right-of-way, Quarterly	EPA Ambient Noise standards	Contractor/ESM	E&SS, IESCO	Completed Record
Dust Emissions	Construction	Visual Checks	At construction sites, campsite and densely populated area, project roads	Twice in 8 Hours and routine monitoring	-	Contractor/ESM	E&SS, IESCO	Completed Record
Public Grievance	Construction	Social parameter	At nearby Communities	Throughout the field activities	Social parameter	ESI	Additional Deputy Director Environment & Social Safeguard Section	Completed Record

Environmental Component	Project Stages	Parameters	Locations	Frequency	Standards	Implementation	Supervision	Documentation
Plantation along with boundary wall of grid station.	Construction	Visual inspection of plant species survival rate and status of maintenance	At sites where plantation was carried out (2) At site within right of- way	(1) One month after plantation (2) One year after plantation 1 month, 3 months 6 months, and 12 months after planting	75 % survival rate	ESI	Additional Deputy Director Environment & Social Safeguard Section	Completed Record
	Operation	Visual inspection of plant species survival rate and status of maintenance	At sites where plantation was carried out	(1) 2.5 years after plantation	75% survival rate	ESI	Additional Deputy Director Environment	Completed Record
Safety and Traffic Rules Compliance	Operation	(1) Faulty, overloaded and speeding vehicles (2)Inspection of signage	Along Ninth Avenue	Quarterly basis, for one year	To be determined	ESI	Additional Deputy Director Environment & Social Safeguard Section	Completed Record

Key:

dBA = *decibels (measured in the audible range)*

USEPA = *United States Environmental Protection Agency*

WHO = *World Health Organization*

EPA = *Environmental Protection Authority,*

PEQS *= Punjab Environmental Quality Standards*

ROW *= Right-of-Way*

PM10 = *Particulate Matter smaller than about 10 micrometres,*

SPM = *Suspended Particulate Matter*

TSS = *Total Suspended Solids*

Table 7.9: Estimated cost for the implementation of Environmental Monitoring Plan for 132 KV Grid Station and Transmission Line Project

Environmental Monitoring Activities	Units/ No. of Samples	Unit Cost specification	Cost (Rs)
Construction phase			
Ambient air quality monitoring	8 (24 months project)	@ 50,000 per sample for 24 hr monitoring	400,000
Ambient water quality monitoring Quarterly basis on one location for 24 months	8	@ 20,000 per sample	160,000
Noise levels, quarterly basis for 24 months	8	@ 5,000 per sample	40,000
Hiring of Environmental Officer for Construction Phase of the Project	24	@ 50,000 per Month	1,200,000
		Total	**1,800,000**

7.11.1 Compliance Monitoring

The compliance monitoring of the project activities is principally a tool to ensure that the environmental and social control measures required in the EIA are strictly adhered to, during the project activities.

Various aspects of the EIA compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractors (and sub-contractors) or any other person associated with the project.
- Verify that the activities are undertaken in compliance with the EIA and EMMP.
- Document and communicate the observations to the concerned person(s) of the contractors, GSC Department and E&SS unit, so that any corrective measures, if required, can be taken in a timely fashion.
- Maintain a record of all incidents of environmental and social significance and related actions and corrective measures.
- Maintain contact with the communities, solicit their views and concerns, and discuss them during the project progress meetings.
- Prepare periodic reports of the environmental and social performance of project.

The mitigation plan will be used as a management and monitoring tool for compliance monitoring. Inspection will be done using checklists prepared by the respective contractors, on the basis of the EMMP.

Compliance monitoring will be the responsibility of all organizations involved in the field activities. It will be carried out by the following:

- Grid Station Construction (GC) Division of IESCO,

- Transmission & Grids (T&G) Division of IESCO,
- Contractors of the Project,
- Environmental and Social Inspector (ESI) of Contractor(s),
- Environmental and Social Monitor/Officer (ESM/ESO) of GSC Directorate, IESCO.

7.11.2 Effects Monitoring

The EIA predicts the impacts of the proposed project on the basis of information available at the time of conducting the assessment and the natural processes that link various environmental and social parameters. Based on this prediction, mitigation measures are introduced such that the predicted residual effects do not exceed acceptable levels. However, there is always an element of uncertainty in such predictions due to an insufficient grasp of the processes, limitations in prediction techniques, or inadequate data on the environment. This is true for the physical, biological, as well as socio-economic environment. Consequently, it is possible that even if the mitigation measures are implemented fully, the negative impacts of the project may exceed acceptable limits.

In order to address the above concerns, effects monitoring will be undertaken during the project activities, with the overall objective of proper management of environmental and social risks and uncertainties. Broadly, effects monitoring has the following objectives:

- To verify that the impacts of the proposed project are within acceptable limits, thus establishing credibility (public assurance)
- To immediately warn the project proponents (and the regulatory agencies, if required) of unanticipated adverse impact or sudden changes in impact trends so that corrective actions can be undertaken, which may include modifications in the proposed activities, or the inclusion of modified or additional mitigation measures
- To provide information to plan and control the timing, location, and level of certain project activities so that the effects are minimized.
- To facilitate research and development by documenting the effects of the proposed project that can be used to validate impact-prediction techniques and provide a basis for more accurate predictions of future projects.

The monitoring will be done during construction and operational phase comprising of the following parameters:

- Soil erosion
- Water quality
- Water consumption and availability
- Air quality
- Noise
- Socioeconomic aspects
- Grievance Monitoring

7.12 Training Program

The key objective of the training program is to ensure that the requirement of EMP is clearly understood and followed throughout the project. The training shall cover the following areas:

- Environmental sensitivity of the project area.

- EMP communication and documentation requirement.
- Vegetation and community issues and their mitigation measures.
- Safe construction practices
- Use of Personal Protective Equipment's (PPEs)
- Environmentally sound construction practices
- Vehicular safety.
- Site restoration requirement.
- Solid Waste Disposal

IESCO will be primarily responsible for providing training to all project personnel. A lump sum fee of Rs. 1,000,000 has been set aside for Environmental & Social Training Program.

The details about the program are shown in **Table 7.10**.

Table 7.10: Framework for Environmental & Social Training Program

Type of Training	Training Description	Period	Duration	Training By	Trainee
Occupational Health and Safety	Training should be provided to aware staff to conform to safety codes	Before Commencement of Project Activities	Full day	External Sources	Site Supervisor, Site Engineer.
Environment & Social Laws, Regulations, procedure and guidelines of the government	The training should detail the laws and regulation concerning the environment, Labour laws and compliance with government regulation.	Before Commencement of Project Activities	Full day	External Sources	Company manager, Site Supervisors, Site Engineers.
Occupational Health & Safety	Health, safety and hygiene. Proper usage of Personal Protective Equipment (PPE's), Precautions to be taken for working in confined areas.	Before Construction Activities	Full Day	Site Supervisor, Site Engineer	Workers
Solid Waste Management	Waste segregation, identification of Hazardous Waste, Use of PPEs and waste Handling	Before Commencement of Project Activities	Full Day	External Sources	Relevant workers and staff
Health Safety and Environmental Auditing	Health Safety and Environmental Audits, Reporting Requirements	Before Commencement of Project Activities	Full Day	External Sources	Relevant Department
Implementation of environmental management and monitoring plan	Explanation of Environment Management and Monitoring Program	Quarterly. As soon as the project activities start	Full Day	External Sources	Site Supervisor, Site Engineer

7.13 Communication and Documentation

An effective mechanism for storing and communicating environmental and social information during the project is an essential requirement of EMMP. The key features of such type of a mechanism are:

- Recording and maintenance of all information generated during the monitoring in a predetermined format.
- Communicating the information to a central location.
- Storing raw information in a central database.
- Processing the information to produce periodic reports.

7.14 Grievance Redressal Mechanism

An attempt has been made during the present EIA to identify all potential impacts of the proposed project, to identify all Project Affected Persons (PAPS), to provide mitigation measures to address the potential impacts, and to chart out a mechanism to implement these mitigation measures.

However during the project implementation, the stakeholders (mostly the communities in the vicinity of the project sites/transmission line route) may still have some grievances with respect to the project activities, their impacts and other mitigation measures.

In order to address the above eventualities, the Grievance Redressal Mechanism (GRM) has been devised. The main objective of the GRM will be to provide a mechanism to mediate conflict and cut down on lengthy litigation, which often delays the infrastructure projects such as the present project. It will also facilitate people who might have objections or concerns about their assistance, a public forum to raise their objections and through conflict resolution, address these issues adequately.

Under the GRM, the contractor will maintain the Social Complaint Register (SCR) at the sites to document all complaints received from the project affected persons and local communities. The information recorded in the Register will include date of the complaint, particulars of the complainant, description of the grievance, actions to be taken, the person responsible to take the action, follow up requirements and the target date for the implementation of the mitigation measure. The register will also record the actual measures taken to mitigate these concerns.

As soon as a complaint is received, the contractor will record it in the complaint register and will refer it to the concerned SDO/XEN, if it could not be addressed by the contractor. The SDO/XEN will respond and resolve the issue within 15 days of the complaint filed. If the issue is not resolved then it will be referred to Project Director GSC, who will address the issue within 15 days of the referral. In case the complaint could not be solved at Project Director's office then Chief Engineer Development will be approached, and the issue will be addressed within one month. For any reason, if the complainant is not satisfied then he/she has the right to approach the court. Once the remedial action is decided, implementation responsibility as well as schedule will be determined.

The proposed remedial action will be documented in the SCR, with complete details (by whom and by when). The proposed remedial action will be shared with the complainant. Similarly, the actual action taken will also be documented in the register and shared with the complainant. The complainant's views on the remedial action taken will also be documented in the register.

The SCR will be reviewed during the fortnightly meetings at the site. The progress on the remedial actions will also be reviewed during the meetings.

7.15 Change Management

The EIA for the proposed operation recognizes that changes in the operation or the EMMP may be required during the operation and therefore provides a Change Management Plan to manage such changes. Overall responsibility for the preparation of change management statements will lie with Islamabad Electrical Supply Company Limited (IESCO).

- Category A changes,
- Category B changes, and;
- Category C changes.

These categories are defined below further one by one.

7.15.1 Category 'A' Change

The 'Category A' change is one that leads to a significant departure from the project described in the EIA and consequently requires a reassessment of the environmental and socioeconomic impacts associated with the change. In such an instance, IESCO will be required to conduct a fresh EIA of the changed portion of the project, and send the report of this assessment to the relevant agencies for approval (Pak-EPA). Examples of such changes are provided below.

- Change in the transmission line route by more than 2 km of the original alignment. Or change in the route by less than 2 km, but the changed route has environmental and/or social sensitivity more than the original route.
- Increase in the transmission line length exceeding 20 % of the original design. Or increase in length by less than 20% but involving areas which are more sensitive - environmentally and/or socially - than the original route.
- Change in the grid station site by more than 2 km of the location studied during the EIA. Or change in the site by less than 2 km but the new location has a higher environmental and/or social sensitivity.
- Inclusion of new grid station or transmission line sub-project not enlisted in this EIA report.

7.15.2 Category 'B' Change

The category 'B' change is one that may entail project activities not significantly different from those described in the EIA, which may result in project effects whose overall magnitude would be similar to the assessment made in this report. In case of such changes, the ESI (with assistance from the E&SS) will be required to reassess the environmental and socioeconomic impacts of the activity, specify additional mitigation measures, if necessary, and report the changes to the relevant agencies (Contractors, E&SS, Punjab EPD). Examples of such changes are provided below.

- Changes in the transmission line route by more than 500 m of the original alignment, but not exceeding 2 km, provided that the changed route does not have environmental or social sensitivity more than the original area.
- Increase in the transmission line length exceeding 10 % of the original design, but not exceeding 20%, provided that the extended route does not have environmental or social sensitivity more than the original area.
- Change in the grid station site by more than 500 m of the location studied during the EIA, but not exceeding 2 km, provided that the new location does not have environmental or social sensitivity more than the original area.

- Such changes will necessitate site surveys for the transmission line route or grid station sites, by the environmental and socioeconomic experts. A site-specific assessment for any additional environmental as well as socio-economic issues will need to be carried out. Complete record of the surveys and assessment will be maintained.

7.15.3 Category 'C' Change

A Category-C change is one that is of little consequence to the EIA findings. This type of change does not result in effects beyond those already assessed in the EIA; rather it may be made onsite to minimize the impact of an activity, such as re-aligning a particular section of the transmission line to avoid cutting a tree, or relocating construction campsites to minimize clearing vegetation. The only action required for such changes will be to document the change.

7.16 Environmental Budget

The cost required to effectively implement the mitigation measures is important for the sustainability of the Project in the operational phase of the Project.

The summary of the cost of monitoring environment and mitigation cost is shown in **Table 7.11**.

Table 7.11: Summary of Environmental Mitigation & Monitoring Cost

Activity	Basis	Cost (Rs)
Environmental Monitoring Cost	Ambient Air, Noise and Water Quality Monitoring and Hiring of Environment Officer	1,800,000
HSE Management Plan	For Construction Phase	848,500
Plantation Plan	Plantation of Trees	350,000
Training Program	Trainings about environment protection of the project site	1,000,000
	Grand Total	**3,998,500**

7.17 Post Project Monitoring

The Project Manager of 132 KV Grid Station at Khanpur and it's Transmission Line, Khanpur, Chakwal, or his representative shall prepare a brief post-project report describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to, any damages to the environment and the mitigation or compensation provided, and monitoring information of scientific or environmental interest that is not propriety in nature. This report should be submitted to the Environmental Protection Department, Punjab.

8 Conclusion and Recommendations

8.1 Introduction

This Chapter presents the assessment of the possible environmental impacts of 132 KV Grid Station at Khanpur, Chakwal and its Feeding Transmission Line Project. The study presents the purpose of the EIA as to the description of the site, the impact of the project during and after implementation, the mitigation measures and residual impacts.

The EIA also includes the justification and detailed description of the project, with an evaluation of the potential impacts and effects on the environment including economic and social consequences. This Chapter describes the conclusion and recommendation of the EIA study of the project.

8.2 Conclusions

The major conclusions of the EIA are:

- The IESCO intends to construct a new 132 KV grid station and 15 Km feeding transmission line at Khanpur, Chakwal.
- The main objective of the project is to increase the efficiency, reliability and quality of the electricity supply in Khanpur, Chakwal city and other small villages in the vicinity.
- The total land allocated for construction of grid station is 40 kanal which has been provided free of cost by the locals. The project consists of construction of a grid station, erection of 54 poles on 15 Km feeding transmission line from 132KV T/Line up to proposed grid station at Khanpur, Chakwal. The total estimated cost of the project is Rs. 1,110 million and would be completed in 24 months (two years).
- The potential impacts during construction phase includes soil erosion, degradation, contamination soil mixing and compaction; air quality deterioration; noise pollution and vibration; water contamination and consumption; loss of/damage to the natural vegetation of the area; loss of /damage to the wildlife of the area and public health and safety.
- The significant environmental management issues during operational phase include soil and water contamination; safety hazards; public health and loss of agriculture.
- The project construction and operational activities can potentially affect the natural resources of the area. These adverse impacts can be largely reduced by implementing the appropriate mitigation measures, which has been discussed in this report.

8.3 Recommendations

On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during present EIA, it is concluded that 132 KV Grid Station at Khanpur and feeding transmission line is likely to cause environmental impacts mainly during its construction phase. However, these impacts can be mitigated provided the proposed activities are carried out as mentioned in the report, and the mitigation measures included in this report are completely and effectively implemented.

The project will directly improve electricity supply for people living in Khanpur, Chabbar Chak, Chak Baqir Shah, Chak Kharak, Saigolabad, Ghanwal, Rabaal, Dheedwal, Shah Said Bullo, Boolay Hajiaal, Thirpal and Jaswal and other villages in the vicinity as well as generate business opportunities for the local communities.

There are no remaining issues that warrant further investigation. This EIA is considered as adequate for the environmental and social justification of the project.

Table 8.1: **Environmental Screening Matrix (mitigated) of 132 KV Grid Station at Khanpur and its Feeding Transmission Line**

	Physical Aspect					**Biological Aspects**		**Socio-Economic Aspects**										
	Soil Issues	**Air Quality**	**Surface Water**	**Ground Water**	**Water Consumption**	**Natural Vegetation**	**Wildlife**	**Noise and vibration**	**Safety Hazard**	**Pressure on local Infrastructure**	**Public Health and Nuisance**	**Aesthetic Value**	**Gender Issues**	**Employment**	**Cultural Issues**	**Blocked Accessed Routes**	**Compensation**	**Agriculture Loss**
Project Siting																		
Visual Impacts	0	N	0	0	N	-1	N	0	0	0	0	N	N	+2	+2	N	N	N
Cumulative Impacts	0	N	N	N	N	0	0	N	0	N	0	+2	+2	+2	+2	N	N	N
Design Phase																		
Site Selection for Grid Station	0	0	N	N	N	-1	0	0	0	0	0	N	N	+2	N	N	N	N
Route Selection for Transmission Lines	0	N	0	0	N	-1	-1	0	0	N	0	N	N	+2	N	N	N	N
Equipment Selection	N	N	N	N	N	N	N	N	0	N	N	N	N	+2	N	N	N	N
Construction Phase																		
Land Acquisition	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Contractor's Mobilization	0	0	0	0	0	0	0	0	0	0	0	0	0	+2	0	0	N	N
Site Preparation	0	0	0	0	0	-1	-1	0	0	0	0	0	0	+2	N	N	N	N
Contractor's Camp	0	0	0	0	0	-1	-1	-1	0	N	0	N	N	+1	N	N	N	N

Construction of Infrastructure	0	0	0	0	0	-1	0	0	0	N	0	0	0	+1	0	0	N	N
Construction Materials Supply	0	0	0	0	N	0	0	0	0	N	N	N	N	+1	N	N	N	N
Solid Waste Disposal	N	N	0	N	N	0	0	N	0	N	N	N	N	N	N	N	N	N
Liquid Waste Disposal	-1	N	-1	-1	N	N	N	N	-1	N	N	N	N	N	N	N	N	N
Immobilization of Contractor	0	0	0	0	0	0	0	0	0	0	0	0	0	+2	0	0	N	N
Operational Phase																		
Project Operation Facility	N	0	0	0	N	N	N	0	N	N	N	N	N	+2	+2	N	N	N
Solid Waste Disposal in grid station	0	N	0	N	N	N	N	N	0	N	0	N	N	+1	N	N	N	N
Effluents Disposal	0	N	0	N	N	N	N	N	0	N	0	N	N	N	N	N	N	N
PCB contaminated Transformer Oils	0	N	0	0	N	N	N	N	-1	N	-1	N	N	N	N	N	N	N
O & M of Grid Station	0	N	0	0	N	N	N	N	0	N	0	N	N	N	N	N	N	N

Annexure-1: List of Names, Qualification and Roles of EIA Team Members

Name and Designation	Qualification and Experience	Tasks Assigned
Mr Saadat Ali, Team Leader	Postgraduate Diploma in Sanitary Engineering, International Institute for Hydraulic and Environmental Engineering, 1984 B. Sc. Civil Engineering, Engineering College, University of Peshawar, 1978	▪ Overall management of the project (Supervision, site visits, guidance, inputs and suggestion, recommendation and discussion and report presentations). ▪ To review overall environmental issues and mitigation measures. ▪ To prepare the draft and final study reports.
Mr Ali Abdullah, Environmental Engineer	M. Sc. Environmental Engineering, Newcastle University (2016) B. Sc. Civil Engineering, The University of Lahore, (2010-1014)	▪ Suggest mitigation measures for impacts that affect the environment. ▪ Identification of site for baseline data collection for water, wastewater, noise, soil, traffic and ambient air quality.
Ms. Javeria Iqbal Environmental Scientist	Masters in Environmental Sciences, National University of Sciences and Technology (NUST) Islamabad, 2023 Bachelors in Environmental Sciences, IIUI Islamabad, 2019	▪ Fieldwork for baseline data collection in the area under study ▪ Research tools preparation for field study. ▪ Secondary data collection for a desk review. ▪ To prepare the draft and final study reports
Ms. Sehrish Shoukat Environmental Engineer	Masters in Environmental Engineering, National University of Sciences and Technology (NUST) Islamabad, 2021 Bachelors in Environmental Engineering, National University of Sciences and Technology (NUST) Islamabad, 2017	▪ To review overall environmental issues and mitigation measures ▪ Draft Environmental Management Plan for successful management of expected environmental impacts from the project.
Mr.Muneeb Hassan Environmental Engineer	Bachelors in Environmental Engineering, National University of Sciences and Technology (NUST) Islamabad, 2022	▪ To review overall environmental issues and mitigation measures ▪ Draft Environmental Management Plan for successful management of expected environmental impacts from the project.

Annexure-2: Terms of Reference

An EIA will be carried out for all stages of the projects, i.e. preconstruction, construction and post-construction with the following objectives:

- Establishing the environmental baseline in the study area and identifying any significant environmental issue.
- Assessing these impacts and providing for the requisite avoidance, mitigation and compensation measures.
- Integrating the identified environmental issues in the project planning and design.
- Developing appropriate management plans for implementing, monitoring and reporting of the environmental mitigation and enhancement measures suggested.
- Give presentation during a public hearing of the EIA of the 132 KV Grid Station at Khanpur, Chakwal and its Transmission Line Project and respond to queries generated by Punjab EPA until issuance of the NOC.

Annexure-3: References

- ***Ahmad, Nazir. 1993.*** Water Resources of Pakistan and their Utilization
- ***Ali, Salim and Ripley, S. Dillon 1968.*** A Synopsis of the Birds of India and Pakistan, Bombay Natural History Society, Bombay, India
- ***Ali, S. I, 1973.*** Mimosaceae (Editors Nasir, E & S.I. Ali) Flora of Pakistan no.1-210, Department of Botany, University of Karachi.
- ***Champion et. al.1965.*** Forest Types of Pakistan. Pakistan Forest Institute, Peshawar.
- ***EPA, 1997.*** Guidelines for the Preparation and Review of Environmental Reports. Pakistan Environmental Protection Agency, Government of Pakistan.
- ***EPA, May 1997.*** Guidelines for Public Consultation. Pakistan Environmental Protection Agency, Government of Pakistan
- ***EPA, 1997.*** Guidelines for Sensitive and Critical Areas. Government of Pakistan
- ***GoP.*** Normals of Period 1961 - 1990. Pakistan Meteorological Department, Government of Pakistan.
- ***IESCO, 2017.*** IESCO Company Profile March 2017.
- ***IUCN, 1998*** August, Environmental Profile of Pakistan. Ministry of Environment, Government of Pakistan
- **Khan J.A, 1993** May, The Climate of Pakistan. Rahber Publishers, Karachi.
- ***MOE,*** Environmental Legislation in Pakistan, Ministry of Environment, Government of Pakistan.
- ***MOE, 2005.*** June, Pakistan Strategic Country Environment Assessment, The World Bank/ Ministry of Environment, Government of Pakistan.
- ***NEPRA, 2005.*** State of Industry Report 2005. National Electric Regulatory Authority
- ***NTDC, 2022.*** Power System Statistics 46th Edition June 2022. National Transmission & Despatch Company
- **Pakistan Clean Air Program**, Ministry of Environment Local Government and Rural Development, Government of Pakistan
- ***Roberts, T.J., 1991.*** The Birds of Pakistan (Vols. I & II), Oxford University Press
- ***Roberts, T.J. 1997.*** Mammals of Pakistan, Oxford University Press, Oxford
- ***Survey of Pakistan, 1997.*** Atlas of Pakistan. Director Map Publication, Survey of Pakistan, Rawalpindi.

Annexure-4: Glossary

Air pollution	Air is made up of a number of gases, mostly nitrogen and oxygen and, in smaller amounts, water vapour, carbon dioxide and argon and other trace gases. Air pollution occurs when harmful chemicals and particles are emitted to the air – due to human activity or natural forces – at a concentration that interferes with human health or welfare or that harms the environment in other ways.
Ambient air quality	Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution.
Archaeology	The study of human history and prehistory through the excavation of sites and the analysis of artefacts and other physical remains.
Biodiversity	The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.
Bye-law	A rule made by a local authority to govern activities within the area it controls. Examples include bye-laws covering waste disposal, traffic or public events or signs.
Carbon dioxide (CO_2)	A colourless gas that is naturally produced by animals and people in the exhaled air and the decay of plants.
Carbon monoxide	A highly poisonous, odourless, tasteless and colourless gas that is formed when carbon material burns without enough oxygen.
Climate	The pattern of weather in a particular region over a set period of time, usually 30 years.
Compost	A rich soil-like material produced from decayed plants and other organic matter, such as food and animal waste, that decomposes (breaks down) naturally.
Conservation	Preserving or protecting animals and resources such as minerals, water and plants through planned action (such as breeding endangered species) or non-action (such as not letting taps run unnecessarily).
Deforestation	The reduction of trees in a wood or forest due to natural forces or human activity such as burning or logging.
Electromagnetic Field	Electromagnetic fields are a combination of invisible electric and magnetic fields of force. They are generated by natural phenomena like the Earth's magnetic field but also by human activities, mainly through the use of electricity.
Effluent	Liquid wastes such as sewage and liquid waste from industries.
Energy efficiency	Actions to save fuels, for example, better building design, changing production processes, developing better transport policies, using better road vehicles and using insulation and double glazing in homes.
EIA	An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs and policies.

EMP	An environmental management plan (EMP) is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.
Fauna	The animals of a particular region, habitat, or geological period.
Flora	The plants of a particular region, habitat, or geological period.
Habitat	The area occupied by a community or species (a group of animals or plants), such as a forest floor, desert or seashore.
Initial Environmental Examination	Initial environmental examinations describe the environmental condition of a project, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring.
Grid Station	An electrical Power grid station is an interconnection point between two transmission ring circuits, often between two geographic regions. They might have a transformer, depending on the possibly different voltages, so that the voltage levels can be adjusted as needed.
PEQS	The Punjab Environmental Quality Standards (PEQS) are quality standards to regulate the air emissions and effluents of industry and other big polluters.
Noise Pollution	Noises that disturb the environment and people's ability to enjoy it, for example continually sounding house alarms, loud music, air conditioning or other electrical units and aircraft or motor engines.
Seismology	The branch of science concerned with earthquakes and related phenomena.
Topography	The arrangement of the natural and artificial physical features of an area.

Annexure-5: List of Persons and Stakeholders met during EIA

No.	Name of Person	Designation
1	Mr. Sher Afzal	Additional Deputy Director, Environment & Social Safeguard Section, IESCO
2	Mr. Ishtiaq Hussain	SDO, IESCO office, Khanpur, Chakwal

No.	Village	Name	Age	Gender	Education	Occupation	Marital Status
5	Khanpur	Mr. Nadeem Asghar	35	Male	Matric	Private Job	Married
6		Mr. Abdul Majeed	37	Male	B.A	Government job	Married
7		Mr. Omer Sultan	32	Male	Primary	Unemployed	Married
8		Mr. M. Younis	53	Male	Primary	Own Business	Married
9		Mr. Abdul Wahab	26	Male	Middle	Unemployed	Single
10		Ms. Taleeman	33	Female	Middle	House wife	Married
11		Ms. Zareena	45	Female	Illiterate	Farmer	Married
12	Chak Kharak	Mr. Faizan	24	Male	Matric	Unemployed	Single
13		Mr. Imran Mehmood	43	Male	Illiterate	Driver	Married
14	Saigolabad	Ms. Ghulam Ghousia	34	Female	B.A	Government job	Married
15		Mr. Farid Shah	47	Male	Illiterate	Farmer	Married
16		Mr. Uzair Minhas	20	Male	F.A	Student	Married
17		Mr. Ansar Minhas	31	Male	B.A	Own Business	Married
18		Mr. Nabeel	22	Male	Inter	Unemployed	Single
19	Sohawa	Mr. Saeed Ahmed	45	Male	B.A	PAF	Married
20		Mr. Syed Faizan Abbas	20	Male	BS	Student	Single
21		Mr. Rang Shah	68	Male	Middle	Unemployed	Married
22		Mr. Hamza Javed	27	Male	BS	Student	Single
23		Mr. Haseeb	25	Male	Matric	Shopkeeper	Single
24	Rabaal	Mr. Nauman	32	Male	Matric	Private Job	Married
25		Mr. Abaad Hussain	57	Male	Illiterate	Own Business	Married
26		Mr. Salman Awais	25	Male	Inter	Unemployed	Single

No.	Village	Name	Age	Gender	Education	Occupation	Marital Status
27	Thirpal	Mr. Zeeshan	32	Male	Illiterate	Government Job	Single
28		Mr. Manzoor Hussain	58	Male	Primary	Farmer	Married
29		Mr. Zaheer	35	Male	Primary	Driver	Married
30		Mr. Sher Muhammad	55	Male	Matric	Private job	Married
31	Shah Said Bullo	Mr. Mateen	19	Male	Inter	Student	Single
32		Mr. Yaseen	24	Male	Illiterate	Labor	Married
33		Mr. Abbas	49	Male	Middle	Farmer	Married

Annexure- 6: Socio-Economic Data Collection Questionnaire

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Public Consultation

Name of Surveyor	Jawein.	Date	9-Dec-2022.
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line Khanpur, Chakwal		
Name of Respondent	Farid Shah, 47, Gujalabad.		
Eductional Qualification, Last Qualification	Illiterate		
Profession	farmer.		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions from **BID**

Positive Impacts		**Negative Impacts**	
Creation of Job Opportunities	✓	Traffic congestions on Khanpur Road due to haulage of construction material.	✓
Upgradation of infrastructure facilities (water, sewerage and electricity) / Improvement of Quality of Living	✓	Dust & Noise pollution due to construction activities	✓
Value enhancement of the project area. Increase in real estate price	✓	Health and Safety issues for construction workers	✓
Increased security of the locality	+	Solid waste littering in the locality	✓
Any other impact you might	Local Jobs.	Any other impact you might forsee	

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

✓	Enclosure of construction site with temporary walls	✓	No night-time construction
	Dust suppression measures such as water sprinkling		Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)		Any other suggestion: Limit movement near work area of locals.
	In house concrete batching plant		
✓	Proper disposal of construction debris		

What is respondent's overall opinion towards the G.S Project?

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Good (specify primary reason for this opinion)	
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	
Remarks	
General remark on the project	

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Public Consultation

Name of Surveyor	Ali Abdullah.	Date	9- Dec -2021.
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line Khanpur, Chakwal		
Name of Respondent	M. Yaseen., 24 (Shah Said)		
Eductional Qualification, Last Qualification	None.		
Profession	labor.		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions from **BID**

Positive Impacts		**Negative Impacts**	
Creation of Job Opportunities	Yes.	Traffic congestions on Khanpur Road due to haulage of construction material.	✓
Upgradation of infrastructure facilities (water, sewerage and electricity) / Improvement of Quality of Living	✓	Dust & Noise pollution due to construction activities	✓
Value enhancement of the project area. Increase in real estate price	✓	Health and Safety issues for construction workers	✓
Increased security of the locality	✓	Solid waste littering in the locality	✓
Any other impact you might	~~local~~ jobs for locals.	Any other impact you might forsee	

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

✓	Enclosure of construction site with temporary walls	✓	No night-time construction
	Dust suppression measures such as water sprinkling		Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)		Any other suggestion:
	In house concrete batching plant		
✓	Proper disposal of construction debris		

What is respondent's overall opinion towards the G.S Project? Yes.

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Good (specify primary reason for this opinion) ✓	Great initiative by IESCO.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	
Remarks	
General remark on the project	

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Public Consultation

Name of Surveyor	Javeria.	Date	9-Dec-2022.
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line Khanpur, Chakwal		
Name of Respondent	Ms. Ghulam Ghazra, 34, Khanpur, married		
Eductional Qualification, Last Qualification	B.A		
Profession	Govt. Job, LHW worker.		
Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions from **BID**			
Positive Impacts		**Negative Impacts**	
Creation of Job Opportunities	✓	Traffic congestions on Khanpur Road due to haulage of construction material.	✓
Upgradation of infrastructure facilities (water, sewerage and electricity) / Improvement of Quality of Living	✓ electricity improvement	Dust & Noise pollution due to construction activities	✓
Value enhancement of the project area. Increase in real estate price		Health and Safety issues for construction workers	
Increased security of the locality	✓	Solid waste littering in the locality	✓
Any other impact you might		Any other impact you might forsee	Disturbance to livestock
What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)			
✓	Enclosure of construction site with temporary walls	✓	No night-time construction
✓	Dust suppression measures such as water sprinkling		Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)		Any other suggestion:
	In house concrete batching plant		
✓	Proper disposal of construction debris		
What is respondent's overall opinion towards the G.S Project?			

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Good (specify primary reason for this opinion)	Needed elec. shortage, voltage v. low in Summers.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	
Remarks	
General remark on the project	the.

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Public Consultation

Name of Surveyor	Jawera.	Date	9 Dec 2022.
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line Khanpur, Chakwal		
Name of Respondent	Mr. Rauf Shah. 68. Sohawa.		
Eductional Qualification, Last Qualification	Middle pass.		
Profession	Unemployed.		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions from **BID**

Positive Impacts		**Negative Impacts**	
Creation of Job Opportunities	✓	Traffic congestions on Khanpur Road due to haulage of construction material.	✓
Upgradation of infrastructure facilities (water, sewerage and electricity) / Improvement of Quality of Living	✓	Dust & Noise pollution due to construction activities	
Value enhancement of the project area. Increase in real estate price		Health and Safety issues for construction workers	✓
Increased security of the locality	✓	Solid waste littering in the locality	✓
Any other impact you might		Any other impact you might forsee	labor movement to be limited / N of approach in villages.

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

✓	Enclosure of construction site with temporary walls	✓	No night-time construction
	Dust suppression measures such as water sprinkling		Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)		Any other suggestion: Completion on Time
	In house concrete batching plant		
✓	Proper disposal of construction debris		

What is respondent's overall opinion towards the G.S Project?

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Good (specify primary reason for this opinion) ✓	Good should be completed on time.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	
Remarks	
General remark on the project	true.

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Public Consultation

Name of Surveyor	Ali Abdullah	Date	9-Dec-2022
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line Khanpur, Chakwal		
Name of Respondent	Mr. M. Zaheer, (Thirpoal.)		
Eductional Qualification, Last Qualification	Primary		
Profession	Driver		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions from **BID**

Positive Impacts		**Negative Impacts**	
Creation of Job Opportunities	✓	Traffic congestions on Khanpur Road due to haulage of construction material.	✓
Upgradation of infrastructure facilities (water, sewerage and electricity) / Improvement of Quality of Living	✓	Dust & Noise pollution due to construction activities	✓
Value enhancement of the project area. Increase in real estate price	✓	Health and Safety issues for construction workers	✓
Increased security of the locality	✓	Solid waste littering in the locality	✓
Any other impact you might		Any other impact you might forsee	Congestion on road

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

✓	Enclosure of construction site with temporary walls	✓	No night-time construction
✓	Dust suppression measures such as water sprinkling	✓	Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)		Any other suggestion: Workers should be confined to work area.
	In house concrete batching plant		
	Proper disposal of construction debris		

What is respondent's overall opinion towards the G.S Project?

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Good (specify primary reason for this opinion) ✓	✓ Good.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	
Remarks	
General remark on the project	

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Public Consultation

Name of Surveyor	Ali Abdullah	Date	9-Dec-2022
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line Khanpur, Chakwal		
Name of Respondent	Mr. Hamza Javed., 27. (Sohawa)		
Eductional Qualification, Last Qualification	BS cont. Studen.		
Profession	Student.		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions from **BID**

Positive Impacts		**Negative Impacts**	
Creation of Job Opportunities	✓	Traffic congestions on Khanpur Road due to haulage of construction material.	—
Upgradation of infrastructure facilities (water, sewerage and electricity) / Improvement of Quality of Living	✓	Dust & Noise pollution due to construction activities	—
Value enhancement of the project area. Increase in real estate price	✓	Health and Safety issues for construction workers	
Increased security of the locality		Solid waste littering in the locality	—
Any other impact you might		Any other impact you might forsee	

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

	Enclosure of construction site with temporary walls		No night-time construction
—	Dust suppression measures such as water sprinkling	—	Optimization of construction activity through use of latest machinery
	Awareness instruments (e.g., safety signboards)		Any other suggestion: → Labors shouldn't be allowed to move freely. → locals to be given jobs.
	In house concrete batching plant		
	Proper disposal of construction debris		

What is respondent's overall opinion towards the G.S Project? Yes.

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Good (specify primary reason for this opinion) ✓	Needed as voltage is typically very low in the area.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	
Remarks	
General remark on the project	

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Stakeholders Consultation

Name of Surveyor	Ali Abdullah	Date	9-Dec-2022
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and Transmission Line		
Full Name and Department Name in	Mr. Sher Afzal , IESCO,		
Main Responsibility e.g. Maintenance /Horticulture/Planning	Manager Env. and Social Safeguard dep.		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions
132 KV, 15Km T/L, Shortage issues in area, land donated by locals.

Extent of impact: Severe/significant/Minor

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

✓	Enclosure of construction site with temporary walls	✓	No night-time construction
✓	Dust suppression measures such as water sprinkling	✓	Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)	✓	Any other suggestion: Minimize noise Pollution.
	In house concrete batching plant		
✓	Proper disposal construction debris		

What is respondent's overall opinion towards the Project	Positive.
Good (specify primary reason for this opinion) ✓	Much needed.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	

Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and its Transmission Line

Questionnaire for Stakeholders Consultation

Name of Surveyor	Javeic.	Date	9-Dec-2022.
Project Name:	Environmental Impact Assessment of EIA of 132 KV Khanpur Grid Station and Transmission Line		
Full Name and Department Name in	Mr. Ishtiaq Hussein., SDO, Khapur.		
Main Responsibility e.g. Maintenance /Horticulture/Planning	SDO, Wapda.		

Give a brief introduction of the silent features of the Project then Impacts/Comments/Suggestions
132 KV, 40 Kanal G.S land, Curred system overloaded, 36000 consumers. Voltage issues in area.

Extent of impact: Severe/significant/Minor

What are critical mitigation measures to be adopted by IESCO to ensure surrounding area is not disturbed during construction phase of the project: (✓ or X)

✓	Enclosure of construction site with temporary walls		No night-time construction
✓	Dust suppression measures such as water sprinkling	✓	Optimization of construction activity through use of latest machinery
✓	Awareness instruments (e.g., safety signboards)		Any other suggestion: shall be commenced in time.
	In house concrete batching plant		
✓	Proper disposal construction debris		

What is respondent's overall opinion towards the Project	
Good (specify primary reason for this opinion) ✓	Needed. Curred system can't bear the demand is increasing. Affordability is also a major issue.
Bad ((specify primary reason for this opinion)	
Neutral (specify primary reason for this opinion)	
Cannot decide/do not have enough information or any other reason, specify?	

Annexure-7: Ambient Air and Noise Quality Monitoring Results

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

ISO 14001:2015 COMPANY

ISO 9001:2015

AMBIENT AIR MONITORING REPORT

Client Name:	IESCO Grid Station	**Sample Location:**	Khan Pur District Chakwal
Monitoring Point:	Mid Of Project	**Time Duration of Monitoring:**	24 Hour
Monitoring Date:	07-12-2022	**Reporting Date:**	12-12-2022
Monitoring By:	Solution Environmental & Analytical Laboratory	**Reference No.:**	SEAL/LAB/2022/AA/001

Results:

Sr. No.	Parameter	Unit	Method	Results	PEQS	Remarks
1	PM_{10}	(µg/m3)	40 CFR Part 50, App J (US-EPA)	128.8	150	All the parameters are well below the PEQS
2	CO	mg/m^3	40 CFR Part 50, App. C (US-EPA)	3.97	10	
3	NO_X	(µg/m3)	40 CFR Part 50, App F (US-EPA)	29.4	80	
4	SO_X	(µg/m3)	EQSA-0197-114 (US-EPA)	44.5	120	

PEQS: Punjab Environmental Quality Standards

Note:

- Quality was assured through self calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report is not valid for any negotiations

ANALYZED BY	REVIEWED BY	APPROVED BY
Lab Analyst	Assistant Lab Manager	Lab Manager

Page 1 of 1

HEAD OFFICE :
Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. Phones : +92-42-35922295-96, Fax : +92-42-35922296
Email: info@seal.com.pk | nihalasghar@gmail.com | hr@seal.com.pk

KARACHI OFFICE :
Office No. M-06-07 in Fort Sultan opp. Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan. Phone : 92-300-9768799
Email : karachi@seal.com.pk

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

ISO 14001:2015 COMPANY

ISO 9001:2015

GROUND WATER ANALYSIS REPORT

Client Name: IESCO Grid Station
Sample Location: Khan Pur District Chakwal

Sampling Point: Tape Water
Sampling Date: 07-12-2022
Nature of Sample: Ground Water
Date of Completion: 12-12-2022
Temp. & Humidity 23-27 C^0 & 50-70 %

Sampling By: Solution Environmental & Analytical Laboratory
Reference No.: SEAL/LAB/2022/GW/457

Results: -

Sr. No.	Parameter	Method	Unit	Result	PEQS
1	pH	APHA 4500-H^+ B	--	7.54	6.5-8.5
2	Total Dissolved Solids (TDS)	APHA 2540 C	mg/l	587	1000
3	Chloride	4500- APHA Cl^- B	mg/l	127.96	250
4	Fluoride	APHA 4500-F^- D	mg/l	0.43	1.5
5	Taste	APHA 2120 B	Object. /unobj.	Non-object.	Unobject.
6	Odour	APHA 2120 B	Object. /unobj.	Non-object.	Unobject.
7	Colour	APHA 2120 B	TCU	0.5	15
8	Nitrate (as NO_3^-)	APHA 4500-NO^{3-} E	mg/l	BDL	50
9	Nitrite (as NO_2^-)	APHA 4500-NO^{2-} B	mg/l	BDL	3
10	Lead	APHA-Pb B	mg/l	0.01	0.05
11	Total Hardness as $CaCO_3$	APHA 2340 C	mg/l	338.52	500
12	Turbidity	APHA 2130 B	NTU	1.32	5
13	Zinc	APHA 3500-Zn B	mg/l	0.82	3
14	Aluminum	APHA 3111 D	mg/l	0.18	0.2
15	Chromium	APHA 3500-Cr B	mg/l	0.012	0.050
16	Cadmium	APHA 3500-Cd D	mg/l	BDL	0.01
17	Copper	APHA 3500-Cu C	mg/l	0.07	2
18	Boron	APHA 4500-B C	mg/l	0.014	0.300
19	Barium	APHA 3111 B	mg/l	0.021	0.700

Page 1 of 2

HEAD OFFICE :
Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. Phones : +92-42-35922295-96, Fax : +92-42-35922296
Email: info@seal.com.pk | nihalasghar@gmail.com | hr@seal.com.pk

KARACHI OFFICE :
Office No. M-06-07 in Fort Sultan opp. Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan. Phone : 92-300-9768799
Email : karachi@seal.com.pk

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

9001:2015

Client Name: IESCO Grid Station **Sample Location:** Khan Pur District Chakwal

Sampling Point: Tape Water **Nature of Sample:** Ground Water
Sampling Date: 07-12-2022 **Date of Completion:** 12-12-2022
Temp. & Humidity 23-27 C^0 & 50-70 %
Sampling By: Solution Environmental & Analytical Laboratory **Reference No.:** SEAL/LAB/2022/GW/457

Results: -

Sr. No.	Parameter	Method	Unit	Result	PEQS
20	Antimony	APHA 3114 C	mg/l	0.006	0.020
21	Arsenic	APHA 3114 C	mg/l	0.036	0.050
22	Cyanide	APHA 4500-CN^- D	mg/l	0.012	0.05
23	Mercury	APHA 3112	mg/l	BDL	0.001
24	Nickel	APHA 3111 B	mg/l	0.005	0.020
25	Residual Chlorine	APHA 4500-Cl_2	mg/l	0.35	0.2 – 0.5
26	Total Thermo Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
27	Total Coliform	APHA 9222 B	Number/100ml	0	0/100 ml
28	E. coli	APHA 9222 C	Number/100ml	0	0/100 ml

PEQS = Punjab Environmental Quality Standards
BDL (Below Detection Limit)
APHA = American Public Health Association

Note:

- Standard Method for the Examination of Water & Wastewater, 23rd Edition, 2017
- 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 left-over samples (if so available) shall be retained for 15 days after the issuance of the report unless otherwise negotiated between the client and the laboratory.
- The report is not valid for any negotiation.

ANALYZED BY	REVIEWED BY	APPROVED BY
Lab Analyst	Assistant Lab Manager	Lab Manager

Page 2of 2

HEAD OFFICE :
Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. Phones : +92-42-35922295-96, Fax : +92-42-35922296
Email: info@seal.com.pk | nihalasghar@gmail.com | hr@seal.com.pk

KARACHI OFFICE :
Office No. M-06-07 in Fort Sultan opp. Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan. Phone : 92-300-9768799
Email : karachi@seal.com.pk

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

9001:2015

NOISE LEVEL MONITORING REPORT

Client Name:	IESCO Grid Station	**Sample Location:**	Khan Pur District Chakwal
Monitoring Point:	Mid of Site		
Monitoring Date:	07-12-2022	**Reporting Date:**	12-12-2022
Monitoring By:	Solution Environmental & Analytical Laboratory	**Reference No.:**	SEAL/LAB/2022/AA/001

Results: -

Sr. No.	Time	Noise dB(A)		PEQS
1	04:00 PM	52.5	Day Time	65
2	05:00 PM	50.8		
3	06:00 PM	53.2		
4	07:00 PM	48.4	Night Time	55
5	08:00 PM	47.8		
6	09:00 PM	45.5		
7	10:00 PM	44.2		
8	11:00 PM	43.4		
9	12:00 AM	41.2		
10	01:00 AM	39.5		
11	02:00 AM	40.1		
12	03:00 AM	42.2		
13	04:00 AM	45.8		

HEAD OFFICE :
Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. Phones : +92-42-35922295-96, Fax : +92-42-35922296
Email: info@seal.com.pk | nihalasghar@gmail.com | hr@seal.com.pk

KARACHI OFFICE :
Office No. M-06-07 in Fort Sultan opp. Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan. Phone : 92-300-9768799
Email : karachi@seal.com.pk

SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY

EPA CERTIFIED

ISO 14001:2015 COMPANY

ISO 9001:2015

14	05:00 AM	47.5	Night Time	55
15	06:00 AM	50.2		
16	07:00 AM	52.4	Day Time	65
17	08:00 AM	56.5		
18	09:00 AM	55.2		
19	10:00 AM	56.3		
20	11:00 AM	57.7		
21	12:00 PM	56.5		
22	01:00 PM	58.3		
23	02:00 PM	60.6		
24	03:00 PM	57.5		
Average Noise Level		**52.5 dB(A)**		

PEQS: Punjab Environmental Quality Standards

Note:

- The average noise levels describe the overall ambient noise levels of the points.
- Selected measurement units were dB (A) otherwise stated.
- Quality was assured through self calibration of the instrument.
- The measurements were carried out on client request.
- The client is responsible lawful usage of reported data in future.
- The report in not valid for any negotiation.

ANALYZED BY	REVIEWED BY	APPROVED BY
	for	
Lab Analyst	Assistant Lab Manager	Lab Manager

HEAD OFFICE :
Plot # 12, Water Avenue, Green View Society, Off Kacha Jail Road, Kot Lakhpat, Lahore, Pakistan. Phones : +92-42-35922295-96, Fax : +92-42-35922296
Email: info@seal.com.pk | nihalasghar@gmail.com | hr@seal.com.pk

KARACHI OFFICE :
Office No. M-06-07 in Fort Sultan opp. Air Port Telephone Exchange, Shahrah-e-Faisal, Karachi, Pakistan. Phone : 92-300-9768799
Email : karachi@seal.com.pk

Annexure-8: Flora and Fauna in the Project Area/Khanpur and surrounding, Chakwal

Scientific Name of Plant	Local Name of Plant	Family	Remarks
Acacia modesta	Phulai	Mimosaceae	Tree
Acacia nilotica	Kikar	Mimosaceae	Tree
Olea ferruginea	Kau	oleaceae	Tree
Dalbergia sissoo	Shisham	Papilionaceae	Tree
Eucalyptus globulus	Sufaida	Myrtaceae	Tree
Melia azadirachta	Bkain	Meliaceae	Tree
Morus alba	Toot	Moraceae	Tree
Zizyphus mauritiana	Ber	Rhamnaceae	Tree
Ficus carica	fig	Moraceae	Tree
Dodonia viscosa	Sanatha	Sapindales	Shrub
Lantana camara	Lantana	Verbenaceae	Shrub
Saccharum munja	Kana	Fabaceae	Shrub
Prosopis juliflora	Musquite	Fabaceae	Shrub
Calotropis procera	Desi Ak	Asclepiadaceae	Shrub
Cannabis sativa	Bhang	Canabaceae	Scatter in patches, throughout the project site
Cynodon dactylon	Ghass	Poaceae	Scatter grass in patches, throughout the project site
Cenchrus ciliaris	Ghass	Poaceae	Scatter grass in patches, throughout the project site

Avi-fauna in the Project Area

Sr. #	Common Name of Birds	Scientific Name	Status		Occurrence				Listing			
			Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
1	Black Drongo	*Dicrurus macrocercus*		X	X							
2	Black Kite	*Milvus migrans*		X	X							I I
4	Brown Hill Warbler	*Prinia criniger*		X			X					
5	Clamorous Reed Warbler	*Acrocephalus stentoreus*		X	X							
6	Collared Dove	*Streptopelia decaocto*		X		X						
7	Common Babbler	*Turdoides caudatus*		X		X						
8	Common/Indian Myna	*Acridotheres tristis*		X		X						
9	Crested lark	*Galerida cristata*		X		X						
10	Greater Grey Shrike	*Lanius excubitor*		X		X						
11	Grey Partridge	*Francolinus pondicerianus*		X		x						
12	Black Partridge	*Melanoperdix niger*		X		X						
13	Chukar	*Alectoris chukar*		X		x						
12	Hoopoe	*Upupa epops*		X	X							
13	House crow	*Corvus splendens*		X		X						
14	House Sparrow	*Passer domesticus*		X		X						
16	Indian Pond Heron	*Ardeola grayii*		X		X						
17	Indian Robin	*Saxicoloides fulicata*		X	X							
18	Indian Roller	*Coracias benghalensis*		X	X							
19	Indian Tree-Pie	*Dendrocitta vagabunda*		X	X							
20	Koel	*Eudynamys scolopac Ea*		X	X							
21	Little Grebe	*Tachybaptus ruficollis*		X	X							
22	Little Green Bee-eater	*Merops orientalis*		X		X						
23	Pied Kingfisher	*Ceryle rudis*		X	X							
24	Purple Moorhen	*Porphyrio porphyrio*		X	X							
25	Purple Sunbird	*Nectarinia asiatica*		X	X							

Sr. #	Common Name of Birds	Scientific Name	Status		Occurrence				Listing			
			Migratory	Resident	Common	Abundant	Less Common	Rare	WPO/Act	IUCN Red List	CMS Appendix	CITES Appendix
26	Red wattled Lapwing	*Hoplopterus indicus*		X		X						
27	Red-vented Bulbul	*Pycnonotus cafer*		X	X							
28	Rose-ringed Parakeet	*Psittacula krameri*		X			X					
29	See see Partridge	*Ammoperdix griseogularis*		X			X					
30	White breasted Kingfisher	*Halcyon smyrnensis*		X	X							
31	White cheeked Bulbul	*Pycnonotus leucogenys*		X	X							
32	Lapwing	*Vanellinae*		X			X					
33	Wagtail	*Motacila alba*		X			X					
34	Magpie	*Pica pica*		X			X					
35	Treepie	*Dendrocitta vagabunda*		X			X					
36	Crested Plover	*Charadrius hiaticula*		X			X					
37	Duck		x									

List of Mammals Observed in the Project area/Khanpur, Chakwal

Sr. #	Common Name	Scientific Name	Occurrence				Listing		
			Abundant	Common	Less Common	Rare	WPO/Act	IUCN Red list	CITES Appendix
	Urial	*Ovis Vignei Punjabiansis*						end	II
	Chinkara (Indian gazelle)	*Gazella bennettii*						Dec/ LC	
	Asiatic jackal	*Canis aureus*		X					III
	Cape hare	*Lepus capensis*		X					
	Common Red Fox	*Vulpes vulpes*		X					III
	House Mouse	*Mus musculus*		X					

	Indian crested Porcupine	*Hystrix indica*		X					
	Indian hare	*Lepus nigricollis*		X					
	Wild Boar	*Sus scrofa*		X					

List of Reptiles Observed at the Project Area/Mirpur

No.	Common Name	Scientific Name	Listing		
			WPO/Act	IUCN	CITES Appendix
1.	Black Rock Agama	*Laudakia melanurus*			
2.	Dhaman/Rat snake	*Ptyas mucosus*	X		II
3.	Garden Lizard	*Calotes versicolor*			
4.	Indian Cobra	*Naja naja*			II
5.	Indian Monitor lizard	*Varanus bengalensis*	X		I
6.	Saw scaled Viper	*Echis carinatus pyramidum*			
7.	Spotted Indian house Gecko	*Hemidactylus brookii brookii*			