



Environmental Impact Assessment of 132 KV Grid Station at Shakrial, Rawalpindi and its Feeding Transmission Line Project

Final Report



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Executive Summary

Title of the Project

This report projects the findings of "Environmental Impact Assessment (EIA) study which has been carried out for the 132 KV Grid Station Shakrial, Rawalpindi and its Feeding Transmission Line Project, in District Rawalpindi".

The EIA study aims to identify the possible environmental and social impacts of the proposed project on its surrounding environment on both short and long-term basis, suggests mitigation measures and identifies the responsible agencies to implement the recommended mitigation measures through an Environmental Management Plan.

Location of the Project

The proposed 132 KV Grid Station is located in the Falcon Complex / Air Force Officers Housing Society in Shakrial, Rawalpindi links with Islamabad Express highway / Faisal Avenue through KRL Road at Khanna Pul, Rawalpindi.

Outline of the Project

Islamabad Electric Supply Company (IESCO) under the 7thSTG program intends to install a grid station in the Falcon Complex Shakrial Rawalpindi to facilitate the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurrum Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghorri Town, Gulberg green, Khanna and surrounding areas in Islamabad with reliable supply of electricity.

Pakistan Air force has provided 12 kanal of land to Islamabad Electric Supply Company (IESCO) to construct a new 132 KV Grid Station and connect it to existing University-Nilore - Taramri Transmission Line near COMSATS University Islamabad.

The main objective of the project is to increase the efficiency, reliability and quality of the electricity supply to Rawalpindi/Islamabad.

The Air Insulated Station (AIS) 132 KV Grid Station will be built on 12 kanal of land provided free of cost by Pakistan Air Force. The feeding 07 km Transmission Line will consist of 65 poles.

The total estimated cost of the project is Rs. 1100 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 and provide the much-needed relief to the existing over-loaded system in Rawalpindi and Islamabad. This will also help in reducing line losses and power breakdowns resulting in the reduction of financial loss to IESCO as well as its customers.

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, which may cause the low voltage of electricity supply. The proposed grid station will be installed to facilitate the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurram Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghori Town, Gulberg green, Khanna and surrounding areas in Islamabad with reliable supply of electricity.

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

b. Technical Alternatives

Route Alternative for Transmission Lines: The Technical Services Wing (TSW), Grid Station Construction (GSC) Department along with Environment & Social Safeguard Department of IESCO after detailed survey has come up with the selected route. 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. Therefore, no alternative route was considered, and 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. 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 pole 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 10m², 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. Tubular poles will be used for the proposed project to reduce the footprint.

Environmental Baseline Conditions

In order to work out the impacts and related mitigation measures, the base line environmental conditions of physical, ecological, and the socio-economic environment of the project area were studied as follows:

Physical Environment

Topography: Rawalpindi falls in the Salt range and Potohar plateau. The terrain surrounding the city is rolling to hilly, criss-crossed by ravines and Nullah running out

from these hills. The highest areas are found in the North-eastern and South-eastern parts (1,043 and 660 m high above sea level, respectively). The terrain of Rawalpindi gradually falls off toward Lai Nullah in the West and the Kurang River in the East.

Geology and Soil:The dominant factor controlling the geology of the Islamabad-Rawalpindi area is the convergence of the Indian and Eurasian tectonic plates where the collision between the plates began about 20 million years ago.

Geologically, the high hills of Murree, Kahuta, and Kotli Sattian tehsils are composed of tertiary sandstone, lime stones, and alluvial deposits. The pebble ridges described as alluvial deposits in Kahuta hills are the remarkable structural features of Kahuta and Rawalpindi tehsils. Most of the forest in the district is on pebbles ridges, large isolated and boulders in many places seem to point to a glacial epoch in the Potohar plain.

The soil in Potohar region is shallow clayey of low productivity. Mostly, on the Southern and Western aspects of the Potohar plateau, the soil is thin and infertile. Streams and ravines cut the loose plain, affected by gully erosion and steep slopes. Such land is unsuitable for cultivation. However, large patches of deep fertile soil are found in the depressions and sheltered localities supporting quality small forests (Rakh) and rain fed agriculture. The soil formed by the disintegration of shells, clay, and sandstone occurs in scattered places.

Land use: The objective of the proposed project is reliable and undisturbed supply of electricity to the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurram Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghorri Town, Gulberg green, Khanna and surrounding areas in Islamabad with reliable supply of electricity. The land allocated is proper leveled and barren.

The groundwater table in the Rawalpindi city has sharply depleted from 550 feet to 650 feet over the decade due to an over-extraction. WASA has recommended a ban on installation of private tube wells in the city area.

Surface Water: The only water body in the project area is Sawan river, which flows 200m north-east of the project site to the north-west of the project site.

There is a small pond 70 meters west of the project site.

Ground Water:The groundwater table in the Rawalpindi city has sharply depleted from 550 feet to 650 feet over the decade due to an over-extraction. WASA has recommended a ban on installation of private tube wells in the city area.

Climate:In Rawalpindi, the summers are short, sweltering, humid, wet, and clear and the winters are short, cold, and mostly clear. Over the course of the year, the temperature typically varies from 3.9°C to 38.3°C and is rarely below 1°C or above 42°C.

The hot season lasts for 2.8 months, from May 3 to July 30, with an average daily high temperature above 93°F. The hottest day of the year is June 11, with an average high of 101°F and low of 76°F.

The cool season lasts for 2.9 months, from December 3 to February 28, with an average daily high temperature below 71°F. The coldest day of the year is January 9, with an average low of 39°F and high of 63°F.

Air Quality: The project site is located in Falcon complex (Air force Housing Society), Rawalpindi. The main source of air and noise pollution in the project area is the emissions from vehicles. However, the concentration is not enough to exceed the NEQS limits for ambient air and noise.

The criteria of ambient air quality pollutants (NO_x, SO₂ PM, CO etc.) are expected to be within the acceptable limits adjacent to the project site.

Ecological Environment

Flora: The vegetation is a representative of Dry Subtropical Scrub Forest which is dominated by *Acacia modesta* (Phulai), *Zizyphus mauritiana* (Ber), etc.

The most common trees in Rawalpindi are Amal Tas (*Casia fistulla*), Chinar (*Platanus orientalis*), Phulai (*Acacia modesta*), Dharek (*Melia zardorachita*), Jangali ber (*Zizyphus maurantiana*), Kiker (*Acacia nilotica*), Mulberry/Shah-toot (*Morus alba*), Safaida (*Eucalyptus camaldulensis*), Shisham (*Dalbergia sissoo*), Coconut (*Cocos nucifera*), Papeta (*Manilkara zapota*), Jaman (*Syzygium cumini*), *Thevetia peruviana* (Peli Kaner), Shireen (*Albizia lebbek*), Bamboo (*Bambusa*), Semal (*Bombax ceiba*), Palm (*Arecaceae*), Mango (*Mangifera indica*), etc. These are planted along the roadsides and other green areas.

Fauna: The project area in its original form constitutes the habitat of wild fauna consisting of a host of animals and birds. Species found in Rawalpindi include: Jackal, Wild Hare, Hedgehog, Rat, Wild boar, Porcupine, Shikra, Grey partridge, Black Partridge, Quail, House Sparrow, House Crow, Koel, Common Myna, Spin Tailed Lizard, Krait etc.

Socio-Economic and Cultural Environment

District Rawalpindi takes its name from its Headquarter town "Rawalpindi" which means abode of Rawals, a jogi tribe. This district is situated in the northwestern part of Pakistan. It is bounded on the north by Islamabad Capital territory, Abbottabad, and Haripur Districts of NWFP; on the south by Chakwal and Jhelum districts and on the west by Attock district. The total area of the district is 52864 square kilometers.

Rawalpindi had an estimated population of 2.09 million people as per the census of 2017. Most of the houses are well constructed. The average growth rate is 5.19 %.

The main languages in the project area are Urdu, English, Punjabi, Pashto, Saraiki, while few people speak other languages too. The most widely spoken languages are Urdu and Punjabi.

Rawalpindi claims to have one of the highest literacy rates in the country. It has 80% literacy rate and enjoying second rank, while Islamabad is the first ranked city having literacy rate of 87%.

The health care services provided by the public health sector in District Rawalpindi consists of 4 THQ Hospitals, 10 Rural Health Centers, 98 Basic Health Units and 66 Dispensaries.

There exists no site of archaeological and cultural significance within the two kilometres radius of the project site.

All other amenities of life like electricity, natural gas, telephone, a police post, post office and bank, etc. are present near the Project area.

Public 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 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 construction of Grid Station at Falcon Complex (Air Force Housing Society) at Shakrial, Rawalpindi.

Respondents in the majority showed a positive attitude towards the project. The viewpoints of respondents are as follows:

Majority of respondents showed a positive attitude towards the project location. They stated that the project would bring further eco-friendly development in the area. People appreciated the concept of eco-building when they were briefed about its significance towards a sustainable development.

Almost all respondents agreed that the project would cope the rapid increase in electric load demand in Rawalpindi and Islamabad. Most of stakeholders do acknowledge the need to increase the efficiency, reliability and quality of the electricity supply in twin cities.

The main concerns of these organizations were regarding traffic congestion, over extraction of ground water, sewerage treatment plant, shrinking green spaces due to urbanization projects, and solid waste management during construction and operational phase of the project.

Impacts and Mitigation Measures

Physical Environment

Impacts: Soil related issues include soil erosion, slope stability, and soil contamination. Land clearing, levelling, and grading, excavation and filling, construction activities and maintenance of equipment/vehicles may cause these issues. Soil may be contaminated because of fuel/oil/chemical spillage and leakage, and inappropriate waste (solid as well as liquid) disposal.

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SO_x), 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, land levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

Noise and vibration will be generated by construction machinery and vehicles. The ground water resources of the project area can be contaminated by solid waste disposal, sewerage disposal, and equipment/vehicles maintenance, spillage/leakage of fuels, oils and chemical, and campsite sanitation facilities.

Mitigations: Soil erosion can be minimized during land clearing, levelling, and grading. Excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken per the design (i.e., stone pitching).

Temporary measures, such as construction of temporary walls, reinforced with brick lining bordering the construction areas to contain debris and spoil, will also be undertaken to avoid soil erosion and water contamination.

For the domestic sewage of contractor's camp, septic tanks with soakage pit will be constructed having adequate capacity. For the operational Phase, vertical SBR Plants have been proposed. Waste oils will be collected in drums and sold for the recycling.

The recyclable waste from the project site (such as cardboard, drums, broken/used parts, etc.) will be sold for recycling, and reused if necessary. The hazardous waste will be kept separate and handled according to the nature of the waste.

Ecological Environment

Impacts: The site preparation and construction activities may necessitate removal of the natural vegetation from the areas where project activities will be carried out resulting in damage and/or loss of vegetation and clearing of other indigenous and introduced species, as well as undergrowth species, comprising bushes, grass, etc. Construction crew can also indulge in tree/shrub cutting to obtain fuel wood for the camp.

The loss of natural vegetation discussed above, and other project activities will potentially have adverse impacts on the faunal resources and habitats of the area. Smoke, chemicals, dust particles, and noise generated by heavy machinery are a scaring factor for wildlife. Rodents, hedgehogs, porcupines would lose their dwellings. In addition, the wildlife may be disturbed by illumination, and presence of the people.

Mitigations: The measures to restore natural vegetation loss in the area will benefit the area's fauna as well. The project staff will not be allowed to indulge in any hunting or trapping activities. Night time construction works will not be undertaken. Illumination levels at the site will be minimized, as far as possible.

Appropriate diffusers will be used to restrict the illumination within the project site. Blasting will not be undertaken at the site for excavation purposes. Porcupine population has increased, as it is not palatable because of its quills. Destruction of habitat and consequent check on the population of this pest may prove to be boon to maintain ecological balance.

Developmental activities and colonization of project site would be a positive step to keep down the number of this undesirable species at the desirable level from human point of view.

Socio-Economic Environment

Impacts: The land for the 132 kV Grid Station Shakrial, Rawalpindi has been provided by Pakistan Air Force to IESCO.

Construction workers may be susceptible to eye and respiratory diseases due to their routine exposure to dust and exhaust emissions on the project site. Injuries can happen primarily by occupational-related accidents, animal bites, etc. Activities such as land clearing, tree cutting, earthworks, and construction of facilities may pose various occupational hazards to the workers on site.

There is no reported site of archaeological or historical significance at the land acquired for the project. However, in case any artefact of such significance is found during the construction activities, the Archaeology Department, Government of Punjab will be informed.

Mitigations: Eye and respiratory diseases will be mitigated through routine health screening and training of the employees. Physical injury will be mitigated through the provision of appropriate training and emergency response procedures. Protected fencing will be fixed around the construction site.

Unauthorized access within the construction area will not be allowed. Vehicle speeds of 15 km/h at the project site will be implemented. Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.

Environmental Management Plan

The purpose of the Environmental Mitigation Plan (EMP) is to minimize the potential environmental impacts due to the project. The EMP reflects the commitment of IESCO to safeguard the environment as well as the surrounding population. The EMP provides a delivery mechanism to address the adverse environmental impacts of the proposed project during its execution and operation, to enhance project benefits and to introduce standards of best practices to be adopted for all phases of the project.

The estimated environmental budget set out for the construction phase of the project is Rs. 1.94 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 132 kV Grid Station Shakrial 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 Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurram Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghori Town, Gulberg green, Khanna and surrounding areas in Islamabad. There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

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List of Abbreviation

AEBS	Area Electricity Boards
AES	Area Electricity Supply
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
GEPCO	Gujranwala Electric Power 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
HESCO	Hyderabad Electric Supply Company
HSE	Health Safety and Environment
HT	High tension
ICT	Islamabad Capital Territory
IEE	Initial Environmental Examination
IESCO	Islamabad Electric Supply Company
KTM	Kohinoor Textile Mill
LAA	Land Acquisition Act (of 1894)
LESCO	Lahore Electric Supply Company

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
PAF	Pakistan Air Force
PAPs	Project Affected Persons
NEQS	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
QESCO	Quetta Electric Supply Company
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
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)
°C	Degree centigrade
cm	Centi meter
dB (A)	Decibel ('A' scale)
ft²	Square foot
ft³	Cubic foot
Km	Kilometer
Km/h	Kilometer/hour
m	Meter
m²	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)

1 Introduction

1.1 Project Background and Overview

The National Power Policy 2013 issued by the Government of Pakistan (herein referred to as Government) aims to develop an efficient and consumer-centric power generation, transmission and distribution system that meets the needs of the people and boosts the economy of the country in a sustainable and affordable manner. Targets of the prescribed policy include complete elimination of load shedding; decreasing the average cost of electricity generation to below 10 Pakistani Rupee /kWh; a decrease in transmission and distribution losses from 23 – 25% to 16%; an increase in revenue collection from 85% to 95%; and a reduction in the time required for decision making at the ministry level or other related departments to a minimum.

According to the Pakistan Economic Survey 2019–20, the installed electricity generation capacity reached 37,402 MW in the year 2020. The maximum total demand coming from residential and industrial estates stands at nearly 25,000 MW, whereas the transmission and distribution capacity is approximately 22,000 MW.

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.

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 – 2022 period.

The project will ensure a reliable supply of electricity to the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurrum Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghorri Town, Gulberg green, Khanna and surrounding areas in Islamabad resulting in load reduction on currently overloaded grid stations and transmission lines, and improvement in the voltage profile as well as the system reliability.

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

Islamabad Electric Supply Company (IESCO) under the 7thSTG program intends to install a grid station within the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurrum Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghorri Town, Gulberg green, Khanna and surrounding areas in Islamabad with reliable supply of electricity.

Pakistan Air Force has provided 12 kanal of land to Islamabad Electric Supply Company (IESCO) to construct a new 132 KV Grid Station, which will be connect to University-Tarmri-Nilore transmission line through 07 km feeding transmission line.

In this report, the 132 kV Grid Station will be referred to as “132 kV Grid Station Shakrial, Rawalpindi”.

1.3 Purpose of Report

In order to comply with the regulatory requirement, IESCO had acquired the services of M/s Emerald Engineering (Pvt) Ltd, Environmental consulting firm, to carry out the Environmental Impact Assessment (EIA) of the project.

This report gives an overview of project description, potential environmental and social impact, 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, Jhelum and Chakwal) and southern areas 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). **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	
	(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	14,315	10,288	164	118	4,007	2,867
1983	90.30	3,901,419	3,163	16,093	11,587	115	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	4,876,157	3,933	20,656	15,504	210	158	4,236	3,179
1987	101.18	5,215,686	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	3,153
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	8,215	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	12,615,022	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	11,015	67,697	51,492	480	365	4,804	3,654
2005	144.07	14,896,242	12,035	71,670	55,215	497	384	4,811	3,711
2006	147.29	15,911,161	13,212	80,404	62,405	546	424	5,053	3,922

Environmental Impact Assessment of 132 KV Grid Station, Shakrial, Rawalpindi

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	160.49	19,582,224	17,847	87,115	68,815	543	429	4,449	3,517
2011	163.86	20,309,483	17,901	89,775	71,672	548	437	4,420	3,529
2012	167.24	21,046,611	18,280	88,987	71,368	532	427	4,228	3,391
2013	170.65	21,875,600	18,227	87,080	70,508	510	413	3,981	3,223
2014	140.09	22,587,870	19,966	93,777	76,543	539	440	4,152	3,389
2015	177.54	23,519,247	21,031	96,463	15,113	543	440	4,101	3,321
2016	180.99	24,516,699	22,559	100,871	81,737	557	452	4,114	3,334
2017	184.44	25,571,803	25,117	106,796	86,763	579	470	4,176	3,393
2018	186.05	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

M/s Emerald Engineering (Pvt) Ltd. is an environmental consultancy firm providing environmental consulting services. The list of team members and their qualification has been provided in **Annexure- 1**.

M/s Emerald Engineering (Pvt) Ltd. engaged the following team of experts to conduct the EIA study:

- Dr. Mohiuddin Zia, Environmental Specialist
- Ayesha Noor, Environmental Scientist
- Bisma Zahoor, Environmental Scientist
- Owas Khan, Horticulturist/ecologist
- Abid Hussain, Environmentalist
- Mansoor Eijaz, Field Officer/data analyst

1.6 Environmental Impact Assessment

According to the Pakistan Environmental Protection Act 1997:

“ No proponent of a project shall commence construction or operation unless he has filed with the 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 agency approval in respect thereof”.

1.6.1 Purpose of the Report

The aims and objectives of the EIA of the proposed 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 measure.
- 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
<p>Mr. Mohammed Yasin Additional Director, Environment & Social Safeguard. PMU, Islamabad Electric Supply Company, Islamabad Tel: 051- 9252036 Email: iescopmu@hotmail.com</p>	<p>Mansoor Eijaz House 107, Street 81, E-11/2, Islamabad Email: emeraldengineering122020@gmail.com Phone: 03458521908, 0345-9777909, 0320-5585955</p>

1.7 The Proponent (IESCO)

IESCO is a public utility company, providing electricity to the Islamabad Capital Territory (ICT), Northern districts of the Punjab Province (Rawalpindi, Attock, Jhelum and Chakwal) 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, Jhelum and Chakwal district of Northern Punjab and Southern area of Azad Jammu and Kashmir (AJK)
- PESCO: Peshawar Electric Supply Company providing utility for the entire Khyber Pukhtunkhwa 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, Sheikhpura 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

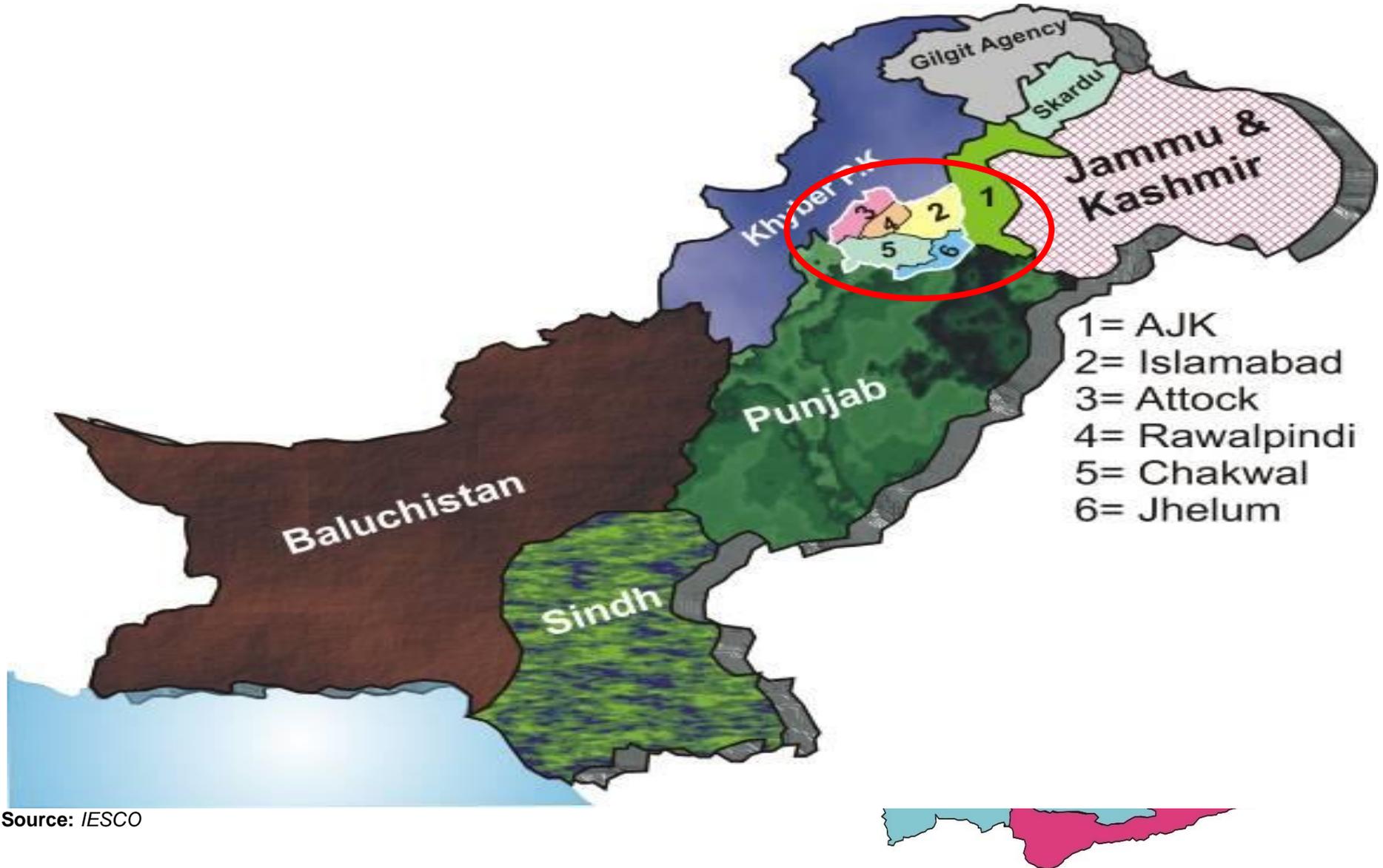
The area within the IESCO network comprises of the following distinct administrative units:

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

Mianwali is included in IESCO-T&G Division network for construction works but for operational and commercial work, it falls in FESCO network. Similarly, Nathiagali is included in T & G Division of IESCO and is under the operational division of PESCO.

Figure 1.1 shows the geographical network of IESCO.

Figure 1.1: Map showing the area covered by IESCO



Source: IESCO

1.7.2 IESCO Network of Transmission

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
66 KV Grid stations	Nos.	1
33 KV Grid stations	Nos.	2
Customer Grid stations (IESCO Maintained)	Nos.	14
Customer Grid stations (Customer Maintained)	Nos.	1
NTDC Grid stations	Nos.	5
Peak load demand – Recorded on 04-07-2019 (1100hrs)	MW	2,718
Power transformers (Numbers)	Nos.	274
Power transformers' installed capacity (MVA)	MVA	6,3979
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, September 2019

1.7.3 Existing Transmission Lines

The IESCO system includes 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

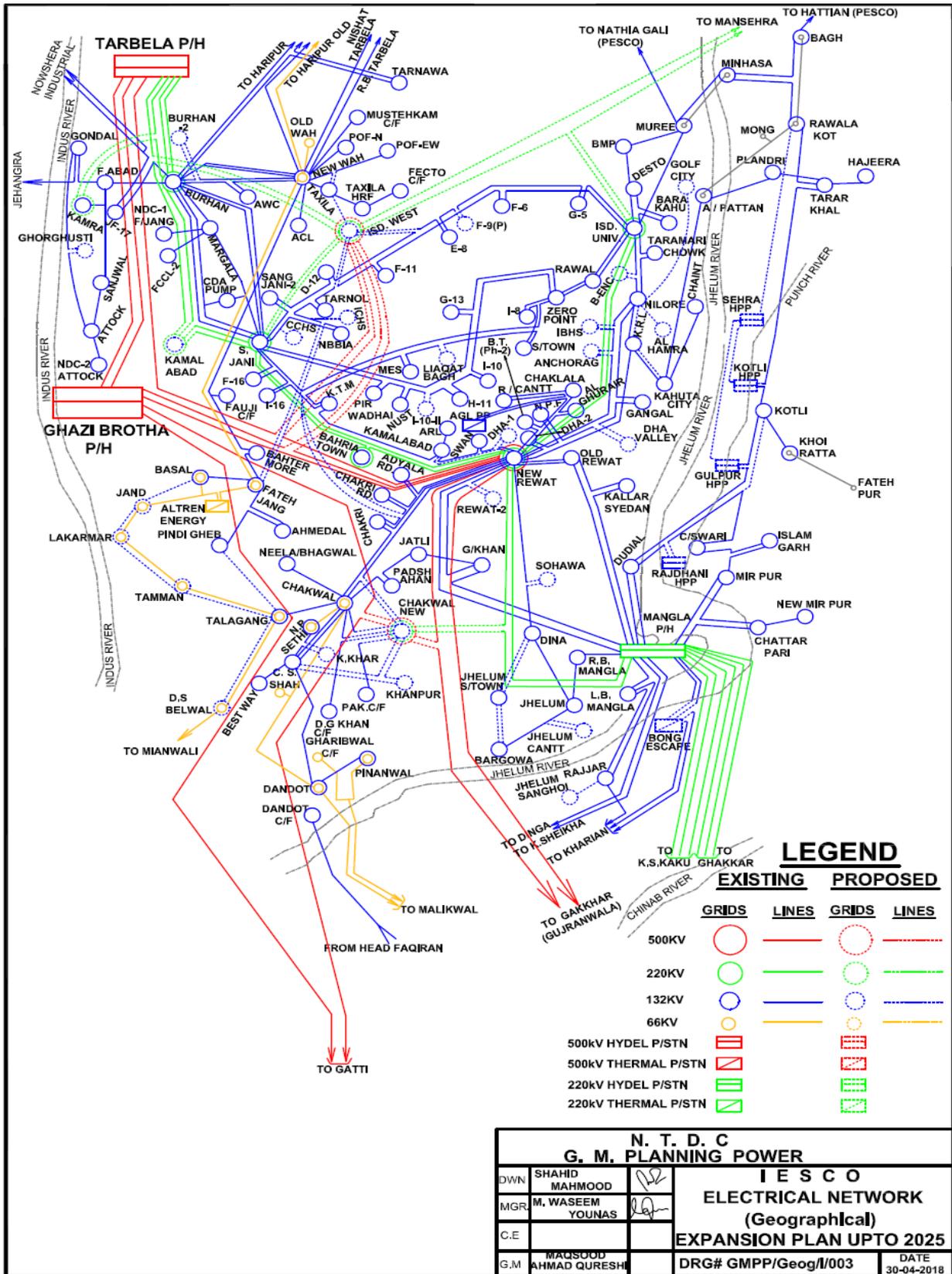
No	Transmission Lines in IESCO's Region		
	Capacity	From	To
Double Circuit Transmission Lines			
		Mangla	Burhan
		Tarbela	Burhan
		Burhan	i) New Wah, ii) Zeropint, iii) Rawal & iv) AEC
		Mangla	AEC
		New Wah	Attock
		Attock	HIT
		HIT	Fecto
		Old Rewat	New Rewat

No	Transmission Lines in IESCO's Region		
	Capacity	From	To
Single Circuit Transmission Lines			
		Burhan	i) KTM, ii) Bakra Mandi, iii) Rewat, iv) Dina, v) Gujar Khan, vi) Jhelum, vii) Saragodah, 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 Shakrial
		New Wah	i) Fateh Jang, ii) Pindi Gheb, iii) Kalar Kahar, iv) Basal, v) Jand, vi) Lakarmar, and vii) Old Wah
		Chakwal	i) Chua Saidan Shah, ii) Dandot, ii) Noorpur Sethi, and iii) Talagang
		Mianwali	i) Danda Shah Balawal, ii) Talagang, iii) Basal, iv) Tamman, v) Fateh Jang and vi) Ahmadal

Source: IESCO

The geographic reach of the transmission line in the IESCO network is shown in **Figure 1.2**.

Figure 1.2: Map showing transmission network of IESCO



Source: IESCO, Dec 2019

1.8 Approach and Methodology

A kick-off meeting was held with the officials of Project Management Unit 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.

1.8.1 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-2** and the glossary is provided in **Annexure-3**.

1.8.2 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 and meetings and consultations were held along the project location.

1.8.3 Pubic Consultation

Roadside discussions were organized with the employees of the industries, which are in the immediate vicinity of the proposed grid station site. Meetings were held with the stakeholders such as IESCO, Environmental Practitioners, Bahria University, NUST University and their opinions and concerns regarding the project were solicited.

Annexure-4 gives a list of persons and stakeholders met during EIA study.

1.8.4 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.

1.8.5 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.

1.8.6 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.

1.8.7 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.

1.8.8 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.

1.8.9 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.

1.9 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).

1.10 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 132 kV Grid Station Shakrial and its feeding 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 overarching 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 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the 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 National Environmental Quality Standards (NEQS) specified by the Pakistan Environmental Protection Agency 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 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 Environmental Protection Agency (Review of IEE and EIA Regulations), 2012.

2.3.2 PEPA (Review of IEE and EIA Regulations), 2000

Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000 (the Regulations) prepared by the 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 proposed 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.
- As per PEPA 1997, Pak-EPA is 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.
- Pak-EPA is required to make every effort to complete the review process for IEE within 45 days and of the EIA within 90 days, of the issue of the confirmation of completeness.
- Pak-EPA 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 Pak-EPA 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.
- Pak-EPA 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 Pak-EPA 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.

2.4 National Environmental Quality Standards (NEQs)

The NEQs, promulgated under the PEPA 1997 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 NEQs 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.

2.4.1 NEQs for Liquid Effluent

The NEQs for the discharge of effluent from industry are presented in **Table 2.1**.

Table 2.1: NEQs for Liquid Effluent Discharge

Parameters	Into Inland Waters	Into Sewage Treatment
Temperature	≤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 ²⁻)	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
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: NEQs, Pakistan Environmental Protection Agency

2.4.2 NEQs for Gaseous Emission

The NEQs for permissible limits of gaseous emission from industry are presented in **Table 2.2**.

Table 2.2: NEQs 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 on 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
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: NEQs, Pakistan Environmental Protection Agency

2.4.3 NEQs for Vehicular Emission

The NEQs for permissible limits of exhaust emissions from vehicles are presented in **Table 2.3**.

Table 2.3: NEQs 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: NEQS, Pakistan Environmental Protection Agency

2.4.4 NEQS for Ambient Air and Noise

The NEQs for Ambient Air and Noise are presented in **Table 2.5** and **2.6**.

Table 2.4: NEQs 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
Suspended Particulate Matter (SPM)	Annual Average* 24 hrs**	360 500
Respirable Particulate Matter (PM ₁₀)	Annual Average* 24 hrs**	120 150
Respirable Particulate Matter (PM _{2.5})	Annual Average* 24 hrs** 1 hr	15 35 15
Lead (Pb)	Annual 24 hrs**	Average* 1 1.5
Carbon monoxide (CO)	8 hrs 1 hr	5 mg/m ³ 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: NEQS, Pakistan Environmental Protection Agency

Table 2.5: NEQs for Noise

Category of Area/ Zone	Limits in dB(A) Leq	
	Daytime	Night time
Residential area	55	45

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Commercial area	65	55
Industrial area	75	65
Silence area	50	45

Source: NEQS, Pakistan Environmental Protection Agency

3 Project Description

3.1 Introduction

This Chapter provides 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 Pakistan Environmental Protection Act, 1997:

“No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection Agency or 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 Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations) 2000:

“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 of Schedule II as per IEE/EIA regulations 2000 and requires an EIA to be conducted.

3.3 Objective of the Project

The primary objective of the proposed project is to increase the efficiency, reliability and quality of the electricity supply to the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurram Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghorri Town, Gulberg green, Khanna and surrounding areas in Islamabad. In addition, the project aims to achieve:

- Strengthening of the electricity transmission network to reduce bottlenecks and improve system reliability and quality,
- Strengthening of the electricity distribution network to reduce losses and improvement in supply,
- The project will ensure the supply of electricity to the Rawal Industrial Estate, Rawalpindi,
- Load reduction on presently overloaded grid stations and transmission lines,
- Improvement in the voltage profile as well as the system reliability, and
- Decrease in technical as well as commercial losses.

3.4 Project Location and Accessibility

The 132 kV Grid Station Shakrial is located within the Falcon Complex (Air Force Housing Society) at Shakrial Rawalpindi, 700 meter from Islamabad Express Highway/Faisal Avenue. The site can be accessed through KRL Road from Khanna pul Interchange.

The coordinates of the grid station site are as follows 33°37'24.7"N, 73°06'10.8"E.

3.5 Project Description

Islamabad Electric supply Company (IESCO) under the STG program intends to install a grid station within the Shakrial area of Rawalpindi to facilitate the residential and commercial customers with reliable supply of electricity. The main objective of the project is to increase the efficiency, reliability and quality of the electricity supply.

Pakistan Air Force has provided 12 kanal of land to Islamabad Electric Supply Company (IESCO) to construct a new 132 KV Grid Station.

3.5.1 Grid Station

The Air Insulated Station (AIS) 132 KV Grid Station will be built on 12 kanal of land provided free of cost by Pakistan Air Force.

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. **Figure 3.1** shows the layout plan of proposed grid station.

3.5.2 Transmission Line

The allied transmission line is 07 km in length which is connected University – Tramri – Nilore transmission line, which is passing through Iethrar road (Taramri, Tarlai, Barma, Khanna) in Islamabad and by crossing Faisal Avenue/ Islamabad Express way and enters into Falcon Complex through KRL Road. The total Transmission line route is 07 KM, where 06 KM falls in the jurisdiction of ICT while 01 KM falls in Rawalpindi. The Transmission line is comprising of a total of 65 tubular poles.

IESCO has decided to install tubular poles instead of conventional towers to avoid the huge occupancy/land for the transmission line.

The distance between poles is determined as per standards of IESCO. The range usually varies from 60m – 300m depending upon the site conditions.

The TSW and GSC along with E&S department of IESCO has marked the route alignment of the proposed 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.

Figure 3.2 shows the overall route of the Transmission Line.

Width of Right of Way (RoW)

The width of RoW for T/L is 8.8m, i.e., 4.4 m on either side from the center of transmission line and the area will be 70.56 m² (i.e., 8.4m x 8.4m) in case of tower spot.

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

The total estimated cost of the project is Rs. 1100 million and will be completed in 24 months (two years).

3.6 Civil works, Equipment, and other Facilities

3.6.1 Civil Works

Basic infrastructure facilities including civil work foundations for installation of equipment, control room buildings & other associated residential & non-residential buildings and cable trenches etc. will be required, for which necessary provision has been made in the cost estimate.

3.6.2 Equipment and Machinery

List of equipment required for 132 kV Substation along with associated transmission line is listed below:

Table 3.1: List of Equipment for Shakrial Grid Station

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 Lightning 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.

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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

Table 3.2: Transmission Line Equipment

Sr. No	DESCRIPTION OF MATERIAL	QTY:	UNIT
1	132KV Poles	65	
2	GROUNDING SET.	65	SET.
3	DISC INSULATOR		
	a. 80 KN	2328	NO.
	b. 100 KN	3006	NO.
4	CONDUCTOR		
	RAIL	07	KM
5	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)	07	KM
6	EARTH WIRE HARDWARE		
	SUSPENSION FITTING	48	SET
	TENSION FITTING	62	SET
	MID SPAN JOINT	20	NO.
7	STOCK BRIDGE DAMPER	158	NO.

The layout plan of the Shakrial Grid Station is shown in **Figure 3.1**.

Figure 3.1: Layout Plan of Proposed 132 KV Grid Station Shakrial

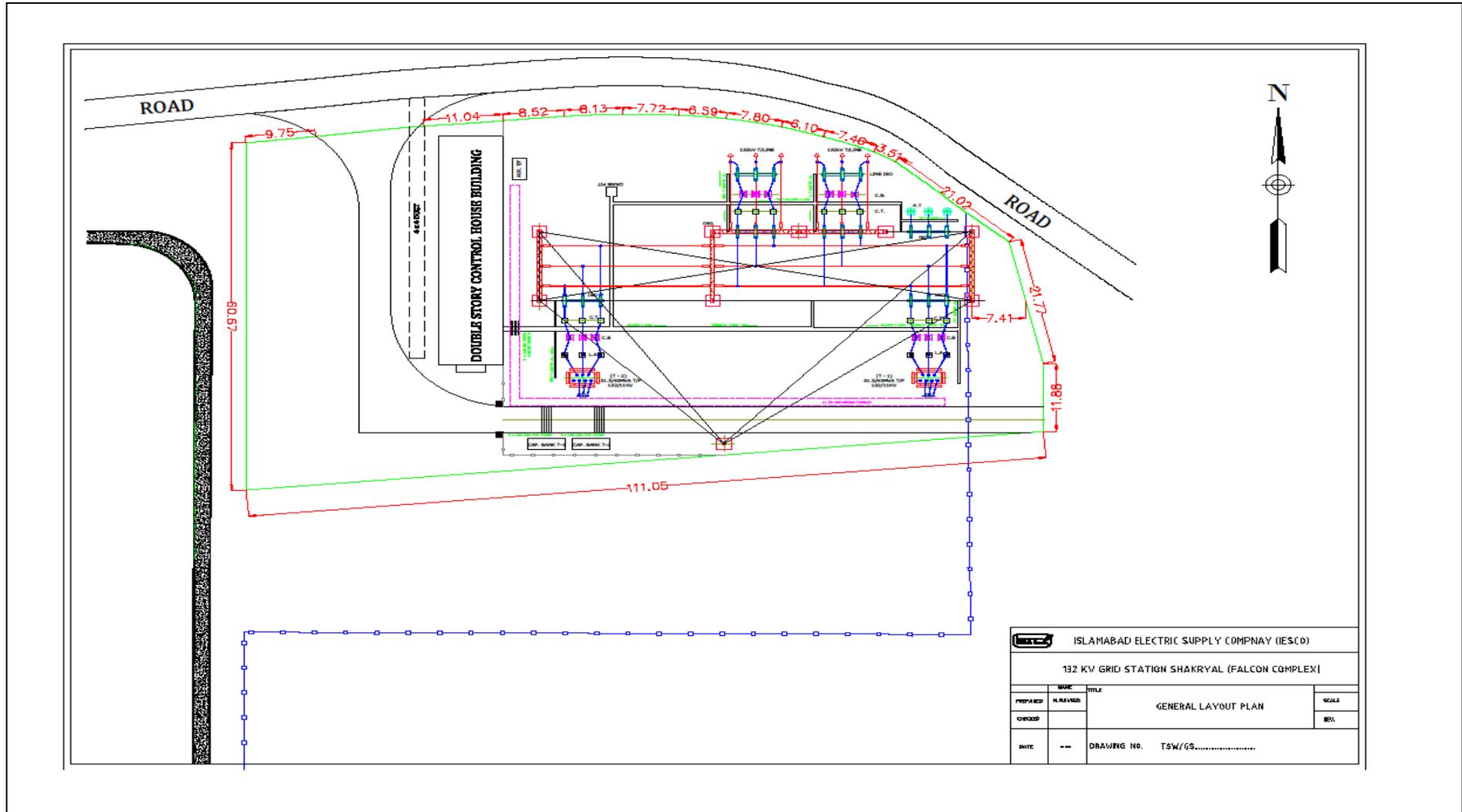
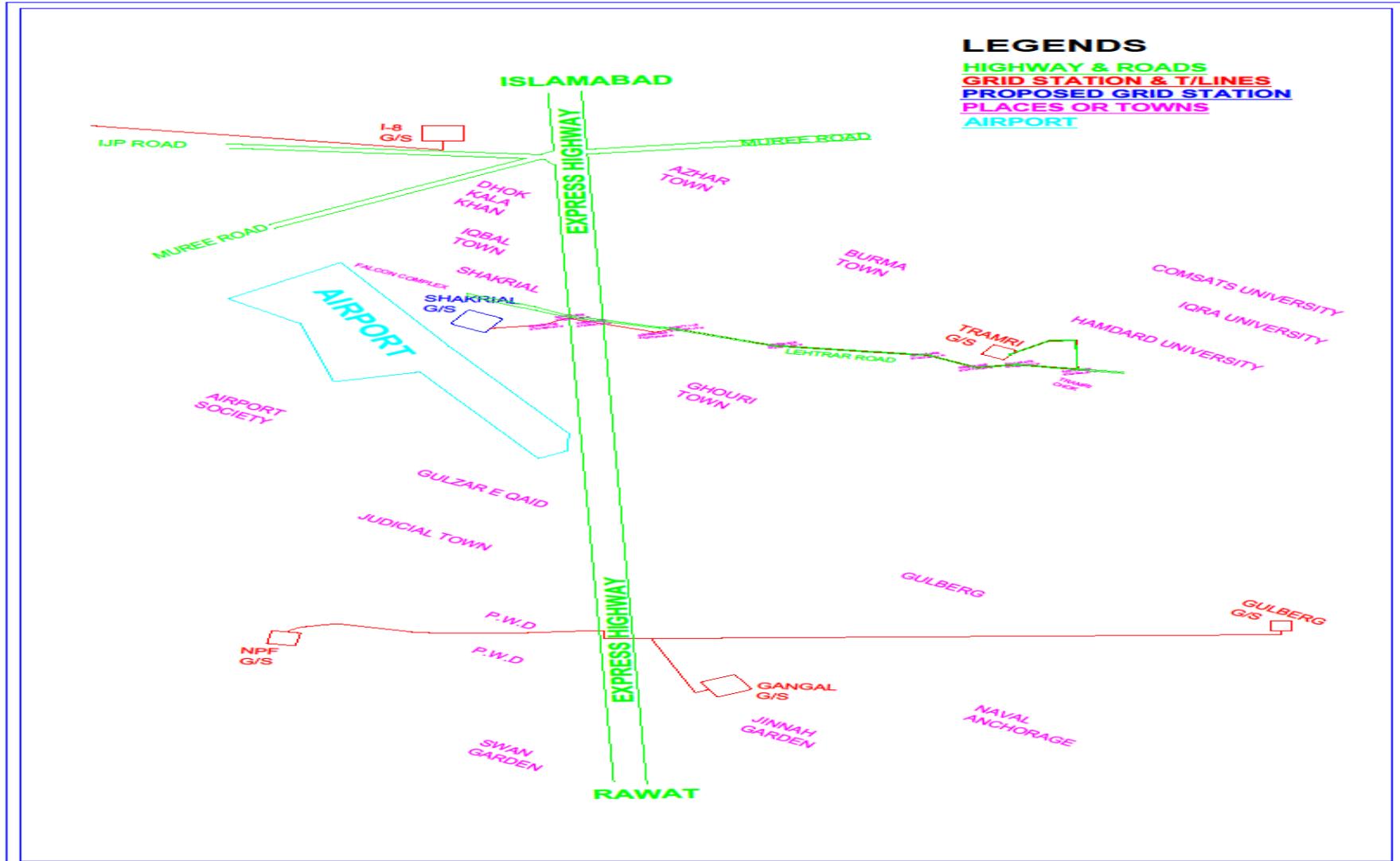


Figure 3.2: Transmission Line Route for Shakrial Grid Station





3.7 Design Aspects

3.7.1 Design Standards for Grid Station

The layout plan of a substation which involves various installations of equipment, control room and ancillary facilities are standardized by NTDC.

NTDC has developed design parameters for the planning and design of transmission systems in Pakistan. The design parameters are based on standard NTDC's existing specifications and practices for the existing as well as proposed Grid Stations and transmission lines. The parameters considered for the system and human safety are described below in detail.

The design of associated Transmission Line is based on following parameters.

Figure 3.1: Permissible Conductor Clearance at 65°

Sr. No	Description	Clearance (m)
1.	Roads and Streets	7.9
2.	Cultivated land and traversed by vehicles	6.7
3.	Highways	7.9
4.	Railroads	7.9
5.	River at high flood	9.1
6.	Electrified railroad trolley wire	3.85
7.	Places accessible to pedestrians	7.9
8.	Building roofs not accessible to people	5.2
9.	Top of trees	5
10.	Canals	9.1
	Communication and Power Lines:	
	Power Line up to 66 KV	2.7
	Power Line up to 33 KV	2.7

3.7.2 Tower Structure for Feeding Transmission Line

All the towers shall be self-supporting type, lattice steel structures, fabricated from galvanized structural steel shapes. The steel employed will be in accordance with the latest edition of the standards. All towers will be equipped with danger plates, number plates and anti-climbing devices.

3.7.3 Safety Parameters

For EHV lines, safety considerations are of two types. One is related with the safety of the system, while others are those that are related to the public. It is for this reason that IESCO has adopted a 27 m wide (13.5 m either side from the centreline) corridor as the ROW for the allied 132 KV transmission line.

1. System Safety

Conductor to Tower Clearance: For the safety of the system, it is essential that any factor that may interrupt the power supply should be considered in the design. The clearance of the conductor from tower legs and trusses is of prime importance. Therefore, in the design, a minimum clearance of 1.55 m has been adopted under

extreme wind conditions. This is based on regulations of GOP/WAPDA and minimum requirements of National Electric Safety Code (ANSI C2). With this clearance, there is 99% probability of withstanding switching surge of 3-sigma margin due to maximum over voltage under adverse climatic conditions.

Earthing of the System: Every tower is connected to an earthing system. This is to keep tower footings resistance at a level lower than 10 ohms. For this, two earth electrodes of copper-clad steel rods are sunk vertically into the ground to a minimum depth of 3 m and the locations where the required resistance not achieved crow footing will be done.

Lightning Performance: The tower geometry, clearance and insulation of the system are designed to perform safely within the permitted lightning intensities. In this respect, consideration has been given to the tower footing resistance and Isokeraunic level of the area. The accepted level is one trip out/ 100 km/ year due to lightning.

Work Uniform and Health and Safety Equipment: Grid Station and allied transmission line construction is a special job and the labour working on such works requires special protective uniform and personal protection equipment to cope up with safety and health requirements. It will be ensured that the labour engaged in handling rough construction materials, mixing of concrete and handling transmission lines etc. shall have long boots, overall dresses, goggles, gloves, and safety hats. They will invariably have their company Identity Cards worn around their necks with the help of a ribbon. As an overall Safety, Health and Environment measure, anyone going into the construction area will also wear safety helmet and safety shoes. Special arrangements must be made for Fire Protection by way of providing appropriate type of fire extinguishers with firefighting training to concerned personnel.

2. Public Safety

General Aspects: In view of public safety, IESCO has adopted a policy such that, the existing orchards having fruit trees with a height of not exceeding 2.5 m are allowed to remain under the lines. Similarly, open wells, including Persian wheels, can remain under the transmission lines. However, tube wells and peter pumps are not permitted under the high voltage conductors. This is because piping, and cranes used to refurbish such wells could come in contact with the lines. No residential or other public buildings like factory, school, hospital, etc. are permitted within the corridor. However, farm buildings, which are not used for residential purposes can remain under the high voltage lines, provided a 7.0 m minimum clearance is maintained. The height of the towers can be increased to accommodate such buildings.

Conductor to Ground Clearance: The conductor to ground clearance is desirable to be worked out based on over voltage due to switching surge. In this consideration, safe clearance is required to be provided for moving objects under the line with a height of 4.5 m, withstanding switching surge of 3-sigma margin with 99.7% probability under adverse atmospheric conditions. This should keep the maximum voltage gradient at ground level and maximum current induced in a person less than the internationally allowable values. As such, the total conductor to ground clearance shall in no way be less than 7.0 meters. This is in accordance with the regulations of Government of Pakistan (GOP) and NTDC practice.

3.8 Cost and Magnitude of Project

The estimated cost of the proposed project is PKR. 1100 Million. The breakup of the cost estimates is provided below in **Table 3.5**.

Figure 3.2: Estimated Cost of the Project

No.	Project Component	Tentative Cost in Rs (Millions)
1.	New Grid Station Shakrial Industrial Estate	
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%	Lump-Sum
2.	New Transmission line	
2.1	Length line 2 km Number of poles 12 Conductor Rail Cost of electrical equipment and installation Cost of civil works including contractor bid Departmental charges @ 26%	
Total Estimated Cost of the Project (PKR in Million)		1100

Source: IESCO

3.9 Project Activities Process Flow

3.9.1 Land Acquisition for Grid Station and Transmission Line

Land for Grid Station

Pakistan Air Force has allocated 12 Kanalsof land within Falcon Complex/ Air Force Housing Society at Shakrial, Rawalpindi for the construction of grid station. No displacement or cutting of trees will occur as a result of allocation of this land to the grid station. The land documents have been provided in **Annexure-7**.

Land for Transmission Line

IESCO GSC department surveyed a fixed route from University – Tramri – Nilore Transmission Line to the proposed Shakrial Grid Station. The business community and general public living along the transmission line have been taken into confidence and will be paid as per The Telegraph Act, 1885 in case of any damage. However, it is to be noted that the transmission line does not pass-through private land. The transmission line corridor is passes through lethrar road by crossing Faisal Avenue/Islamabad Expressway at Khannapul and enters into Falcon Complex through KRL road in Road.

Therefore, there is no issue of land acquisition or resettlement of the community due to the project. The compensation for any damage of infrastructure and trees, etc., will be paid within one month of the damage caused due to the construction activities along the transmission line.

3.9.2 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, and planning) 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 (transformers, breakers, isolators, control panels, feeder and allied equipment) is 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 5,000 gallons during the peak construction period and the contractor camp will generate a maximum of 0.25 ton 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.

3.9.3 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 the HEC heavy mechanical complex 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 New Wah Hasanabdal Attock and Rajjar Jhelum.

Transformer Oil Testing Procedure

The dielectric strength of the transformer oil filled in the power transformers is tested every year at the grid 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.

3.10 Government Approval

Presently, the project is in the planning phase. However, all the required government approvals have been acquired by IESCO. Land for 132 kV Grid Station Shakrial has been allotted free of cost by Pakistan Air Force. The transmission line route has been selected by the GSC department IESCO in consultation with the government of Punjab and ICT administration. No compensation is involved as the transmission line passes through the land owned by Pakistan Air Force, Govt. of Punjab and ICT. In

case of any damage to the private infrastructure, compensation will be made accordingly as per the Telegraph Act 1895.

3.11 Project Time Schedule

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

3.12 Alternatives considered and Reasons for Rejection

3.12.1 No Project Option

The proposed project seeks to upgrade the secondary transmission and grid network of the IESCO system and provide the much-needed relief to the existing over-loaded system in Dina. This will also help reduce in-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, which may cause the industries stop operation due to low voltage and variation in the electricity supply. The proposed grid station will be installed specifically for the Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurrum Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghorri Town, Gulberg green, Khanna and surrounding areas in Islamabad.

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

3.12.2 Site Alternatives

a. Site for 132 kV Grid Station Shakrial

Pakistan Air Force has allocated a piece of undulating land measuring 12 Kanal within Falcon complex/Air Force Officers Housing Society at Shakrial for the construction of grid station and its feeding transmission line.

There is residential and commercial area in the immediate vicinity of the proposed project site; in addition, proposed project site has no vegetation as the land is levelled and developed by the administration of Falcon complex administration.

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. However, in this case, the selected route is the only best possible route as it disturbs minimum flora fauna and local communities along its route. The basic considerations including land use, ecological environment and nearby settlements were taken in account while selecting the route for the transmission line.

3.12.3 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 in 2020-21 has collected 78000 liters of PCB contaminated transformer oil and disposed off in environment friendly manner. This activity was done in collaboration with Ministry of Climate Change (MoCC) Pakistan and United Nations Development Program (UNDP).

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 10m², and finding this much space in congested urban areas may be a problem. For such applications, IESCO has been using tubular steel poles which require considerably less space. Since the current project is in urban area, therefore there is no issue of space, which is why; the conventional towers will be preferred. **Figure 3.3 & 3.4** 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 preferred option would be to use the tubular poles for the proposed project.

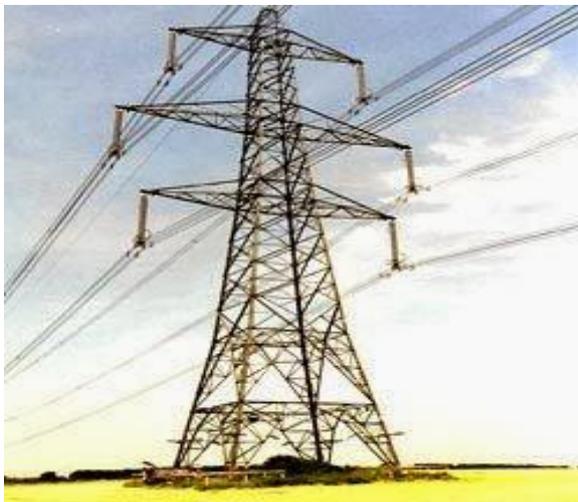


Figure 3.3: Typical Tower

(Exhibit-1: Conventional Tower)



Figure 3.4: Tubular Pole

(Exhibit-2: 1 Korean Tubular Pole)

3.13 Current Land Use of the Project Site

The 132 kV Grid Station Shakrial project site is on barren and levelled land with no infrastructure or agricultural activities.

3.14 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 is a barren and levelled land.

Figure 3.5 (a): Pictorial view of the Project Site



Figure 3.5 (b): Project site



Figure 3.5 (c): Project site briefing to the consultant by PAF & IESCO officials

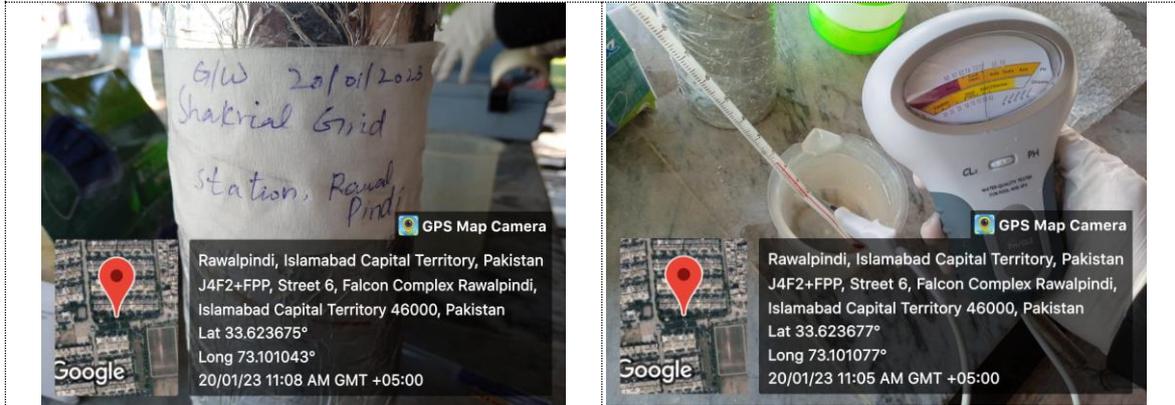


Figure 3.5 (d): Baseline monitoring for Air, Water and Noise Quality Monitoring at Project Site

4 Description of the Environment

4.1 Introduction

This Chapter describes the existing environmental and socio-economic conditions of the project area. The site of proposed 132 kV Grid Station Shakrial is located within the Falcon Complex (Air Force Housing Society) at Shakrial Rawalpindi, 700 meter from Islamabad Express Highway/Faisal Avenue. The site can be accessed through KRL Road from Khanna pul Interchange

4.2 Rawalpindi

Rawalpindi lies along the ancient trade route from Persia and Europe across the Khyber Pass to India. The area has been a cultural meeting place and invasion route for millennia and was visited by Alexander the Great, Genghis Khan, the Moghul conquerors, and other prominent historical figures. Today it remains the site of a major military cantonment and headquarters of the Pakistan Armed Forces. Compared to Islamabad, Rawalpindi is an older and much larger city and is a centre of industrial, commercial, and military activity.

Rawalpindi District, lying in the Northern region of the Punjab province, has an area of 5,286 km². The district is divided into eight tehsils; Gujar Khan, Kahuta, Kallar Syedan, Kotli Sattian, Murree, Rawalpindi, Taxila, and Potohar. Rawalpindi is located in between 33° 04' – 34° 01' North latitudes and 72° 38' - 73° 37' East longitudes.

The district is bounded on the North by Islamabad Capital Territory, Abbottabad, and Haripur districts of KPK, on the West by Attock district, on the South by Chakwal and Jhelum districts, and on the East by the River Jhelum across which lies Bagh, Rawalakot and Kotli districts of Azad Kashmir. The project site is located within the Falcon Complex Shakrial, Rawalpindi.

4.3 Physical Environment

4.3.1 Topography

Physical features of the Rawalpindi district exhibit a rich variety which is continental in dimensions. Here, all possible species of topography which physical processes could produce during the course of ages are located. These include mountains, forests, plateaus, valleys, ravines, torrents, streams, plains, etc. Nature has endowed the district with some beautiful scenery. Within the district, there are also areas fantastic, dreary, tumbled upside down, where there can be no human habitation for kilometres around. The district is shaped like a square. The Murree hills are located at the top. The Murree hills form offshoot of the Himalayan system. They rise in spurs rising to heights between 2133 to 2438 meters.

Rawalpindi falls in the Salt range and Potohar plateau. The terrain surrounding the city is rolling to hilly, criss-crossed by ravines and Nullah running out from these hills. The highest areas are found in the North-western and south eastern parts (1,043 and 660 m high above sea level, respectively). The terrain of Rawalpindi gradually falls off toward Lai Nullah in the West and the Kurang River in the East.

The topography within 2 miles of Rawalpindi contains only modest variations in elevation, with a maximum elevation change of 121 feet and an average elevation above sea level of 1,646 feet. Within 10 miles contains only modest variations in elevation (1,896 feet). Within 50 miles contains very significant variations in elevation (8,904 feet).

The area within 2 miles of Rawalpindi is covered by artificial surfaces (100%), within 10 miles by bare soil (51%) and artificial surfaces (35%), and within 50 miles by bare soil (39%) and cropland (32%).¹

The proposed project site is located within the Falcon Complex (Air Force Housing Society) at Shakrial Rawalpindi, 700 meter from Islamabad Express Highway/Faisal Avenue. The site can be accessed through KRL Road from Khannapul Interchange. The ground level elevation on the project site above sea level varies between 1626 ft to 1680 ft, which indicates that the project site is gently undulating.

4.3.2 Geology and Soil

The dominant factor controlling the geology of the Islamabad-Rawalpindi area is the convergence of the Indian and Eurasian tectonic plates and the collision between the plates that began about 20 million years ago.

Geologically, the high hills of Murree, Kahuta and Kotli Sattian tehsils are composed of tertiary sandstone, lime stones and alluvial deposits. These sand stones apparently belong to the Sirniar and Siwalik series of the sub-Himalayan system. Some of the strata yield excellent building material and are also quarried for road material. Limestone is the character of the Margalla range, and this is the main cause of fertility of villages which lies at its base. It is found also but in limited quantity in Murree hills. The alluvial deposits occur chiefly in the lower portion of Kahuta tehsil, in Rawalpindi tehsil, limestone crops out everywhere along with the low hills and in the plains Kankar deposits are common. The pebble ridges described

¹ <https://weatherspark.com/y/107754/Average-Weather-in-Rawalpindi-Pakistan-Year-Round>

as alluvial deposits in Kahuta hills are the remarkable structural features of Kahuta and Rawalpindi tehsils.

The area in and around Rawalpindi has a complex geological history of mountain formation, alluvial-loessic depositions, and erosion cycles. In the west of the Potohar Uplands, the main depositions of loess are from the Pleistocene period. Streams and ravines cut the loess plain, affected by gully erosion and steep slopes. Such land is unsuitable for cultivation. The area is composed of sandstone and limestone. There is an extensive area with exposed bedrock and fragmentary, thin soil formations.

Important minerals like limestone, marble, and fire clay are found in the area. Limestone is found abundantly in the Margalla Hills and marble in the western section of Margalla Range. Clay soils in the district exhibit five distinct strata, from bottom to top:

(i) Course pebbles with sand or clay, (ii) An alluvial stratum deposited by an older river system in the Soan Basin, (iii) Alluvial deposits of the present river system, (iv) An airborne top layer of silt or clay (loess), and (v) Conglomerate and loose gravel deposits.

4.3.3 Hydrology

The Soan and Kurang Rivers are the main streams draining the area. Their primary tributaries are the Ling River, draining north westward into the Soan; Gumreh Kas, draining westward into the Kurang from the area between the Kurang and Soan; and Lei Nala, draining southward into the Soan from the mountain front and urban areas. The Kurang and Soan Rivers are dammed at Rawal and Simly Lakes, respectively, to supply water for the urban area. Extensive forest reserves in the headwaters of the Kurang and Soan Rivers benefit the quality and quantity of supply. A supplemental network of municipal and private wells as deep as 200 meters (m) produces ground water primarily from quaternary alluvial gravels.

Lai Nullah enters the city from the southwest and joins the Soan Nullah in the southern side. Occasionally it overflows during the rainy season, causing considerable damage. Lei Nala carries most of the liquid waste from Rawalpindi and contributes greatly to the pollution of the Soan Nullah below their confluence. Solid-waste disposal practices threatened the quality of ground-water reserves.

4.3.4 Surface Water

There is no water body along the project site at a distance of 500m. However, the transmission crosses Korang Nala at Barma Islamabad.

4.3.5 Ground Water

The groundwater table in the Rawalpindi city has sharply depleted from 550 feet to 650 feet over the decade due to an over-extraction. WASA has recommended a ban on installation of private tube wells in the city area.

4.3.6 Climate

In Rawalpindi, the summers are short, sweltering, humid, wet, and clear and the winters are short, cold, and mostly clear. Over the course of the year, the temperature typically varies from 3.9°C to 38.3°C and is rarely below 1°C or above 42°C.

The hot season lasts for 2.8 months, from May 3 to July 30, with an average daily high temperature above 93°F. The hottest day of the year is June 11, with an average high of 101°F and low of 76°F.

The cool season lasts for 2.9 months, from December 3 to February 28, with an average daily high temperature below 71°F. The coldest day of the year is January 9, with an average low of 39°F and high of 63°F.

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in Rawalpindi varies very significantly throughout the year.

The wetter season lasts 2.5 months, from June 22 to September 8, with a greater than 30% chance of a given day being a wet day. The chance of a wet day peaks at 55% on July 26.

The drier season lasts 9.5 months, from September 8 to June 22. The smallest chance of a wet day is 5% on November 7.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. Based on this categorization, the most common form of precipitation throughout the year is rain alone, with a peak probability of 55% on July 26.

4.3.7 Landuse

The objective of the proposed project is to provide reliable and undisturbed supply of electricity to Falcon Complex / Air Force Officers Housing Society, Dohke Lalyal, Gangal, Khurram Colony, Babar colony, Muslim Town, Jinnah Camp, PAF Base Nur Khan Khanna, Muslim Town, Iqbal Town and Airport Housing Society in Rawalpindi and Sohan, Ghori Town, Gulberg green, Khanna and surrounding areas in Islamabad. The land allocated is barren and properly leveled by Falcon complex administration.

4.3.8 Air Quality and Noise

The ambient air quality monitoring was conducted in compliance with NEQs and NEQs for Sulphur dioxide (SO₂), Oxide of Nitrogen (as NO), Oxide of Nitrogen (as NO₂), Ozone (O₃), Suspended Particulate Matter (as SPM), Reparable Particulate Matter (as PM₁₀), Respirable Particulate Matter (as PM_{2.5}), Lead (Pb) 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 Shakrial 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 dioxide (SO₂): Sulphur dioxide (SO₂) is a colourless, poisonous gas with a strong odour and mostly present in Coal and petroleum containing Sulphur compounds.

The 24h average concentration of SO₂ at the monitoring site was 12.45µg/m³ which is in compliance with the NEQS (120 µg/m³) of Pakistan. The detailed environmental monitoring report is enclosed as **Annexure-6** of the report.

The SO₂ concentration levels are well below the NEQS limits at the project site as there is no industrial activity or heavy traffic in the vicinity of the project site.

Figure 4.1: Hourly Variation of Sulphur dioxide (SO₂) at the Project Site

Nitrogen dioxide (NO): Nitric oxide (nitrogen oxide, nitrogen monoxide) is a molecular, chemical compound with a chemical formula of NO. One of several oxides of 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 (N₂O), anaesthetic, or with nitrogen dioxide (NO₂), brown toxic gas and a major air pollutant, the latter being a product to which nitric oxide is rapidly oxidized in air.

NO concentration levels are within the NEQs 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.

Figure 4.2: Hourly Variation of Oxide of Nitrogen (as NO) at the Project Site

Nitrogen dioxide (NO₂): Nitrogen dioxide (NO₂) 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 NO₂ 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.

Figure 4.3: Hourly Variation of Oxide of Nitrogen (as NO₂) at the Project Site

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. PM₁₀ 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 PM₁₀, PM_{2.5} hourly variations in concentrations are shown in **Figure 4.5** and **Figure 4.6** respectively.

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 vehicular emissions may have caused a slight increase in the concentration of CO.

4.3.9 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 there are no residential areas within 1km of the project site.

Conclusion of ambient air quality and noise level monitoring

The ambient air quality monitoring was carried in the month of January 2023. The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure-6**.

The SO₂, NO, NO₂, O₃, PM_{2.5}, SPM, PM₁₀, CO concentrations meets the NEQs limits. A summary of ambient air quality and noise levels results are given in **Table 4.1** below:

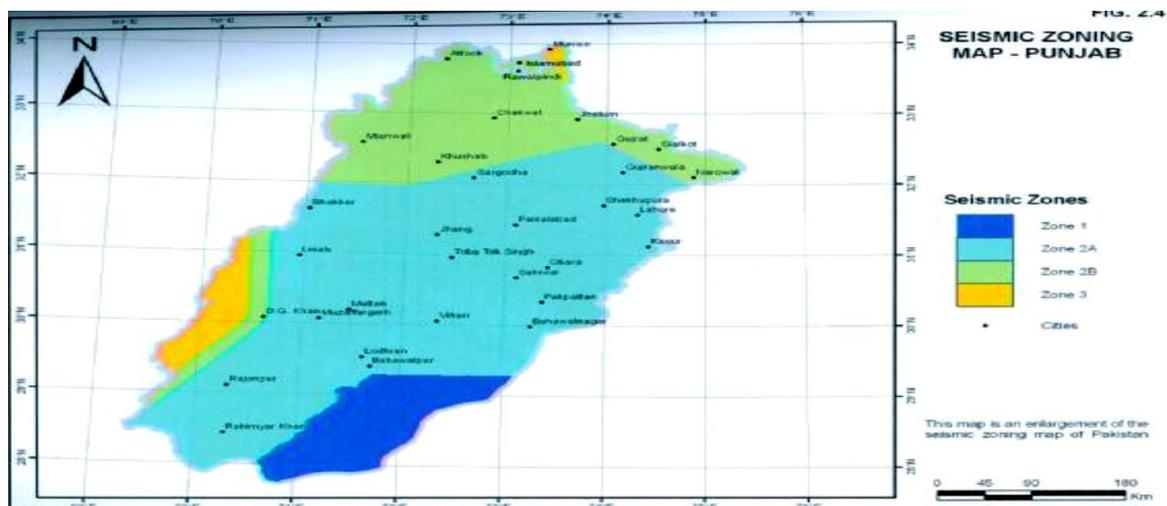
Table 4.1: Summary of Ambient Air Quality and Noise Results at the Project Site

Parameter	Averaging Time	NEQs	Unit	Concentration at the Project Site
Sulphur dioxide (SO ₂)	24 h	120	µg/m ³	40.4
Nitrogen dioxide (NO ₂)	24 h	80	µg/m ³	19.5
Particulate Matter (PM ₁₀)	24 h	150	µg/m ³	93
Particulate Matter (PM _{2.5})	24 h	35	µg/m ³	19.7
Carbon monoxide (CO)	24 h	5	mg/m ³	2.46
	Day-time 6:00AM-10:00PM	75		Annexure-6
	Night-time 11:00 PM-6:00AM	65		Annexure-6

4.3.10 Seismology

The Project Area is located in Seismic Zone 2B, where 2B represents peak horizontal ground acceleration from 0.16 to 0.24g, where 2B represents upper moderate damage zone. **Figure 5.2** shows the seismic zoning map of Punjab with the Project Area falling under Seismic Zone-2B.

Figure 4.1: Seismic Zoning Map of Rawalpindi (Punjab Province)



4.3.11 Traffic and Transportation

Rawalpindi is located on the ancient Grand Trunk Road (N-5); which links the city to nearly every major city in the northern and the southern parts of Pakistan, from Lahore in the Punjab to Peshawar in the Khyber Pakhtunkhwa. The city is also served by two Motorways, M2 (Lahore-Islamabad) and M1 (Islamabad-Peshawar). The public transport for travel within Rawalpindi is diverse, ranging from taxis, auto-rickshaws, mini-buses. Due to lack of proper planning of roads, there is severe traffic congestion on almost all types of roads, particularly Murree Road. The city has an international airport, railway station and a dry port.

4.4 Ecological Environment

4.4.1 Flora

According to natural vegetation of Pakistan, ecologically Rawalpindi lies under thorny zone of vegetation. The area is characterized by medium rainfall, high summer and low winter temperatures and low diversity of plant species. Besides that, there exists high disturbance due to urbanization and high development rate in Rawalpindi from previous some decades that degrade the local flora of the area.

Trees commonly found in district Rawalpindi are Shisham, (*Dalbergia sissoo*), Keekar (*Acacia Arabica*), Shareen (*Albizzia lebbck*), Bari (*Ziziphus Jujuba*), Guava, Citrus etc. in the recent past some farmers have started growing nurseries of Popular, eucalyptus, Symbal etc. Pine, Kai, fir and other trees like poplar, shisham, kikar, willow, walnut, ban-akhore, and mannu are found plentiful in the district. Among flowers zianna, dahlia, merrygold, cosmos, daffodil aster and rose of different kinds are found in the district.

The project site has scarce vegetation in the form of shrubs with no trees at the project site as well as along the transmission line route.

4.4.2 Fauna

In its original form, the Dry Sub Tropical Semi Evergreen Scrub Forest constitutes the habitat of wild fauna consisting of a host of animals and birds. As the disturbances increased to a maximum level with complete inhabitation, wildlife abundance and diversity decreased to a minimum degree.

The species found in the Rawalpindi are:

Mammals

- *Canis aureus* (Asian Jackal)
- *Rattus rattus* (Rat)
- *Herpestes javanicus* (Grey Mangoos)
- *Felis chaus* (Jungle Cat)
- *Lepus negricollis* Indian Hare)
- *Hystrix indica* Porcupine)

Reptiles

- *Calotes versicolor* Garden Lizard)
- *Eschis carinatus* (Saw scaled viper)

- Passer domesticus (House Sparrow)
- Spalerosophis diadema (Diadem Snake),
- Uromastix hardwicki (Spiny Tailed Lizard),

Birds

- Coturnix coturnix (Quail)
- Centropus sinensis (Common Crow)
- Alcedo atthis (Kingfisher)
- Passer domesticus (House Sparrow)
- Corvus splendons (House Crow)

A complete list of the flora and fauna of the Rawalpindi is given in **Annexure-7**.

4.5 Socio-Cultural Environment

4.5.1 Rawalpindi

District Rawalpindi takes its name from its Headquarter town “Rawalpindi” which means abode of Rawals, a jogi tribe. This district is situated in the north-western part of Pakistan. It is bounded on the north by Islamabad Capital Territory, Abbotabad and Haripur Districts of Khyber Pakhtunkhwa; on the south by Chakwal and Jhelum districts and on the west by Attock district. The total area of the district is 52864 square kilometers.

Population and Ethnic Structure

Rawalpindi had an estimated population of 2.09 million people as per the census of 2017. Most of the houses are well constructed. The average growth rate is 5.19 %.

Almost all the population of the district is Muslim. They constitute 97.6 per cent of the total population in rural as well as in urban areas. There are very few Christian, Hindu, Qadiani, schedule caste and other communities which are only 1.7 per cent of the total population.

Languages

The main languages in the project area are Urdu, English, Punjabi, Pashto, Siraiki, while few people speak other languages too. The most widely spoken languages are Urdu and Punjabi.

Education

Rawalpindi claims to have one of the highest literacy rates in the country. It has 80% literacy rate and enjoying second rank, while Islamabad is the first ranked city having literacy rate of 87%. There are many educational institutions in the project area. Higher secondary educational institutions for boys and girls are present with all basic infrastructure and highly qualified staff. The education facilities in the project area are extra ordinary.

Table 4.2: Educational Institutions

District	Education Status					
	Numbers			Enrolment		
	School	Universities & Colleges	Others	School	Universities & Colleges	Others

Rawalpindi	2,901	46	394	595,000	60,809	26,734
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Public Health

Rawalpindi has both public and private medical Centre. There are a number of hospitals in and around Rawalpindi mainly on G.T Road.

The health care services provided by the public health sector in District Rawalpindi consists of 4 THQ Hospitals, 10 Rural Health Centres, 98 Basic Health Units and 66 Dispensaries. In addition, there are three public sector tertiary care hospitals. Pakistan Army also provides specialized tertiary care through Military Hospital, Combined Military Hospital and Armed Forces Institutes of Pathology, Cardiology, Ophthalmology, Rehabilitation, Dentistry and Blood Transfusion.

Table 4.3: Health Facilities

Sr. No	Number of Health Facilities	District Rawalpindi
1.	Hospitals (150 beds and above)	13
2.	District Headquarters Hospitals	1
3.	T.B.	2
4.	Others (Sub Health Centres, Dispensaries and Private Facilities)	200

Drinking Water Supply

The underground water obtained through tube wells is used for drinking and domestic purposes. Plenty of underground water with low water table will fulfil the water demand of construction crews during construction Phase of the project.

Employment

Much like rest of the country, the male members of the family in the project area are the breadwinners. Of the total male population, on average 47 % are economically active in businesses, private and public sector organizations, while remaining 53 % are inactive. Among them 25 % are under the age of 10, remaining are students, domestic workers, landlords, property owners, retired persons, disabled and unemployed.

4.5.2 Sites of Archaeological and Cultural Significance

There exists no site of archaeological and cultural significance within the two kilometres radius of the project site.

4.5.3 Other Facilities

All other amenities of life like electricity, natural gas, telephone, a police post, post office and bank, etc. are present near the Project area.

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 Shakrial and its feeding Transmission Line, District Rawalpindi, will create both positive and negative 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. The

stake holder’s consultation during this phase of the work targeted the project area, administrative, private offices, Govt. offices, shops, stores, etc. near the Project area.

Potential stakeholders for consultation and participation were identified and initial discussions were held with the owners/management of the private business i.e shopkeepers, petrol pump managers, banking officials, hotel and bakery owners and government offices etc. along with the ROWs, business community and general public welcomed and showed their full support to the project. The team made aware the public about possible traffic congestion/jam issues during installation of transmission line.

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.

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)
3	Government Organizations
4	Non-Governmental Organizations/ Agencies
5	Environment & Social Experts (Public and Private Institutes/Academia)
6	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 resided in villages in the vicinity of the sub-project area. Accordingly, the consultations were made with all primary stakeholders for

sharing the information regarding the sub-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
Mr. Muhammad Yasin, Additional Director Environment and Social Safeguard Section	IESCO, Islamabad	<p>The project is a part of a positive approach for providing reliable power supply to Rawalpindi and Islamabad. IESCO will make every effort to make the project sustainable and green as possible.</p> <p>There will be no harm to the general public living in the vicinity of the project location as the grid station is located within the Falcon complex, away from residential area.</p> <p>The grid station site should be declared as “No Go Area” for the general public.</p> <p>The transmission line alignment has been established considering important factors like flying zone, land use, ecological environment and nearby settlements along the route.</p>
Mr. Sher Afzal, Additional Dy. Director, Environment and Social Department	IESCO, Islamabad	<p>The construction of grid station will improve the reliability of IESCO system and undisturbed supply of electricity to the twin cities.</p> <p>This grid station is Air Insulated Station (AIS) type. AIS technology is cheap but it requires large space and it is out door.</p> <p>Construction of grid station will not affect the physical and biological environment of the project area.</p> <p>The route of the transmission line is safest and passed though least congested areas.</p> <p>Transmission line of 132KV has no serious electromagnetic effects.</p>
Dr. Asif Khoja, Assistant Professor, NUST	NUST, Islamabad	<p>The project will improve the serviceability of IESCO for electricity supply.</p> <p>Technically, there are no adverse impacts of constructing grid station on a barren vacant plot within the Falcon complex.</p> <p>During constructional phases of the project, cutting of indigenous plant trees should be avoided.</p> <p>Grid station site should be fenced.</p> <p>EMP should be given special consideration during construction phase to mitigate air pollution.</p> <p>By establishment of a grid station the efficiency of electricity transmission will increase i.e. line losses will decrease. This will in turn reduce the carbon footprint on the environment.</p>

Designation	Location	Opinions/Concerns/Issues/Suggestions
Mr. Awais Squadron Leader (Pakistan Air Force)	Falcon Complex, Shakrial.	<p>He encouraged the project and its objective.</p> <p>He said that due to low voltage of electricity the residents of Falcon complex and adjacent areas facing sever difficulties.</p> <p>Keeping in view the Pakistan Air Force offered a piece of land measuring 12 kanal free of cost to IESCO for installation of this project.</p> <p>He further added that the transmission line route should be selected in consultation with Pakistan Air Force experts to avoid any difficulty (safety) in flying of air crafts.</p>
Mehr Kamran	Shokeeper-Mehr Sweets Khannapul	Supported and in favor
Sadi Ali	Manager Operations-Bank Al Habib Tarlai	Supported and in favor
Nisar M. Khan	Branch Manager UBL Taramri	Supported and in favor
Qamar Sabir	IDC Tramri	Supported and in favor
Atif Majeed	Business Man-Tayyab Bakery Taramri	Supported and in favor
Shamshed Abbasi	Manager-Jilani CNG Pump	In favor of the project with a view that this is a Govt. project that will help in reducing the load shedding issues in the area
Riaz Ahmad Khan	HR & Accounts Head-HBS Medical College Taramri	Installation of transmission lines will have a purpose. In condition to the benefit to the community, supported the project
Yasir Abbasi	Manager TKR Hotel	Supported the project with a view that he has nothing to do with it.
Raja Ghaznafaer	Chairman/Secretary-Union Council Tarlai	He was of the opinion that the project will be helpful in overcoming the load shedding issue in the area.

5.6.1 Public Consultation

The discussions were held in the vicinity of the project site and general public were also consulted.

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

- The area will be benefited with the upgraded system because the existing quality of the electricity will be enhanced.
- The existing system is overloaded all the year round and business-related activities have reduced due to unavailability of electricity.
- 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 is affecting the families badly.
- People complained that utility bills for electricity are very high as compared to consumption.
- Proper safety 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 passage of electricity distribution networks and lines 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.
- There should be proper safety measures in case of any emergency.
- Environmental degradation will occur so plantation should be done around the project site to minimize its eye soaring aesthetic effects.

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.

- The 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 norms should be obliged.

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 132 kV Grid Station Shakrial 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	0	N	0	N	N	N	-2
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
Liquid Waste Disposal	-1	0	-1	-1	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
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.

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 is 85 ft.

6.3.2 Change of Land use

The proposed grid station site is on barren land. While the route for the 07 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 the transmission line poles will be used which occupy low footprint as compared to tower.

No major change in the RoWs of transmission lines is expected as all area under transmission line will remain underuse as previously.

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 drainage nullah to protect the poles from being damaged in monsoon season due to flooding. Furthermore, counter plantation in these areas can be helpful in reducing the land sliding and lesser damage during floods.

6.3.3 Loss of Trees

The project site of the grid station has no trees and there will not be any tree cutting along the transmission line route. 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 along the transmission line.

Mitigation Measures

- IESCO will ensure the plantation of 5 trees against one cut tree in RoW of transmission line
- IESCO should keep a close liaison with forest department and use special high elevation poles to avoid tree cutting in forest area
- IESCO has agreed to work on a plantation plan and plant around 400 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 following 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 poles; 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.

- Construction camp will be in a stable and flat area, requiring minimal removal of vegetation and leveling. 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.
- 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 of 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 (SO₂), 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. Since water availability is an issue and there is only one boring system installed at the site, it is recommended that the wastewater from kitchen and washing area of the construction camp may be used for water spraying.
- 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.

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 the entire 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. 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, in order to construct the 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 fuel wood.

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 fuel wood will not be allowed.
- No fires will be allowed inside the forest area.

- Tree plantation plan has been discussed in Chapter 7 which will be implemented after completion of the project. Indigenous tree species will be selected for plantation; Eucalyptus trees will not be used in any case.

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. 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. The proposed project activities may have adverse effects on the wildlife of the area having some wildlife species still surviving despite severe pressures from increasing human habitation, deforestation and solid waste disposal.

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 other areas within the park. 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 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 to the park 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, and Hepatitis etc during the construction phase due to labor 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 labors.
- 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 labors 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 of the park.
 - 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 behavioral 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 through KRL road via Islamabad Express Highway/Faisal Avenue. 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 benign 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 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 poles 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 carryout and sustain the plantation plan. The trees (Neem, Sheesham, Kahu, Orange, Guava, Lemon, Beri and other local fruit-bearing trees) planted within the proposed project site, the trees 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, only 07 small size wood 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 socioeconomic 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

Pakistan Air Force has allocated a piece of land measuring 12 Kanal within the Falcon complex/Air Force Housing Society at Shakrial 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 'high'.

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.
- 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 the entire transmission line pole 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 living 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 park.
- 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 Labour

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, and such sites 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&S) 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

Table 6.1: Summary of Impacts & mitigation measures

Impact	Mitigation Measures
Design Phase Impacts	
Electromagnetic Field near Transmission Line	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ The proposed grid station site is on a 12 kanal barren land. While the route for the 5 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. ▪ 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	<ul style="list-style-type: none"> ▪ 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.
Air Quality Deterioration	<ul style="list-style-type: none"> ▪ 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

Impact	Mitigation Measures
	emissions.
Contamination of Surface and Ground Water	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ 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 pole 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; 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 fuel wood will not be allowed
Operational Phase Impacts	
Soil and Water Contamination	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ IESCO will use special poles 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	
Land Acquisition	<ul style="list-style-type: none"> ▪ IESCO should obtain formal allotment letter from concerned authorities for the allocation of land. ▪ 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	<ul style="list-style-type: none"> ▪ 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.

Impact	Mitigation Measures
Public Health Issues	<ul style="list-style-type: none">▪ 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 park.▪ 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	<ul style="list-style-type: none">▪ 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.

1.1 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.

7.1 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&S will provide advisory services to the project and other IESCO departments/division/directorate. Currently, the E&S has one Additional Dy. Director Environment and one Additional Dy. Director Social Impact under the supervision of Additional Director, Environmental and Social Safeguard (E&S). The strength can be increased in future as required.

7.1.1 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 approval with conditions from the Pak-EPA.

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 contracts with Islamabad Electrical Supply Company Limited (IESCO).

7.1.2 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, T&G Division 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.

7.1.3 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&S unit will be the focal point for all matters relating to environmental and socioeconomic issues during the routine operations of the Organization. The E&S unit will advise various departments within IESCO for environmental and socioeconomic issues. The E&S unit will develop an environmental and socio-economic management system for the Company, defining roles and responsibilities of various departments and their respective staff.

7.2 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.

7.2.1 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/Chief Engineer (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&S section PMU will be responsible for the project's compliance with the EIA and EMMP throughout the project.
- The Additional Dy. 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&S unit will coordinate with relevant government departments (PAK-EPA) 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.

7.2.2 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 In charge (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.

7.2.3 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 Project Management Unit (PMU), IESCO

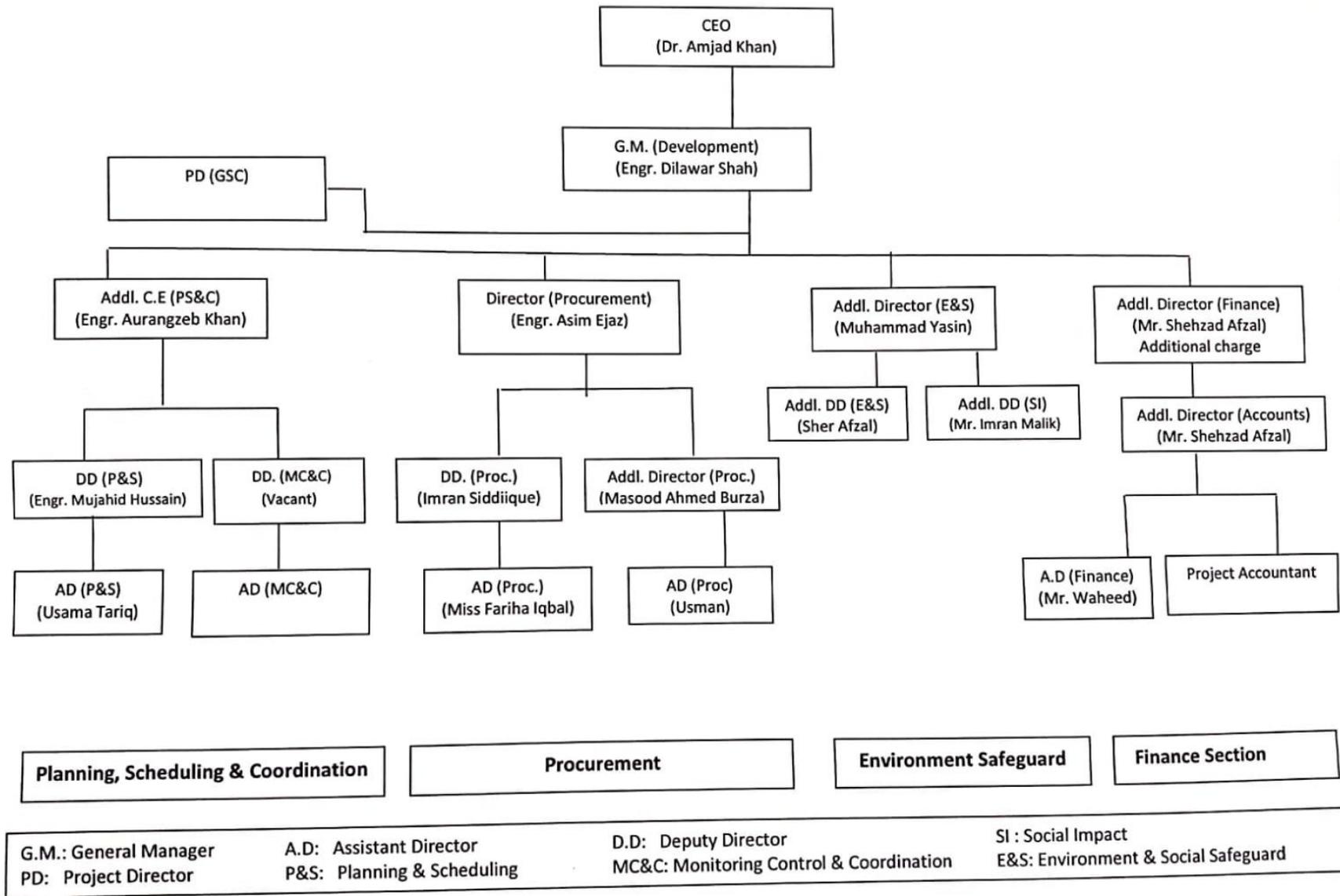


Table 7.2: Role and Responsibility Chart for the Proposed Project

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	Chief Engineer (Development)	General Manager / 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).
		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.
		Additional Director E&S	Advise GSC and other IESCO departments on matters relating to environment and social aspects of the project.

No.	Department/ Division/ Cell	Role	Responsibility
			<p>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).</p>
		<p>Additional Deputy Director Environment & Social Impact</p>	<p>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, Advice and support ESI for the implementation of EIA and EMMP. Report regularly to the Deputy Manager Environment.</p>
6	<p>Contractors related to all works i-e grid station construction, T/L and Civil works</p>	<p>Site Engineer</p>	<p>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.</p>

7.3 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 7.3: 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 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 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 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 IESCO
Waste Management Plan					
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 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 (PD) IESCO
Land Acquisition Issues					
Grid Station Construction	Land Acquisition	The land for grid station has been allocated by PAF to IESCO free of charge.	Pre-construction Phase	GSC Division	PD IESCO
Transmission Lines Construction	Land Acquisition	The route of transmission line has been selected keeping in view the human settlements and agricultural land.	Pre-construction Phase	GSC Division	PD 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	Addl. Dy. Director Environment and Social Safeguard Section (E&S)
Site clearing and preparation, and re-installation works after contract completion	Loss of vegetation and assets on the selected land, and dissatisfaction on rehabilitation measures after completion	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 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	While establishing Camp Site	GSC Division/Contractor	Addl. Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		planted			
Contractor Mobilization and Demobilization	Soil Erosion and Contamination	<p>Vehicular traffic on unpaved roads will be avoided as far as possible.</p> <p>Operation of vehicles and machinery close to the water bodies will be minimized.</p> <p>Vehicles and equipment will not be repaired on the site. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.</p>	During Construction Phase	GSC Division/Contractor	Addl. Dy. Director Environment and Social Safeguard Section (E&S)
Sanitation & waste disposal facilities at camp	Soil and water contamination, Health risks to workforce and public if not properly managed	<p>The sewage system for such camp will be properly designed i.e., septic tank with soakage pit to receive all sanitary wastewater.</p> <p>Sewage treatment facility will be designed and located to ensure that no water pollution takes place.</p> <p>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.</p> <p>For the domestic sewage, appropriate treatment and disposal system will be constructed having adequate capacity.</p> <p>Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination.</p>	Throughout operation of work camp	GSC Division/Contractor	Addl. Dy. Director Environment and Social Safeguard Section (E&S)
		<p>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.</p> <p>Waste oil will be collected in drums and sold to the recycling contractors.</p> <p>Contractor will prepare a waste disposal plan and submit to ESI for his approval.</p>			
Work safety and hygienic conditions	Health risks if work conditions provide unsafe and/or	<p>Obligatory insurance against accidents to work labors</p> <p>Providing basic First Aid training to specified work staff, and basic medical service and supplies to workers</p> <p>Layout plan for camp site, to be approved by the ESI indicating</p>	At establishment of camp site	GSC Division/Contractor	Addl. Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
	unfavorable work conditions	<p>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.</p> <p>Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labors,</p> <p>Protection devices (earmuffs) will be provided to the workers operating in the vicinity of high noise generating machines,</p> <p>Provision of adequate sanitation, washing, cooking. and dormitory facilities including light up to satisfaction approved by the ESI,</p> <p>Proper maintenance of facilities for workers will be monitored by ESM,</p> <p>Regular pest control measures at the campsite.</p> <p>Protective fencing to be installed around the camp to avoid any accidents.</p> <p>Firefighting equipment will be made available at the camp.</p> <p>The camp staff will be provided firefighting training.</p> <p>All safety precautions will be taken to transport, handle, and store hazardous substances, such as fuel.</p>			Safeguard Section (E&S)
Campsite location	Public Health	<p>Camps will be at least 500 m from any groundwater wells used by the community.</p> <p>The construction crew will be provided awareness for the transmissible diseases (such as HIV/AIDS, hepatitis B and C).</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Campsite security	Security hazards and related conflicts in the project area.	<p>Proper storage and fencing/locking of storage rooms containing hazardous material</p> <p>Employment of guard for storage rooms.</p> <p>Provision of adequate security against sabotage petrol pilfering and theft.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Generation of construction waste material	Contamination of soil from construction wastes and quarry materials	All waste will be disposed of 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 of in an identified dumping site approved by ESI.	Throughout construction period	GSC Division/Contractor	Section (E&SS) Addl Dy. Director Environment and Social Safeguard Section (E&S)
Movement of vehicles in the construction site and along the haulage routes	Soil compaction and alteration of percolation and vegetation pattern. Damage to properties and utilities	Construction vehicles, machinery and equipment will move, or be stationed in the designated RoW, to avoid unnecessary compaction of soil. 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	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Movement, maintenance and fueling of construction vehicles	Contamination of soil and groundwater from fuel and lubricants	<p>Construction vehicles and equipment will be properly maintained and refueled in such a way that oil/diesel spillage does not contaminate the soil.</p> <p>Fuel storage and refueling sites will be kept away from drainage channels.</p> <p>Oil and grease traps will be provided at fueling locations, to prevent contamination of water.</p> <p>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.</p> <p>Operation of vehicles close to the water channels; water reservoirs will be minimized.</p> <p>Waste oil and oil-soaked cotton/cloth shall be sold off to authorized vendors</p> <p>Water quality will be monitored as envisaged in the Environmental Monitoring Plan as discussed in chapter 8.</p> <p>Slopes of embankment leading to water bodies will be modified and screened so that contaminants do not enter the water bodies,</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Waste material disposal sites	Contamination of soil/water and impact on landscape value	<p>If spoil material develops, pits will be used after examination on possible soil and water contamination risks.</p> <p>Spoils will then be covered with sandy conglomerates.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Soil related Issues					
Contractor Mobilization and Demobilization	Soil Erosion and Contamination	<p>Vehicular traffic on unpaved roads will be avoided as far as possible.</p> <p>Operation of vehicles and machinery close to the water channels, water reservoir will be minimized.</p> <p>Vehicles and equipment will not be repaired on the site. If unavoidable, impervious sheathing will be used to avoid soil</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		and water contamination.			
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Construction work for grid station and pole 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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Construction work for grid station and pole 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	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		<p>Appropriate measures will be taken to avoid soil erosion during the excavation of transmission line poles foundations, particularly within the park area. These include temporary embankments to protect excavated soil, stone pitching and placing gabions. The surplus soil will be disposed as stated above.</p> <p>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.</p> <p>The construction works for transmission line route will not be undertaken during the rainy season.</p> <p>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.</p> <p>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).</p>			
Construction work for grid station and pole installation.	Soil contamination due to leakage, spoilage etc.	<p>Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.</p> <p>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.</p> <p>As stated above, the camp will preferably be established inside the near the grid station site.</p> <p>Waste oils will be collected in drums and sold to the recycling contractors.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		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.			
Soil and Burrow Material, Cut and Fill					
Construction work for grid station and pole 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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		will be carried out for sprinkling and gardening purposes.			Safeguard Section (E&S)
Waste Disposal Issues					
Spillage of liquid wastes	Risk of polluting surface and groundwater from liquid waste spillage, drainage and runoff from construction sites	<p>Application of good engineering and construction practices.</p> <p>The contractor should ensure that construction debris do not find their way into streams which may get clogged.</p> <p>Work on riverbanks will be kept to a minimum, and retaining walls be constructed.</p> <p>To maintain surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structure along urban settlements.</p> <p>If spillage occurs, it will be disposed of in an identified dumping site approved by ESI.</p> <p>Contractor will prepare a waste disposal plan and submit to ESI for his approval.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Disposal of Solid waste		<p>Proper and safe waste disposal designated site by ESI or ESM,</p> <p>Contractor will prepare a waste disposal plan and submit to ESI for his approval.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	<p>The diversion road will be regularly water-sprayed to minimize the dust generation: Schedules will be adjusted to actual needs, determined by the ESI.</p> <p>Vehicle trips to be minimize to the extent possible</p> <p>All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the NEQS.</p> <p>All equipment is operated within specified design parameters.</p> <p>Air quality parameters will be monitored at determined sites</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		and schedule determined by the ESI. Ambient air quality within the premises of camp site and grid station should be monitored.			
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 NEQS 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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Running of construction	Noise from vehicles, other machinery and	List of all noise-generating machinery onsite along with age to be prepared. Equipment to be maintained in good working	Throughout construction	GSC Division/Contractor	Addl Dy. Director

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
machinery	equipment	<p>order</p> <p>The plant and equipment used for construction will strictly conform to noise standards specified in the NEQS.</p> <p>Vehicles and equipment used will be fitted as applicable, with silencers and properly maintained.</p> <p>Work at night be minimized</p> <p>In urban settlements construction activities will be restricted to be carried out between 6 am and 8 p.m.</p> <p>Implement good working practices (equipment selection and siting) to minimize noise and also reduce its impacts on human health (earmuffs, safe distances, and enclosures).</p> <p>No machinery running when not required</p> <p>Acoustic mufflers/enclosures to be provided in large engines</p> <p>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.</p> <p>Vehicle trips to be minimized to the extent possible</p> <p>All equipment operated within specified design parameters.</p> <p>The noise level will not exceed the permissible limit both during day and night times</p>	period		Environment and Social Safeguard Section (E&S)
Vehicular movement	Traffic congestion and accidents	<p>The movement of vehicles carrying construction material should be restricted during daytime to reduce traffic load and inconvenience to the local people.</p>	Throughout construction period	GSC Division/Contractor	<p>Addl Dy. Director</p> <p>Environment and Social Safeguard Section (E&S)</p>
Vehicular movement	Safety Hazards	<p>Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic.</p> <p>Project drivers will be trained on defensive driving.</p> <p>Vehicle speeds near/ within the communities will be kept low, to avoid safety hazard and dust emissions.</p>	Throughout construction period	GSC Division/Contractor	<p>Addl Dy. Director</p> <p>Environment and Social Safeguard Section (E&S)</p>

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Construction work for grid station, civil works and T/L	Vibration due to construction activities, vehicular movement etc.	<p>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.</p> <p>Confining excessively noisy work to normal working hours in the day, as far as possible.</p> <p>Providing the construction workers with suitable hearing protection like earmuffs and training them in their use.</p> <p>Preferably, restricting construction vehicles movement during nighttime.</p> <p>Heavy machinery like percussion hammers and drills should not be used during nighttime without prior approval of the client.</p> <p>Contractors should comply with submitted work schedule. Keeping noisy operations away from sensitive points;</p> <p>Implement regular maintenance and repairs; and employ strict implementation of operation procedures.</p> <p>Noise barriers in sensitive areas (in front of schools, hospitals, university, mosques).</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Construction work for grid station, civil works and T/L	Dust due to construction activities, vehicular movement etc.	<p>Roads and path should be regularly sprayed with water during dry weather.</p> <p>All excavation work should be sprinkled with water.</p> <p>Construction workers should be provided with masks for protection against the inhalation of dust.</p> <p>Vehicle speed in the project area should be prescribed and controlled accordingly.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Fauna and Flora Resources Issues					
Construction work for grid station, civil works and T/L	Loss of Vegetation	<p>Clearing of natural vegetation will be minimized as far as possible during the transmission line works.</p> <p>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,</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		<p>condition and photograph of the trees to be cut/trimmed.</p> <p>Indigenous tree species will be selected for plantation; in particular, Eucalyptus trees will not be used in any case.</p> <p>Cleaning natural vegetation will be avoided as far as possible.</p> <p>The camp will be established in a natural clearing, outside forested areas.</p> <p>Complete record will be maintained for any tree cutting.</p> <p>The construction crew will be provided. With LPG as cooking (and heating, if required) fuel.</p> <p>Use of fuelwood will not be allowed.</p> <p>No herbicide will be used to clear vegetation</p>			
Construction work and illegal hunting by worker	Damage to habitat and danger to wildlife, disturbance of ecosystem	<p>Measures to protect and rehabilitate floral resources of the area discussed in section above will also protect the wildlife resources of the area.</p> <p>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.</p> <p>Vehicle movement will be limited to the existing tracks in the above area.</p> <p>The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.</p> <p>Garbage will not be left in the open places.</p> <p>The project staff will not be allowed to indulge in any hunting activities.</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Health and Safety of Workers					
Hygiene related issues during construction phase		<p>Obligatory insurance of workers against accidents.</p> <p>Providing basic medical training to specified work staff and basic medical service and supplies to workers.</p> <p>Layout plan for camp site, indicating safety measures taken by the contractor, e.g., firefighting equipment, safe storage of</p>	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		<p>hazardous material, first aid, security, fencing and contingency measures in case of accidents.</p> <p>Work safety measures and good workmanship practices are to be followed by the contractor to ensure on health risks for laborer.</p> <p>Protection devices should be provided to the workers operating in the vicinity of high noise generating machines.</p> <p>Provision of adequate sanitation, washing, cooking, and dormitory facilities to workers.</p> <p>Provision of protective clothing for labors handling hazardous material e.g., hard hats, adequate footwear for bituminous pavement works etc.</p> <p>Adequate signage, lightning devices, barriers, and person with the flags during construction to manage traffic at construction sites.</p> <p>Timely public notification on planned construction works.</p>			Section (E&S)
Social and Gender Issues					
Construction work for grid station, civil works and T/L	Social and Gender Issues	<p>Construction crew will avoid entering the villages and settlements.</p> <p>Local social norms and practices will be respected.</p> <p>No child labor will be employed.</p> <p>Road signage will be fixed at appropriate locations to reduce safety hazards associated with project-related vehicular traffic.</p> <p>Project drivers will be trained on defensive driving.</p> <p>Vehicle speeds near/within the community will be kept low, to avoid safety hazard and dust emissions.</p> <p>The communities near the transmission line route will be informed about the construction activities. Protective fencing will be installed where required.</p> <p>Before commencing the testing commissioning of the system, the nearby community will be informed.</p> <p>Protective fencing will be used where appropriate/possible.</p>	Throughout construction period	GSC Division/Contractor	Addl. Dy. 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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Socio-Economic Issues					
Construction work for grid station, civil works and T/L	Loss of Agriculture	Temporary RoW has been allocated	Throughout construction period	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
Accidents in grid station	Contamination from spills due to traffic and accidents	The spills at the accident sites will be cleared immediately and disposed of properly.	Throughout Operational	GSC Division/Contractor	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl Dy. Director Environment and Social Safeguard Section (E&S)
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	Throughout Operational period	GSC Division/Contractor	Addl. Dy. Director Environment

Activities and Actions	Issue/Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		that least affects the local communities. Wastewater recycling will be carried out for sprinkling and gardening purposes.			and Social Safeguard Section (E&S)
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	Addl. Dy. Director Environment and Social Safeguard Section (E&S)
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	Addl. Dy. Director Environment and Social Safeguard Section (E&S)

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	Addl Dy. Director Environment and Social Safeguard Section (E&S)

7.4 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 Shakrial 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.

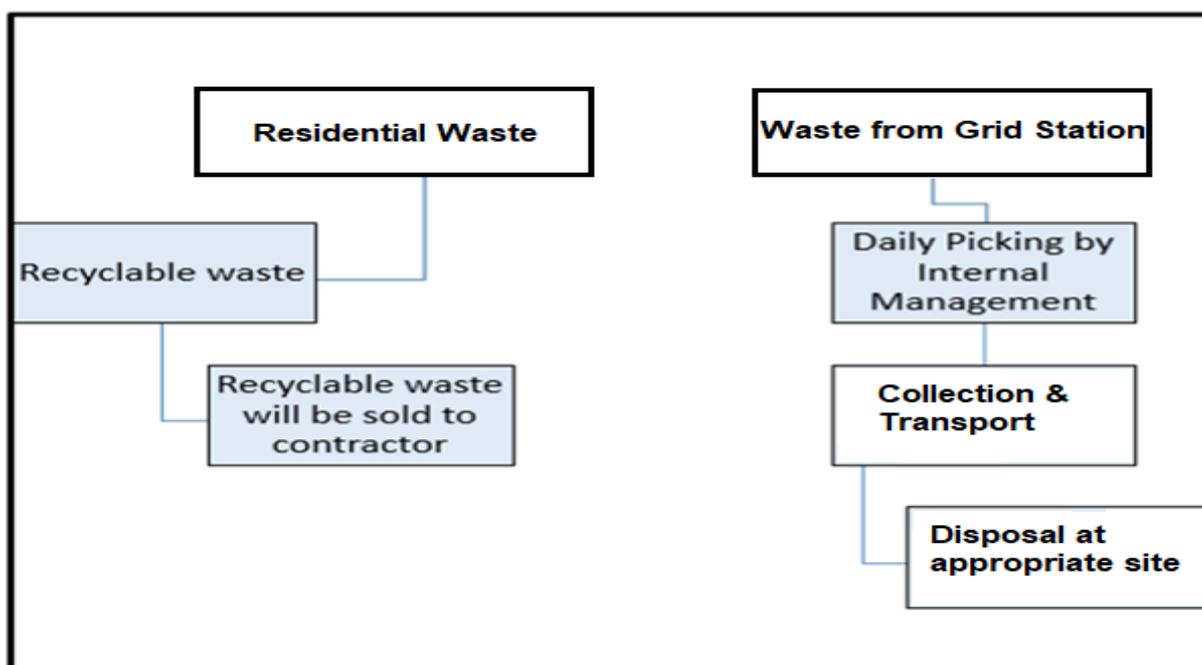
Operational Phase: IESCO will contract with a waste management company for collection, transportation and disposal of solid waste generated by IESCO Project.

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.

- Refuse suitable for preparation of compost
- 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



7.5 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
- Fully equipped Ambulance will be made available at site for 24/7
- 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 7.1: Estimated Cost for the Implementation of Environmental Monitoring Plan for Shakrial 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	200	2000	400,000
3	Gloves	2400	200	480,000
4	First Aid Box	1	3000	3,000
5	Ear Plugs	1200	50	60,000
6	Safety Helmets	100	1000	100,000
7	Safety Jackets (Hi Vis)	200	500	100,000
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)				1,200,500

- 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

7.6 Traffic Management and Construction Material Transportation Plan

- All the contractor's construction material will be transported to the project site through Industrial Estate Road via GT 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.

7.7 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.
- Experienced and qualified paramedic staff will be available at First Aid Post at the site under the command of HSE Manager.
- Fully equipped Ambulance will be available at the project site along with all mandatory items (Oxygen cylinder, Statures & First Aid Box)
- 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 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.

7.8 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.

7.9 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, 400 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 Shakrial 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. 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 (5 ft. and above): Trees comprising of shady, flowering, fruit trees have been recommended for plantation.

The project area is sub-tropical scrub forest ecosystem. Predominantly occupied by Kau, Phulai, Ber, and Sanatha forest trees and shrub species. However, following are some tree species recommended which suits to the project area, include.

Table 7.5: Recommended Plant Species to be planted at the Project Site

Sr.#	Local Name of Plant	Scientific Name	Taxonomy / Family
1	Chir Pine	<i>Pinus roxburghii</i>	Pinaceae
2	Kikar	<i>Acacia nilotica</i>	Fabaceae or Papilionoideae
3	Ber	<i>Zizyphus maurishiana</i>	Rhamnaceae.
4	Mulberry	<i>Moris alba</i>	Moraceae
5	Shisham	<i>Dalbargia sissoo</i>	Fabaceae
6	Neem	<i>Azadirachta indica</i>	Meliaceae
7	Semal	<i>Bombax ceiba</i>	Bombacaceae
8	Kachnar	<i>Bauhinia varigata</i>	Fabaceae
9	Siris	<i>Albizia lebbek</i>	Mimosaceae
10	Alstonia	<i>Alstonia scholaris</i>	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.300, 000.

The tentative cost of equipment for is given below in **Table 7.6** and maintenance plan for three months is given in **Table 7.7**.

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	200,000
3	Maintenance Cost	Lump-sum	Lump-sum	50,000
Grand Total Cost				300,000

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			

7.10 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&S, 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 7.7**, at the end of this chapter.

Table 7.8: Environmental Monitoring Plan for Shakrial Grid Station 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	Perennial and seasonal streams near to grid stations and IESCO's staff colony.	Quarterly	WHO and NEQS	Contractor/ESM	E&S, 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&S, 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&S, IESCO	Completed Record
Public Grievance	Construction	Social parameter	At nearby Communities	Throughout the field activities	Social parameter	ESI	Additional. Dy 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. Dy 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. Dy 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. Dy 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,

NEQS = 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)	@ 30,000 per sample for 24 hr monitoring	240,000
Ambient water quality monitoring Quarterly basis on one location for 4 months	8	@ 20,000 per sample	100,000
Noise levels, quarterly basis for 4 months	8	@ 5,000 per sample	40,000
Total			380,000

7.10.1 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.

7.10.2 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

7.11 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. 150,000 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

7.12 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.

7.13 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 General Manager / 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.

7.14 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.

7.14.1 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.

7.14.2 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&S, Pak-EPA). 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.

7.14.3 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.

7.15 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	380,000
HSE Management Plan	For Construction Phase	1,108,500
Plantation Plan	Plantation of Trees	300,000
Training Program	Trainings about environment protection of the project site	150,000
Grand Total		1,938,500

7.16 Post Project Monitoring

The Project Manager of Construction of Grid Station and it's Transmission Line, 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 Pak-EPA.

8 Conclusion and Recommendations

8.1 Conclusions

The major conclusions of the EIA are:

- Pakistan air Force has provided 12 kanal land to IESCO for construction a new 132 KV grid station and 7 Km feeding transmission line.
- The main objective of the project is to increase the efficiency, reliability, and quality of the electricity supply.
- The total estimated cost of the project is Rs. **1100 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.

8.2 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 grid station and 132 KV feeding transmission line Project, Shakrial Industrial Estate 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 the Rawalpindi and Islamabad.

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 (mmitigated) of Shakrial Grid Station Project

	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	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

Conclusion and Recommendations

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	0	N	0	N	N	N	N	N	0	N	0	N	N	N	N	N	N	N

Conclusion and Recommendations

Disposal																		
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: 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 Shakrial and its Transmission Line Project and respond to queries generated by Pak-EPA until issuance of approval with conditions.

Annexure-2: References

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- **NEPRA, 2005.** State of Industry Report 2005. National Electric Regulatory Authority
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Annexure-3: 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 (CO₂)	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.
NEQS	The Punjab Environmental Quality Standards (NEQS) 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-4: List of People met during EIA

No.	Name of Person	Designation
1	Mr. Muhammad Yasin	Addl. Director Environment & Social Safeguard Section, IESCO
2	Mr. Sher Afzal	Addl. Dy. Director ,Environment & Social Safeguard Section, IESCO
3	Mr. Shazaib	Surveyor, IESCO, Islamabad
4	Mr. Asif Khoja	Assistant Professor (NUST)
5	Mr. Awais	Sq. Leader (PAF) Falcon complex
6	Mr. M. Amin	Ex. Surveyor, IESCO, Islamabad
7	-	General public & business community of the project area

Annexure- 5: Land Documents

Disclaimer (Confidential)

To be provided separately if required
by the Agency

Annexure-6: Ambient Air, Noise and Ground Water Quality Monitoring Results



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AMBIENT AIR MONITORING REPORT

Client Name: Shakrial Grid Station Sample Location: Shakrial, Rawalpindi
 Monitoring Point: Centre of Site Time Duration of Monitoring: 24 Hour
 Monitoring Date: 20-01-2023 Reporting Date: 30-01-2023
 By: SEAL Reference No.: SEAL/LAB/2023/AA/001

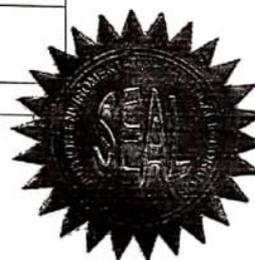
Sr. No.	Parameter	Unit	Method	Results	PEQS
1	PM ₁₀	(µg/m ³)	40 CFR Part 50, App J (US-EPA)	93.00	150
2	CO	mg/m ³	40 CFR Part 50, App. C (US-EPA)	2.46	10
3	NO _x	(µg/m ³)	40 CFR Part 50, App F (US-EPA)	19.5	80
4	SO _x	(µg/m ³)	EQSA-0197-114 (US-EPA)	40.4	120
5	Particulate Matter (PM _{2.5})	(µg/m ³)	40 CFR Part 50, App J (US-EPA) µg/m ³	19.7	35

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

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NOISE LEVEL MONITORING REPORT

Client Name: Shakrial Grid Station **Sample Location:** Shakrial, Rawalpindi
Monitoring Point: Mid of Project
Monitoring Date: 20-01-2023 **Instrument Used:** Digital Sound Level Meter BSWA-308
Reporting Date: 30-01-2023 **Time of Monitoring:** 24 Hours
Monitoring By: Solution Environmental & Analytical Laboratory **Reference No.:** SEAL/LAB/2023/NM/001

Results: -

Sr. No.	Time	Noise dB(A)		NEQS
1	02:00 PM	64.6	Day Time	65
2	03:00 PM	60.4		
3	04:00 PM	62.8		
4	05:00 PM	58.7		
5	06:00 PM	54.2		
6	07:00 PM	52.4	Night Time	55
7	08:00 PM	53.0		
8	09:00 PM	48.5		
9	10:00 PM	53.3		
10	11:00 PM	47.2		
11	12:00 AM	44.8		
12	01:00 AM	64.6		
13	02:00 AM	60.4		



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14	01:00 AM	50.6	Night Time	55
15	02:00 AM	49.5		
16	03:00 AM	46.2		
17	04:00 AM	46.3		
18	05:00 AM	45.6		
19	06:00 AM	62.8	Day Time	65
20	07:00 AM	64.6		
21	08:00 AM	65.0		
22	09:00 AM	61.8		
23	10:00 AM	63.3		
24	11:00 AM	64.5		
Average Noise Level		55.62 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 is not valid for any negotiation.

ANALYZED BY	REVIEWED BY	APPROVED BY
	for 	
Lab Analyst	Assistant Lab Manager	Lab Manager



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THIS RECYCLED PAPER PROTECTS OUR ENVIRONMENT





SOLUTION ENVIRONMENTAL & ANALYTICAL LABORATORY



Client Name: Shakrial Grid Station	Sample Location: Shakrial, Rawalpindi
Sampling Point: Tap Water	Nature of Sample: Ground Water
Sampling Date: 20-01-2023	Date of Completion: 30-01-2023
Sampling By: Solution Environmental & Analytical Laboratory	Temp. & Humidity: 23-27 C ^o & 50-70 %
	Reference No.: SEAL/LAB/2023/GW/137

Results:

Sr. No.	Parameter	Method	Unit	Result	PEQS
20	Antimony	APHA 3114 C	mg/l	0.004	0.020
21	Arsenic	APHA 3114 C	mg/l	0.011	0.050
22	Cyanide	APHA 4500-CN ⁻ D	mg/l	0.01	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	0.39	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 2 of 2



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Annexure-7: Flora and Fauna of project location (As of secondary data collection)

S. #	Common Name	Scientific Name	Form*
1.	Ak.	<i>Calotropis procera.</i>	Sh
2.	Aksan.	<i>Withania somnifera.</i>	Sh
3.	Anar.	<i>Punica granatum.</i>	T
4.	Anjan.	<i>Cenchrus ciliaris.</i>	Gr
5.	Ban Kewra.	<i>Agave americana.</i>	Sh
6.	Bathu.	<i>Chenopodium album.</i>	H
7.	Beladona.	<i>Atropa belladonna.</i>	H
8.	Ber.	<i>Zizyphus jujuba.</i>	T
9.	Bhabber.	<i>Eulaliopsis binata.</i>	Gr
10.	Bhaikar.	<i>Adhatoda vasica.</i>	Sh
11.	Bhakara.	<i>Tribulus terrestris.</i>	H
12.	Bhang.	<i>Cannabis sativa.</i>	Us
13.	Chhichhri.	<i>Plectranthus rugosus.</i>	Sh
14.	Chhimber.	<i>Eleusine flagellifera.</i>	Gr
15.	Chhitar Thor.	<i>Opuntia monacantha.</i>	Sh
16.	Chiraita.	<i>Swertia chirata.</i>	H
17.	Dab.	<i>Eragrostis cynosuroides.</i>	Gr
18.	Danda Thor.	<i>Euphorbia royleana.</i>	Sh
19.	Dhamian.	<i>Fagonia bruguieri.</i>	Gr
20.	Dhamman.	<i>Grewia oppositifolia.</i>	T
21.	Dhatura.	<i>Datura metel.</i>	Sh
22.	Farash.	<i>Tamarix articulate.</i>	T
23.	Gugal.	<i>Commiphora mukul.</i>	T
24.	Hermal.	<i>Peganum harmala.</i>	Us
25.	Itt Sitt.	<i>Boerhaavia diffusa.</i>	Us
26.	Jungli Gulab.	<i>Rosa moschata.</i>	Cl
27.	Jungli Piyaz.	<i>Urginea indica.</i>	H
28.	Jungli Podina.	<i>Mentha sylvestris.</i>	H
29.	Jhinjin.	<i>Setaria verticillata.</i>	Gr
30.	Kachmach, Makoh.	<i>Solanum nigrum.</i>	Us
31.	Kahi.	<i>Saccharum spontaneum.</i>	Gr
32.	Kahu.	<i>Olea cuspidata.</i>	T
33.	Kandi.	<i>Prosopis spicigera.</i>	T
34.	Kaner.	<i>Nerium odorum.</i>	Sh

S. #	Common Name	Scientific Name	Form*
35.	Kandiari.	<i>Solanum indicum.</i>	Sh
36.	Karir.	<i>Capparis aphylla.</i>	T
37.	Khaar.	<i>Haloxylon recurvum.</i>	Us
38.	Khabbal.	<i>Cynodon dactylon.</i>	Gr
39.	Khawi.	<i>Cymbopogon jawarancusa.</i>	Gr
40.	Khip.	<i>Leptadenia spartium.</i>	Sh
41.	Kikar.	<i>Acacia arabica.</i>	T
42.	Kikri.	<i>Acacia jacquemontii.</i>	T
43.	Kundar, Dib.	<i>Typha angustifolia.</i>	Gr
44.	Laidha Booti.	<i>Xanthium strumarium.</i>	Sh
45.	Lana.	<i>Suaeda fruticosa.</i>	Sh
46.	Lani.	<i>Salsola foetida.</i>	Sh
47.	Lasoora.	<i>Cordia myxa.</i>	T
48.	Lumbh.	<i>Aristida depressa.</i>	Gr
49.	Luni.	<i>Cotoneaster bacillaris.</i>	T
50.	Malla.	<i>Zizyphus nummularia.</i>	Sh
51.	Panch Phuli.	<i>Lantana camara.</i>	Sh
52.	Pattaka.	<i>Abutilon bidentatum.</i>	Us
53.	Pattaki.	<i>Gymnosporia royleana.</i>	Sh
54.	Phagwara.	<i>Ficus palmata.</i>	T
55.	Phulai.	<i>Acacia modesta.</i>	T
56.	Pilchhi.	<i>Tamarix dioica.</i>	Sh
57.	Pit Papara.	<i>Fumaria excelsior.</i>	H
58.	Puth Kanda.	<i>Achyranthes aspera.</i>	Us
59.	Sanatha.	<i>Dodonaea viscosa.</i>	Sh
60.	Sanp Booti.	<i>Arisoema wallichianum.</i>	H
61.	Sariala.	<i>Andropogon contortus.</i>	Gr
62.	Sarkanda.	<i>Sachhrum munja.</i>	Gr
63.	Sawank.	<i>Echinochloa columnum.</i>	Gr
64.	Walliati Ak.	<i>Ipomoea crassicaulis.</i>	Sh
65.	Willaiti Jand.	<i>Prosopis glandulosa.</i>	T
66.	Willaiti Jand.	<i>Prosopis juliflora.</i>	T
67.	Willaiti Kikar.	<i>Acacia farnesiana.</i>	T

Fauna:

List of Mammals

S. #	English Name.	Scientific Name.	Status.
1.	Asiatic Jackal.	<i>Canis aureus.</i>	Migratory/Rare.
2.	Common Leopard.	<i>Panthera pardus.</i>	- do -
3.	Common Otter.	<i>Lutra lutra.</i>	- do -
4.	Common Yellow-bellied Bat.	<i>Scotophilus heathii.</i>	- do -
5.	Crested Porcupine.	<i>Hystrix cristatus.</i>	Resident & Common.
6.	Desert Hare.	<i>Lepus nigricollis.</i>	- do -
7.	Field Mouse.	<i>Mus booduga.</i>	- do -
8.	Field Rat.	<i>Millardia meltada.</i>	- do -
9.	Five-striped Palm Squirrel.	<i>Funambulus pennantii.</i>	- do -
10.	Fruit Bat.	<i>Rousettus leschenaultia.</i>	- do -
11.	Horseshoe Bat.	<i>Rhinolophus blasii.</i>	- do -
12.	House Mouse.	<i>Mus musculus.</i>	- do -
13.	House Rat.	<i>Rattus rattus.</i>	- do -
14.	House Shrew.	<i>Suncus murinus.</i>	- do -
15.	Indian False Vampire.	<i>Megaderma lyra.</i>	- do -
16.	Indian Fox.	<i>Vulpes bengalensis.</i>	- do -
17.	Indian Gerbil.	<i>Tatera indica.</i>	- do -
18.	Indian Grey Mongoose.	<i>Herpestes edwardsi.</i>	- do -
19.	Jungle Cat.	<i>Felis chaus.</i>	- do -
20.	Kuhl's Pipistrelle.	<i>Pipistrellus kuhlii.</i>	- do -
21.	Large Rat-tailed Bat.	<i>Rhinopoma microphyllum.</i>	- do -
22.	Leaf-nosed Bat.	<i>Hipposideros fulvus.</i>	- do -
23.	Long-eared Hedgehog.	<i>Hemiechinus collaris.</i>	- do -
24.	Pangolin / Scaly Anteater.	<i>Manis crassicaudata.</i>	- do -
25.	Pipistrelle.	<i>Pipistrellus ceylonicus.</i>	- do -
26.	Punjab Urial.	<i>Ovis vegnei punjabiensis.</i>	Resident/Rare.
27.	Pygmy Gerbil.	<i>Gerbillus nanus.</i>	- do -
28.	Ratel / Honey Badger.	<i>Mellivora capensis.</i>	- do -
29.	Short-tailed Mole Rat.	<i>Nesokia indica.</i>	- do -
30.	Small Indian Civet.	<i>Viverricula indica.</i>	- do -
31.	Small Indian Mongoose.	<i>Herpestes javanicus.</i>	- do -
32.	Small Rat-tailed Bat.	<i>Rhinopoma hardwickii.</i>	- do -
33.	Striped Hyaena.	<i>Hyaena hyaena.</i>	- do -
34.	Wild Boar.	<i>Sus scrofa.</i>	Resident & Common.

List of Reptiles

1.	Common Spiny-tailed Lizard.	<i>Uromastyx hardwickii.</i>	
2.	Fan Toe-tip Gecko.	<i>Ptyodactylus homolepis.</i>	
3.	Indian Cobra.	<i>Naja naja naja.</i>	
4.	Indian Gamma Snake.	<i>Boiga trigonata trigonata.</i>	
5.	Indian House Gecko.	<i>Hemidactylus brookii.</i>	
6.	Indian Monitor.	<i>Varanus bengalensis.</i>	
7.	Indian Python.	<i>Python molurus molurus.</i>	
8.	Indian Sand Boa.	<i>Eryx johnii jhnii.</i>	
9.	Krait.	<i>Bungarus caeruleus.</i>	
10.	Oxus Cobra.	<i>Naja naja oxiana.</i>	
11.	Rohtas Fort Gecko.	<i>Tenuidactylus rohtasfortai.</i>	
12.	Russell's Viper.	<i>Daboia russelii russelii.</i>	
13.	Salt Range Rock Gecko.	<i>Cyrtodactylus montiumsalsorum.</i>	
14.	Saw-scaled Viper.	<i>Echis carinatus pyramidum.</i>	
15.	Sharp-tailed Spider Gecko.	<i>Rhinogekko femoralis.</i>	
16.	Soan Sakasser Gecko.	<i>Tenuidactylus indusoani.</i>	
17.	Yellow Monitor.	<i>Varanus flavescens.</i>	
18.	Yellow-bellied House Gecko.	<i>Hemidactylus flaviviridis.</i>	
19.	Yellow-tailed Sand Lizard.	<i>Acanthodactylus micropholis.</i>	

List of Birds:

S. #	English Name.	Scientific Name.	Status.
1.	Alexandrine Parakeet.	<i>Psittacula eupatria.</i>	Migratory & Frequent.
2.	Ashy-crowned Finch Lark	<i>Eremopterix grisea.</i>	Resident & Common.
3.	Bank Myna.	<i>Acridotheres ginginianus.</i>	- do -
4.	Baya Weaver.	<i>Ploceus philippinus.</i>	- do -
5.	Bay-back Shrike.	<i>Lanius vittatus.</i>	- do -
6.	Black Drango.	<i>Dicurus macrocercus.</i>	- do -
7.	Black Partridge.	<i>Fracolinus francolinus.</i>	- do -
8.	Black-bellied Tern.	<i>Sterna acuticauda.</i>	Migratory & Common.
9.	Black-crowned Heron.	<i>Nycticorax nycticorax.</i>	- do -
10.	Black-winged Kite.	<i>Elanus caeruleus.</i>	Resident & Common.
11.	Blue Kingfisher.	<i>Alcedo atthis.</i>	- do -
12.	Blue Rock Pigeon.	<i>Columbia livia.</i>	- do -
13.	Brahminy Kite.	<i>Haliastur Indus.</i>	- do -

S. #	English Name.	Scientific Name.	Status.
14.	Cattle Egret.	<i>Babulcus ibis.</i>	- do -
15.	Chakor.	<i>Alectoris chukar.</i>	Resident & Frequent.
16.	Cliff Swallow.	<i>Hirundo fluvicola.</i>	- do -
17.	Collared Owl.	<i>Otus bakkamoewa.</i>	Resident & Common.
18.	Common Babbler.	<i>Turdoides caudatus.</i>	Resident & Common.
19.	Common Crow Pheasant.	<i>Centropus sinensis.</i>	- do -
20.	Common Heron.	<i>Ardea cinrea.</i>	Migratory & Common.
21.	Common Myna.	<i>Acridotheres tristis.</i>	Resident & Common.
22.	Common Pochard.	<i>Aythya ferina.</i>	Migratory & Occasional.
23.	Common Quail.	<i>Coturnix coturnix.</i>	Migratory & Common.
24.	Common Snipe.	<i>Gallinago gallinago.</i>	Resident & Common.
25.	Common Swallow.	<i>Hirundo rustica.</i>	Migratory & Common.
26.	Common Teal.	<i>Anas crecca.</i>	- do -
27.	Coot.	<i>Fulica atra.</i>	Migratory & Common.
28.	Black Coot.	<i>Porphyrio porphyrio.</i>	- do -
29.	Crested Cuckoo.	<i>Clamator jacobinus.</i>	- do -
30.	Crested Lark.	<i>Galerida cristata.</i>	- do -
31.	Fan-tailed Warbler.	<i>Cisticola juncidis.</i>	Resident & Common.
32.	Demoiselle Crane.	<i>Anthropoides virgo.</i>	Migratory/Rare.
33.	Egyptian Vulture.	<i>Neophron percnopterus.</i>	Resident & Common.
34.	Eurasian Kestrel.	<i>Falco tinnunculus.</i>	- do -
35.	Fantail Flycatcher.	<i>Rhipidura aureola.</i>	- do -
36.	Flamingo.	<i>Phoenicopterus ruber.</i>	Migratory & Frequent.
37.	Gadwall.	<i>Anas strepera.</i>	- do -
38.	Garganey.	<i>Anas querquedula.</i>	- do -
39.	Golden Oriole.	<i>Oriolus oriolus.</i>	- do -
40.	Golden-backed Woodpecker.	<i>Dinopium benghalense.</i>	Resident & Common.
41.	Gray Partridge.	<i>Francolinus pondicrianus.</i>	- do -
42.	Great Cormorant.	<i>Phalacrocorax sinensis.</i>	Migratory & Frequent.
43.	Homed Owl.	<i>Bubo coromandus.</i>	- do -
44.	Honey Buzzard.	<i>Pernis apivorus.</i>	Migratory & Common.
45.	Hoopoe.	<i>Upupa epops.</i>	Resident/Rare.
46.	Houbara Bustard.	<i>Chlamydotis undulata macqueenii.</i>	Migratory/Rare.
47.	House Crow.	<i>Corvus splendens.</i>	Resident & Common.
48.	House Sparrow.	<i>Passer domesticus.</i>	- do -

S. #	English Name.	Scientific Name.	Status.
49.	House Swift.	<i>Apus affinis.</i>	- do -
50.	Imperial Sand Grouse.	<i>Pterocles orientalis.</i>	Migratory & Frequent.
51.	Indian Cormorant.	<i>Phalacrocorax fuscicollis.</i>	Resident & Common.
52.	Indian Courser.	<i>Cursorius coromandelicus.</i>	Resident/Rare.
53.	Indian Peafowl.	<i>Pavo cristatus.</i>	- do -
54.	Indian Robin.	<i>Saxicoloides fulicata.</i>	Resident & Common.
55.	Brown Roller.	<i>Coracias benghalensis.</i>	- do -
56.	Indian Sand Grouse.	<i>Pterocles exustus.</i>	Migratory & Common.
57.	Indian Swallow.	<i>Hirundo fluvicola.</i>	Resident & Common.
58.	Indian Tree-pie.	<i>Dendrocitta vagabunda.</i>	- do -
59.	Intermediate Egret.	<i>Egretta intermedia.</i>	Migratory & Common.
60.	Isabellian Wheateater.	<i>Oenanthe isabellina.</i>	- do -
61.	Jungle Sparrow.	<i>Passer pyrrhonotus.</i>	Migratory & Common.
62.	Koel.	<i>Eudynamys scolopacea.</i>	Migratory & Common.
63.	Large Egret.	<i>Egretta alba.</i>	- do -
64.	Lesser Whitethroat.	<i>Sylvia curruca.</i>	- do -
65.	Little Brown Dove.	<i>Streptopelia senegalensis.</i>	- do -
66.	Little Egret.	<i>Egretta garzetta.</i>	Resident & Common.
67.	Little Grebe.	<i>Tachybaptus ruficollis.</i>	- do -
68.	Little Green Bee-eater.	<i>Merops orientalis.</i>	- do -
69.	Little Ringed Plover.	<i>Charadrius dubius.</i>	Migratory & Common.
70.	Little Stint.	<i>Calidris minuta.</i>	- do -
71.	Long-legged Buzzard.	<i>Buteo rufinus.</i>	- do -
72.	Luggar Falcon.	<i>Falco juggar.</i>	- do -
73.	Mallard.	<i>Anas platyrhynchos.</i>	- do -
74.	Marsh Harrier.	<i>Circus aeruginosus.</i>	Migratory & Common.
75.	Marsh Sandpiper.	<i>Tringa stagnatilis.</i>	- do -
76.	Moorhen.	<i>Gallinula chloropus.</i>	Resident & Common.
77.	Osprey.	<i>Pandion halliaetus.</i>	Migratory/Rare.
78.	Paddyfield Pipit.	<i>Anthus novaeseelandiae.</i>	Resident & Common.
79.	Painted Snipe.	<i>Rostratula benghalensis.</i>	- do -
80.	Pallid Harrier.	<i>Circus maerourus.</i>	Migratory & Frequent.
81.	Pariah Kite.	<i>Milvus migrans govinda.</i>	Resident & Common.
82.	Peregrine Falcon.	<i>Falco peregrines.</i>	Migratory & Frequent.
83.	Pheasant-tailed Jacana.	<i>Hydrophasianus chirurgus</i>	- do -
84.	Pied Kingfisher.	<i>Ceryle rudis.</i>	Resident & Frequent.

S. #	English Name.	Scientific Name.	Status.
85.	Pied Woodpecker.	<i>Dendrocopos assimilis.</i>	- do -
86.	Pintail.	<i>Anas acuta.</i>	Migratory & Common.
87.	Plum-headed Parakeet.	<i>Psittacula cynocephali.</i>	Migratory & Frequent.
88.	Pond Heron.	<i>Ardeola graggi.</i>	Resident & Common.
89.	Purple Gallinule.	<i>Porphyrio porphyrio.</i>	- do -
90.	Purple Sunbird.	<i>Nectarinia asiatica.</i>	- do -
91.	Red Munia.	<i>Estrilda amandava.</i>	- do -
92.	Red Turtle Dove.	<i>Streptopelia tranquebarica</i>	Migratory & Common.
93.	Red-headed Merlin / Turumtee.	<i>Falco chicquera.</i>	Resident & Common.
94.	Red-vented Bulbul.	<i>Pycnonotus cafer.</i>	- do -
95.	Red-wattled Lapwing.	<i>Hoplopterus indicus.</i>	- do -
96.	Ringed Dove.	<i>Sterptopelia decaocta.</i>	- do -
97.	Rose-ringed Parakeet.	<i>Psittacula krameri.</i>	Resident & Common.
98.	Ruddy Shelduck.	<i>Tadoma ferruginea.</i>	Migratory/Rare.
99.	Rufous-fronted Warbler.	<i>Prinia buchanani.</i>	Migratory & Common.
100.	Saker Falcon.	<i>Falco cherrug.</i>	Migratory/Rare.
101.	Sand Martin.	<i>Riparia paludicola.</i>	Resident & Common.
102.	See-see Partridge.	<i>Ammoperdix griseogularis.</i>	Resident & Common.
103.	Shikra.	<i>Accipiter badius.</i>	- do -
104.	Short-eared Owl.	<i>Asio flammeus.</i>	Migratory/Rare.
105.	Sky Lark.	<i>Alauda gulgula.</i>	Migratory & Frequent.
106.	Spoonbill.	<i>Platalea leucorodia.</i>	Migratory & Common.
107.	Spotted Little Owl.	<i>Athene brama.</i>	- do -
108.	Spotted Owlet.	<i>Athene brama.</i>	- do -
109.	Tawny Eagle.	<i>Aquila rapax.</i>	- do -
110.	Tawny Pipit.	<i>Anthus campestris.</i>	- do -
111.	Tree Warbler.	<i>Hippolais scita.</i>	Migratory/Rare.
112.	Water Rail.	<i>Rallus aquaticus.</i>	- do -
113.	White-backed Vulture.	<i>Gyps bengalensis.</i>	Resident/Rare.
114.	White-breasted Kingfisher.	<i>Halocyon smyrnensis.</i>	- do -
115.	White-breasted Waterhen.	<i>Amaurornis phoenicurus.</i>	Migratory & Common.
116.	White-cheeked Bulbul.	<i>Pycnonotus leucogenys.</i>	Resident & Common.
117.	White-eyed Buzzard.	<i>Butastur teesa.</i>	Migratory & Common.
118.	White-necked Stork.	<i>Ciconia episcopus.</i>	- do -
119.	Wigeon.	<i>Anas penelope.</i>	- do -
120.	Wren Warbler.	<i>Prinia subflava.</i>	- do -

S. #	English Name.	Scientific Name.	Status.
121.	Yellow Wagtail.	<i>Motacilla flava.</i>	- do -
122.	Yellow-crowned Pied Woodpecker.	<i>Dendrocopos maharattensis.</i>	- do -
123.	Yellow-eyed Babbler.	<i>Chrysomma sinense.</i>	- do -
124.	Yellow-footed Green Pigeon.	<i>Treron phoenicoptera.</i>	- do -
125.	Yellow-fronted Woodpecker.	<i>Dendrocopos mahattensis.</i>	Resident/Rare.

Annexure-8: Pictorial Evidence of Public Consultation



