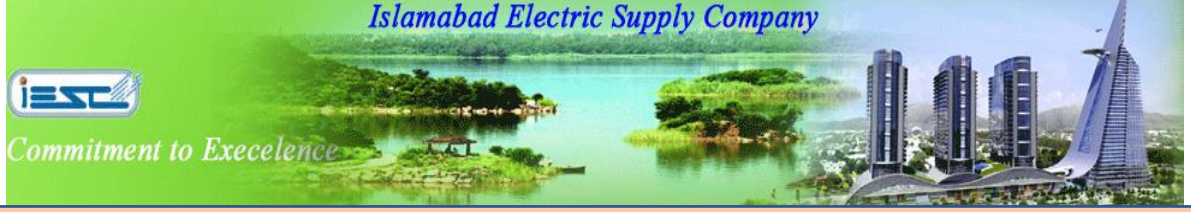

Environmental Impact Assessment of 132 KV Grid Station at Sector I-11/2 and its Transmission Feeding Line Project, Islamabad

FINAL REPORT

NOVEMBER 2020

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Executive Summary

Title of the Project

This report presents the findings of "Environmental Impact Assessment (EIA) of 132 KV Grid Station at Sector I-11/2 and its Feeding Transmission Line Project Islamabad".

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

Location of the Project

The proposed 132 KV Grid Station is located at Sector I-11/2, Islamabad. The transmission line originates from H-11 Grid Station. The entirety of the grid station and its feeding transmission line is located in Islamabad.

Outline of the Project

Islamabad Electric Supply Company (IESCO) intends to construct a new 132 KV Grid Station and 1.5 km feeding transmission line in Sector I-11/2, Islamabad.

The main objective of the project is to provide electricity to Sector I-11 and adjoining areas and increase the efficiency, reliability, and quality of the electricity supply in the project area.

The Air Insulated Station (AIS) 132 KV Sector I-11 Grid Station will be built on 18.6 kanal of land provided by CDA and the 1.5 km Transmission Line will consist of 10 tubular poles.

The total estimated cost of the project is Rs. 602.094 million and will be completed in 24 months (two years).

Analysis of Alternatives

a. No Project Option

The proposed project seeks to provide electricity supply to the Sector I-11 and adjoining areas. There is **no supply of electricity to the Sector** and people are using alternate sources like solar energy while others depend on generators for extraction of groundwater as there is no surface water resource of any government water supply system in the project area.

In case the proposed project is not undertaken, the existing IESCO system will not be able to cope with a load of supplying electricity to the Sector I-11 and adjoining areas. Increasing electricity demand in future, the existing system will remain over-loaded, line losses will also remain high, and the system reliability will progressively decrease, with increasing pressure on the system. The IESCO will also forego the opportunity of increasing its consumers as well as revenue associated with the system expansion.

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

b. Technical Alternatives

Route Alternative for Transmission Lines: The Grid Station Construction (GSC) Department along with Environment & Social Safeguard Department of IESCO after detailed survey has come up with the selected route. The parameters considered were, nearby settlements, frequency of mobility of people along the route, ecological environment and ease of access.

The proposed transmission line length is only 1.5 km long and will be erected with the help of 10 tubular poles along the route from H-11 grid Station to the proposed Grid Station site in Sector I-11.

The proposed route is the best possible option as the route alignment has limited vegetation cover; no trees will be cut down to make way for the transmission line.

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 tower options: single circuit vs. double circuit towers. The cost of the double circuit towers is slightly higher than the single circuit variants, however, in view of their expansion capacity, greater reliability, enabling transfer of more power over a particular distance, double-circuit towers are the preferred ones in this project.

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

Environmental Baseline Conditions

a. Physical Environment

Physiographic and Geology: Islamabad is located on the Northern edge of the track known as Potohar Plateau. The Potohar Plateau has an uneven land and is gradually rising in elevation from 500 to 600 meters above the sea level and the highest point is 1,600 meters above mean sea level. The land gradually slopes towards the South. The land is composed either of alluvium (clay or silt) or of gravel caps.

Geological Setting and Soil Texture: The Potohar region has a complex geological history of mountain formation, alluvial-loessic depositions, and erosion cycles. Limestone is the characteristic rock of Margalla range. In age, it ranges from the Jurassic to Triassic. It is usually reddish or bluish-white in colour mixed or alternating with its beds of red or bluish clay or shades or sandstones.

Climate: Islamabad has distinct seasons marked by wide variation in temperature. Rainfall in April and May is occasional but the heaviest rain befalls in July and August. The temperature ranges between -1 ^{0}C to 46 ^{0}C. The coldest month is January when the mean maximum temperature is 18.3 ^{0}C and a mean minimum of 3.8 ^{0}C. The highest temperature is reached in May when the mean maximum temperature remains 39.1 ^{0}C. The average daily wind speed is 3.78 Km/h while average relative humidity remains 60.5%. Islamabad receives 114.57 mm of rain on an average monthly basis.

Water Resources: There is a perennial Nullah flows from H-11 to I-11 and passes along the proposed project site for grid station.

The groundwater is generally available in Islamabad and the depth of water quality varies from 150 to 250 ft.

Surface water analysis was carried out at the project site. All the water quality parameters were found to be in compliance with the permissible limits.

b. Ecological Environment

The project site is located in I-11, Islamabad, along the bank of seasonal Nullah.

Flora

The project site of the grid station has no trees except for a few natural shrubs.

The vegetation of Project area around Islamabad is a representative of Dry Subtropical Scrub Forest which is dominated by Acacia Modesta (Phulai), Ziziphus mauritiana (Ber); Ziziphus nummularia (Mullah), etc. Other associates existing in varying proportions include Prosopis cineraria (Jand), Melia azadirachta (Dharek); Morus alba (Mulberry-Shahtoot); Dalbergia sissoo (Tahli-Shisham); Acacia nilotica (Kiker). In the undergrowth Cannabis sativa (Bhang), Calotropis procera (Desi Ak), Parthenium hysterophorous (Gandi Booti) and Ocimum bacilicum (Niazbo) are predominant.

Fauna

In its original form the Dry Subtropical Scrub Forest constituted the habitat of wild fauna consisting of a host of animals and birds.

As the disturbance increased to a maximum level with complete inhabitation, wildlife abundance and diversity decreased to a minimum degree.

c. Socio-Economic and Cultural Environment

Sector I-11, Islamabad

Location: Sector I-11 is part of the Master Plan of Islamabad city and is in series next to Sector I-10.

Transport/Communication: The Sector I-11 can be accessed from Faqir Aipee road from the north and through IJP road from the south. Local transport is easily available on IJP road as well as on Faqir Aipee Road.

Cultural Heritage: The population of I-11 village is largely Muslim by faith. There is one mosque, a shrine of Hazrat Khawaja Husain Basra and a graveyard. No archaeologically significant site was found near the project site.

Other Facilities: There is no supply of gas in Sector I-11. The facilities like commercial area, banks, post office, hospital, school and supply of water are not available at the sector.

Public Consultation

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

Generally, the community within the project area is in favour of the project that it will provide electricity supply to the Sector I-11 and adjoining areas. People also believed that the project would also create employment opportunities for local people. They also suggested that proper mitigation plans should be adopted to safeguard environment during the construction phase of the project. People of the project area were hopeless about their future because they do not have access to the necessity of the time i.e. electricity. The people who can afford have installed a solar energy system as an alternate source, but it is so expensive that everyone in the project area cannot afford it.

People use the generator to extract water from the ground as it is the only source of water in the area. The CDA's water supply is not reliable and is blocked in some areas.

Meetings were held with stakeholders such as IESCO, Capital Development Authority's Environment Protection Department, National University of Sciences and Technology, International Islamic University, ZIG Engineers, MOJAZ Foundation, Diamond Architects and environmental practitioners (Dr Irshad Ahmad).

All stakeholders agreed that the project should commence as soon as possible as a whole sector of Islamabad is being deprived of electricity due to lack of this project. Similarly, stakeholders were of the opinion that the project is site also suitable as there is no tree or is not located in an environmentally sensitive area. The major concern of stakeholders was that the construction should be carried out in an environmentally friendly manner.

Potential Impacts and Mitigation Measures

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

a. Physical Impacts

Change of Land use: The location of the grid station of the proposed project is on vacant land with no infrastructure or agricultural activity. There is a seasonal drainage Nullah flowing along with the project site.

While the route for the 1.5 km transmission line has been selected, keeping in view the current land use of the area through which it will pass. The land area under transmission line will remain available for use as previously. However the change in land use will be of permanent nature.

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

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

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

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

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

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

Mitigation Measures

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

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

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

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

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

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

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

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

a. Disposal of construction waste,

b. Solid waste disposal from construction camp,

c. Waste effluents disposal,

d. Equipment/vehicle maintenance,

e. Spillage/leakage of fuels, oils and chemicals.

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

b. Ecological Environment

Impacts

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

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

Mitigation Measures

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

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

c. Socio-Economic Environment

Impacts

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

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

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

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

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

Land Acquisition: Capital Development Authority has allotted a piece of land measuring 18.6 kanal at Sector I-11/2, Islamabad for the construction of 132 KV Grid Station.

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

Mitigation Measures

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

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

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

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

Impacts on Sites of Historical, Cultural, Archaeological or Religious Significance: There is no site within the project site, however in case of discovery of any sites or artefacts of historical, cultural, archaeological or religious significance the provincial and federal archaeological departments will be notified immediately, and their advice will be sought before the resumption of the construction activities at such sites.

Environmental Management and Monitoring Plan (EMMP)

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

The environmental budget set out for the construction phase of the project is Rs. 2.24 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 proposed Grid Station at Sector I - 11/2 and its 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 enable IESCO to supply electricity to the residents of Sector I – 11 and will have a direct positive impact on the environment residents living in the project area.

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
AJK	Azad Jammu and Kashmir
AM	Assistant Manager
Amsl	Above Mean Sea Level
BOD	Biological Oxygen Demand
CEO	Chief Executive Officer
CED	Chief Engineer Development
CITES	Convention on International Trade in Endangered Species
COD	Chemical Oxygen Demand
DC	Deputy Commissioner
DCO	District Coordination Officer
DISCO	Distribution Company
EA	Environmental Assessment
EIA	Environmental Impact Assessment
ELR	Energy Loss Reduction
EMP	Environmental Management Plan
EMMP	Environmental Management and Monitoring Plan
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESG	Environmental and Social Guidelines
ESI	Environmental and Social Inspector
E&SS	Environmental and Social Safeguard
FESCO	Faisalabad Electric Supply Company
GoAJK	Government of Azad Jammu and Kashmir
GDP	Gross Domestic Product
GENCO	Generating Company
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

ICNIRP	International Commission on Non-Ionizing Radiation Protection
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
PAPs	Project Affected Persons
NEQS	National 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

List of Units

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

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

1 Introduction

1.1 Project Background and Overview

The core objective of Pakistan's Energy Policy is to augment the energy system of the country since its independence in 1947. However, despite the substantial increase in production capacity of the energy sector, Pakistan still suffers from an energy shortage. This situation poses constraints on the growth of the economy and social sector development.[1]

Pakistan is considered as an energy-deficient country and per capita electricity generation has traditionally been low in recent years (581 KWh against the World average of 2,657 KWh). 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 – 2018 period.

The project will ensure supply of electricity to Sector I-11 and adjoining areas, load reduction on currently overloaded grid stations and transmission lines, and improvement in the voltage profile as well as the system reliability in Islamabad.

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

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

1.2 The Project

Islamabad Electric Supply Company Limited intends to establish a 132 kV Grid Station and its feeding transmission line at Sector I-11/2, Islamabad. The grid station will be 132 KV Air Insulated Sub-station on 18.6 kanal of land, providing an efficient and undisturbed supply of electricity to Sector I-11 and adjoining areas. The transmission line will be originated from Sector H – 11 Grid Station and will be 1.5 km involving erection of 10 tubular poles.

1.3 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.

[1] https://www.sciencedirect.com/science/article/abs/pii/S1364032116302866

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

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

2007	150.53	16,986,554	15,138	85,987	67,480	571	448	5,062	3,973
2008	153.82	17,955,366	16,838	84,584	66,539	550	433	4,711	3,706
2009	157.14	18,640,114	17,325	82,702	65,286	526	415	4,429	3,496
2010	160.49	19,582,224	17,847	87,115	68,878	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	78,113	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	189.00	28,473,069	25,627	122,302	99,046	647	524	4,295	3,479

Source: *Power System Statistics 44th Edition-2020 (NTDC)*

1.4 Details of Consultant

Project Procurement International (PPI) is an environmental and management consultancy firm which is operating in the field of environment for the last 15 years. PPI has completed more than 250 environmental studies (EIA & IEEs) of different development projects. The list of team members and their qualification has been provided in **Annexure- 1**.

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

- Mr. Saadat Ali, Environmental Engineer
- Mr. Ali Abdullah, Environmental Engineer
- Mr. Amir Saeed, Flora Fauna Expert
- Mr. Zahid Hussain, Environmental Engineer
- Mr. Mohammad Jahanzaib Khan, Environmental Engineer

1.5 Environmental Impact Assessment

According to the Pakistan Environmental Protection Act 1997, section 12 (1):

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

1.5.1 Purpose of the Report

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

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

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

1.5.2 Contact Persons

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

Table 1.2: Name and Addresses of Proponents Representative and Consultant

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

1.6 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 eighth 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 the 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 areas 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, Sheikhupura and Okara districts.
- FESCO: Faisalabad Electric Supply Company for Faisalabad, Sargodha, Khushab, Jhang, Toba Tek Singh, Bhalwal, Mianwali and Bhakkar districts.
- HESCO: Hyderabad Electric Supply Company for Hyderabad, Nawab Shah, Sanghar, Mirpur Khas, Umar Kot, Tharparkar, Badin and Thatta districts in Sindh Province.
- SEPCO: Sakkhar Electric Power Company is responsible for electricity supply to Jacobabad, Shikarpur, Ghotki, Larkan, Dadau Nowsheroferoz, Khairpur and Sakkhar districts of Sindh province.
- TESCO: Tribal Electric Supply Company is responsible for electricity supply to seven agencies and FRs that are situated along Afghanistan boundary. The seven agencies are, Kurram Agency, Orakzai Agency, Khyber Agency, North Waziristan Agency, South Waziristan Agency, Bajur Agency, Mohmand Agency. The Frontier Regions are FR Peshawar, FR Kohat, FR Bannu, FR Lakki, FR Dera Ismail Khan, FR Tank.
- QESCO: Quetta Electric Supply Company for the entire Balochistan Province, except Lasbela, which is covered by the KESC network.

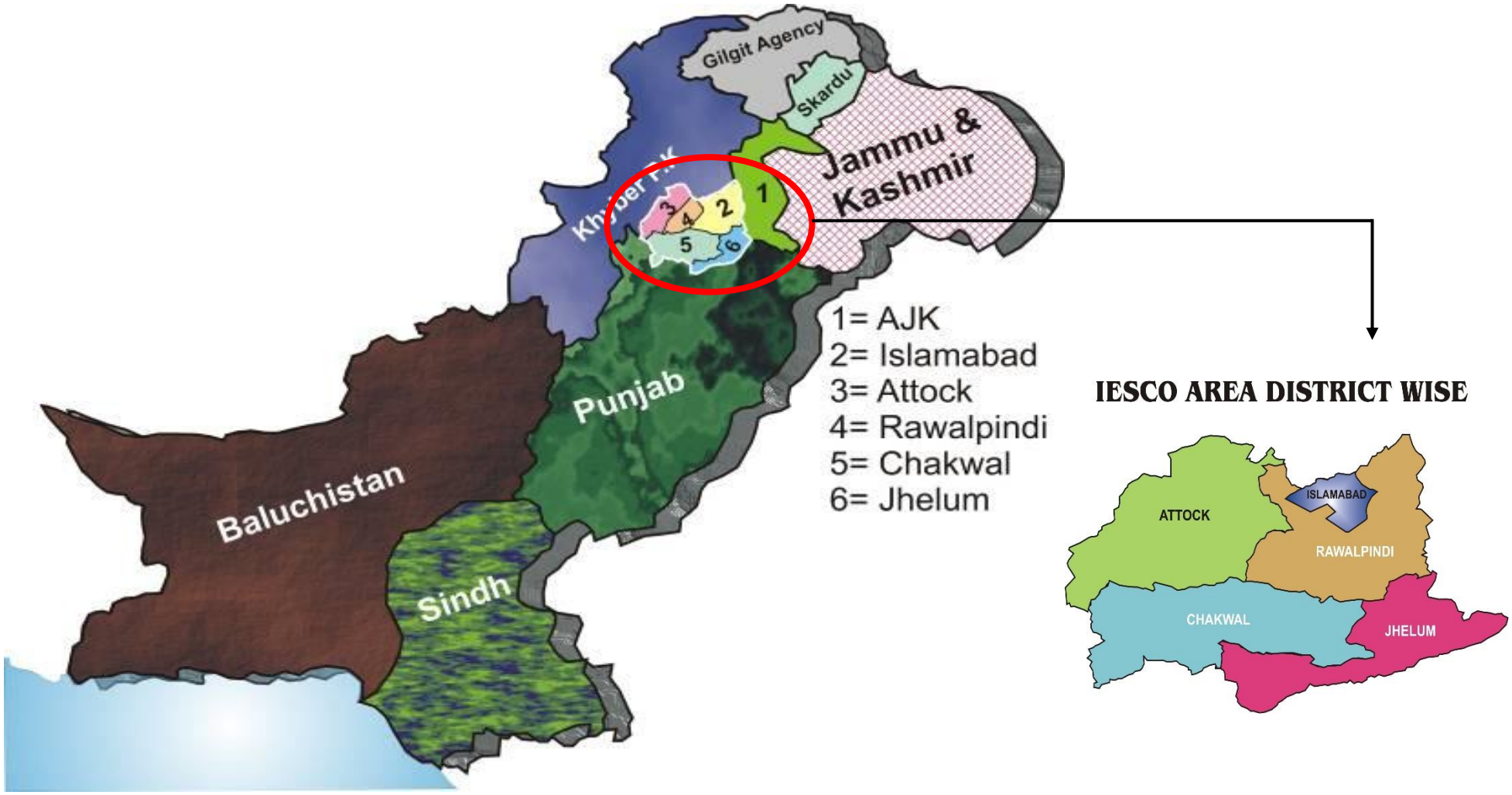
1.6.1 IESCO Area

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*

1.6.2 Technical Data of IESCO

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

Table 1.3: IESCO'S Technical Profile

Description	Unit	Qty
Grid stations (Including NTDC)	Nos.	110
132 KV Grid stations	Nos.	80
66 KV Grid stations	Nos.	1
33 KV Grid stations	Nos.	2
Customer Grid stations (IESCO Maintained)	Nos.	12
Customer Grid stations (Custom er Maintained)	Nos.	1
Customer Grid stations (Consumer Maintained)	Nos.	14
NTDC Grid stations	Nos.	5
Peak load demand – Recorded on 04-07-2019 (1100hrs)	MW	2,496
Power transformers (Numbers)	Nos.	256
Power transformers' installed capacity (MVA)	MVA	6,324
Transmission line	Km	3,547
HT lines	Km	25,553
LT lines	Km	27,089
11 KV feeders	Nos.	1,073
Distribution transformers	Nos.	49,290
Distribution transformation capacity	MVA	4,048

Source: *IESCO Company Profile, September 2019*

1.6.3 Existing Transmission Lines

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

Table 1.4: List of Transmission Lines

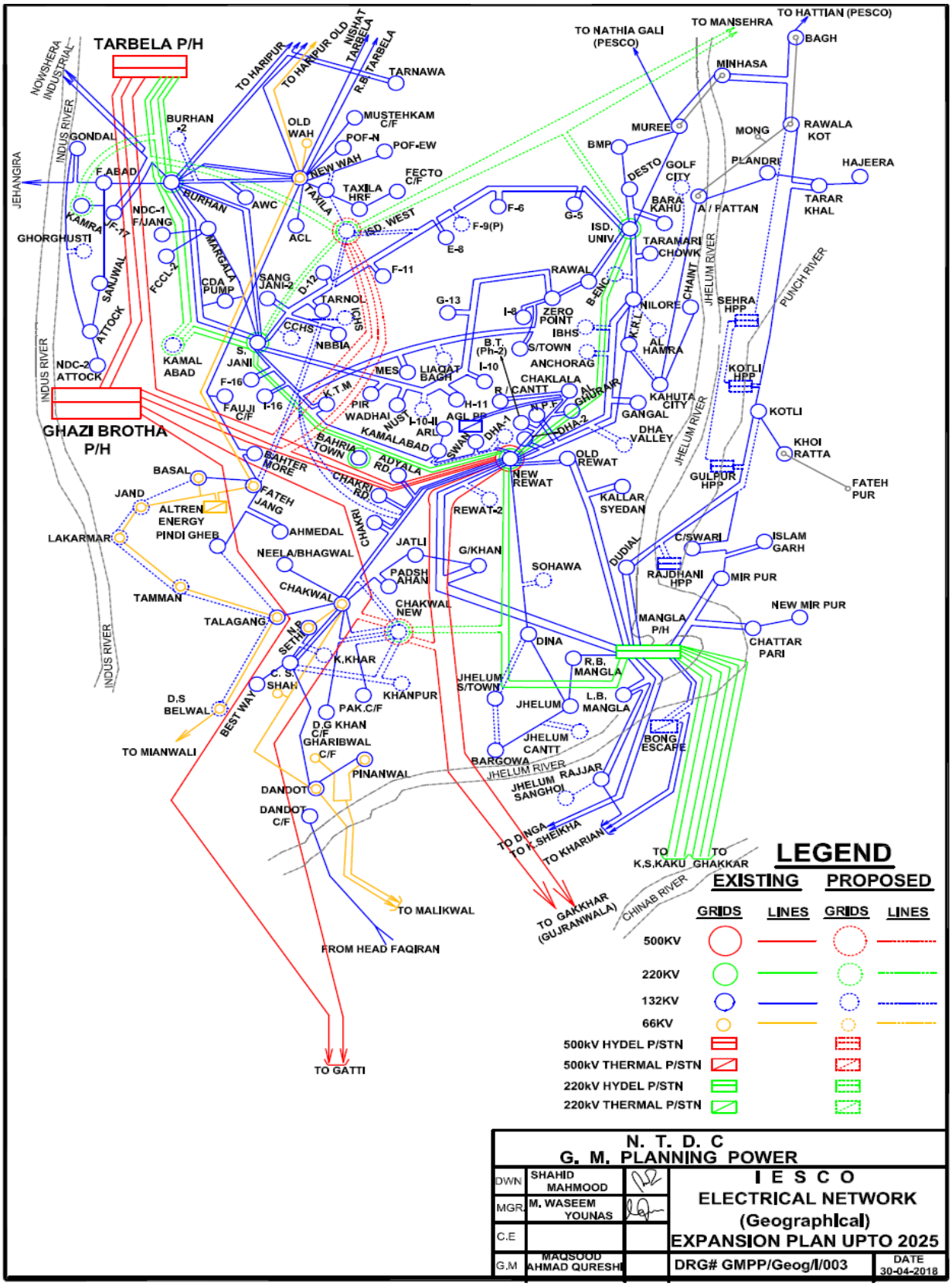
No	Transmission Lines in IESCO's Region		
	Capacity	From	To
Double Circuit Transmission Lines			
1	220 KV Transmission Lines	Mangla	Burhan
		Tarbela	Burhan
2	132 KV Transmission Lines	Burhan	i) New Wah, ii) Zero point, iii) Rawal & iv) AEC
		Mangla	AEC
		New Wah	Attock
		Attock	HIT
		HIT	Fecto

No	Transmission Lines in IESCO's Region		
	Capacity	**From**	**To**
		Old Rewat	New Rewat
Single Circuit Transmission Lines			
3	132 KV 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 Rawat
4	66 KV Transmission Lines	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*

1.7 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.

1.7.1 Secondary Data Collection

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

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

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

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

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

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

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

1.7.2 Field Visits and Base Line Data Collection

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

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

1.7.3 Pubic Consultation

Roadside discussions were organized with the people living in Sector I-11, Islamabad.

Annexure-5 gives a list of persons and stakeholders met during the EIA study.

1.7.4 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.

1.7.5 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.

1.7.6 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.

1.7.7 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.

1.7.8 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.

1.7.9 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.

1.8 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).

1.9 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 Sector I-11/2 Grid Station and transmission line was reviewed with reference to the legislation and existing legal framework on the environment in Pakistan and International level as described henceforth.

2.2 National Environmental Policy, 2005

The National Environment Policy (NEP) aims to protect, conserve, and restore Pakistan's environment 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 a framework for addressing the Environmental issues of 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-sector 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 provide 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 (the Act) 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 import and 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 (Pak EPA) has been prohibited under the Act, and penalties have been prescribed for those contravening the provisions of the Act. The powers of the Federal and Provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Ordinance 1983, have also been considerably enhanced under this legislation and they have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord, or upon the registration of a complaint.

The requirement for environmental assessment is laid out in Section12 (1) of the Act. 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), 2000 and are discussed hereinafter.

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 Pakistan 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.
- The EPA is bound to conduct preliminary scrutiny and reply within 10 days of submittal of the report a) confirming completeness, b) asking for additional information, or c) requiring additional studies.
- The EPA 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.
- EPA accord their approval subject to the following conditions:
- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from EPA a written confirmation of compliance with approval conditions and requirements of the IEE/ EIA.
- An EMP is required to be submitted with the request for obtaining confirmation of compliance.

- The EPA is required to issue a confirmation of compliance within 15 days of receipt of the request and complete documentation.

The IEE/EIA approval will be valid for three years from the date of the accord.

A monitoring report is required to be submitted to the EPA 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.

2.3.3 National Environmental Quality Standards (NEQS), 2010

The National Environmental Quality Standards (NEQS), 2000 specify the following standards:

- 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.

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.

2.3.4 NEQS for Liquid Effluent

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

Table 2.1: NEQS for Liquid Effluent Discharge

Parameters	Standards		
	Into Inland Waters	Into Sewage Treatment	Into Sea
Tempereture	=<3°C	=<3°C	=<3°C
pH Value	6-9	6-9	6-9
Biological Oxygen Demand $(BOD)_5$	80	250	80
Chemical Oxygen Demand (COC)	150	400	400
Total Suspended Solids (TSS)	200	400	200
Total Dissolved Solids (TDS)	3500	3500	3500
Grease & Oil	10	10	10
Phenolic Compounds (as phenol)	0.1	0.3	0.3
Chlorides (as Cl')	1000	1000	SC
Fluoride (as F')	10	10	10
Cyanide (CN') total	1.0	1.0	1.0

Parameters	Standards		
	Into Inland Waters	Into Sewage Treatment	Into Sea
An-ionic Detergents (as MBAs)	2.0	20	20
Sulphate (SO'')	600	1000	SC
Sulphide (S')	1.0	1.0	1.0
Ammonia (NH^3)	40	40	40
Pesticides	0.15	0.15	0.15
Cadmium	0.1	0.1	0.1
Chromium (trivalent & hexavalent)	1.0	1.0	1.0
Copper	1.0	1.0	1.0
Lead	0.5	0.5	0.5
Mercury	0.01	0.01	0.01
Selenium	0.5	0.5	0.5
Nickel	1.0	1.0	1.0
Silver	1.0	1.0	1.0
Total Toxic Metals	2.0	2.0	2.0
Zinc	5.0	5.0	5.0
Arsenic	1.0	1.0	1.0
Barium	1.5	1.5	1.5
Iron	8.0	8.0	8.0
Manganese	1.5	1.5	1.5
Boron	6.0	6.0	6.0
Chlorine	1.0	1.0	1.0

Source: *NEQS, National Environmental Protection Agency*

2.3.5 NEQS for Gaseous Emission

The National Environmental Quality Standards (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	Standards
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number
Particulate Matter	Boilers & 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

Parameter	Source of Emission	Standards
Hydrogen Chloride	Any	400
Chlorine	Any	150
Hydrogen Fluoride	Any	150
Hydrogen Sulphide	Any	10
Sulphur Oxides	Sulfuric Acid/sulphonic Acid Plants Other Plants except power plants operating an oil and coal	5000 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 Other plants except for power plants operation on oil or coal: Gas-fired Oil fired Coal-fired	3000 400 600 1200

Source: *NEQS, National Environmental Protection Agency*

2.3.6 NEQS for Vehicular Emission

The National Environmental Quality Standards (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	Emission Standards: New Vehicle = 4.5% Used Vehicle = 6%	Under idling conditions: non-dispersive infrared detection through the gas analyzer.
Noise	85 db (A)	The sound meter at 7.5 meters from the source

Source: *NEQS, National Environmental Protection Agency*

2.3.7 NEQS for Drinking Water, 2010

The National Environmental Quality Standards (NEQS) for drinking water quality are presented in **Table 2.4**.

Table 2.4: NEQS for Drinking Water Quality

Parameter	Standard values for Pakistan	WHO guidelines
Physical		
Color	≤ 15 TCU	≤ 15 TCU
Taste	Non-acceptable	Non-acceptable
Odour	Non-acceptable	Non-acceptable
Turbidity	< 5 NTU	< 5 NTU
Total hardness	< 500 mg/L	---
TDS	<1000	<1000
Ph	6.5- 8.5	6.5- 8.5
Chemical		
Essential Organic	**Mg/Litre**	**Mg/Litre**
Alminium	≤ 0.2	0.2
Antimony	≤ 0.005	0.02
Arsenic	≤ 0.05	0.01
Barium	0.7	0.7
Boron	0.3	0.3
Cadmium	0.01	0.003
Chloride	≤ 250	250
Chromium	≤ 0.05	0.05
Copper	2	2
Toxic Inorganic		**mg/Litre**
Cyanide	≤ 0.05	0.07
Flouride	≤ 1.5	1.5
Lead	≤ 0.05	0.01
Mangnese	≤ 0.5	0.5
Mercury	≤ 0.001	0.001
Nickel	≤ 0.02	0.02
Nitrate	≤ 50	50
Nitrite	≤ 3	3
Zinc	5	3
Organic		
Pesticides mg/L		PSQCA No.4639-2004.page No 4 Table No. 3serial No. 20-58
Phenolic Compounds		<0.002

Parameter	Standard values for Pakistan	WHO guidelines
Polynuclear aromatic hydrocarbons		0.01
Radioactive		
Alpha emitters bq/L	0.1	0.1
Beta emitters	1	1

Source: *NEQS, National Environmental Protection Agency*

2.3.8 NEQS for Ambient Air and Noise

The National Environmental Quality Standards (NEQS) for Ambient Air and Noise, 2010 are presented in **Table 2.5** and **2.6.**

Table 2.5: NEQS for Ambient Air

Pollutants	Time Weighted Average	Concentration in Ambient Air (ug/m^3)
Sulfur Dioxide (SO_2)	Annual Average* 24 hrs**	80 120
Oxides of Nitrogen gas (NO)	Annual Average* 24 hrs**	40 40
Oxides of Nitrogen gas (NO_2)	Annual Average* 24 hrs**	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 Average* 24 hrs**	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 2.6: NEQS for Noise

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

Source: *NEQS, Pakistan Environmental Protection Agency*

2.4 National Sanitation Policy

The National Sanitation Policy aims at providing adequate sanitation coverage for improving the quality of life of the people of Pakistan and to provide the physical environment necessary for a healthy life. The Policy can be reached at

http://waterinfo.net.pk/sites/default/files/knowledge/National%20Sanitation%20Policy%202006.pdf

2.5 Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance, 1979

The Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance 1979 provides the protection, preservation, conservation and management of wildlife in Islamabad Capital Territory. The main aim of this act is the preservation and conservation of wildlife, flora and fauna for sustainable development to comply with the concept of national parks internationally.

2.6 Forest Act, 1927

The Act authorizes Provincial Forest Departments to establish forest reserves and protected forests. The Act prohibits any person from setting a fire in the forest, quarry stone, remove any forest-produce or cause any damage to the forest by cutting trees or clearing up area for cultivation or any other purpose. Much like the Islamabad Wildlife Act described above, the Forest Act is also not likely to be applicable to the proposed project. No project activities will, however, be carried out in any protected forests, and no unauthorized tree cutting will be carried out for any facility expansion or waste disposal.

2.7 Land Acquisition Act, 1894

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

2.8 The Telegraph Act, 1885

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

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

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

2.9 Antiquity Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc.

The law prohibits new construction in the proximity of protected antiquity and empowers the Government of Pakistan to prohibit excavation in an area that may contain articles of archaeological significance.

Under the Act, the project proponents are obligated to:

- Ensure that no activity is undertaken in the proximity of protected antiquity, and
- If during the project an archaeological discovery is made, it should be reported to the Department of Archaeology, Government of Pakistan.

2.10 Cutting of Trees (Prohibition Act), 1975

Section 3 of this Act states “No person shall, without the prior written approval of the local formation commander or an officer authorized by him in this behalf, cut fell or damage or cause to cut, fell or damage any tree.”

2.11 Protection of Trees and Bush wood Act, 1949

This Act prohibits cutting or chopping of trees and bush wood without permission of the Forest Department.

2.12 Pakistan Explosive Act, 1884

This Act provides regulations for the handling, transportation and use of explosives during quarrying, blasting and other purposes. The transmission line tower installation may need blasting at rocky/mountainous areas. Thus these regulations will be applicable to the proposed project.

2.13 Employment of Child Act, 1991

Section 3, Prohibition of Employment, of this Act starts “No child shall be employed or permitted to work in any of the occupations set forth in Part I of the Schedule or in any workshop wherein any of the processes set forth in Part II of that Schedule is carried on: Provided that nothing in this section shall apply to any establishment wherein such process is carried on by the occupier with the help of his family or to any school established, assisted or recognized by Government.”

The Employment of Child Act, 1991 is available at

http://www.na.gov.pk/uploads/documents/1335242011_887.pdf

2.14 Factories Act, 1934

The clauses relevant to the proposed project are those that address the health, safety and welfare of the workers, disposal of solid waste and effluents, and damage to private and public property. The Act also provides regulations for handling and disposing toxic and hazardous substances. The Pakistan Environmental Protection

Act, 1997 (discussed above), supersedes parts of this Act pertaining to the environment and environmental degradation.

2.15 Pakistan Penal Code, 1860

This outlines the penalties for violations concerning pollution of air, water bodies and land. Sections 272 and 273 of this Act deal with the adulteration of food or drink. Noise pollution has been covered in Section 268, which defines and recognizes noise as a public nuisance. “A person is guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy the property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right.”

The code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The code also addresses control of noise, noxious emissions and disposal of effluents. Most of the environmental aspects of the code have been superseded by the Pakistan Environmental Protection Act, 1997.

2.16 Institutional Set-Up

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

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

The Grid Station at Sector I – 11/2 and its Transmission Line is located in Islamabad. Therefore, the EIA report will be submitted to the Pakistan Environmental Protection Agency, Islamabad for obtaining environmental approval for the project.

2.19 Environmental Protection Agency’s Environmental Guidelines

The Pak EPA has prepared a set of guidelines for conducting environmental assessments. The package of regulations, of which the guidelines form a part, includes the PEPA 1997 and the NEQS. The guidelines themselves are listed below:

- Guidelines for the Preparation and Review of Environmental Reports,
- Guidelines for public consultation,
- Guidelines for Sensitive and Critical Areas, Sectorial Guidelines.

It is stated in the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 that the EIA or IEE must be prepared, to the extent practicable, in accordance with the Pakistan Environmental Protection Agency guidelines.

The government of Pakistan has also framed guidelines for the preparation of IEE of Projects in various developmental sectors.

2.20 The obligation under International Treaties

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. The country is obliged to adhere to the commitments specified in these treaties. The Convention on Biological

Diversity (CBD) was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity and to integrate these plans into national development programs and policies.

Parties are also required to identify components of biodiversity that are important for conservation and to develop systems to monitor the use of such components with a view to promoting their sustainable use.

The Convention on the Conservation of Migratory Species of Wild Animals, 1979 requires countries to take action to avoid endangering migratory species, where the term migratory species refers to species of wild animals of which significant proportions cyclically and predictably cross one or more national jurisdictional boundaries.

The parties are also required to promote or cooperate with research into migratory species. Under the international plant protection convention, 1951, Pakistan is required to take steps to ensure the protection of certain plant species that face the extinction threat.

Pakistan signed and ratified on several international agreements and convention and bound to implement them in its territory.

These "Multilateral Environmental Agreements" or MEAs relevance for the proposed project is that, IESCO through the Government of Pakistan is legally bound to commit to achieve the specific environmental goals agreed thereunder and reduce human impacts on the environment.

2.21 The implication of Legislations to the project

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

The project will be subjected to four basic provisions relating to pollution control under the Act are contained in section 11, 13, 14 and 15 as follows:

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

3 Project Description

3.1 Introduction

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

3.2 Type and Category of the Project

According to the Pakistan Environmental Protection Act, 1997, section 12 (1)

"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 main objective of the proposed project is to provide the supply of electricity to Sector I-11 and adjoining areas and to increase the efficiency, reliability and quality of the electricity supply. 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 Sector I-11 and adjoining areas,
- Load reduction on presently overloaded grid stations and transmission lines,
- Improvement in the voltage profile as well as the system reliability, and
- The decrease in technical as well as commercial losses.

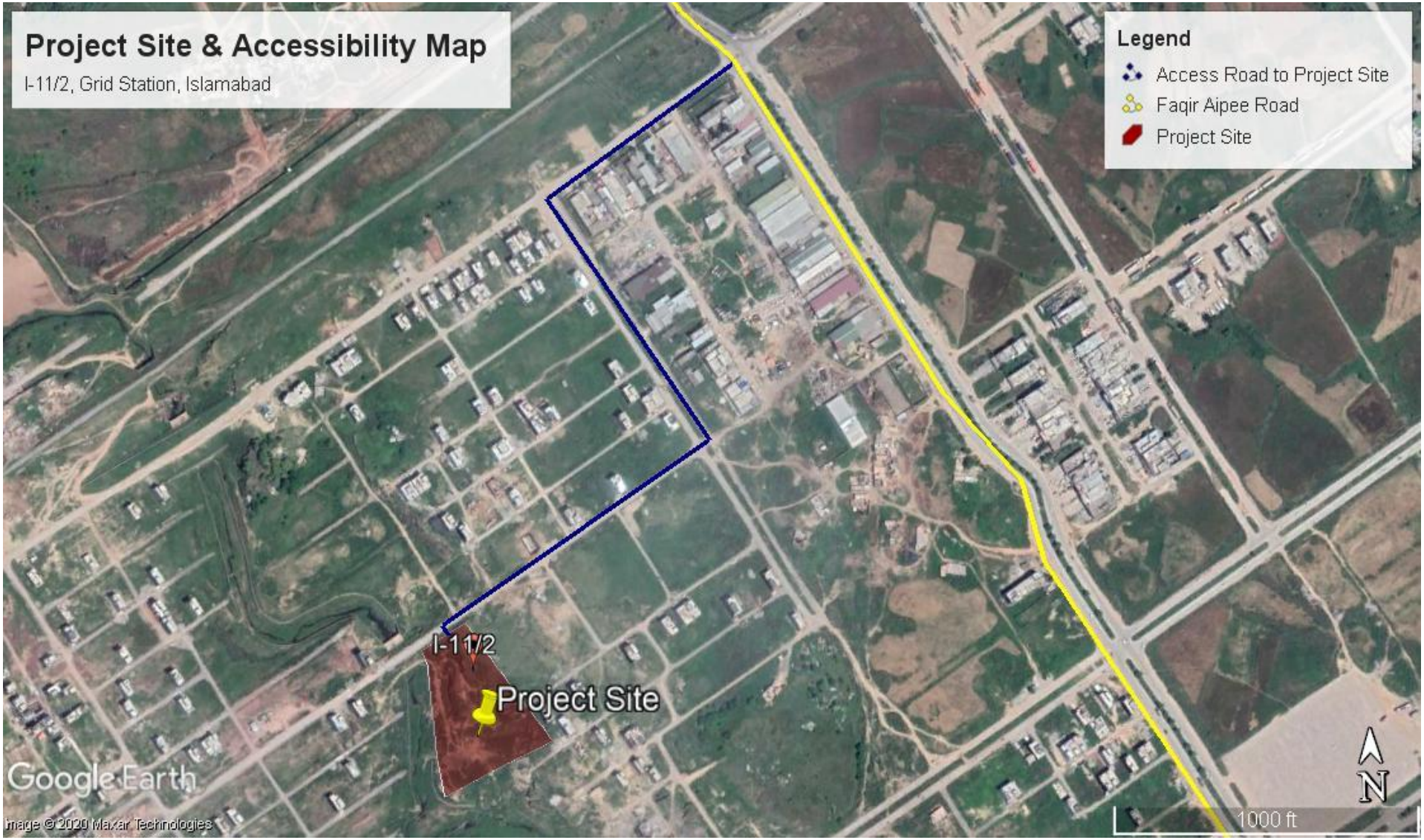
3.4 Project Location and Accessibility

Sector I-11 can be accessed from the north through Faqir Aipee Road (which is commonly known as Police Line Road) which is connected to Srinagar Highway in the north and connected to IJP road at the southern end of Sector I-12. The IJP road passes along the southern end of Sector I-11, service road south will be connected to IJP road.
The Grid Station is located in Sector I-11/2 at the bank of the Nullah passing through the sector. The transmission line will be erected from the Grid Station at Sector H-11. The latitude/longitude coordinates of the grid station site are as follows 33°38'31.57"N, 73° 0'53.94"E.

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

- **North:** Residential Area I-11/2
- **East:** Proposed School Plot + Residential Area
- **West:** Drainage Nullah passing along the site
- **South:** Vacant Land & Drainage Nullah Flows to the south of the site

Figure 3.1: Location and Accessibility Map of the Project Site



3.5 Project Description

Islamabad Electric Supply Company (IESCO) intends to construct a new 132 KV Grid Station and 1.5 km feeding transmission line in Sector I-11/2, Islamabad.

The main objective of the project is to provide electricity to Sector I-11 and adjoining areas and increase the efficiency, reliability, and quality of the electricity supply in the project area.

The proposed Grid Station at Sector I - 11/2 is spread over 18.6 Kanal and the Land has been provided by CDA.

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

The allied transmission line is 1.5 km in length comprising of 10 tubular poles which will be connected to Grid Station at Sector H -11.

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

3.6 Project Components

3.6.1 Grid Station

The list of equipment for Grid Station at Sector I-11/2 is listed below in **Table 3.1.**

Table 3.1: List of Equipment for Grid Station at Sector I-11/2

NAME OF GRID STATION		132KV GRID STATION I-11 ISLAMABAD ON COST DEPOSIT BASIS.	
(i) TRANSFORMER CAPACITY		02 x 31.5/40 MVA	
(ii) TRANSFORMER BAY		02 No	
(iii) LINE BAY		02 No	
(iv) PT BAY		01No	
Sr. No	**DESCRIPTION OF MATERIAL**	**QTY:**	**UNIT**
1	31.5/40 MVA 132/11.5 KV Power Transformer along with all allied accessories	2	No.
2	132 KV Circuit Breaker With SSS along with allied accessories & Termination Connectors	4	Set
3	132 KV Transformer C.T With SSS along with allied accessories & Termination Connectors Ratio 200:100:5/5A	6	No.
4	132 KV Line C.T With SSS along with allied accessories & Termination Connectors Ratio 1200:600:300:5/5A	6	No.
5	132 KV PT With SSS along with allied accessories & Termination Connectors	3	No.
6	132KV Bus Isolator With SSS with allied accessories & Termination Connectors	5	Set
7	132KV Line Isolator with SSS with allied accessories & Termination Connectors	2	Set

8	132KV Lightening Arrester With SSS with allied & Termination Connectors accessories	6	No.
9	11KV Lightning Arrestor with allied accessories	6	No.
10	11 KV Post Insulator with clamps	6	No.
11	132KV Column	6	No.
12	132KV Beam	4	No.
13	132KV Earth Mast	2	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 TMHH.	18	No.
21	Connector Type TM100F	30	No.
22	Connector Type 90B100F	6	No.
23	AC/DC Station Aux Panel	2	No.
24	11KV Incoming Panel 25KA For 40 MVA	2	No.
25	11KV Outgoing Panel 25 KA	16	No.
26	11KV Bus Bar Coupler	1	No.
27	Pad-Mounted Auxiliary Transformer 200 KVA	1	No.
28	Earthing Platform	9	No.
29	110 Volt Battery Bank a/w allied accessories	1	Set
30	110 Volt Battery Charger	1	No.
31	Earth Rod 16mm dia 3Mtr Long	65	No.
32	Cartridge Type A	350	No.
33	Cartridge Type B	150	No.
34	Cartridge Type C	75	No.
35	Mould for Type A	5	No.
36	Mould for Type B	4	No.
37	Mould for Type C	5	No.
38	Handle for Mould	5	No.
39	String Tension Assembly for Conductor 600mm	6	Set
40	Tension Assembly for Earth wire 9 mm	18	No.
41	Earth wire 9mm	250	Mtr
42	Aluminium Conductor 600 mm	650	Mtr
43	Grounding Conductor 95 mm	3500	Mtr
44	Disc Insulator 100 KN	54	No.
45	All: Pipe 100 mm dia 4Mtr long	6	No.
46	Power Cable 1000 MCM	3000	Mtr
47	Indoor Termination Kits for 1000 MCM	30	Set
48	Outdoor Termination Kits for 1000 MCM	30	Set
49	Power Cable 500 MCM	4000	Mtr
50	Indoor Termination Kits for 500 MCM	48	Set
51	Outdoor Termination Kits for 500 MCM	48	Set
52	Control Cable 4x2.5 mm	4000	Mtr
53	Control Cable 8x2.5 mm	2500	Mtr

54	Control Cable 16x2.5 mm	3500	Mtr
55	Control Cable size 4x6 mm	3500	Mtr
56	Power Cable 4/0 AWG	80	Mtr
57	Outdoor Termination Kits for 4/0 AWG	1	Set
58	Indoor Termination Kits for 4/0 AWG	2	Set
59	L.T Power Cable 4/0 Core 19/0.83	150	Mtr
60	11 KV Capacitor Control Panel	2	No.
61	11 KV Capacitor 200 KVAR	72	No.
62	11 KV Capacitor Rack with Structure along with all allied accessories Complete Set	6	No.
63	Neutral CTs	2	No.

Source: *IESCO*

The layout plan of the Grid Station at Sector I-11/2 is shown in **Figure 3.2**.

Figure 3.2: General Layout Plan of the Grid Station at Sector I-11/2

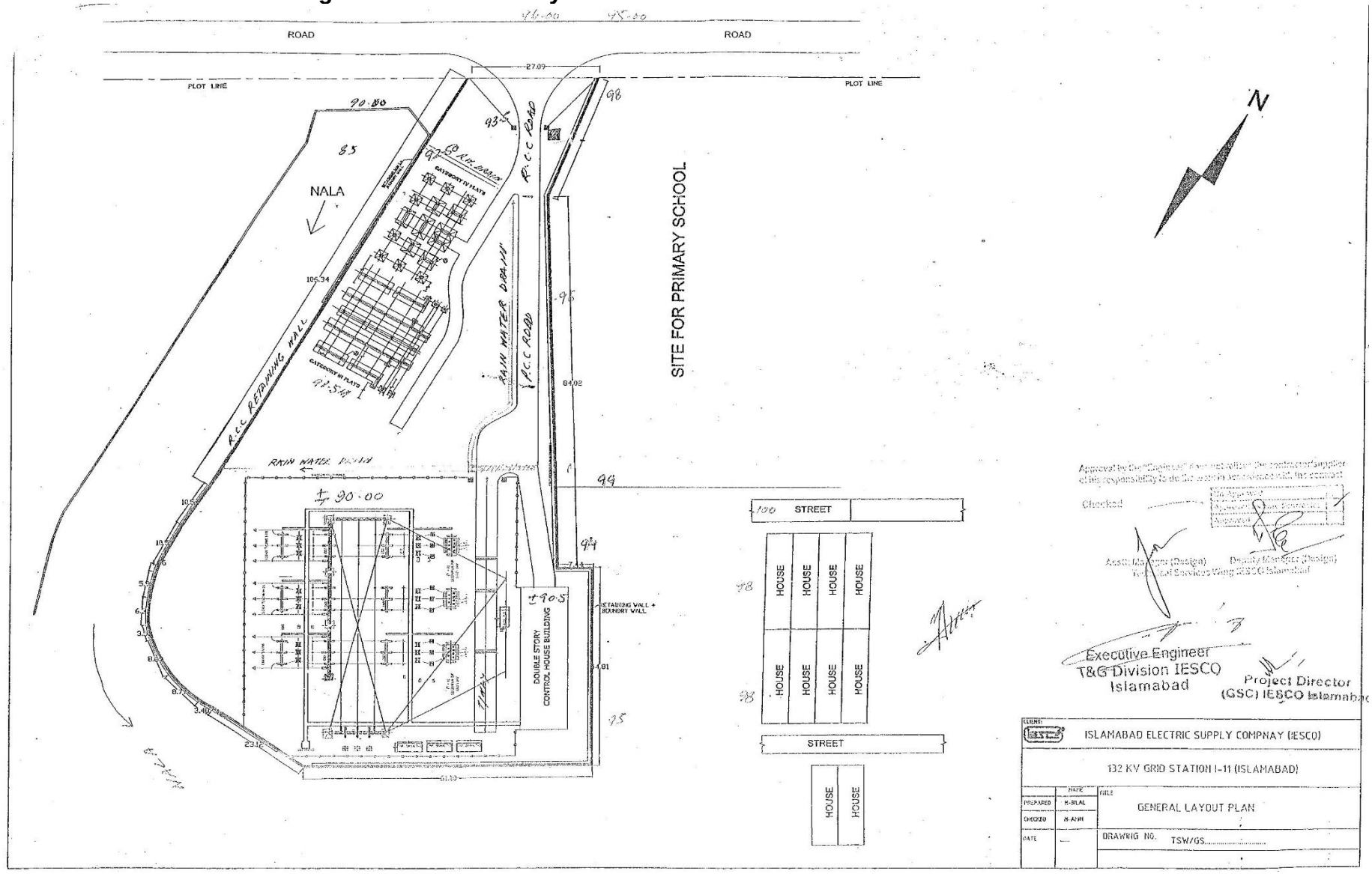
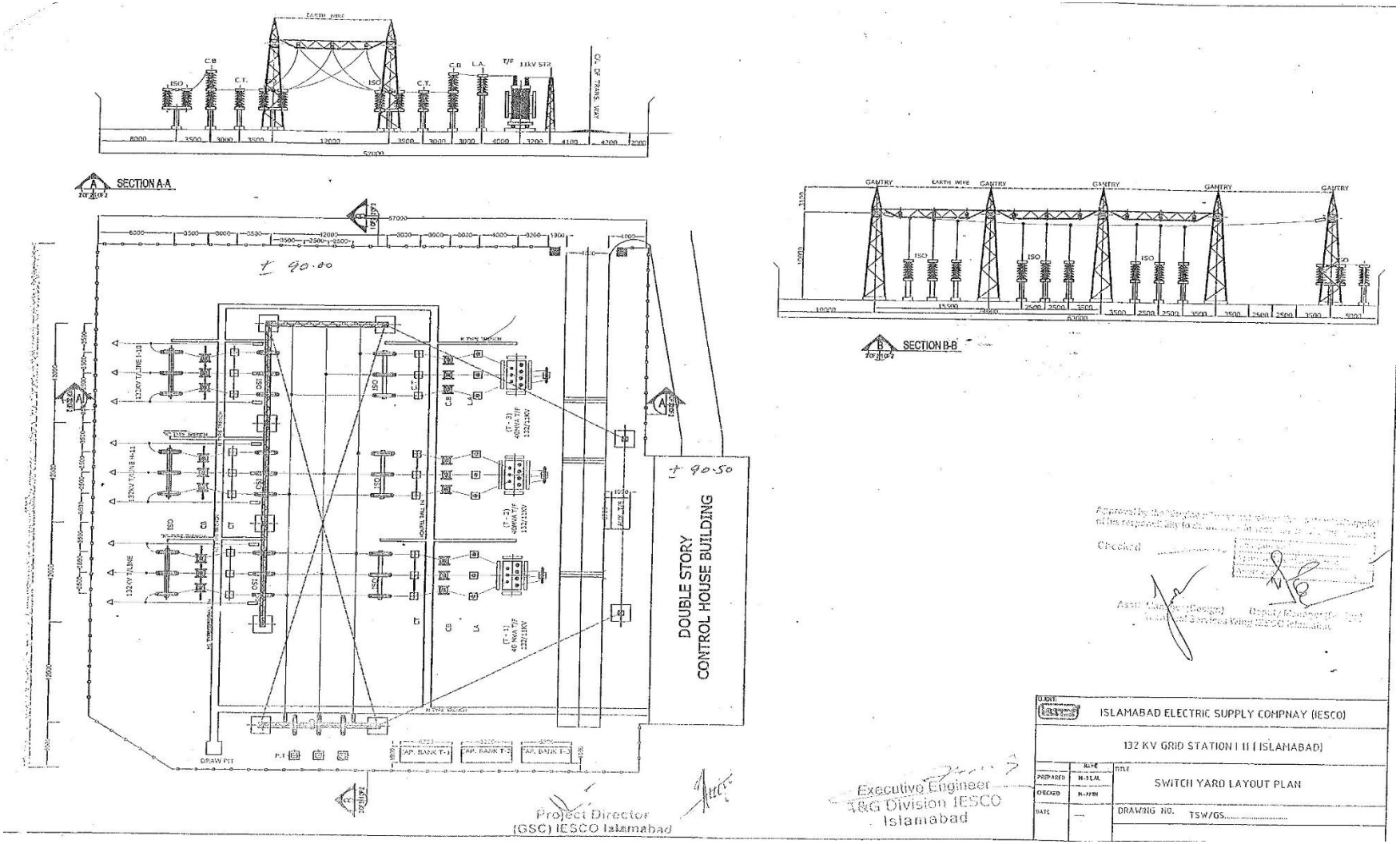


Figure 3.3: SwitchYard Layout Plan of Grid Station at Sector I-11/2



3.6.2 Transmission Line

The proposed transmission line length is 1.5 km and will be erected with the help of 10 tubular poles along the route from H-11 grid Station to the proposed Grid Station site in I-11/2. The distance between towers is determined as per standards of IESCO. The range usually varies from 60m – 300m depending upon the site conditions.

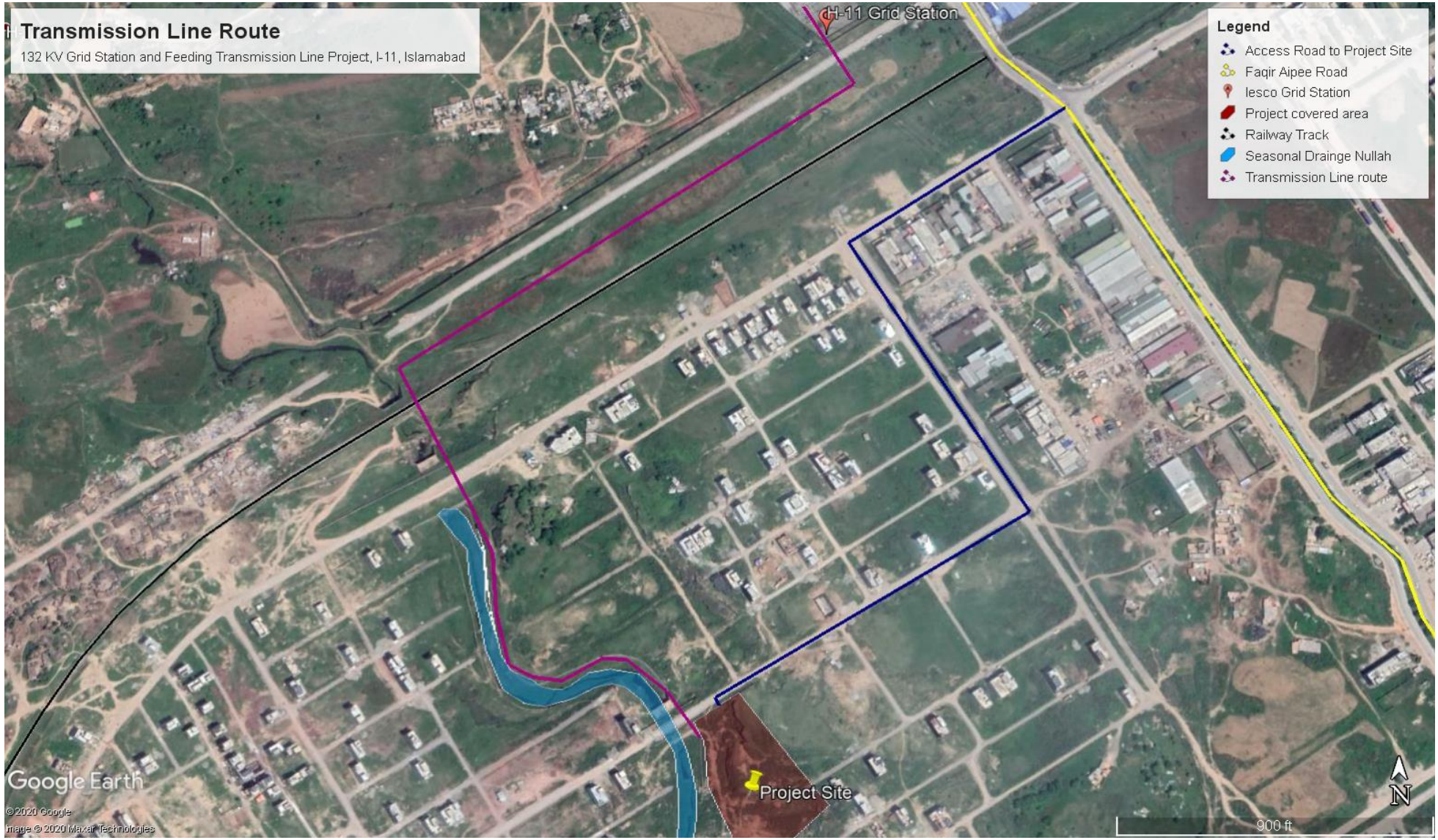
The route of the transmission line is the most appropriate route to connect the proposed grid station at I-11/2 with H-11 Gird Station. The transmission line originates from the south most end of sector H-11/1 and passes along the railway track up to the seasonal nullah flowing through the west side of sector H-11/1 and entering into Sector I-11/2. From that point up to the proposed grid station site, the transmission will be erected alongside the nullah which passes along the west side of the project site.

The Grid Station Construction (GC) Department along with Environment and Social Safeguard Section of IESCO has marked the route alignment of a transmission line after careful consideration of the land use, ecological environment, and nearby settlements along the route. The route alignment has limited vegetation cover; no trees will be cut down to make way for the transmission line.

Width of Right of Way (RoW)

The width of RoW for T/L has been considered to be 8.8m, i.e. 4.4 m on either side from the centre of transmission line path.

Figure 3.4: Transmission Line Route I-11 Grid Station



3.7 Cost and Magnitude of Project

The estimated cost of the proposed project is PKR**.** 602.094 Million. The breakup of the cost estimates is provided below in **Table 3.5**.

Figure 3.5: Estimated Cost of the Project

No.	Project Component	Tentative Cost in Rs (Millions)
1.	**New Grid Station at I-11, Islamabad**	
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 lines from H-11 to I-11**	
2.1	Length line 1.5 km Number of poles 10 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)		**602.094**

Source: *IESCO*

3.8 Project Activities Process Flow

3.8.1 Land Acquisition for Grid Station and Transmission Line

Land for Grid Station

CDA has provided 18.6 kanal of land for the construction of grid station at I-11/2, Islamabad, near the drainage nullah passing through the sector. No displacement will occur due to the allocation of this land to the grid station project will occur.

Land for Transmission Line

GSC department of IESCO, has allocated a fixed route from H-11 Grid Station to the proposed I-11/2 Grid Station. The communities living along the transmission line will be taken into confidence and will be paid as per The Telegraph Act, 1885. However, it is to be noted that the transmission line does not pass through private land. The transmission line originates from H-11 Grid Station and will be erected westwards along the north side of railway track passing between the service road south H-11 and service road north Sector I-11, as shown in **Figure 3.4**. The point at which the railway track passes above the drainage nullah entering Sector I-11 from H-11, the transmission line will be making a sharp southwards turn towards I-11/2 and will pass along the nullah up to the proposed project site. There are no private properties along the transmission line route.

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

3.8.2 Construction Phase

A: Construction of New Grid station

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

- First of all, the location where the new grid station is to be established is identified. This was carried out based on the load on the existing feeders, load on the nearby existing grid stations, the trend of the load growth and 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 counterplan 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) are obtained from the central stores.
- The equipment is handed over to GSC Department, who installs them once the civil works are completed.
- Once the installation is completed, the system will be tested jointly by the GSO and GSC Division.
- After the testing, the grid station is commissioned and put into operation.

The contractor will engage a staff of 50 persons during the construction phase of the project. The estimated demand for water supply will be 1,000 gallons during the peak construction period and the contractor camp will generate a maximum of 31.25 kg of a solid waste considering 0.625 kg/capita/day. In view of the extent of the works under the proposed project, IESCO's GSC directorate officials will work as supervision engineers to ensure the quality of the construction, installation, and testing work.

B: Construction of New Transmission Line

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

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

3.8.3 Restoration and Rehabilitation after completion of Project

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

A: Operation Activities

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

B: Scheduled Maintenance

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

Maintenance Procedure of Transformers

Power Transformer Repairs: The minor repairs for the power transformers are carried out at the grid stations. However, for the major repairs, the transformers are transported to the WAPDA's Power Transformer Reclamation Workshop at Kot Lakhpat, Lahore. IESCO, much like the other DISCOs, intends to utilize the same facility in the future as well.

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.

Transformer Oil Testing Procedure

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

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

- Flashpoint

- Viscosity
- Moisture
- Gas contents
- Dielectric strength

Transformer Oil Disposal Procedure

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

3.9 Government Approval

Presently, the project is in the planning phase. However, all the required government approvals have been acquired by IESCO. Land for I-11 Grid Station has been allotted by CDA. While the transmission line route has been selected by the GSC department of IESCO. If the transmission line passes through any private property, the compensation for damages will be paid according to the Telegraph Act.

3.10 Project Time Schedule

The construction of I-11 Grid Station and its Feeding Transmission Line will be completed in a period of 24 months (Two Years).

3.11 Alternatives considered and Reasons for Rejection

3.11.1 No Project Option

The proposed project seeks to provide electricity supply to the Sector I-11 and adjoining areas. There is **no supply of electricity** to the Sector and people are using alternate sources like solar energy while others depend on generators for extraction of groundwater as there is no water supply of any government water supply system in the project area.

In case the proposed project is not undertaken, the existing IESCO system will not be able to cope with a load of supplying electricity to the sector I-11 and adjoining areas. Increasing electricity demand in future, the existing system will remain over-loaded, line losses will also remain high, and the system reliability will progressively decrease, with increasing pressure on the system. The IESCO will also forego the opportunity of increasing its consumers as well as revenue associated with the system expansion.

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

3.11.2 Site Alternatives

a. Site for I-11 Grid Station

CDA has allocated 18.6 kanal of land at I-11/2, Islamabad for the construction of grid station and its feeding transmission line project.

The proposed project site has no vegetation cover, except for a few shrubs. A seasonal nullah passes along the west side of the project site. No tree will be cut due to the construction of Grid Station and erection of Transmission Line.

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. Damages along the route have been discussed in section **3.6.2.**

3.11.3 Technical Alternatives

a. Type of Grid Station

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

- Gas-insulated
- Air Insulated (Conventional)

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

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

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

b. Type of Circuit Breakers

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

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

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

However, now SF-6 circuit breakers are available for 132-KV and above, and vacuum circuit breakers are available for the 11-KV system. These breakers have very effective arc-quenching characteristics, compared to the old oil-type breakers. Therefore, these modern circuit breakers are the preferred option for the proposed project.

c. Type of Transformer Oil

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

it was included in a group of chemicals collectively known as persistent organic pollutants (POPs).

The manufacture and procurement of PCBs containing transformers are banned in Pakistan since 2002. However, the old transformers which already exist in the power distribution system may have PCBs contaminated oil. Currently the MoCC in collaboration with UNDP is implementing a project “Comprehensive Reduction and Elimination of Persistent Organic Pollutants (POPs) in Pakistan” through Global Environmental Facility (GEF) funding. The aim of this project is to make an inventory of PCBs contaminated transformers and to phase out the PCBs contaminated transformer oil and other equipment from Pakistan or onsite treatment of PCBs contaminated transformer oil due to financial and technical constraints of DISCOs. In view of their extremely harmful effects however, use of this oil is not a preferred option for all applications, including the proposed project.

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

d. Type of Transmission Line Towers

Single Circuit vs. Double Circuit

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

Tower vs. Tubular Pole

The base of the transmission line towers is about $10m^2$, and finding this much space in congested urban areas may be a problem. For such applications, WAPDA/IESCO has been using tubular steel poles which require considerably less space. Since the current project is in an urban area, which is why; the tubular steel poles will be preferred. **Figure 3.6** & **3.7** show typical tower and Korean tubular pole respectively. The environmental and socio-economic aspect of the tubular pole includes a smaller footprint, compared to the conventional tower. Therefore, for this transmission line, the preferred option would be to use the tubular steel poles.

3.12 Current Land Use of the Project Site

The I-11 Grid Station site is on vacant land with a few shrubs. A seasonal nullah is passing along the project site on the west side.

The transmission line originates from H-11 Grid Station and passes over the railway track and reaches I-11 service road north; from there, the transmission line route will pass along the drainage nullah up to the project site.

3.13 Vegetation Features of the Site

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

There are no trees along the transmission line route except for natural shrubs. In addition, no human settlements will be disturbed as the transmission line route is along the drainage nullah from I-11 service road north to the project site.

Figure 1: 132 KV Conventional Tower

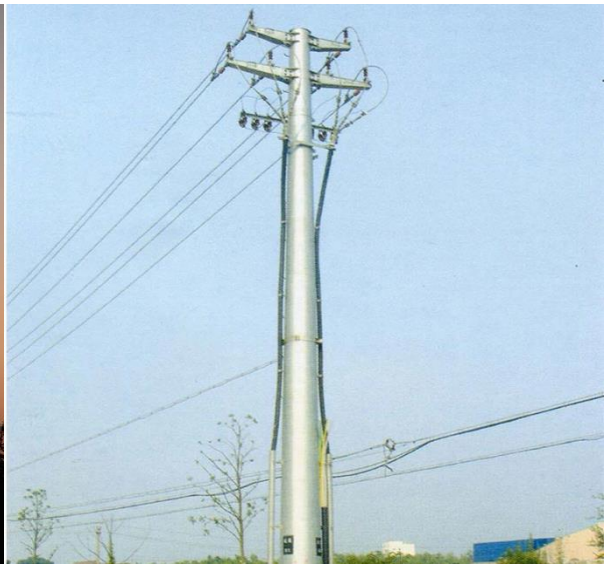


Figure 2: 132 KV Korean Tubular Pole

4 Description of the Environment

4.1 Introduction

This Chapter describes the existing environmental and socio-economic conditions of the project area. The project site is 18.6 Kanal for Grid Station and the 1.5 km transmission line. The Project area is the area falling within 1 km radius of the Project Site.

4.2 Islamabad

Islamabad is located at 33°40′N, 73°10′E. With a population of 2.01 million, it is the 9th largest city of Pakistan, while the larger Islamabad-Rawalpindi metropolitan area is the third-largest in Pakistan with a population exceeding four million.

Islamabad is the capital city of Pakistan and is located in the Potohar Plateau in the North-West of the country. Margalla Hills is located within the Islamabad Capital Territory, though the area has historically been a part of the crossroads of the Punjab region and the North-West Frontier Province (the Margalla pass being a historic gateway to the North-West Frontier Province, and the Potohar Plateau historically a part of Punjab).

The city was built between 1960 - 1970 to replace Karachi as the capital. The idea of the national capital of Islamabad was conceived by President Ayub Khan (1907–1974). Karachi had been the capital because it was Pakistan's commercial centre, but it was not considered an appropriate administrative centre due to many issues and therefore a planned city became a necessity.[2]

Islam is the most practised religion in the city, with over 95% of Muslims making up the population. The second-largest religion is Christianity, which accounts for just over 4% of the population.[3]

The city is home to Faisal Mosque, the largest mosque in South Asia and the sixth largest mosque in the world. Islamabad's micro-climate is regulated by three artificial reservoirs: Rawal, Simli, and Khanpur Dam. Khanpur Dam is located on the Haro River near the town of Khanpur, about 40 kilometres (25 mi) from Islamabad. Simli Dam is located 30 kilometres (19 mi) north of Islamabad. 220 acres (89 ha) of the city consists of Margalla Hills National Park. Loi Bher Forest is situated along the Islamabad Highway, covering an area of 1,087 acres (440 ha).[4]

Islamabad has the highest literacy rate in the country at 88%. Over 10% of the population has a bachelor's degree and 5.2% have a master's degree, in part because of the higher education system which consists of 16 recognized universities. Punjabis make up 65% of the population, followed by Urdu-speaking Muhajirs (14%), Pashtuns (10.51%) and others including Sindhi, Balochi, and Kashmiris) making up the remaining 7%.

[2] http://www.islamabad.net/about_islamabad.html

[3] http://worldpopulationreview.com/world-cities/islamabad-population/

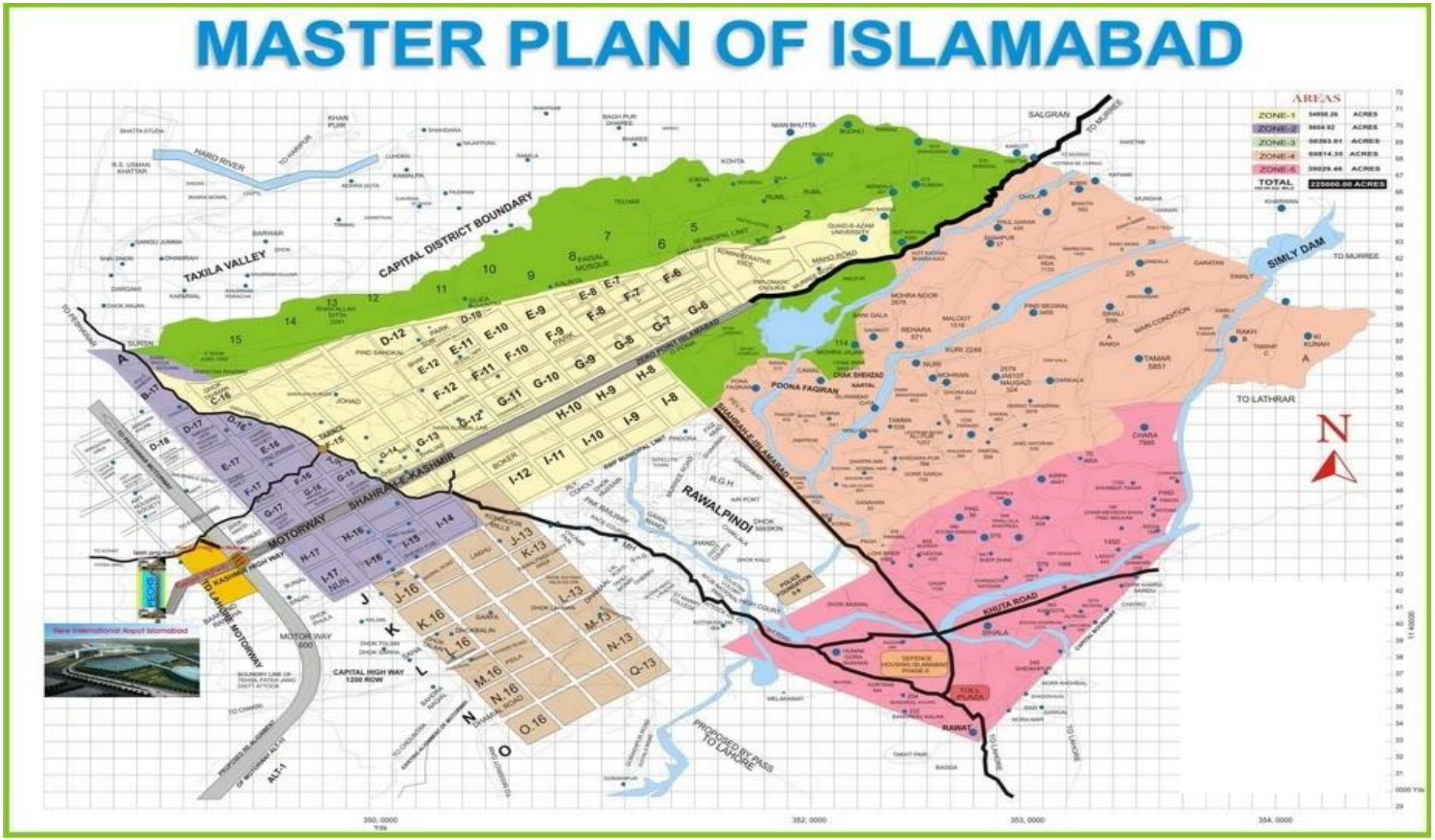
[4] https://explorepak.wordpress.com/about-pakistan/islamabad/

Islamabad is a net contributor to the Pakistani economy, as whilst having only 0.8% of the country's population, it contributes 1% to the country's GDP.[5] Islamabad was ranked as the best place to start a business in Pakistan.

The map of Islamabad is provided in **Figure 4.1**.

[5] Pakistan | Economics and extremism". Dawn. 5 January 2010. Archived from the original on 8 January 2010. Retrieved 2 June 2010.

Figure 4.1: Map of Islamabad



4.3 Physical Environment

4.3.1 Topography

Islamabad is located on the Northern edge of the track known as Potohar Plateau. The Potohar Plateau has an uneven table and land is gradually rising in elevation from 500 to 600 meters above the sea level and the highest point is 1,600 meters above mean sea level. The land gradually slopes towards the South. The land is composed either of alluvium (clay or silt) or of gravel caps. The plains are formed of alluvial deposits laid by the past and the present river systems in varying thickness. A large part of the area is undulating and at various places it is badly dissected by gullies and ravines. The Kurang stream has been dammed at a place named Rawal to form the Rawal Lake. Another dam has been built on the Soan River to form the Simly Lake.

The Potohar plateau is a well-defined physiographic unit of Pakistan between the Indus basin plain and the foothills of Himalayas. It covers about 11,200 Km^2 area bounded by Kala Chitta and Margallah hills in the North and the Salt Range in the South, Indus River in the West, and Jhelum River in the East.

The plateau slopes from NE to SW, in the direction of flow of the River Soan, which is the main river of the area and joins the River Indus in North of Kalabagh. In the Eastern Potohar, Kanshi, Kahan and Bunha Rivers drain into the Jhelum River. Only the Soan and Kanshi Rivers are perennial while rests of the drainage are seasonal streams. The plateau has level to undulating topography with scattered gullies and gorges created through active water erosion.

The topography of the project site marked by undulating land running adjacent to Sector I-11 nullah.

4.3.2 Geology and Soil Texture

The Potohar region has a complex geological history of mountain formation, alluvial-loessic depositions, and erosion cycles. Limestone is the characteristic rock of Margalla range. In age it ranges from the Jurassic to Triassic. It is usually reddish or bluish-white in colour mixed or alternating with its beds of red or bluish clay or shades or sandstones. Adiala, Dhamial-Loibher forests are situated over alluvial deposits. The deposits contain small-sized rounded pebbles of sandstone, quartzite or granite and sand mixed or alternating with clayey deposits. They have been described as alluvial deposits, but it is equally probable that they have a glacial origin.

The soil in the 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 of the project area is composed of clay/ silt formed of alluvial deposits laid by the past and present river system in varying thickness. A large part of the area is undulating and at various places it is dissected by gullies and ravines.

4.3.3 Water Resources

Surface water

Adjacent to the project site, a seasonal nullah flows North to South along with the project site. Surface water samples were taken on 23 October 2020 by Pak-EPA

approved laboratory ESPAK. The results of the surface water test are shown in **table 4.1**. The lab tests are shown in **Annexure-6**.

Table 4.1: Surface Water Analysis of adjacent nullah

S.No	Parameters	References values	Concentration	Method/ Equipment Used
1	pH value(H*)	6-9	8.2	SMWW 4500H^+B
2	Turbidity	<29 NTU	5.26 NTU	SMWW 2130B
3	Odour	NGVS	Acceptable	Organoleptic
4	Total Dissolved Solids (TDS)	3500 mg/L	651 mg/L	SMWW 2540 C
5	Sulphate(SO_4^{3-})	600 mg/L	37 mg/L	SMWW 4500-SO_4^{2-}C
6	Fluoride (as F^-)	10 mg/L	0.34 mg/L	U.S, EPA 9214
7	Nitrate	NGVS	9.98 mg/L	SMWW 4500-NO_3-B
8	Nitrite	NGVS	1.79 mg/L	SMWW 4500 NO2 B
9	Total Suspended Solids(TSS)	200 mg/L	17 mg/L	SMWW 2540 D
10	Arsenic (As)	1.0 mg/L	ND	U.S. EPA-200.7
11	Lead (Pb)	0.5 mg/L	ND	U.S. EPA-200.7
12	Mercury (Hg)	0.01 mg/L	ND	U.S. EPA-200.7
13	Biochemical Oxygen Demand (BOD) at 20°C	80 mg/L	8 mg/L	SMWW5210 B
14	Chemical Oxygen Demand (COD)	150 mg/L	62 mg/L	SMWW 5220 D
15	Total hardness as $CaCO_3$	NGVS	441 mg/L	SMWW 2340-C

The results indicate the surface water quality of the project area is within NEQS limits.

Figure 4.2: Water samples being taken from Sector I-11 Seasonal Nullah

Ground Water

The groundwater in the project area is available at a depth of 150-250 ft. People of the project area use groundwater for drinking and other domestic purposes.

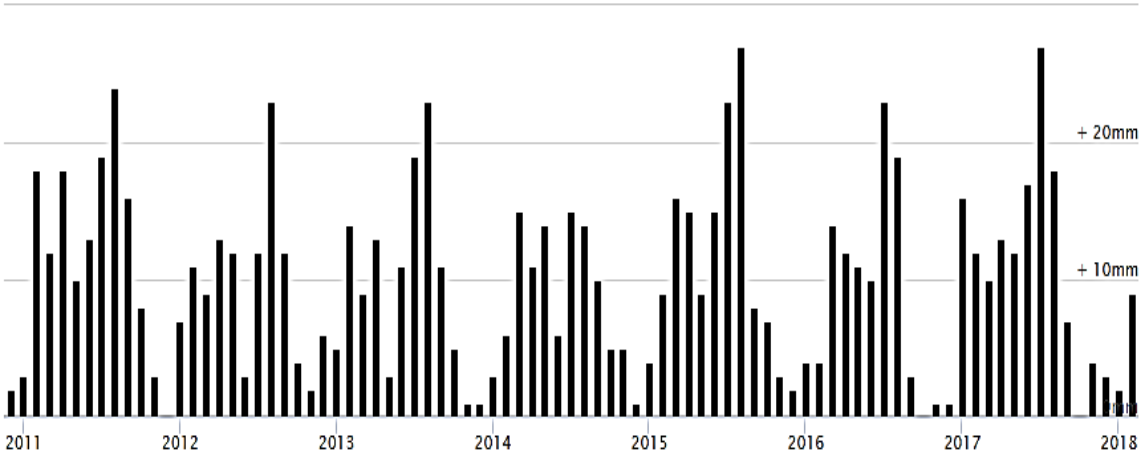
4.3.4 Climate

Islamabad has distinct seasons marked by wide variation in temperature. The climate remains very salubrious from April to October, but the winters get very cold due to snowfall. The coldest months are December, January, and February. The hottest months are June and July. Rainfall in April and May is occasional, but the heaviest rain is in July and August.

The temperature of capital territory Islamabad ranges between -1 ^{0}C to 46 ^{0}C. The coldest month is January when the mean maximum temperature is 18.3 ^{0}C and the mean minimum is 3.8 ^{0}C. From February to May the temperature rises at the rate of 5.0 ^{0}C per month. The highest temperature reached in May when the mean maximum temperature remains 39.1 ^{0}C. Humidity varies greatly in Islamabad.

Metrological Data of Islamabad including rainfall and mean minimum and maximum temperature is shown in **Figure 4.3**.

Figure 4.3: Mean Monthly Precipitation Data of Islamabad



4.3.5 Ambient Air Quality Monitoring

The ambient air quality monitoring was conducted for National Environmental Quality Standards (NEQS) for Sulphur dioxide (SO_2), Oxide of Nitrogen (as NO), Oxide of Nitrogen (as NO_2), Ozone (O_3), Suspended Particulate Matter (as SPM), Respirable Particulate Matter (as PM_{10}), 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 from 22nd October 2020 to 23rd October 2020 at the project site of I-11 Grid Station .

The ambient air quality and noise monitoring were carried out by PAK-EPA approved laboratory of ESPAK, Lahore.

4.3.6 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.

The noise level data for daytime was 48 dB(A) and 43 dB (A) at night time. The Noise level measured at the project site was within the NEQS Limit that is 65 dB(A) for the day and 55 dB(A) for the night.

Conclusion of ambient air quality and noise level monitoring

The ambient air quality monitoring was carried out for 24h from October 22, 2020, to October 23, 2020.

The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure-6**.

The SO_2, NO, NO_2, O_3, $PM_{2.5}$, SPM, PM_{10}, CO concentrations meets the NEQS limits. A summary of ambient air quality and noise levels results are given in **Table 4.1** below:

Table 4.2: 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/m³	20.6
Nitric Oxide (NO)	24 h		40	µg/m³	12.3
Nitrogen dioxide (NO_2)	24 h		80	µg/m³	22.2
Ozone (O_3)	24 h		130	µg/m³	0.01-14.6
Suspended Particulate Matter (SPM)	24 h		500	µg/m³	199
Particulate Matter (PM_{10})	24 h		150	µg/m³	115
Particulate Matter ($PM_{2.5}$)	24 h		35	µg/m³	27.2
Carbon monoxide (CO)	24 h		5	mg/m3	0.9-1.5
Noise	Day-time	6:00AM - 10:00PM	55	dB(A)	48
	Night-time	11:00 PM-6:00AM	45		43

4.4 Ecological Environment

4.4.1 Flora

The vegetation of Islamabad has been described as subtropical, dry, broad-leaved forests as per categorization of forest types by Mr. Mahmood Iqbal Shaikh. (Forests and Forestry in Pakistan, 1997).

As the area is part of Pothohar Plateau, the vegetation is characteristic of the tract. Kau (Olea cuspidate) is the climax species.It grows almost in pure form on northern slopes and in cool and sheltered situations on the southern slopes. Elsewhere Phulahi (Acacia Modesta) dominates. Sanatha (Deodonia viscosa), Granda (Carissa

spinatum) and Pataki (Gymnosporea royaleana) grow as secondary species. The project site has very little vegetation and mostly comprises of natural shrubs.

Table 4.3: Types of trees in the project area

S.No	Local Name	Scientific Name
1	Jacaranda	*Jacaranda ovalifolia*
2	Kikar	*Acacia nilotica*
3	Ber	*Ziziphus mauritiana*
4	Sukh Chain	*Ponogamia glabra*
5	Shisham	*Dalbergia*
6	Phulai	*Acacia modesta*
7	Amaltas	*Cassia fistula*

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 Islamabad are:

Mammals

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

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)

4.4.3 Protected Areas and Reserved Forest

Islamabad has a unique location in the Himalayan foothills. The capital city of Pakistan has great potential for flora and fauna diversity. It is surrounded by very important protected area, the Margalla Hills National Park on one side. While, on other sides there are impartment wetland sites of Rawal Dam, Simly Dam and Khanpur Dam. These water bodies, the Lakes provide a good waterfowl habitat and serves as a refuge for many fish species

List of Flora and Avi-Fauna has been provided in **Annexure-7.**

Figure 4.4: Pictorial Presentation of Floral Species at Project Area

Exhibit 4.1: Dhrekh

Exhibit 4.2: *Kikar*

Exhibit 4.3: Ber

Exhibit 4.4: Sukh Chain

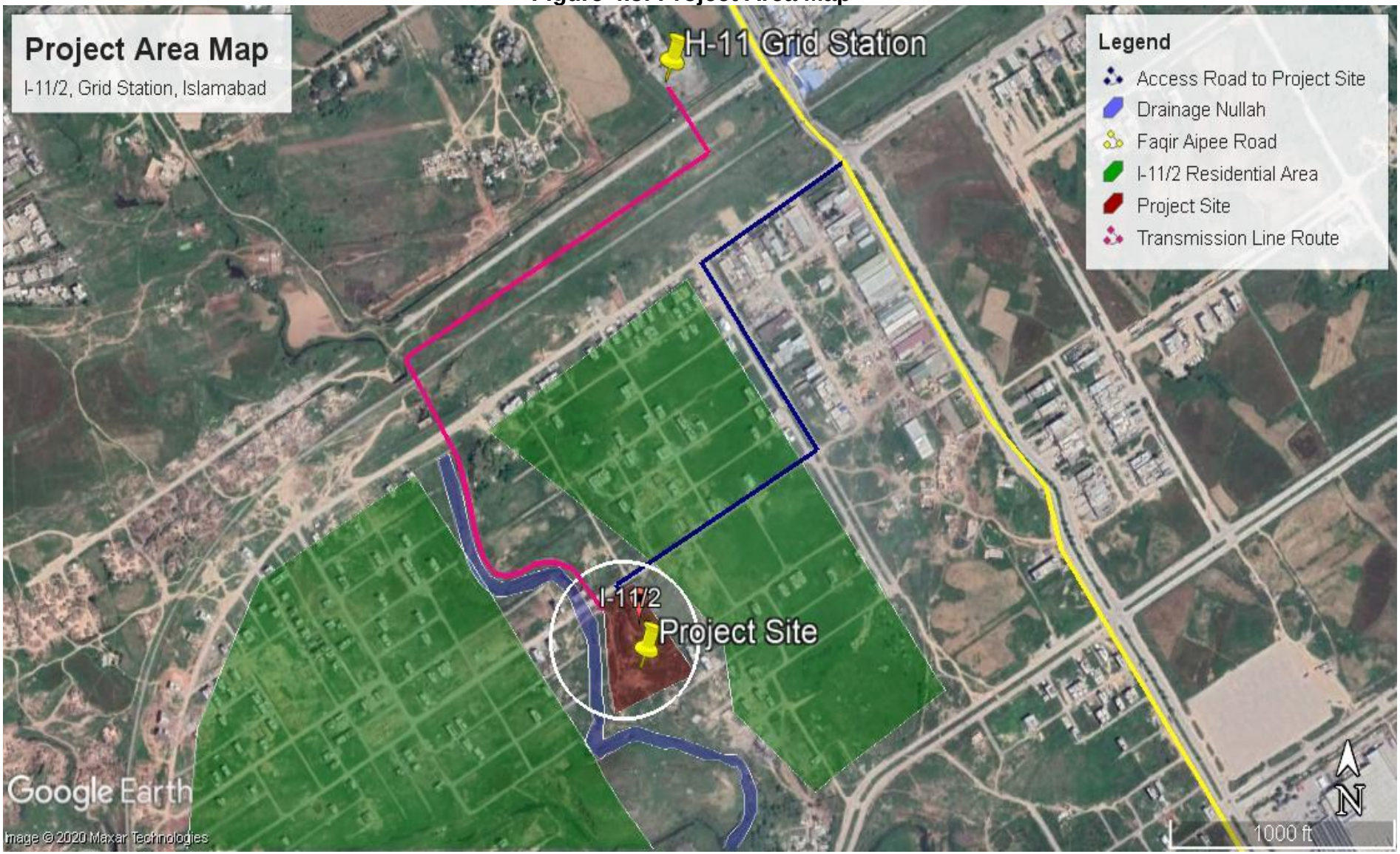
4.5 Quality of Life Values in the Project Area

Following are the details of the present socio-cultural and socio-economic conditions of the localities around the project site. These are the localities which may get direct positive or negative impacts from the construction of Grid Station at Sector I-11/2.

4.5.1 Villages in the Vicinity of Grid Station Site

The project site is located in Sector I-11/2, which is a residential sector. The people living in Sector I-11 were approached and their views were also recorded as part of the EIA process. **Figure 4.5** shows the description of the project site. The details are elaborated as below:

Figure 4.5: Project Area Map



a. Sector I-11, Islamabad

Location: Sector I-11 is part of the Master Plan of Islamabad city and is in series next to Sector I-10.

Transport/Communication: The sector I-11 can be accessed from faqir Aipee road from the north and through IJP road from the south. Local transport is easily available on IJP road as well as on Faqir Aipee Road.

Agriculture: The sector has been allocated for residential purpose and is part of the master plan. Therefore, there is no agricultural activity in the sector. People have been awarded the plots by CDA.

Livestock and poultry Development: Some of the people indigenous people who have been living there for many years have cows, buffaloes, goats and other livestock.

Education: There are no educational institutions in the sector as of now, because the sector is not yet fully developed.

Health Care: There are no government or private medical facilities available in the sector.

Drinking-Water Supply: There is no drinking water supply system installed in the village. People depend on groundwater and have dug bore systems and tube wells privately. The groundwater is being pumped out using electricity from generators because there is no supply of electricity in the sector.

Cultural Heritage: The population of Sector I-11 village is largely Muslim by faith. There is one mosque, a shrine of Hazrat Khawaja Husain Basra and a graveyard. No archaeologically significant site was found.

Other Facilities: There is no supply of gas in the sector. The facilities like commercial area, banks, post office, hospital, school and supply of water are not available at the sector.

Figure 4.6: Pictorial Presentation of Consultation at Project Area

Exhibit 4.1: View of Project Site

Exhibit 4.2: Gathering information from the Surveyor of IESCO

Exhibit 4.3: Public Consultation near the project site

Exhibit 4.4: Roadside Consultation in I-11/2

Exhibit 4.5: Public Consultation in I-11/4

Exhibit 4.6: Consultation with locals

Exhibit 4.7: Focus Group Discussion in I-11/3

Exhibit 4.8: Consultation with Excavator Driver

Exhibit 4.9: Consultation with the owner of the nearest house

Exhibit 4.10: Consultation with Imam Masjid

Exhibit 4.11: Consultation with hardboard business owner

Exhibit 4.12: Shrine of Hazrat Khawaja Hussain Basra in the project area

Exhibit 4.13: Consultation with CEO ZIG Engineers

Exhibit 4.14: Ambient Air Noise and Quality Monitoring at project site

Exhibit 4.15: Consultation with Project Engineer, MOJAZ Foundation

Exhibit 4.16: Consultation with Mr. Asif Majeed, Director Environment, CDA Environment Protection Cell

Exhibit 4.17: Livestock in the project area

Exhibit 4.18: Jamia Masjid Madni in 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 Grid Station at Sector I – 11/2 and its feeding Transmission Line, will create both positive and negatives impacts in and around the project site that may affect the local people and other stakeholders both directly and indirectly. The EIA team has done a detailed survey to find such impacts but it was necessary to involve all the stakeholders at the EIA stage.

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

5.1 Objectives of Consultation

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

The important general objectives of the consultation process are:

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

5.2 Methodology

The consultant carried out public consultations with the stakeholder of multidimensional background at various locations around the proposed Project. 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.

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)

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, Deputy Manager Environment and Social Safeguard Section	IESCO, Islamabad	▪ The project will be completed on a priority basis as there is no access to electricity in I-11 Sector due to which the development work is slow as well. ▪ The objective of the project is a reliable supply of electricity to the community living in the project area. IESCO will make every effort to make the project sustainable and green as possible. ▪ There will be no harm to the public living in the vicinity of the project location as the grid station is quite far away from public activities area. ▪ The grid station site should be declared as “No Go Area” for the public. ▪ The transmission line alignment has been established considering important factors like land use, ecological environment, and nearby settlements along the route.
Mr. Asif Majeed, Director of Environment	CDA Environment Protection Cell	▪ IESCO must carry out the project in an environmentally friendly manner as there is a residential area around the project site. The recommendations of the EIA study must be implemented during the execution of the project. ▪ The wastewater from domestic use and labour camps must not be disposed of in the nullah passing along the west side of the project site. A septic tank with a soakage pit should be constructed which will be used during the operational phase as well. ▪ The municipal as well as construction waste must be managed properly. IESCO should coordinate with the CDA MCI Directorate for appropriate disposal of solid waste from the project site. ▪ A plantation plan should be in place, recommending the plantation of local indigenous species of trees and ornamental plants to improve the aesthetics in and around the project site.
Dr. Asif Khoja Assistant Professor, NUST	H-12, Islamabad	▪ It is appreciable that the Environmental Impacts of the project are being assessed before the start of the project. ▪ Construction of new Grid Station and its allied infrastructure should be carried out keeping in mind the occupational health and safety standards. ▪ Electricity is the necessity of life these days, it is the basic right of the people living in the project area to be facilitated. The project should be initiated as soon as possible. ▪ All the environmental impacts of the project during construction as well as operational phase must be compensated which is important to contribute towards sustainable development. ▪ IESCO should devise a plantation plan for environmental enhancement

Designation	Location	Opinions/Concerns/Issues/Suggestions
		▪ PPEs should be provided to the workers during the construction phase of the project
Engr. Mohammad Usama	IIUI, Islamabad	▪ Engr Usama was aware of the proposed project and encouraged the process of Environmental Assessment before the commencement of the project. ▪ He said there would be limited negative environmental impact with the construction of the Grid Station as there are no protected areas near the project site. ▪ He emphasized on the appropriate management of solid waste during construction as well as operational phase. Mr. Usama suggested that dustbins should be placed at different locations and waste should be collected and disposed of properly. ▪ Indigenous trees should be part of the plantation plan. Trees that have properties to have air quality improving properties need be planted. ▪ Construction should be carried out in such a way that there is minimum disturbance to surrounding flora and fauna of the area. ▪ A buffer zone (10 ft.) around the site of grid station should be incorporated in the design of the project. Indigenous plants should be planted in the buffer zone.
Engr Syed Zain Shah CEO, ZIG Engineers	F-11, Islamabad	▪ Mr. Zain focused on the construction phase of the project and raised the point that contractors and environmental consultants should work together to achieve sustainable development. ▪ He further said that the EIA consultants should be part of the project execution phase to assist the civil works in an environment-friendly manner. There should be cooperation between relevant stakeholders to achieve the desired results as per standards. ▪ He said that for construction of the grid station, land levelling and clearing activities could create dust which should be suppressed with the help of water sprinkling system and the water used for domestic purposes can be stored and used for sprinkling purposes. ▪ In addition, there will be exhaust emissions from construction machinery which can deteriorate the air in the project area, which can be minimized by tuning the vehicles and machinery regularly and by using exhaust mufflers. ▪ EPA guidelines should be followed during construction as well as operational phase of the project. If the construction activities involve cutting of trees than the cutting should be compensated with plantation of indigenous species against each cut tree. ▪ Solid and liquid effluents are part of the construction activities. The solid waste should be collected in dustbins and must be disposed of at designated dumping site. While for the liquid effluents, a septic tank along with a soakage pit can be constructed which will be used during the operational phase as well. ▪ All the environmental parameters must be considered during the planning phase of the project.

Designation	Location	Opinions/Concerns/Issues/Suggestions
		▪ EPA should regularly monitor the implementation of the recommendations given in the EIA report.
Yasir Hussain Senior Architect, Diamond Architects	F-11, Islamabad	▪ When briefed about the project and the current situation in the project area, Mr. Yasir Hussain encouraged the project and its objective. He added that, everything in human life these days is dependent on electricity and the people of the project area have the right to be facilitated with the reliable and undisturbed supply of electricity. ▪ He said that during the construction phase the contractor should take measures for dust suppression and noise pollution as the project is to be installed near the residential area. ▪ Transmission Line route should be selected keeping in view the environmental parameters and it must not pass through any residential area and a minimum of 30 meters distance should be kept if unavoidable. ▪ He further said that the proposed project would create job opportunities for locals which is the dire need of the time. People are out of work, IESCO should prefer to hire labours locally. ▪ To avoid tree cutting along the transmission line, IESCO should take measures to change the route alignment or increase the height of the poles to avoid cutting of trees.
Engr. Mohammad Danial Project Engineer MOJAZ Foundation	F-8, Islamabad	▪ IESCO should ensure that the contractor's camp is established away from the school and the contractor should be instructed that labourers do not disturb school children and staff. ▪ Grid station should have a robust firefighting mechanism as any incident can have a direct impact on the neighbouring residential area that was surrounding the grid station. ▪ Construction activities should be carried as quickly as possible and should be avoided nighttime. ▪ It is requested to IESCO / PAK EPA that environmental monitoring of air and noise pollution should be carried out monthly and any non-compliance should be rectified immediately as the grid station will be surrounded by residential areas. ▪ It is a positive sign that a grid station will be built which will alleviate the electricity problems of Islamabad.
Dr Irshad Ahmad, Director HSEQ Consultants	Rawalpindi	▪ The project will provide electricity to Sector I 11. ▪ Technically, there are no adverse impacts of constructing a grid station in a vacant plot. ▪ During constructional phases of the project, cutting off indigenous plant trees should be avoided. ▪ Grid station should be fenced. ▪ EMP should be given special consideration during the construction phase to mitigate air pollution. ▪ By the 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.

5.6.1 Public Consultation

The roadside discussions were held with the communities living in the vicinity of Grid Station site.

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

- There is **no supply of electricity to the sector I-11.** People who can afford are using solar energy; however, most of the people are living without the necessity of electricity.
- The usage of electricity is primarily for domestic purposes followed by commercial activities. With a growing population, the demand for electricity is increasing day by day.
- Electric appliances like T.V, fridge, fans, bulbs, electric rods, iron, washing machines and electric water pumps are available in most of the houses.
- The project implementation will be very beneficial for the community as the grid station after making a ring system will minimize electricity failure chances in future and reliability of the system will be increased.
- People promoted the idea of installation of grid station, as they would be able to get a reliable supply of electricity. This will also create employment opportunities for local people.
- People complained that there is no supply of water due to unavailability of electricity. They are spending the extra money to extract water from the ground using generators.
- The government water supply system is flawed and the supply line is blocked at more than one point.
- People emphasized that the transmission lines passing near houses must be insulated.
- People of I-11 were also concerned about the security measures at the sector. There are no streetlights on the roads. One of the residents near the project site told PPI team that they hear gunshots at night sometimes.
- The residents were of the view that sector I-11 is the connecting sector between Rawalpindi and Islamabad, which must be developed like any other sector of Islamabad.
- People emphasized the implementation of proper mitigation plans during the construction as well as operational phase of the project.
- The project must be initiated as soon as possible and 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.

6 Impact Assessment and Mitigation Measures

6.1 Introduction

This Chapter provides;

a. mitigation measures to minimize if not eliminating the potentially 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 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 I-11 Grid Station and its Transmission Line Project

	Physical Aspects					Biological Aspects		Socio-Economic Aspects								
	Soil Issues	Air Quality	Surface Water	Ground Water	Water Consumption	Natural Vegetation	Wildlife	Noise and vibration	Safety Hazard	Pressure on local Infrastructure	Public Health and Nuisance	Aesthetic Value	Gender Issues	Employment	Cultural Issues	Agriculture Loss
Design Phase																
Site Selection for Grid Station	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	+2	0	N
Route Selection for Transmission Lines	-1	-1	0	-1	-1	-1	-1	-1	-1	-1	-1	0	0	+2	0	N
Equipment Selection	N	N	-1	-1	N	N	N	-1	-1	N	N	N	N	+2	N	N
Land Acquisition	N	N	N	N	N	N	N	N	N	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

Key: -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible negative; +1: low positive impact; +2; High positive impact, N: no impact.

6.2.3 Identification of Mitigation Measures

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

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

6.3 Design Phase Potential Impacts

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

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

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

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

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

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

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

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

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

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

The research to date has uncovered only weak and inconsistent associations between exposures and human health. To date the research has not been able to establish a cause and effect relationship between exposure to magnetic fields and

human disease, nor a plausible biological mechanism by which exposure to EMF could cause disease. The magnetic fields produced by electricity do not have the energy necessary to break chemical bonds and cause DNA mutations.

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

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

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

The proposed transmission line originates H-11 Grid Station and will be erected on a 1.5 km route with the help of 10 tubular transmission line poles.

The table below shows the results of an EMF assessment which was carried out at two grid stations installed; one installed in 2020 and the other in 1998.The results were compared with the ICNIRP safe exposure limits for EMF radiations from a grid station and were concluded that the observed results were within the safe limits.

Table 6.1: Assessment of EMF Radiations from two different Grid Stations

Sr. No	Location of G.S	EMF of G.S installed in 2020 (µT)	EMF of G.S installed in 1998 (µT)	ICNIRP Safe Limits (µT)
1.	Control Room	0.02	0.02	100
2.	Yard	19.1	22.1	
3.	Inside boundary wall	0.01	0.01	
4.	Outside boundary wall	0.00	0.00	

Mitigation Measures

No part of the feeding transmission line passes through any residential area and the transmission line will consist of the tubular poles which are taller resulting less magnetic field will reach to ground level. The height of the poles is 55-85 ft.

During the operational phase of the project, IESCO will monitor the exposure levels and will compare them with the safe limits in order to take measures to remediate the exposure above safe limits, if there is any.

6.3.2 Change of Land use

The proposed grid station site is on barren land with a few natural shrubs. While the route for the 1.5 km transmission line has been selected, keeping in view the current

land of the areas through which it will pass. There will be no change to land use because for the most part of it, the transmission line passes along drainage nullah.

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

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

Mitigation Measures

The negative environmental impacts related to the land-use change could be effectively minimized by making provisions for plantation of trees and landscaping of the surrounding areas. The land sliding can be mitigated by the 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 the monsoon season due to flooding. Furthermore, the 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 construction of Grid Station at Sector I-11/2 and its feeding transmission line involves no cutting of trees. Though there is no major cutting of trees observed for construction of this project still, IESCO has a tree plantation plan which will be implemented towards the end of the construction phase.

Mitigation Measures

- IESCO will ensure the plantation of 3 trees against one cut tree in RoW of transmission line
- IESCO has agreed to work on a plantation plan and plant around 450 trees of different local species in the project area to compensate for the loss of vegetation.
- A complete record will be maintained for any tree cutting or trimming.

6.3.4 Soil Erosion and Degradation

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

Mitigation Measures

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

6.4 Construction Phase Potential Impacts

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

- Physical Environment
  - Soil erosion, degradation, contamination soil mixing and compaction
  - Air quality deterioration

- Water contamination and consumption

- Biological Environment
- Loss of/damage to the natural vegetation of the area
- Loss of/damage to the wildlife of the area.

These impacts and their respective mitigation measures are discussed below.

6.4.1 Soil Erosion, Degradation and Contamination

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

A: Soil erosion and degradation:

Soil erosion is likely to take place in the mountainous areas caused by land clearing for construction camps, grid stations and transmission line towers; the subsequent construction activities; and the vehicular traffic on unpaved roads. Since the site for the new grid station is located in the 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 the 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 an approximate depth of 50 m to 100 m.
- Low embankments will be protected from erosion by planting indigenous grasses that can flourish under relatively dry conditions.

- High embankments i.e. over 2 meters will be protected by construction stone pitching or riprap across the embankments.
- Ditches or burrow pits that cannot be fully rehabilitated will be landscaped to minimize erosion and to avoid creating hazards for people.

B: Soil Erosion:

The following are recommended mitigation measures for soil erosion;

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

6.4.2 Air Quality Deterioration

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

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

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

Mitigation Measures

The following mitigation measures will minimize 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 the 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 with the above mitigation measures and their adequacy, as well as the 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 the driller,
- Construction plant and heavy vehicle movement.

Since the project site includes 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 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 the night without prior approval of the client.
- The contractor will comply with the submitted work schedule. Keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ a 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 the above mitigation measures, the residual noise and vibration impact will be “very low”.

6.4.4 Surface Water and Groundwater Contamination

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

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

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

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

These impacts will be encountered at all of the sites 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 forestalling 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 the construction crew, during the 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 with the above mitigation measures and their adequacy, as well as the 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 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 a daily water consumption rate to IESCO.
- Extreme care will be taken when working close to wells and watercourses; the 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, 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, for the most part of it, the transmission line passes along the drainage nullah. These include:

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

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 a significant loss of biodiversity. The construction crew can also indulge in tree/shrub cutting to obtain fuelwood.

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

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

Mitigation Measures

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

- Clearing of natural vegetation will be minimized as far as possible during the transmission line works.
- Herbicides will not be used to clear vegetation along the transmission line route (or at other project locations).
- It will be ensured to reach the transmission line poles location without developing any new tracks. The existing tracks will be used to transport equipment, material and personnel, except for a few poles having no access in the hilly areas. Vehicles will not be operated off-track in this area.
- For the transmission line route, vegetation clearing plan will be prepared and submitted to IESCO for approval. A complete record will be maintained for any

tree cutting or trimming. The record will include: the number, species, type, size, age, condition and photograph of the trees to be cut/trimmed.

- Indigenous tree species will be selected for plantation in consultation with the Forest Department; in particular, Eucalyptus trees will not be used in any case.
- The construction crew will be provided with LPG for cooking (and heating, if required). Use of fuelwood will not be allowed.
- No fires will be allowed inside the forest area.
- Tree plantation plan has been discussed in Chapter 7 which will be implemented at the proposed Grid Station. 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. The trimming of trees will be a permanent impact without any remediation/mitigation. With the help of the proposed mitigation measures described above, these impacts will decrease considerably. However these impacts cannot be completely mitigated, and there will be some residual impacts of this component of the proposed project on the vegetation of the area. The significance of these residual impacts is expected to be “low”.

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

The environmental monitoring will ensure compliance with the above mitigation measures and their adequacy, as well as the 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 especially along the drainage Nullah, 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 the 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 open places.
- The project staff will not be allowed to indulge in any hunting or trapping activities.

Residual Impact

Despite the above mitigation measures, there will be some residual impacts of the project on the faunal resources of the area. However, these impacts will be of a 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 recourses 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 are 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 the proper site. Contractor(s) must remove all construction waste and dispose of 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, 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 a potential impact on public health are:

- Environmental conditions created by the project which may lead to physical injuries or deterioration in the 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 the increased incidence of communicable diseases such as sexually transmitted (STDs), HIV/AIDS, and Hepatitis etc. during the construction phase due to labour mobility.

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

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

Mitigation Measures

The mitigation measures during the construction phase will include:

- Obligatory insurance against accidents for workers.
- The contractors should provide proper occupation health and safety training before starting construction activities.
- Provision of first aid boxes 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 health risks for labours.
- IESCO shall ensure that each contractor has provided proper PPEs to the workers and that the PPEs are properly utilized during the work.
- Protection devices will be provided to the workers operating in the vicinity of high noise generating machines.
- Provision of adequate sanitation, washing, cooking, and dormitory facilities to workers.
- Provision of protective clothing for labourer's 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 too 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 communicable diseases and STDs.
- Initiatives to involve a combination of behavioural and environmental modifications in the workers to address social and environmental aspects that can potentially have an impact on the local communities.

6.4.11 Traffic Issues

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

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

Mitigation Measure

Following measures will be taken to mitigate the impacts due to the 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 the worksite 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 the worksite and roads where necessary.

6.5 Operational Phase Impacts

The O&M activities of the electricity network are environmentally begun 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 an 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 of in accordance with their respective Material Safety Data Sheet (MSDS). MSDS will be made available at the grid stations and maintenance workshops.
- Non-toxic recyclable waste (such as cardboard) will be given away for recycling.
- Toxic waste will be stored separately; such areas will be marked and incinerated at an appropriate double chamber incinerator.
- Grid stations will have channels and drainage pits to collect any leaked oil from the transformers in the grid stations. This oil will be sent back to the workshop for recycling.

Residual Impact

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

6.5.2 Impacts on Biological Resources

The grid station O&M activities will not have any interaction with the biological resources of the project area. However, the transmission line maintenance activities, particularly along the drainage Nullah, agricultural land and forest area, 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 essential of two types: damage to the habitat as a result of the loss of vegetation; and direct disturbance/threat to the wildlife species as a result of human presence, equipment/vehicle operation and noise. These unmitigated impacts related to biological resources are characterized below.

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

Mitigation Measures

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

- IESCO will use special towers and pass the conductor above the trees, particularly under the forested segment, in order to maintain a safe clearance between the trees/branches and the transmission line. This will prevent the electrocution hazard for the people passing by; and wildlife, while also avoids any forest fires that can be caused by the sparking between the live transmission line and tree branches.

- Herbicides will not be used to clear/control vegetation under the transmission line.
- The nighttime maintenance works will be avoided as far as possible.

Residual Impact

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

6.5.3 Maintenance of Plantation

IESCO will hire manpower to carry out and sustain the plantation plan. Trees of different local species will be planted within the project site and around the project site and will be properly fed with water and other nutrients required throughout their initial growth period. In addition, there would be recreational activities and parks for children, which will have lawns, green patches, and flowering plants as well to enhance the aesthetics of the site.

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

6.5.4 Employment

The operation of the proposed project will accelerate the business activity in the project area and will provide employment to locals that will have a 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 a 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

CDA has allocated 18.6 kanal of land at Sector I-11/2 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 land acquisition and damaged crops are characterized as 'low'.

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 the 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 with the above mitigation measures and their adequacy, as well as the significance of the residual impacts.

6.6.4 Damage to Infrastructure

The construction of grid station and erection 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 an original or better condition.

Residual Impact

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

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

6.6.5 Noise and Vibration

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

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

Mitigation Measures

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

Residual Impact

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

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

6.6.6 Safety Hazards

The construction activities will involve the 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.
- The campsite will be selected with IESCO's approval**.**
- Firefighting equipment will be made available at the camp.

- The camp staff will be provided for 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 the residual impact of safety hazards associated with 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 with the above mitigation measures and their adequacy, as well as the 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 public health are characterized as 'high'.

Mitigation Measures

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

- The construction camp will have a septic tank with the 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 with the above mitigation measures and their adequacy, as well as the 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 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 the residual impact associated with gender issues.

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

6.6.9 Child Labor

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

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

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

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

Mitigation Measures

- In case of discovery of any sites or artefacts 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 the 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, the 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 with safety training. Refresher courses will be arranged on a regular basis.
- Firefighting equipment will be made available at the grid stations.
- The Emergency Response Plan (ERP) will be made available for the grid station. Its salient points will be displayed at prominent places within the grid station. The O&M staff will be given training on the ERP. The Environmental and Social Safeguard Section (E&SS) will review the ERP and with respect to the environmental and social considerations, and recommend changes if needed. The ERP will include a 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 the above few sections. All these measures need to be adopted to avoid public health issues.
- Studies have shown that there is 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 a continuous basis.

Residual Impacts

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

6.6.14 Agricultural loss

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

Mitigation Measures

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

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

Residual Impacts

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

6.7 Summary of Impacts and their Mitigation Measures

Impact	Mitigation Measures
Design Phase Impacts	
Electromagnetic Field near Transmission Line	▪ Electric overhead lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. ▪ Electric and magnetic fields do induce voltage and currents in the human body but even directly beneath a high voltage transmission line, the induced currents are too small compared to the threshold for producing electrical effects in the human body.
Change of Land Use	▪ The proposed grid station site is on barren land with a few shrubs. While the route for the 1.5 km transmission line has been selected, keeping in view the current land of the areas through which it will pass.

Impact	Mitigation Measures
	▪ No major change in the RoWs of transmission lines is expected as all area under transmission line will remain underuse as previously. However, the land space under a transmission line tower usually remains un-occupied and barren. ▪ The 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.
Construction Phase Impacts	
Soil Erosion, Degradation and Contamination	▪ Soil may be contaminated as a result of fuel/oils/chemicals spillage and leakage, and inappropriate waste (solid as well as liquid) disposal. ▪ The excavation of earth fills to be limited to an 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	▪ Air quality analysis of the site will be conducted before mobilization of the construction crew, in order to establish baseline data of the ambient air quality. ▪ Construction machinery, generators and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions. ▪ There will be no unnecessary mobility of the project vehicles and if unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.
Contamination of Surface and Ground Water	▪ The groundwater quality analysis of the grid station site will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the water quality at this location. ▪ Groundwater quality analysis will be carried out three times at the project site; before mobilization of the construction crew, during the construction phase and after the completion of the project.
Loss of Natural Vegetation	▪ Clearing of natural vegetation will be minimized as far as possible during the transmission line works. ▪ Herbicides will not be used to clear vegetation along the transmission line route (or at other project locations). ▪ It will be ensured to reach the transmission line poles location without developing any new tracks. The existing tracks will be used to transport equipment, material and personnel, except for a few poles having no access in the hilly areas. Vehicles will not be operated off-track in this area.

Impact	Mitigation Measures
	▪ Indigenous tree species will be selected for plantation in consultation with the Forest Department; in particular, Eucalyptus trees will not be used in any case. ▪ The construction crew will be provided with LPG for cooking (and heating, if required). Use of fuelwood will not be allowed
Operational Phase Impacts	
Soil and Water Contamination	▪ The grid station will have an 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 of in accordance with their respective Material Safety Data Sheet (MSDS). MSDS will be made available at the grid stations and maintenance workshops.
Impacts on Biological Resources	▪ IESCO will use special towers and pass the conductor above the trees, particularly under the forested segment, in order to maintain a safe clearance between the trees/branches and the transmission line. This will prevent the electrocution hazard for the people passing by; and wildlife, while also avoids any forest fires that can be caused by the sparking between the live transmission line and tree branches.
Socio-Economic Impacts	
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 the implementation of the plantation plan.
Damage to Infrastructure	▪ All damaged infrastructure will be restored to an original or better condition. ▪ The social monitoring will ensure compliance with the above mitigation measures and their adequacy, as well as the significance of the residual impacts.
Public Health Issues	▪ The construction camp will have a septic tank with the 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.

Impact	**Mitigation Measures**
Agricultural Loss	▪ Damage to the crops will be avoided during the transmission line patrolling. ▪ Any damage during repair and maintenance activities will be compensated.

7 Environmental Management and Monitoring Plan

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

7.1 Purpose and Objectives of EMMP

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

The primary objectives of the EMMP are to:

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

7.2 Institutional Capacity

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

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

7.2.1 Pre-Construction Phase

Approvals

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

7.2.2 Construction Phase

The organizational roles and responsibilities are summarized below:

IESCO

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

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

The E&SS unit will provide overall supervision and advisory services during the construction phase of the project. The E&SS unit will supervise the IESCO's environmental monitors (discussed below) and will also advise GSC, 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 the project will be defined located and in a documented form.
- IESCO, through the E&SS unit, will cooperate with regulatory agencies (such as the PAK-EPA) and other stakeholders who may want to send their own teams to monitor the project activities and IESCO will facilitate them during their visits.

PAK-EPA

The Pakistan Environmental Protection Agency will periodically visit the project site to monitor the compliance of environmental protection measures detailed in the EIA report.

7.2.3 Operation Phase

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

7.3 Organizational Structure, Role and Responsibilities

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

7.3.1 Primary Responsibilities

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

- The 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&SS section PMU will be responsible for the project's compliance with the EIA and EMMP throughout the project.
- The Additional Dy. Manager of Environment/Social Impact, IESCO will have to monitor project activities in the project area.
- The GC & T&G Divisions (or the Supervision Consultant, if IESCO chooses to employ one) will be responsible for ensuring that the contractors adhere to the quality requirements and other commitments including implementation of the EMMP and EIA.
- The contractor(s) will be responsible for the implementation of the EMMP during field execution in the project area and will report to the GSC directorate and E&SS unit.
- The E&SS unit will coordinate with relevant government departments (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.

7.3.2 Field Management and Quality Control

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

7.3.3 On-the-job Supervision and Monitoring

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

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

Figure 7.1: Organizational Structure of PMU, IESCO

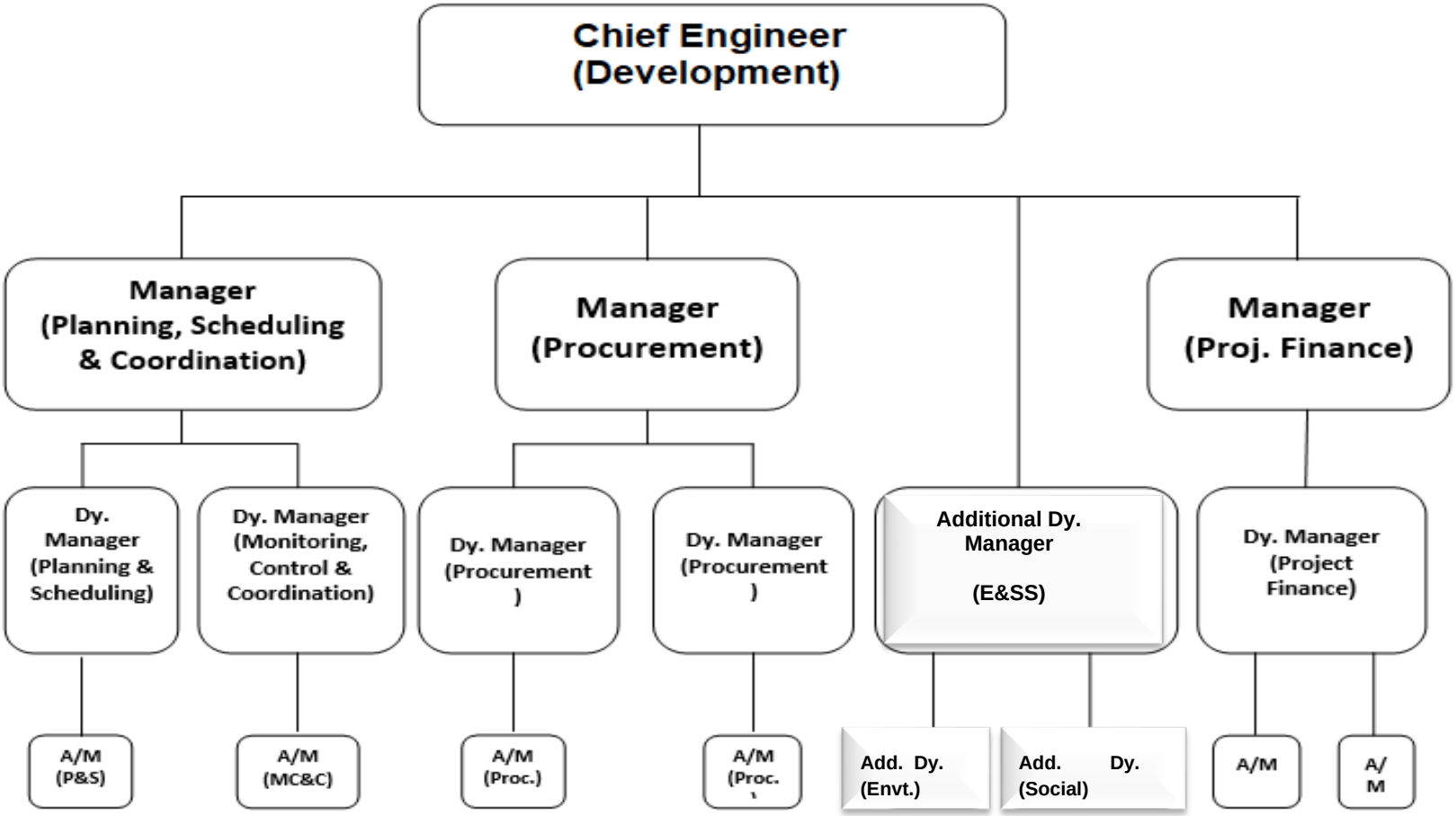


Table 7.1: Role and Responsibility Chart for the Proposed Project

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

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

7.4 Environmental and Social Mitigation Plan

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

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

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

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

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

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
A. Design and Pre-construction Phase					
Change of Land Use					
Land Use Change	Land use and cutting of Natural Vegetation	Careful selection of land for grid station and T/lines, Soil characteristics must be considered, High fertile land to be avoided. Avoid obvious scars and blemishes on the landscape;	Pre-construction Phase	GSC Division	PD IESCO
Loss of Natural Vegetation					
Loss of Natural Vegetation	Cutting of trees	The re-plantation plan should be considered in the 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 decides on further action.	Pre-construction Phase	Design Engineer & GSC Division	PD IESCO
Waste Management Plan					
Waste Management Plan	Waste Disposal	Implement a waste management plan that identifies and characterizes every waste arising associated with proposed	Prior to site clearance	Design Engineer & GSC Division	PD IESCO

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		activities and which identifies the procedures for collection, handling & disposal of each waste.			

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 CDA to IESCO free of charge.	Pre-construction Phase	GSC Division	PD IESCO
Transmission Lines Construction	Land Acquisition	The route of transmission line has been allocated by IESCO.	Pre-construction Phase	GSC Division	PD IESCO
B. Construction Phase					
B1. Construction Camp Site Selection Issue					
Site selection	Acceptability to public/owner; interferences	The contractor needs to obtain necessary permission for a campsite 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 the campsite 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. Manager Environment and Social Safeguard Section (E&SS)
Site clearing and preparation, and re-installation works after contract completion	Loss of vegetation and assets on the selected land, and dissatisfaction on rehabilitation	All efforts during the design stage should be made to minimize the removal of existing macro-plants at the campsite The contractor will provide a plan for removal & rehabilitation of site upon completion	While establishing Camp Site	GSC Division/Contractor	Addl Dy. Manager, E & SS

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

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

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		The camp staff will be provided for firefighting training. All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel.			
Campsite location	Public Health	Camps will be at least 500 m from any groundwater wells used by the community. The construction crew will be provided awareness for the transmissible diseases (such as HIV/AIDS, hepatitis B and C).	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Campsite security	Security hazards and related conflicts in the project area.	Proper storage and fencing/locking of storage rooms containing hazardous material Employment of guard for storage rooms. Provision of adequate security against sabotage petrol pilfering and theft.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
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 off in an identified dumping site approved by ESI.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
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 the soil. Damages will be instantly repaired and/or compensated at the Contractor's obligation Water and soil quality will be monitored as envisaged in the Environmental Monitoring Plan	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Movement, maintenance and fuelling of construction vehicles	Contamination of soil and groundwater from fuel and lubricants	Construction vehicles and equipment will be properly maintained and refuelled in such a way that oil/diesel spillage does not contaminate the soil. Fuel storage and refuelling sites will be kept away from drainage channels. Oil and grease traps will be provided at fueling locations, to prevent contamination of water. Unusable debris shall be dumped in nearest landfill sites if available, on the other hand then on an approved designated site by IESCO, or local administration. Operation of vehicles close to the water channels; water reservoirs will be minimized. Waste oil and oil-soaked cotton/cloth shall be sold off to authorized vendors Water quality will be monitored as envisaged in the Environmental Monitoring Plan as discussed in chapter 8. Slopes of the embankment leading to water bodies will be modified and screened so that contaminants do not enter the water bodies,	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Waste material disposal sites	Contamination of soil/water and impact on landscape value	Dismantling of existing formation is not considered, instead, bituminous layers will be used as sub-base for topping up If spoil material develops, pits will be used after examination on possible soil and water contamination risks. Spoils will then be covered with sandy conglomerates.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Soil related Issues					
Contractor Mobilization and Demobilization	Soil Erosion and Contamination	Vehicular traffic on unpaved roads will be avoided as for as possible. Operation of vehicles and machinery close to the water channels, water reservoir will be minimized.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Vehicles and equipment will not be repaired on the site. If unavoidable, impervious sheathing will be used to avoid soil 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, the land levelled and re-contoured to the original condition or better.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Construction work for grid station and tower installation.	Loss of top fertile soil.	The excavation of earth fills to be limited to an 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 the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Construction work for grid station and tower installation.	Soil erosion	Cut and fill at the proposed grid station sites will be carefully designed, and ideally should balance each other. The surplus soil, if any, will be disposed at places approved by IESCO. Such sites will be selected after surveying the area and ensuring that soil deposition will not have any significant impacts, such as loss of productive land, blocked access, natural vegetation and disturbance to drainage	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Appropriate measures will be taken to avoid soil erosion during the excavation of transmission line poles foundations, particularly within the parking area. These include temporary embankments to protect excavated soil, stone pitching and placing gabions. The surplus soil will be disposed of as stated above. After the completion of tower foundations particularly on the above-mentioned slopes, additional stone pitching around the foundation will be carried out, where required, to avoid any subsequent soil erosion/land sliding. Post-construction monitoring of such sites will be carried out to detect early signs of any soil erosion/land sliding. The construction works for the transmission line route will not be undertaken during the rainy season. After the completion of the construction work, the transmission line route, campsites and other construction sites will be completely restored. No debris, surplus construction material or any garbage will be left behind. A 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).			
Construction work for grid station and tower installation.	Soil contamination due to leakage, spoilage etc.	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 tanks and soaking pits, will be constructed having adequate capacity. The contractor(s) will submit the plans for the camp layout and waste disposal system to the IESCO and obtain approval. As stated above, the camp will preferably be established inside the near the grid station site.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		Waste oils will be collected in drums and sold to the recycling contractors. Domestic solid waste from the construction camp will be disposed of 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 tower installation	Borrow pit land lease agreement	The Contractor must obtain any necessary permission for burrow pits from the competent authorities.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Water-related Issues					
Use of water for construction and consumption	Conflict with local water demand	The contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected. For construction purposes, water shall be drawn from surface water bodies on priority and as available.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
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 of in a manner that does not cause soil contamination.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Construction work for grid station, civil works and T/L	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 a manner that least affects the local communities. Wastewater recycling will be carried out for sprinkling and gardening purposes.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Waste Disposal Issues					
Spillage of liquid wastes	Risk of polluting surface and groundwater from liquid waste spillage, drainage and runoff from construction sites	Application of good engineering and construction practices. The contractor should ensure that construction debris does not find their way into streams which may get clogged. Work on riverbanks will be kept to a minimum, and retaining walls be constructed. To maintain surface water flow/drainage, proper mitigation measures will be taken along the road, like drainage structure along with urban settlements. If spillage occurs, it will be disposed of off in an identified dumping site approved by ESI. The contractor will prepare a waste disposal plan and submit to ESI for his approval.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Disposal of Solid waste		Proper and safe waste disposal designated site by ESI or ESM, The contractor will prepare a waste disposal plan and submit to ESI for his approval.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Air Quality related Issues					
Vehicular movement and running of machinery	Emission from construction vehicles and machinery, causing public health risks, nuisance and	The diversion road will be regularly water-sprayed to minimize the dust generation: Schedules will be adjusted to actual needs, determined by the ESI. Vehicle trips to be minimized to the extent possible	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
	other impacts on the biophysical environment	All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the NEQS. All equipment is operated within specified design parameters. Air quality parameters will be monitored at determined sites and schedule determined by the ESI. Ambient air quality within the premises of campsite and grid station should be monitored.			
Transportation of materials, and other construction activities that create dust and emissions	Dust and emissions from machines causing a health risk to operators; Impacts on the biophysical environment	Vehicles delivering loose and fine materials, like sand and fine aggregates, should be covered by sheets to reduce spills on the 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 the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Construction work for grid station, civil works and T/L	Air Quality Deterioration	Vehicular traffic on unpaved roads will be avoided as far as possible. Operation of vehicles and machinery close to the water channels, water reservoir will be minimized. Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Noise, Vibration Dust Related Issues					
Construction work for grid	Noise due to construction activities,	Vehicles will have exhaust mufflers (silencers) to minimize noise generation.	Throughout the	GSC Division/Contractor	Addl Dy. Manager, E & SS

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

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

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

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		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 open places. The project staff will not be allowed to indulge in any hunting or trapping activities.			
Health and Safety of Workers					
Hygiene related issues during the construction phase		Obligatory insurance of workers against accidents. Providing basic medical training to specified work staff and basic medical service and supplies to workers. Layout plan for the campsite, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing and contingency measures in case of accidents. Work safety measures and good workmanship practices are to be followed by the contractor to ensure health risks for labourers. Protection devices should be provided to the workers operating in the vicinity of high noise generating machines. Provision of adequate sanitation, washing, cooking, and dormitory facilities to workers. Provision of protective clothing for labours handling hazardous material e.g. hard hats, adequate footwear for bituminous pavement works etc. Adequate signage, lightning devices, barriers and person with the flags during construction to manage traffic at construction sites. Timely public notification on planned construction works.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
Social and Gender Issues					
Construction work for grid station, civil works and T/L	Social and Gender Issues	The construction crew will avoid entering the villages and settlements. Local social norms and practices will be respected. No child labour will be employed. Road signage will be fixed at appropriate locations to reduce safety hazards associated with project-related vehicular traffic. Project drivers will be trained on defensive driving. Vehicle speeds near/within the community will be kept low, to avoid safety hazard and dust emissions. The communities near the transmission line route will be informed about the construction activities. Protective fencing will be installed where required. Before commencing the testing commissioning of the system, the nearby community will be informed. Protective fencing will be used where appropriate/possible.	Throughout the construction period	GSC Division/Contractor	Additional Manager Social Safeguard Section
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 the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Socio-Economic Issues					
Construction work for grid station, civil works and T/L	Loss of Agriculture	Temporary RoW has been allocated by IESCO.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
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 artefacts 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 the resumption of the construction activities at such sites.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Aesthetic Value					
	Aesthetic Value	Transmission lines and feeders will be constructed after astute planning, in order to avoid dense concentration of electrical lines. Tree plantation will be carried inside and at the periphery of the grid stations, without compromising the safety aspects (i.e., required clearances will be maintained). For this purpose, provisions will be made in the site layout of the grid stations.	Throughout the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Damage to Infrastructure					
Construction work for grid station, civil works and T/L	Damage to Infrastructure	Avoid damaging the local infrastructure, If any infrastructure is 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 the construction period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Operational Phase					
Water-related Issues					
Drainage of water from grid station runoff	Water pollution from rainwater containing hazardous	Water quality monitoring will be carried out during the operation phase at schedule approved by ESI.	Throughout Operational period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
into water bodies	substances, congestion of drainage structures near settlements.	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.			
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. Manager, E & SS
Wastewater	Wastewater Discharge	No untreated discharge to be made to surface water, groundwater or soil. Take care in the disposal of wastewater generated such that soil and groundwater resources are protected	Throughout operational period	GSC Division/Contractor	Addl Dy. Manager, E & SS
Grid station colony	Water Consumption	Water will be obtained from the source approved by the ESI. Astute planning will be employed to conserve water at the construction sites and camp. Water will be procured in a manner that least affects the local communities. Wastewater recycling will be carried out for sprinkling and gardening purposes.	Throughout Operational period	GSC Division/Contractor	Addl Dy. Manager, E & SS
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. Manager, E & SS
C3. Maintenance of Plantation					
Grid station Plantation	Maintenance of Flora	Monitoring of survival of trees at the rate of 75 % should be done in the first year of the operation phase and suitable mitigation measures should be taken to protect the trees Efforts will be made for proper maintenance of planted trees to maintain greenery and aesthetics The saplings planted in the project area against the trees cut should be properly maintained throughout their initial growth	Throughout Operational period	GSC Division/Contractor	Addl Dy. Manager, E & SS

Activities and Actions	Issue/ Component	Proposed Mitigation Measures	Timeframe	Institutional Responsibility	
				Implementation	Supervision
		period in terms of water requirements and necessary nutrients.			

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 are taken for their prevention.	Throughout Operational period	GSC Division/Contractor	Addl Dy. Manager, E & SS

7.5 Solid Waste Management Plan

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

IESCO will collaborate with MCI for collection, transportation and disposal of solid waste generated by Grid Station at Sector I -11/2 Project.

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

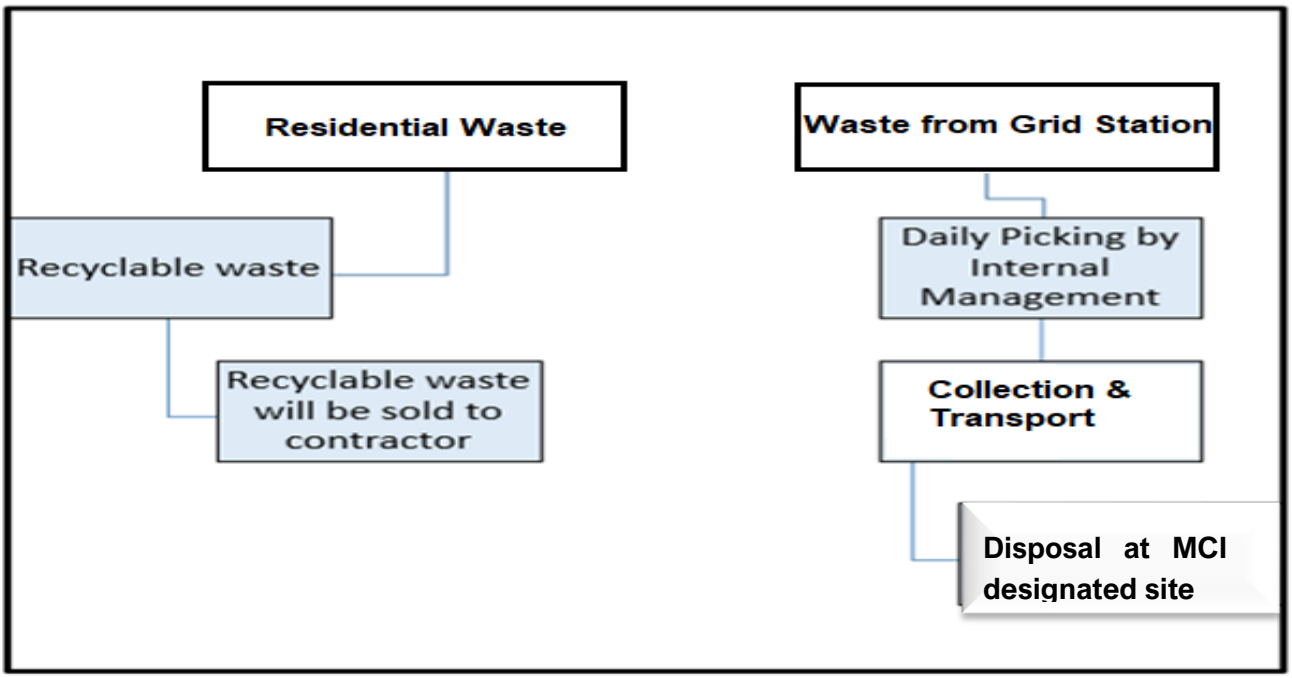
Operational Phase: IESCO will contract with a waste management company for collection, transportation and disposal of solid waste generated by IESCO Project.

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 the Solid Waste Management System



7.6 HSE Management Plan

- Health Safety and Environment (HSE) induction/orientation will be provided to all workers 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.
- The 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 a 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 the first-aid post for day & night shift
- Fully equipped Ambulance will be made available at the site for 24/7
- In-house training will be conducted on 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 the HSE Manager to achieve its objectives. Training will be conducted for capacity building of employees / workers / labour / sub-contractors to make them well effective to respond in any kind of emergency.

The breakup cost for the safety of workers is described in **Table 7.3.**

Table 7.3: Estimated Cost for the Implementation of Environmental Monitoring Plan for I-11 Grid Station Project

Sr No	Item	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Personal Protective Equipment (A)				
1	Dust Masks	4800	10	48,000
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)	**1,308,500**

- 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 the earplug to be used for 1 month for each labourer
- Safety Helmet 1 safety helmet for each labourer for 12 months
- Safety Jackets 2 safety Jackets (Hi-Vis) for each labourer for 12 months
- Dust Bin: Rough estimate
- Water Sprinkling the whole construction period
- Rain Cost: 1 Raincoat for each labourer

7.7 Traffic Management and Construction Material Transportation Plan

- The entire contractor's construction material will be transported to the project site via IJP Road and Faqir Aipee Road.
- 15 km/h speed limited should be maintained at the project site.
- All the light vehicles like cars, jeep etc. should be parked in a designated area.
- Speed breakers will be followed properly.
- All the experienced and license holders (drivers & operators) will be hired for transportation.
- All the heavy machinery will be checked properly and inspected on a regular basis.
- Speed limit signboards must be installed at the project site.
- All the (headlights, backlights, Indicator etc.) will be checked and maintained regularly.
- All the warning lights, reverse back alarms will be maintained properly.
- All the routes within the project site will be marked and designated properly.

7.8 Emergency Preparedness, Response and Site Evacuation Plan

- The Contractor will always be ready for response in any kind of emergency at the project site.
- Special assembly points will be established at the project site (offices & site).
- The emergency siren will be installed at assembly points.
- Contact numbers of emergency response team will be circulated at the project site.
- Close coordination will be carried out with 1122 in the case of any serious injury/accident.
- Close coordination will be carried out with all law enforcement agencies (police) in case of an aggressive mob of people in the shape of any kind of protest.
- Emergency response drill will be carried out once in a month for provision of awareness to the workforce at the project site.
- First Aid Boxes will be available at the 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 the HSE Manager regarding the awareness towards any emergency condition and control.
- Proper water sprinkling will be carried out at service road along with the project site for dust control to avoid any hazardous and risky situation which can be a cause of transport emergency.

7.9 Fire Fighting Plan

The campsite will be equipped with fire extinguishers as well as communication equipment for contacting the appropriate emergency response teams.

At all the campsites should be equipt with emergency alarms. Persons will be nominated to ring the emergency alarm in case of any emergency or any emergency risk.

All the camp residents will be trained and well communicated how to respond to the emergency alarm and reach assembly point immediately. Workers will be trained to respond to an emergency alarm as discussed below:

- If the alarm rings for 20 seconds, only once, then it is a less severe emergency;
- If it rings for 20 seconds thrice after intervals, then it is medium to a severe high emergency, but it can be much severe; and
- If it rings for 60 seconds or more continuously, then the emergency is most severe so, everyone should respond to it immediately, evacuate the workplace and move towards the assembly point.

Proper evacuation routes will be designated, nominated and well communicated to all. All the workers will be trained to follow the evacuation routes and reach the assembly point in case of an emergency.

7.10 Plantation Plan

In order to improve the environment and aesthetical essence of the project site; a plantation plan is being recommended. According to the plantation plan, 450 mature plants having 4-5 feet height and 1.0 to 1.5 inches stem diameter will be planted in the project area and in the premises of Grid Station.

The practice of plantation of mature plants will be effective compensation against the expected damages to the existing vegetation.

IESCO will make the provision of staff and budget for the implementation of the 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; however, no trees will be cut during the construction of the proposed project.

The plantation plan consists of trees, shrubs and indoor plant which are recommended.

Trees (20 ft. and above): Trees comprising of shady, flowering, fruit trees have been recommended for plantation along eastern, northern and western boundaries as well as green and parking areas of Grid Station.

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

Table 7.4: Recommended Plant Species to be planted at the Project Site

Sr. No	Trees Species	Flowering Trees
1	Shisham *(Dalbergia Sissoo)*	Dhak (*butea frondosa*)
2	Phulai *(Acacia Modesta)*	Anar (*Punicum grantum*)
3	Poplar *(Populus)*	Kachnar (*Bauhinia variegate*)
4	Phulai (Acacia modesta),	Amaltas (*cassia fistula)*
5	Chir Pine (Pinus roxburghii)	Jasmine (*Jasminum humile)*

Plantation Plan Cost

The cost of plantation includes the cost of equipment, labour, and plants purchase and maintenance cost for the first three months of the plantation. The total estimated cost of implementation of the plantation plan is Rs.200,000.

The tentative cost of equipment for is given below in **Table 7.5** and a maintenance plan for three months is given in **Table 7.6.**

Table 7.5: 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	30,000
2	Cost of Plantation of tree saplings	Lump-sum		100,000
3	Maintenance Cost	Lump-sum	Lump-sum	70,000
	Grand Total Cost			**200,000**

Table 7.6: Maintenance Plan for the first three months

Sr. #	Description		February	March	April
1	Layout/ pits formation/clearing site				
2	Planting of Saplings				
3	Weeding/maintenance	3 months			

7.11 Environmental Monitoring Plan

The Environmental Monitoring Plan (EMP) will ensure that mitigation measures are being implemented and that these are effective to provide a delivery mechanism to address the adverse environmental impacts of the proposed project during its execution and operation phases of the project.

The Monitoring plan will be a monitoring tool for the mitigation measures to be implemented during the different phases of the 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 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 the project area,
- Record of waste produced, a record of waste disposal, and;
- Project-related vehicular traffic.

The key responsibilities are;

- The Additional Manager E&SS, IESCO will make necessary arrangements to monitor the key environmental parameters during the construction and operation phases.
- The Additional Deputy Manager 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 the 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 7.7: Environmental Monitoring Plan for Grid Station at Sector I – 11/2 and its 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&SS, IESCO	Completed record of sampling and Analysis
Noise Levels	Construction	dB (A)	At construction sites, campsite and densely populated area	Twice in 8 hours at selected sites at 1 m, 7.5 m, 15 m, and 50 m from the right-of-way, Quarterly	EPA Ambient Noise standards	Contractor/ESM	E&SS, IESCO	Completed Record
Dust Emissions	Construction	Visual Checks	At construction sites, campsite and densely populated area, project roads	Twice in 8 Hours and routine monitoring	-	Contractor/ESM	E&SS, IESCO	Completed Record
Public Grievance	Construction	Social parameter	At nearby Communities	Throughout the field activities	Social parameter	ESI	Additional Deputy Manager 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 the plantation was carried out (2) At site within the right of- way	(1) One month after plantation (2) One year after plantation 1 month, 3 months 6 months, and 12 months after planting	75 % survival rate	ESI	Additional Deputy Manager Environment & Social Safeguard Section	Completed Record
	Operation	Visual inspection of plant species survival rate and status of maintenance	At sites where the plantation was carried out	(1) 2.5 years after plantation	75% survival rate	ESI	Additional Deputy Manager Environment	Completed Record
Safety and Traffic Rules Compliance	Operation	(1) Faulty, overloaded and speeding vehicles (2)Inspection of signage	Along Ninth Avenue	Quarterly basis, for one year	To be determined	ESI	Additional Deputy Manager Environment & Social Safeguard Section	Completed Record

Key:

dBA = *decibels (measured in the audible range)*

WHO = *World Health Organization*

NEQS = *National Environmental Quality Standards*

PM10 = *Particulate Matter smaller than about 10 micrometres,*

SPM = *Suspended Particulate Matter*

TSS = *Total Suspended Solids*

USEPA = *United States Environmental Protection Agency*

EPA = *Environmental Protection Authority,*

ROW = *Right-of-Way*

Table 7.8: Estimated cost for the implementation of the Environmental Monitoring Plan for 132 KV Grid Station and Transmission Line Project

Environmental Monitoring Activities	Units/ No. of Samples	Unit Cost specification	Cost (Rs)
Construction phase			
Ambient air quality monitoring	8 (24 months project)	@ 50,000 per sample for 24 hr monitoring	400,000
Ambient water quality monitoring Quarterly basis on one location for 4 months	8	@ 20,000 per sample	100,000
Noise levels, quarterly basis for 4 months	8	@ 5,000 per sample	40,000
		Total	**540,000**

7.11.1 Compliance Monitoring

The compliance monitoring of the project activities is principally a tool to ensure that the environmental and social control measures required in the EIA are strictly adhered to, during the project activities.

Various aspects of the EIA compliance monitoring will be to:

- Systematically observe the activities undertaken by the contractors (and sub-contractors) or any other person associated with the project.
- Verify that the activities are undertaken in compliance with the EIA and EMMP.
- Document and communicate the observations to the concerned person(s) of the contractors, GSC Department and E&SS unit, so that any corrective measures, if required, can be taken in a timely fashion.
- Maintain a record of all incidents of environmental and social significance and related actions and corrective measures.
- Maintain contact with the communities, solicit their views and concerns, and discuss them during the project progress meetings.
- Prepare periodic reports of the environmental and social performance of the project.

The mitigation plan will be used as a management and monitoring tool for compliance monitoring. The 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.

7.12 Training Program

The key objective of the training program is to ensure that the requirement of EMP is clearly understood and followed throughout the project. The training shall cover the following areas:

- Environmental sensitivity of the project area.
- EMP communication and documentation requirement.
- Vegetation and community issues and their mitigation measures.
- Safe construction practices
- Use of Personal Protective Equipment's (PPEs)
- Environmentally sound construction practices
- Vehicular safety.
- Site restoration requirement.
- Solid Waste Disposal

IESCO will be primarily responsible for providing training to all project personnel. A lump sum fee of Rs. 200,000 has been set aside for Environmental & Social Training Program. The training program will include the basics of health and safety at the construction site and hazards related to the grid station project and ways to stay safe.

The details about the program are shown in **Table 7.9**.

Table 7.9: Framework for Environmental & Social Training Program

Type of Training	Training Description	Period	Duration	Training By	Trainee
Occupational Health and Safety	Training should be provided to aware staff to conform to safety codes	Before Commencement of Project Activities	Full day	External Sources	Site Supervisor, Site Engineer.
Environment & Social Laws, Regulations, procedure and guidelines of the government	The training should detail the laws and regulation concerning the environment, Labour laws and compliance with government regulation.	Before Commencement of Project Activities	Full day	External Sources	Company manager, Site Supervisors , Site Engineers.
Occupational Health & Safety	Health, safety and hygiene. Proper usage of Personal Protective Equipment (PPE's), Precautions to be taken for working in confined areas.	Before Construction Activities	Full Day	Site Supervisor, Site Engineer	Workers
Solid Waste Management	Waste segregation, identification of Hazardous Waste, Use of PPEs and waste Handling	Before Commencement of Project Activities	Full Day	External Sources	Relevant workers and staff
Health Safety and Environmental Auditing	Health Safety and Environmental Audits, Reporting Requirements	Before Commencement of Project Activities	Full Day	External Sources	Relevant Department
Implementation of environmental management and monitoring plan	Explanation of Environment Management and Monitoring Program	Quarterly. As soon as the project activities start	Full Day	External Sources	Site Supervisor, Site Engineer

7.13 Communication and Documentation

An effective mechanism for storing and communicating environmental and social information during the project is an essential requirement of EMMP. The key features of such type of mechanism are:

- Recording and maintenance of all information generated during the monitoring in a predetermined format.
- Communicating the information to a central location.
- Storing raw information in a central database.
- Processing the information to produce periodic reports.

7.14 Grievance Redressal Mechanism

An attempt has been made during the present EIA to identify all potential impacts of the proposed project, to identify all Project Affected Persons (PAPS), to provide mitigation measures to address the potential impacts, and to chart out a mechanism to implement these mitigation measures.

However during the project implementation, no private property will be damaged and if unavoidable, the affected will be compensated.

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 the date of the complaint, particulars of the complainant, description of the grievance, actions to be taken, the person responsible for taking 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 the Project Director's office then Chief Engineer Development will be approached, and the issue will be addressed within one month. For any reason, if the complainant is not satisfied then he/she has the right to approach the court. Once the remedial action is decided, implementation responsibility as well as scheduled will be determined.

The proposed remedial action will be documented in the SCR, with complete details (by whom and by when). The proposed remedial action will be shared with the complainant. Similarly, the actual action taken will also be documented in the register and shared with the complainant. The complainant's views on the remedial action taken will also be documented in the register.

The SCR will be reviewed during the fortnightly meetings at the site. The progress on the remedial actions will also be reviewed during the meetings.

7.15 Change Management

The EIA for the proposed operation recognizes that changes in the operation or the EMMP may be required during the operation and therefore provides a Change Management Plan to manage such changes. Overall responsibility for the preparation of change management statements will lie with Islamabad Electrical Supply Company Limited (IESCO).

- Category A changes,
- Category B changes, and;
- Category C changes.

These categories are defined below further one by one.

7.15.1 Category 'A' Change

The 'Category A' change is one that leads to a significant departure from the project described in the EIA and consequently requires a reassessment of the environmental and socioeconomic impacts associated with the change. In such an instance, IESCO will be required to conduct a fresh EIA of the changed portion of the project, and send the report of this assessment to the relevant agencies for approval (Pak-EPA). Examples of such changes are provided below.

- Change in the transmission line route by more than 2 km of the original alignment. Or change in the route by less than 2 km, but the changed route has environmental and/or social sensitivity more than the original route.
- Increase in the transmission line length exceeding 20 % of the original design. Or increase in length by less than 20% but involving areas which are more sensitive - environmentally and/or socially - than the original route.
- Change in the grid station site by more than 2 km of the location studied during the EIA. Or change in the site by less than 2 km but the new location has a higher environmental and/or social sensitivity.
- Inclusion of new grid station or transmission line sub-project not enlisted in this EIA report.

7.15.2 Category 'B' Change

The category 'B' change is one that may entail project activities not significantly different from those described in the EIA, which may result in project effects whose overall magnitude would be similar to the assessment made in this report. In case of such changes, the ESI (with assistance from the E&SS) will be required to reassess the environmental and socioeconomic impacts of the activity, specify additional mitigation measures, if necessary, and report the changes to the relevant agencies (Contractors, E&SS, 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. A complete record of the surveys and assessment will be maintained.

7.15.3 Category 'C' Change

A Category-C change is one that is of little consequence to the EIA findings. This type of change does not result in effects beyond those already assessed in the EIA; rather it may be made onsite to minimize the impact of an activity, such as re-aligning a particular section of the transmission line to avoid cutting a tree, or relocating construction campsites to minimize clearing vegetation. The only action required for such changes will be to document the change.

7.16 Environmental Budget

The cost required to effectively implement the mitigation measures is important for the sustainability of the Project in the operational phase of the Project.

The summary of the cost of monitoring environment and mitigation cost is shown in **Table 7.10**.

Table 7.10: Summary of Environmental Mitigation & Monitoring Cost

Activity	Basis	Cost (Rs)
Environmental Monitoring Cost	Ambient Air, Noise and Water Quality Monitoring	540,000
HSE Management Plan	For Construction Phase	1,308,500
Plantation Plan	Plantation of Trees	200,000
Training Program	Training about environment protection of the project site	200,000
	Grand Total	**2,248,500**

7.17 Post Project Monitoring

The Project Manager of Construction of Grid Station at Sector I-11/2 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 the Pakistan Environmental Protection Agency.

8 Conclusion and Recommendations

8.1 Introduction

This Chapter presents the assessment of the possible environmental impacts of 132 KV Grid Station at Sector I-11/2, Islamabad and its Feeding Transmission Line Project. The study presents the purpose of the EIA as to the description of the site, the impact of the project during and after implementation, the mitigation measures and residual impacts.

The EIA also includes the justification and detailed description of the project, with an evaluation of the potential impacts and effects on the environment including economic and social consequences. This Chapter describes the conclusion and recommendation of the EIA study of the project.

8.2 Conclusions

The major conclusions of the EIA are:

- IESCO intends to construct a new 132 KV Grid Station at Sector I – 11/2 and 1.5 Km feeding transmission line at I-11, Islamabad.
- The main objective of the project is the supply of electricity and an increase in the efficiency, reliability and quality of the electricity supply to Sector I-11 and adjoining areas.
- The total land allocated for construction of grid station is 18.6 kanal which has been provided by the Capital Development Authority (CDA). The project consists of the construction of a grid station, erection of 10 tubular poles on 1.5 Km feeding transmission line from H-11 Grid Station.
- The total estimated cost of the project is Rs. 602.094 million and would be completed in 24 months (two years).
- The potential impacts during construction phase include soil erosion, degradation, contamination soil mixing and compaction; air quality deterioration; noise pollution and vibration; water contamination and consumption; loss of/damage to the natural vegetation of the area; loss of /damage to the wildlife of the area and public health and safety.
- The significant environmental management issues during operational phase include soil and water contamination; safety hazards; public health and loss of agriculture.
- The project construction and operational activities can potentially affect the natural resources of the area. These adverse impacts can be largely reduced by implementing the appropriate mitigation measures, which has been discussed in this report.

8.3 Recommendations

On the basis of the overall impact assessment, more specifically, nature and magnitude of the residual environmental impacts identified during present EIA, it is concluded that Grid Station at Sector I – 11/2 and its feeding Transmission Line Project 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 provide electricity supply to Sector I-11 and adjoining areas.

There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

Table 8.1: Environmental Screening Matrix (mitigated) of Grid Station at Sector I-11/2 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 Routes	Compensation	Agriculture Loss
Project Siting																		
Visual Impacts	0	N	0	0	N	-1	N	0	0	0	0	N	N	+2	+2	N	N	N
Cumulative Impacts	0	N	N	N	N	0	0	N	0	N	0	+2	+2	+2	+2	N	N	N
Design Phase																		
Site Selection for Grid Station	0	0	N	N	N	-1	0	0	0	0	0	N	N	+2	N	N	N	N
Route Selection for Transmission Lines	0	N	0	0	N	-1	-1	0	0	N	0	N	N	+2	N	N	N	N
Equipment Selection	N	N	N	N	N	N	N	N	0	N	N	N	N	+2	N	N	N	N
Construction Phase																		
Land Acquisition	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Contractor's Mobilization	0	0	0	0	0	0	0	0	0	0	0	0	0	+2	0	0	N	N
Site Preparation	0	0	0	0	0	-1	-1	0	0	0	0	0	0	+2	N	N	N	N
Contractor's Camp	0	0	0	0	0	-1	-1	-1	0	N	0	N	N	+1	N	N	N	N
Construction of Infrastructure	0	0	0	0	0	-1	0	0	0	N	0	0	0	+1	0	0	N	N

Construction Materials Supply	0	0	0	0	N	0	0	0	0	N	N	N	N	+1	N	N	N	N
Solid Waste Disposal	N	N	0	N	N	0	0	N	0	N	N	N	N	N	N	N	N	N
Liquid Waste Disposal	-1	N	-1	-1	N	N	N	N	-1	N	N	N	N	N	N	N	N	N
Immobilization of Contractor	0	0	0	0	0	0	0	0	0	0	0	0	0	+2	0	0	N	N
Operational Phase																		
Project Operation Facility	N	0	0	0	N	N	N	0	N	N	N	N	N	+2	+2	N	N	N
Solid Waste Disposal in grid station	0	N	0	N	N	N	N	N	0	N	0	N	N	+1	N	N	N	N
Effluents Disposal	0	N	0	N	N	N	N	N	0	N	0	N	N	N	N	N	N	N
PCB contaminated Transformer Oils	0	N	0	0	N	N	N	N	-1	N	-1	N	N	N	N	N	N	N
O & M of Grid Station	0	N	0	0	N	N	N	N	0	N	0	N	N	N	N	N	N	N

Key: -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible negative; +1: low positive impact; +2; High positive impact, N: no impact.

Annexure-1: List of Names, Qualification and Roles of EIA Team Members

Name and Designation	Qualification and Experience	Tasks Assigned
Mr Saadat Ali, Team Leader	Postgraduate Diploma in Sanitary Engineering, International Institute for Hydraulic and Environmental Engineering, 1984 B. Sc. Civil Engineering, Engineering College, University of Peshawar, 1978	▪ Overall management of the project (Supervision, site visits, guidance, inputs and suggestion, recommendation and discussion and report presentations). ▪ To review overall environmental issues and mitigation measures. ▪ To prepare the draft and final study reports.
Mr Ali Abdullah, Environmental Engineer	M. Sc. Environmental Engineering, Newcastle University (2016) B. Sc. Civil Engineering, The University of Lahore, (2010-1014)	▪ Suggest mitigation measures for impacts that affect the environment. ▪ Identification of site for baseline data collection for water, wastewater, noise, soil, traffic and ambient air quality.
Mr Amir Saeed, Ecological Expert	Pakistan Forest Institute (PFI), University of Peshawar 1991-1993 M.Sc. Forestry Govt. Post Graduate College for Boys, Kohat, University of Peshawar, KP province 1988- 1990 B.Sc. Organic Chemistry	▪ Identifying flora and fauna of the area. ▪ Identifying any rare, endemic, protected or endangered species in the project area.
Mr. Zahid Hussain, Environmental Engineer	Bachelor's in Environmental Engineering, National University of Sciences and Technology (NUST) Islamabad, 2017	▪ Secondary data collection for a desk review. ▪ Research tools preparation for field study. ▪ Fieldwork for baseline data collection in the area under study.

Annexure-2: Terms of Reference

An EIA will be carried out for all stages of the projects, i.e. preconstruction, construction and post-construction with the following objectives:

- Establishing the environmental baseline in the study area and identifying any significant environmental issue.
- Assessing these impacts and providing for the requisite avoidance, mitigation and compensation measures.
- Integrating the identified environmental issues in 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 Sector I-11/2, Islamabad and its Transmission Line Project and respond to queries generated by PAK-EPA until issuance of the NOC.

Annexure-3: References

- ***Ahmad, Nazir. 1993.*** Water Resources of Pakistan and their Utilization
- ***Ali, Salim and Ripley, S. Dillon 1968.*** A Synopsis of the Birds of India and Pakistan, Bombay Natural History Society, Bombay, India
- ***Ali, S. I, 1973.*** Mimosaceae (Editors Nasir, E & S.I. Ali) Flora of Pakistan no.1-210, Department of Botany, University of Karachi.
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- ***NEPRA, 2005.*** State of Industry Report 2005. National Electric Regulatory Authority
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- ***Roberts, T.J., 1991.*** The Birds of Pakistan (Vols. I & II), Oxford University Press
- ***Roberts, T.J. 1997.*** Mammals of Pakistan, Oxford University Press, Oxford
- ***Survey of Pakistan, 1997.*** Atlas of Pakistan. Director Map Publication, Survey of Pakistan, Rawalpindi.

Annexure-4: Glossary

Air pollution	Air is made up of a number of gases, mostly nitrogen and oxygen and, in smaller amounts, water vapour, carbon dioxide and argon and other trace gases. Air pollution occurs when harmful chemicals and particles are emitted to the air – due to human activity or natural forces – at a concentration that interferes with human health or welfare or that harms the environment in other ways.
Ambient air quality	Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution.
Archaeology	The study of human history and prehistory through the excavation of sites and the analysis of artefacts and other physical remains.
Biodiversity	The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.
Bye-law	A rule made by a local authority to govern activities within the area it controls. Examples include bye-laws covering waste disposal, traffic or public events or signs.
Carbon dioxide (CO_2)	A colourless gas that is naturally produced by animals and people in the exhaled air and the decay of plants.
Carbon monoxide	A highly poisonous, odourless, tasteless and colourless gas that is formed when carbon material burns without enough oxygen.
Climate	The pattern of weather in a particular region over a set period of time, usually 30 years.
Compost	A rich soil-like material produced from decayed plants and other organic matter, such as food and animal waste, that decomposes (breaks down) naturally.
Conservation	Preserving or protecting animals and resources such as minerals, water and plants through planned action (such as breeding endangered species) or non-action (such as not letting taps run unnecessarily).
Deforestation	The reduction of trees in a wood or forest due to natural forces or human activity such as burning or logging.
Electromagnetic Field	Electromagnetic fields are a combination of invisible electric and magnetic fields of force. They are generated by natural phenomena like the Earth's magnetic field but also by human activities, mainly through the use of electricity.
Effluent	Liquid wastes such as sewage and liquid waste from industries.
Energy efficiency	Actions to save fuels, for example, better building design, changing production processes, developing better transport policies, using better road vehicles and using insulation and double glazing in homes.
EIA	An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs and policies.
EMP	An environmental management plan (EMP) is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.
Fauna	The animals of a particular region, habitat, or geological period.

Flora	The plants of a particular region, habitat, or geological period.
Habitat	The area occupied by a community or species (a group of animals or plants), such as a forest floor, desert or seashore.
Initial Environmental Examination	Initial environmental examinations describe the environmental condition of a project, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring.
Grid Station	An electrical Power grid station is an interconnection point between two transmission ring circuits, often between two geographic regions. They might have a transformer, depending on the possibly different voltages, so that the voltage levels can be adjusted as needed.
NEQS	The National 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-5: List of Persons and Stakeholders met during EIA

No.		Name of Person	Designation
1.	Stakeholders	Mr. Muhammad Yasin	Deputy Manager, Environment & Social Safeguard Section, IESCO
2.		Mr. Sher Afzal	Assistant Manager, Environment & Social Safeguard Section, IESCO
3.		Mr. Mohammed Amin	Surveyor, IESCO, Islamabad
4.		Mr. Asif Majeed	Director, CDA, Environment Protection Cell
5.		Dr. Asif Khoja	Assistant Professor, NUST
6.		Engr. Mohammad Usama	International Islamic University
7.		Mr. Syed Zain Shah	CEO, ZIG Engineers
8.		Mr. Mohammad Yasir	Architect, Diamond Architects
9.		Mr. Mohammad Daniyal	Project Engineer, MOJAZ Foundation
10.		Dr, Irshad Ahmed	Director, HSEQ Consultants

No.	Area	Name	Age	Gender	Education	Occupation	Marital Status
11.	Sector I-11, Islamabad	Hakim Khan	26	Male	Primary	Dumper Driver	Married
12.		Mohammad Zia	18	Male	Primary	Student	Single
13.		Zubair Abbas	39	Male	F.A	Private Job	Married
14.		Wazir Azam	28	Male	Primary	Excavator Driver	Married
15.		Ali Asghar	35	Male	Matric	Business	Married
16.		Mohammad Ali Khan	55	Male	Middle	Business	Married
17.		Mohammad Hayat	32	Male	Matric	Shopkeeper	Married
18.		Danish Mughal	25	Male	Primary	Labor	Single
19.		Malik Shahid	40	Male	Illiterate	Labor	Married
20.		Mohammad Ikhlaq	38	Male	Illiterate	Driver	Married
21.		Yahya Ali	55	Male	PhD	Professor	Married
22.		Mohammad Shahid	50	Male	Primary	Zameedar	Married
23.		Hameed Ullah	38	Male	M.A	Private Job	Married

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

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CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

Reference Number: ESPAK/323/20/AA/2026/00151 **Date:** 26/10/2020
Name of Industry/Client: Project Procurement International
Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Telephone No.: ----
Nature of Sample: Ambient Air **Monitoring Location:** Grid Station - 11, I-11/2, Islamabad.
Date of Sample Collection: 22/10/2020 **Grab / Composite:** Continuous - 24 Hours
Sample Collected/Sent By: Ameer Hamza, Field Officer, ESPAK
Date of Completion of Analysis: 23/10/2020

S. No	Parameters	Limit Values (NEQS-24Hours)	Concentration	Method / Equipment Used	Remarks
1	Carbon Monoxide (CO)	10 mg/m³ (1 Hour)	0.5-1.9 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
2	Carbon Monoxide (CO)	5 mg/m³ (8 Hours)	0.9-1.5 mg/m³	Non Dispersive Infrared Absorption (NDIR)	Within Prescribed Limits
3	Sulfur Dioxide (SO_2)	120 µg/m³	20.6 µg/m³	UV Fluorescence (UVF)	Within Prescribed Limits
4	Ozone (O_3)	130 µg/m³ (1 Hour)	0.01-14.6 µg/m³	Non Dispersive UV Absorption	Within Prescribed Limits
5	Oxides of Nitrogen as NO	40 µg/m³	12.3 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
6	Oxides of Nitrogen as NO_2	80 µg/m³	22.2 µg/m³	Chemiluminescence Detection	Within Prescribed Limits
7	Particulate Matter $PM_{2.5}$	35 µg/m³	27.2 µg/m³	Particulate Sensor	Within Prescribed Limits
8	Particulate Matter PM_{10}	150 µg/m³	115 µg/m³	Particulate Sensor	Within Prescribed Limits
9	Suspended Particulate Matter (SPM)	500 µg/m³	199 µg/m³	Particulate Sensor	Within Prescribed Limits

NEQS: National Environmental Quality Standards for Ambient Air, 2010
- Uncertainty of Measurement (UoM) data will be provided on request, if applicable.

Note:
- **The report should be reproduced as a whole and not in parts.**
- **The responsibility of the ethical use of this report lies with the client.**
- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**

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ISO 9001:2015 ISO 14001:2015 ISO 45001-2018

Environmental Services Pakistan

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NOISE MONITORING REPORT

Reference Number: ESPAK/323/20/N/2027/00143 **Date:** 26/10/2020
Name of Industry/Client: Project Procurement International
Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Telephone No.: ----
Nature of Sample: Noise
Date of Sample Collection: 22/10/2020 **Grab / Composite:** Continuous - 24 Hours
Sample Collected/Sent By: Ameer Hamza, Field Officer, ESPAK
Date of Completion of Analysis: 23/10/2020
Method/Equipment Used: Sound Level Meter

S. No	Measurement Point	Limit Values (NEQS)	Noise Level in dB(A) Leq	Remarks
1	Grid Station - 11, I-11/2, Islamabad - Day Time	75 dB(A)	48 dB(A)	Within Prescribed Limits
2	Grid Station - 11, I-11/2, Islamabad - Night Time	65 dB(A)	43 dB(A)	Within Prescribed Limits

NEQS: National Environmental Quality Standards for Noise in Industrial Area, 2010 Day Time Hours (6:00 am to 10:00 pm) Night Time Hours (10:00 pm to 6:00 am)

- Uncertainty of Measurement (UoM) data will be provided on request, if applicable.

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- The report data is not intended to be used legally by the client.

1. **Sample Analyzed By:** Ameer Hamza, Field Officer
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**
   Name: Imran Malik
   General Manager
   Date: 26/10/2020

---------- End of Report ----------

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ISO 9001:2015 ISO 14001:2015 ISO 45001-2018

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CHEMICAL ANALYSIS TEST REPORT (SURFACE WATER)

Reference Number: ESPAK/323/20/SW/2025/00301 **Date:** 29/10/2020
Name of Industry / Client: Project Procurement International
Address: Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
Telephone No.: ----
Nature of Sample: Water in I-11/2 Stream
Date Sample Received: 24/10/2020 **Grab / Composite:** Grab
Date of Sample Collection: 23/10/2020
Sample Collected / Sent By: Ameer Hamza, Field Officer, ESPAK
Date of Completion of Analysis: 29/10/2020

S. No	Parameters	Reference Values (NEQS)	Concentration	Method / Equipment Used	Remarks
1	pH value (H^+)	6-9	8.2	SMWW 4500H^+ B	----
2	Turbidity	≤ 29 NTU (US Class IV)	5.26 NTU	SMWW 2130B	----
3	Odor	NGVS	Acceptable	Organoleptic	----
4	Total Dissolved Solids (TDS)	3500 mg/L	651 mg/L	SMWW 2540 C	----
5	Sulfate (SO_4^{2-})	600 mg/L	37 mg/L	SMWW 4500 - SO_4^{2-} C	----
6	Fluoride (as F^-)	10 mg/L	0.34 mg/L	U.S. EPA 9214	----
7	Nitrate	NGVS	9.98 mg/L	SMWW 4500-NO_3-B	----
8	Nitrite	NGVS	1.79 mg/L	SMWW 4500 NO2 B	----
9	Total Suspended Solids (TSS)	200 mg/L	17 mg/L	SMWW 2540 D	----
10	Arsenic (As)	1.0 mg/L	ND	U.S. EPA-200.7	----
11	Lead (Pb)	0.5 mg/L	ND	U.S. EPA-200.7	----
12	Mercury (Hg)	0.01 mg/L	ND	U.S. EPA-200.7	----
13	Biochemical Oxygen Demand (BOD_5) at 20 °C	80 mg/L	8 mg/L	SMWW 5210 B	----
14	Chemical Oxygen Demand (COD)	150 mg/L	62 mg/L	SMWW 5220 D	----
15	Total Hardness as $CaCO_3$	NGVS	441 mg/L	SMWW 2340-C	----

NEQS: National Environmental Quality Standards for Municipal & Liquid Industrial Effluents, 2000
SMWW: Standard Methods for the Examination of Water and WasteWater 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation USA (2017)
USEPA: United States Environmental Protection Agency
NGVS: No Guideline Value Set
ND: Not Detected
oratory tests and measurements were carried out at 25 ± 2 °C and 50 ± 10 % Relative Humidity conditions unless stated otherwise.
ertainty of Measurement (UoM) data will be provided on request, if applicable.

Note:
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The values represent sample conditions when monitoring/testing was carried out.
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ISO 9001:2015 ISO 14001:2015 ISO 45001-2018

Annexure-7: Flora and Fauna in the Project Area

Flora

No	Botanical Name	Family	Life type	Status	Habitat type		
					Agri. Land	Eroded Shrub Land	River Bed
1	Acacia nilotica	Mimosaceae	Tree	C	✓	✓	
2	Acacia modesta	Mimosaceae	Tree	C	✓	✓	
3	Achyranthes aspera	Amaranthaceae	Herb	C	✓	✓	✓
4	Acrachne ramosa	Poaceae	Grass	C	✓	✓	
5	Amaranthus viridis	Amaranthaceae	Herb	C	✓	✓	✓
6	Aristida mutabilis	Poaceae	Grass	C	✓	✓	✓
7	Artemisia scoparia	Asteraceae	Herb	C	✓	✓	✓
8	Boerhaavia procumbens	Nyctaginaceae	Herb	C	✓	✓	
9	Broussonesia papyrifera	Moraceae	Tree	R	✓	✓	
10	Calotropis procera	Asclepiadaceae	Shrub	C	✓	✓	✓
11	Sepium sebiferum	Euphorbiaceae	Tree	Cult.	✓		
12	Chenopodium album	Chenopodiaceae	Herb	C	✓	✓	
13	Alternanthera sessilis	Amaranthaceae	Herb	C	✓	✓	
14	Convolvulus arvensis	Convolvulaceae	Climber	C	✓	✓	
15	Rumex nepalense	Polygonaceae	Herb	C	✓		✓
16	Cannabis sativus	Cannabaceae	Herb	C	✓	✓	
17	Cassia fistula	Caesalpiniaceae	Tree	LC	✓		
18	Asphodelus tenuifolius	Liliaceae	Herb	C	✓		
19	Conyza Canadensis	Asteraceae	Herb	C	✓	✓	✓
20	Thuja orientalis	Cupressaceae	Shrub	LC	✓		
21	Chenopodium ambrossioides	Chenopodiaceae	Herb	VC	✓	✓	✓
22	Bauhinia variegata	Caesalpiniaceae	Tree	C	✓		
23	Cordia myxa	Boraginaceae	Tree	LC	✓		
24	Jasminum humile	Oleaceae	Shrub	LC	✓	✓	
25	Fumaria indica	Fumariaceae	Herb	C	✓	✓	✓
26	Albizia lebbeck	Caesalpiniaceae	Tree	LC	✓	✓	
27	Pinus roxburghii	Pinaceae	Tree	LC	✓		
28	Ricinus communis	Euphorbiaceae		C	✓	✓	✓
29	Cynodon dactylon	Poaceae	Grass	VC	✓	✓	✓
30	Silybum marianum	Asteraceae	Herb	VC	✓	✓	✓
31	Leucaena leucantha	Mimosaceae	Tree	C	✓	✓	
32	Cyperus rotundus	Cyperaceae	Sedge	C	✓		✓

No	Botanical Name	Family	Life type	Status	Habitat type		
					Agri. Land	Eroded Shrub Land	River Bed
33	Bambusa indica	Poaceae	Grass	LC	✓		
34	Dactyloctenium scindicum	Poaceae	Grass	VC	✓	✓	✓
35	Dalbergia sissoo	Papilionaceae	Tree	C	✓	✓	
36	Cassia oxidentalis	Caesalpiniaceae	Herb	C	✓	✓	✓
37	Desmostachya bipinnata	Poaceae	Grass	VC		✓	✓
38	Eriobotrya japonica	Rosaceae	Tree	Cult.	✓		
39	Dicanthium anulatum	Poaceae	Grass	C	✓	✓	
40	Eragrastis japonica	Poaceae	Grass	C		✓	✓
41	Eucalyptus globulus	Myrtaceae	Tree	Cult.	✓		
42	Ficus virgata	Moraceae	Shrub	C	✓	✓	
43	Ipomoea carnea	Convolvulaceae	Shrub	C		✓	✓
44	Imperata cylindrica	Poaceae	Grass	C		✓	
45	Lantana camara	Verbenaceae	Shrub	VC	✓	✓	
46	Dodonaea viscosa	Sapindaceae	Shrub	C		✓	
47	Launaea procumbens	Asteraceae	Herb	C	✓	✓	✓
48	Euphorbia helioscopia	Euphorbiaceae	Herb	C	✓	✓	✓
49	Pongamia pinnata	Papilionaceae	Tree	Cult.	✓		
50	Malva sylvestris	Malvaceae	Herb	C	✓	✓	✓
51	Malvastrum coromendelianum	Malvaceae	Herb	C	✓	✓	✓
52	Melia azadirach	Meliaceae	Tree	Cult.	✓		
53	Morus alba	Moraceae	Tree	C	✓	✓	
54	Sonchus asper	Asteraceae	Herb	C	✓	✓	✓
55	Ochthocloa compressa	Poaceae	Grass	C	✓	✓	
56	Parthenium hysterophorus	Asteraceae		VC	✓	✓	✓
57	Persicaria glabra	Polygonaceae	Herb	C			✓
58	Echinops echinatus	Asteraceae	Herb	LC		✓	✓
59	Phoenix sylvestris	Palmae	Tree	Cult.	✓		
60	Populus euphratica	Salicaceae	Tree	Cult.	✓	✓	
61	Tecomella undulata	Bignoniaceae	Shrub	LC		✓	
62	Psidum guajava	Myrtaceae	Tree	Cult.	✓		
63	Tamarix aphylla	Tamaricaceae	Tree	R		✓	✓
64	Saccharum bengalense	Poaceae	Grass	C		✓	✓
65	Saccharum spontaneum	Poaceae	Grass	C		✓	✓
66	Trichodesma indicum	Boraginaceae	Herb	LC		✓	✓

No	Botanical Name	Family	Life type	Status	Habitat type		
					Agri. Land	Eroded Shrub Land	River Bed
67	Salvia moorcroftiana	Labiatae	Herb	C		✓	✓
68	Solanum nigrum	Solanaceae	Herb	C	✓	✓	✓
69	Sorghum halepense	Poaceae	Grass	C	✓	✓	✓
70	Withania somnifera	Solanaceae	Herb	C	✓	✓	✓
71	Xanthium strumarium	Asteraceae	Herb	VC	✓	✓	✓
72	Salix babylonica	Salicaceae	Tree	LC			✓
73	Zaleya pentandera	Aizoaceae	Herb	C	✓		
74	Ficus elastica	Moraceae	Tree	LC	✓		
75	Ziziphus nummularia	Rhamnaceae	Tree	C	✓	✓	
76	Eugenia jambolana	Myrtaceae	Tree	Cult.	✓		
77	Euphorbia royleana	Euphorbiaceae	Shrub	Cult.	✓		
78	Carica papaya	Caricaceae	Tree	Cult.	✓		
79	Solanum surrattense	Solanaceae	Herb	LC		✓	✓
80	Datura innoxia	Solanaceae	Herb	LC		✓	✓
81	Toona sinensis	Meliaceae	Tree	Cult.	✓		
82	Ligustrum sp.	Oleaceae	Shrub	Cult.	✓		
83	Canna indica	Cannaceae	Herb	Cult.	✓		
84	Citrus acida	Rutaceae	Shrub	Cult.	✓		
85	Aloe vera	Liliaceae	Herb	Cult.	✓		
86	Callistamon lanceolatus	Myrtaceae	Tree	Cult.	✓		
87	Yucca sp.	Agavaceae	Herb	Cult.	✓		
88	Albizia sp.	Caesalpiniaceae	Tree	Cult.	✓		

Note:

C = *Common*

VC = *Very Common*

LC = *Less Common*

R = *Rare*

Cult = *Cultivated*

Fauna

No.	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	Trachybaptus ruficollis	Little Grebe		x				x
2	Coturnix coturnix	Common Quail		x				x
3	Columba livia	Rock Pigeon		x				x
4	Psittacula krameri	Parakeet		x				x
5	Centropus sinensis	Common crow		x				x
6	Alcedo atthis	Kingfisher		x				x
7	Merops orientalis	Blue tailed ant eater		x				x
8	Coracias benghalensis	Indian roller/ Blue jay		x				x
9	Pycnonotus cafer	Red vented, Bulbul		x				x
10	Saxicola caprata	Pied bush		x				x
11	Dicrurus macrocercus	King crow	x				x	
12	Acridotheres ginginianus	Myna		x				x
13	Francolinus francolinus	Black Partridge			x			x
14	Streptopelia decaocto	Collared dove		x				x
15	Francolinus pondecerianus	Grey Partridge	x					x
16	Corvus splendens	House Crow	x					x
17	Passer domesticus	House Sparrow	x					x
18	Acridotheres tristis	Indian Myna		x				x
19	Streptopelia senegalensis	Little Brown Dove		x				x
20	Pycnonotus leucogenys	White cheeked Bulbul		x				x

List of Mammals

No.	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	Canis aureus	Asian Jackal		x				x

2	Canis lupus	Wolf		x				x
3	Felis chaus	Jungle Cat		x				x
4	Herpestes javanicus	Grey Mangoos		x				x
5	Hystrix indica	Indian Porcupine		x				x
6	Lepus nigricollis	Indian Hare, Wild Hare		x				x
7	Sus scrofa	Indian Wild Boar		x				x

List of Reptiles

No	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	Calotes versicolor	Garden Lizard		x				x
2	Echis carinatus	Saw scaled viper			x			x
3	Spalerosophis diadema	Diadem Snake			x			x
4	Uromastix hardwicki	Spiny Tailed Lizard			x			x
5	Varanus bengalensis	Indian Monitor			x			x