Electricity Distribution Efficiency Improvement Project (EDEIP)

Islamic Republic of Pakistan

Environmental and Social Impact Assessment (ESIA)

Volume I – Main Text

of

132-kV Arifwala-II Grid Station,
132-kV Dera Ghazi Khan-III Grid Station,
132-kV Khanewal-II Grid Station,
132-kV Layyah-II Grid Station,
132-kV Rahim Yar Khan-III Grid Station,
132-kV Shah Jamal Grid Station,
and
Associated Transmission Lines

Multan Electric Power Company (MEPCO)

January 2026

Executive Summary

The Multan Electric Power Company (MEPCO) is planning to construct six new grid stations namely 132-kilovolt (kV) Arifwala-II, 132-kV Dera Ghazi Khan-III, 132-kV Khanewal-II, 132-kV Layyah-II, 132-kV Rahim Yar Khan-III, and 132-kV Shah Jamal grid stations and the associated 132-kV transmission lines to connect these grid stations with the existing transmission line network (these works will be described as the proposed subproject in this document). All components of the proposed subproject are located in the Punjab province.

MEPCO is undertaking the proposed subproject under the Electricity Distribution Efficiency Improvement Project (EDEIP), with the financial assistance from the World Bank (WB). The EDEIP also includes the Peshawar Electric Supply Company (PESCO) and the Hyderabad Electric Supply Company (HESCO), in addition to the Power Division of the federal Ministry of Energy.

This Environmental and Social Impact Assessment (ESIA) has been prepared to address the potential environmental and social (E&S) risks and impacts of the proposed subproject, in compliance with the national/provincial regulatory requirements as well as the WB Environmental and Social Framework (ESF).

EDEIP Overview

The aim of EDEIP is to improve the operational efficiency, reliability, and quality of electricity distribution companies (DISCOs). The EDEIP has four components: Improving Grid Reliability, Modernizing Operations and Management; Building Capacity and Technical Assistance; and Reform Support. The first component covers the investments for the Secondary Transmission and Grid (STG) and Energy Loss Reduction (ELR) programs. The second component includes modernization of the operations and management functions using latest equipment, technology and information systems. The third component includes improving operations and maintenance, capacity building and training, and EDEIP implementation support. The fourth component aims to support implementation of power sector reforms and improve sector governance.

Subproject Overview

The proposed subproject is a part of the first component of EDEIP and comprises construction and operation of six new 132-kV grid stations and their associated 132-kV transmission lines, as described below.

The 132-kV Arifwala-II Grid Station will be constructed in an agricultural area just outside the Arifwala town, about 193-kilometers (km) from Multan. About five acres of government-owned barren land is being acquired for this grid station. About 200-meters (m) long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network.

The 132-kV Dera Ghazi Khan (DG Khan)-III Grid Station will be constructed in an agricultural area outside the DG Khan town, about 100-km from Multan. About four acres of privately owned cultivated land is being acquired for this grid station. About 400-m long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network.

The 132-kV Khanewal-II Grid Station will be constructed in an agricultural area just outside the Khanewal town, about 60-km from Multan. About eight acres of government-owned barren land is being acquired for this grid station. About 1-km long 132-kV double circuit transmission line

will also be constructed to connect the proposed grid station with the existing transmission line network.

The 132-kV Layyah-II Grid Station will be constructed in Layyah town, about 130-km from Multan. About three acres of government-owned barren land is being acquired for this grid station. About 200-m long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network.

The 132-kV Rahim Yar Khan-III Grid Station will be constructed in an agricultural area outside the Rahim Yar Khan town, about 260-km from Multan. About seven acres of government-owned barren land is being acquired for this grid station. About 5-km long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network.

The 132-kV Shah Jamal Grid Station will be constructed outside the Shah Jamal town, about 85-km from Multan. About six acres of government-owned barren land is being acquired for this grid station. About 14-km long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network.

The key equipment and components to be installed in each grid station will include power transformers, circuit breakers and isolators, switchgears, lightning arrestors, protection and control system, earthing system, and control panels. The key construction activities will include land clearing and leveling, excavations for foundations, concreting for foundations, erection of steel works and gantries, equipment installation, cabling and connections, construction of control building and office block, construction of boundary wall and fencing, and finally, testing and commissioning. For the transmission lines, the key equipment includes lattice steel towers, conductors, insulators and other accessories. The key construction activities for the transmission lines will include excavation for foundations of towers, concreting for foundations, tower erection, stringing of conductors, installation of insulators and other accessories, and finally, testing and commissioning.

Institutional and Legislative Framework for Environmental and Social Management

The key regulatory institution for the management of E&S aspects of the proposed subproject is the Punjab Environmental Protection Agency (Punjab EPA) that has been established under the Pakistan Environmental Protection Act 1997. The key provincial legislation to manage the E&S aspects of the proposed subproject is the Punjab Environmental Protection Act, 2012, which is a comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment in the Punjab province. Under this Act, MEPCO will seek environmental approvals for the proposed subproject from the Punjab EPA.

In addition to the national/provincial legal requirements, the subproject will also comply with the World Bank's ESF as well as the Environmental and Social Standards (ESSs).

Environmental and Social Management Framework (ESMF)

To address the generic environmental and social impacts associated with the EDEIP and to define principles, assessment criteria and procedures to prepare various E&S documents for various EDEIP subprojects, an Environmental and Social Management Framework (ESMF) has been prepared, in accordance with the WB ESF. The present ESIA has been prepared based upon the principles and criteria described in the ESMF.

Overview of Baseline Conditions

In the administrative setup of Punjab, the province is divided in to divisions, districts and tehsils. There are nine divisions, 36 districts and 143 tehsils in Punjab. The total population[1] of Punjab was estimated to be 127.7 million in 2023, which is about 53% of the national population. The province had an annual population growth rate of 2.4% to 2.55% in 2025 compared with the national growth rate of 1.5% to 1.9%. The main languages spoken in the province include Punjabi, Urdu and Saraiki and the dialects of Mewati and Potowari.

In 2023, the national literacy rate was about 60.6% while the literacy rates in the province was 64-66% in 2024. According to Pakistan Social and Living Standards Measurement (PSLM) survey[2], out of school children at National level is 32 percent in 2019- 20. Overall regional comparison shows that out of school children are higher in rural areas with 37 percent as compared to 22 percent in urban areas. Overall Punjab has the lowest out of school children with 24 percent while Balochistan has the highest out of school children with 47 percent.

The health facilities are available to the people in the province. In 2019[3], 389 hospitals, 1201 dispensaries, 319 rural health centers, 2510 basic health units, 17 tuberculosis (TB) centers and 280 MCH centers were providing services to the people of Punjab.

The major crops in the province are wheat, rice, sugarcane, cotton, gram, maize, jowar and bajra. In 2018-19[4], the area under cultivation of wheat was 6.49 million hectares (ha), rice 1.90 million ha, sugarcane 711000 ha, cotton 1.88 million ha, gram 856000 ha, maize 574000 ha, jowar 212000 ha, and bajra 428000 ha.

The livestock of Punjab included cattle, buffalos, sheep, goats, poultry, camels, horses, mules and donkeys. The population of cattle in the province was 13.2 million, buffalos were 16.01 million, sheep were 4.9 million, goats were 17.4 million, poultry were 481.6 million, camels were 0.2 million, horses were 0.1 million, mules were 73000 and donkeys were 1.99 million.

The civilian labor force in the province was 39.98 million in 2017-18 which included 28.76 million male and 11.22 million female. Out of total reported labor force, 37.60 million is employed and 2.39 million labor force was unemployed.

Arifwala-II Grid Station: Situated on degraded agricultural state land in Chak No. 61/EB near Burewala – Arifwala road. The surrounding area is mostly cultivated. There is no major water body in the vicinity of the grid station (GS) site except the irrigation channels. There are no major existing sources of environmental pollution in the area. The site is not located in any ecological sensitive area, in view of the presence of settlements and cultivation in the area. The ambient air and water quality as well as noise levels in the area were found to be within the acceptable limits.

DG Khan-III Grid Station: Situated on agricultural land in Basti Jhok Yar Shah on Indus Highway, about 8-km from DG Khan city. The area is mostly agricultural with scattered settlements. There is no major water body in the vicinity of the GS site. There are no major existing sources of environmental pollution in the area. The site is not located in any ecological

[1] Bureau of Statistics, Punjab in Figures 2020

[2] Key Findings Report Pakistan Social and Living Standards Measurement Survey 2019-20

[3] Bureau of Statistics, Punjab in Figures 2020

[4] Bureau of Statistics, Punjab in Figures 2020

sensitive area, in view of the presence of settlements and cultivation in the area. The ambient air and water quality as well as noise levels in the area were found to be within the acceptable limits.

Khanewal-II Grid Station: Located in Chak No. 167/10-R near District Jail Khanewal, the site comprises state land already transferred to MEPCO. It is easily accessible via local roads connecting to the N-5 National Highway. The surrounding area is mostly cultivated with scattered settlements. There is no major water body in the vicinity of the GS site. There are no major existing sources of environmental pollution in the area. The site is not located in any ecological sensitive area, in view of the presence of settlements and cultivation in the area. The ambient air and water quality as well as noise levels in the area were found to be within the acceptable limits.

Layyah-II Grid Station: This site is situated at Chak Mandi Town near Chowk Azam. It is a semi urban area with some agriculture fields, under-construction government college and settlements. There is no major water body in the vicinity of the GS site. There are no major existing sources of environmental pollution in the area. The site is not located in any ecological sensitive area, in view of the presence of settlements and cultivation in the area. The ambient air and water quality as well as noise levels in the area were found to be within the acceptable limits.

Rahim Yar Khan-III Grid Station Situated on barren state land in Mouza Bhutta Kot, near Iqbalabad on main national highway (N-5). The surrounding area is mostly agricultural with some small industrial units. There is no major water body in the vicinity of the GS site. There are no major existing sources of environmental pollution in the area except some air pollution and noise caused by the vehicular traffic on the adjacent highway. The site is not located in any ecological sensitive area, in view of the presence of settlements and cultivation in the area. The ambient air and water quality as well as noise levels in the area were found to be within the acceptable limits.

Shah Jamal Grid Station: Situated on barren land in Basti Jarh, Moza Rukh, about 3-km from Shah Jamal town. The area is semi-rural with sparse population. There is no major water body in the vicinity of the GS site. There are no major existing sources of environmental pollution in the area except some air pollution and noise caused by the vehicular traffic on the adjacent highway. The site is not located in any ecological sensitive area, in view of the presence of settlements and cultivation in the area. The ambient air and water quality as well as noise levels in the area were found to be within the acceptable limits.

E&S Scoping

The E&S scoping was carried out during the preparation of this ESIA. The Scoping considered all E&S impacts and issues that could be caused by grid station construction and transmission line laying works and then considered their relevance with the proposed subproject's nature, activities involved and its environmental and social settings. The E&S issues that were considered to be relevant to the proposed subproject were scoped-in and the ones that were not relevant to the proposed subproject were scoped-out. The aspects that are scoped-in include soil erosion and contamination, air quality deterioration, water contamination, noise generation, land acquisition and involuntary resettlement, occupation health and safety (OHS) risks, community health and safety (CHS) risks, blocked roads and routes, waste generation, labor influx, sexual exploitation and abuse (SEA) and sexual harassment (SH), child labor, and damage to existing infrastructure such as roads, public utilities and irrigation network. The key aspects that have been scoped-out include impacts on biological resources and impacts on

cultural heritage sites. The aspects that have been scoped-in have been further assessed and their mitigation and control measures have been identified in this ESIA. The aspects that have been scoped-out have not been further discussed in this ESIA.

Potential Impacts

Most of the grid station construction works will be carried out within the grid station sites, hence their potential E&S impacts will mostly be confined to the site boundaries and their immediate vicinities. During the construction phase, these impacts will include: dust and noise generation as well as air quality deterioration caused by the excavation activities and operation of construction machinery and movement of vehicles; waste water releases from the construction sites and workers' camps causing soil and water contamination; soil erosion caused by excavation for foundations; OHS risks for construction workers caused by working near moving machinery/vehicles, lifting and hoisting, working at heights, working in confined spaces, fall and trips, and working at/near energized systems/equipment; CHS risks for nearby population associated with the vehicle movement, construction activities and electrocution; generation of solid waste including hazardous waste; disposal of spoil/excavated material; land acquisition and involuntary resettlement; damage to crops; issues related to labor influx (such as SEA/SH); living conditions within workers' camps; and child labor.

During the operation and maintenance (O&M) phase, the potential E&S risks associated with the grid stations will include OHS risks particularly working at heights and electrocution, safety risks for the communities particularly the residents of staff colony, soil and water contamination in case of transformer oil leakage, release of effluents (particularly, toilet waste) from office/control building and staff colony; and solid waste generation from office, workshop and staff colony.

The construction of transmission lines (TLs) will mostly cause impacts quite similar to the ones described above for the grid station construction. These include dust and noise generation as well as air quality deterioration caused by the excavation activities and operation of construction machinery and movement of vehicles; waste water releases from the construction sites causing soil and water contamination; soil erosion caused by excavation for tower foundations; OHS risks for construction workers caused by working near moving machinery/vehicles, lifting and hoisting, working at heights, fall and trips, and working at/near energized systems/equipment; safety risks for nearby population associated with the vehicle movement, construction activities and electrocution; generation of solid waste including hazardous waste; disposal of spoil/excavated material; damage to crops; blocked local roads and routes; issues related to labor influx (such as SEA/SH); and child labor. Furthermore, the construction activities will pose a greater risk of SEA/SH issues, privacy issues, as well as community health and safety risks.

The E&S risks associated with the O&M phase of the TLs include OHS risks particularly working at heights and electrocution, and SEA/SH and safety risks particularly electrocution for communities within the right of way (RoW) of TLs.

Mitigation Measures

The risks and impacts described above will be mitigated and controlled mostly with the help of standard mitigation measures. For the construction phase, the mitigation measures to address environmental risks and impacts would include balancing cut and fill operations to minimize spoil production and also need of fill material; water sprinkling to control dust emissions; scheduling construction activities during the daytime to minimize the impact of noise generation; apprising the local communities about noise generation and safety risks associated with the construction activities; treating the waste effluents released from the site; treating the toilet waste from the

workers' camps appropriately (such as through septic tanks); avoiding soil erosion by appropriate techniques such as building dykes and covering the loose soil; disposing non-hazardous waste through the municipality waste handling and disposal system; disposing hazardous waste in accordance with the associated material safety data sheet (MSDS); addressing OHS risks through adopting a stringent OHS management regime that would include employing properly qualified and trained OHS staff at the construction sites, hazard risk assessment and implementing standard operating procedure (SOP) for each construction activity.

The construction phase mitigation measures for social risks and impacts would include preparing and implementing resettlement plans for the grid station sites and transmission line RoWs where involuntary resettlement issues are likely to exist; barricading the construction sites to avoid entry of community members particularly children; awareness raising and training of subproject staff and workers about gender issues particularly SEA/SH; adopting a code of conduct (CoC) covering gender, cultural and SEA/SH issues, to be followed by all site personnel; ensuring proper living conditions within the worker's camps in accordance with the labor laws; identifying alternate routes in consultation with the communities, in case of blockage of routes and tracks; ensuring that no child labor is employed at the site and workers' camps; repairing any damaged infrastructure or public utilities; and paying compensation for any crop or any structure damaged by the construction works.

During the O&M phase, the MEPCO's existing OHS management system will be strictly followed to address the OHS risks. The mitigation and control measures for the remaining O&M-related risks will mostly be the same as described above for the construction phase.

With the help of the above-described mitigation measures, the E&S performance of the proposed subproject is expected to be environmentally and socially sound and sustainable.

Environmental and Social Management Plan (ESMP)

Institutional setup. MEPCO has already established the Project Management Unit (PMU) that includes E&S personnel. MEPCO has also employed the Project Implementation and Management Support Consultants (PIMSC) that also have E&S specialists to carry out E&S assessments and prepare the associated documents (such as this ESIA) for the MEPCO's subprojects under the EDEIP, and also ensure compliance of this ESIA and other E&S documents during the construction phase. The construction contractors to be engaged by MEPCO will also be required to employ fulltime E&S specialists at the construction site to ensure compliance with the E&S documents including this ESIA.

E&S Mitigation and Monitoring. The contractor will be required to implement the mitigation measures identified on the basis of the E&S impact assessment carried out as part of this ESIA (and briefly described above). The PIMSC will carry out compliance monitoring of these mitigation measures. The PIMSC will also carry out effects monitoring for the key E&S parameters such as noise and dust emissions, OHS and CHS incidents, community complaints, and waste management.

Contractor's ESMP (C-ESMP). The construction contractor will be required to prepare and implement C-ESMP that will comprise a number of site- and subproject-specific plans including camp management plan, waste management plan, traffic management plan, OHS management plan, CHS management plan, and site restoration plan. These plans will be prepared on the basis of mitigation and control measures identified in this ESIA.

Capacity building. The PMU, PIMSC and contractors will be required to conduct regular training and awareness raising for the subproject personnel including construction workers, on key E&S aspects such as waste management, OHS management, camp management, grievance management, traffic management, gender aspects particularly SEA/SH, and implementation of CoC.

Grievance Redress Mechanism (GRM). For all of its subprojects under EDEIP, MEPCO has established a three-tier GRM to receive, evaluate, and facilitate the resolution of concerns, complaints, and grievances of the affected communities about the E&S aspects of the subprojects. The GRM will provide a time-bound, early, transparent and fair resolution for affected persons' and other stakeholders' grievances regarding E&S management of the proposed subproject (and MEPCO's other subprojects under EDEIP). Under this GRM, a separate mechanism will be established to address labor-related complaints; similarly, a mechanism will also be established to address the complaints related to gender-based violence (GBV).

Stakeholder Consultations

A Stakeholder Engagement Plan (SEP) has been prepared for the entire EDEOP, to provide the context, objectives, principles and procedures for the stakeholder engagement and consultations to be carried out during the EDEIP implementation. The stakeholder consultations for this ESIA were carried out in accordance with the guidelines provided in the SEP. These consultations were carried out in July-August 2024 and then during January 2025. These consultations comprised 44 community sessions engaging 353 participants. During these sessions, subproject details and their likely E&S impacts were explained to the participants and their views, comments and concerns obtained about the subproject and its impacts. Separate consultations were carried out with the relevant government departments to seek their views and concerns about the proposed subproject and its E&S impacts.

During these consultations, community participants generally welcomed the subproject, appreciating that it would improve the electricity availability and reliability in the area. Their key concerns particularly related to the safety risks, damage to crops, decrease in value of land under the TLs, inappropriate behavior of contractors, violation of local norms, labor influx, lack of communication from MEPCO, noise and dust generation, health and safety issues, blocked accesses and disturbance, issues related to land acquisition, delay in compensation payments; while their key expectation from the subproject was about the availability of job opportunities during the construction phase. They were assured, during the consultations, that MEPCO would take all necessary precautionary and mitigation measures to ensure safety of the nearby communities, and to address all the subproject-related impacts. They were informed that these consultations will be documented in the ESIA of the subproject. They were further informed that the ESIA will describe all the mitigation and monitoring measures of the proposed subproject and the contractors would be bound to implement these mitigation measures. They were also informed that the contractor will be required to offer job opportunities to the local population.

The government departments broadly supported the proposed subproject and assured their full support to MEPCO and its contractors during the subproject implementation. The Assistant Director of the Punjab EPA enquired about the compliance with the Punjab Environmental Quality Standards (PEQS). The Deputy Director of the Social Welfare Department enquired about the job opportunities to the local people. The Assistant Director of the Agriculture Department was concerned about damage to irrigation channels and cultivated fields. The representative of the Forest Department raised concerns about tree cutting. These officials were

assured that their concerns will be included in the impact assessment and appropriate mitigation measures will be included in the ESIA.

Cost of ESIA Implementation

The implementation cost of ESIA has been estimated to be about **PKR 15 million**. It includes cost of laboratory analysis for the key environmental parameters, cost of E&S training, and contingencies.

List of Abbreviations

ABC	Aerial Bundled Cable
AC	Alternating current
ACSR	Aluminum Conductor Steel-Reinforced
AIS	Air Insulated Substation
AMI	Advanced Metering Infrastructure
American National Standards Institute	ANSI
ARAP	Abbreviated Resettlement Action Plan
°C	Degree Celsius
CBO	Community-Based Organization
C-ESMP	Contractor's Environmental and Social Management Plan
CFR	Code of Federal Regulations
CHS	Community health and safety
CSO	Civil society organization
CO	Carbon Monoxide
CoC	Code of conduct
CSA	Canadian Standards Association
CT	Current transformer
dB	Decibel
DC	Deputy Commissioner
DC	Direct Current
DG Khan	Dera Ghazi Khan
DISCO	Distribution Company
E&S	Environmental and social
EC	Electrical conductivity
ECA	Employment of Child Act
ECoP	Environmental Code of Practices
EDEIP	Electricity Distribution Efficiency Improvement Project
EIA	Environmental Impact Assessment
ELR	Energy Loss Reduction
EMF	Electromagnetic Field
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
ERP	Emergency Response Plan
ESHS	Environmental, Social, Health and Safety

ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
ESU	Environmental and Social Cell
ET	Environmental Tribunals
FGD	Focus Group Discussion
GAP	Gender Action Plan
GBV	Gender Based Violence
GDP	Gross domestic product
GHG	Greenhouse Gases
GIIP	Good International Industry Practices
GIS	Gas Insulated Substation
GPS	Global Positioning System
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GS	Grid Station
HESCO	Hyderabad Electric Supply Company
HIV/AIDS	Human immunodeficiency virus / acquired immunodeficiency syndrome
HT	High Tension
HTLS	high-tension low sag
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labor Organization
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JHA	Job Hazard Analysis
kg	Kilogram
km	Kilometer
km/h	Kilometer per hour
kV	Kilovolt
kVA	Kilo Volt Amperes
kWh	Kilowatt-hour
LAA	Land Acquisition Act

LMP	Labor Management Procedures
LOTO	Lockout-Tagout
LT	Low tension
M&E	Monitoring and Evaluation
m	Meter
m	Million
mm	Millimeter
MEPCO	Multan Electric Power Company
MMP	Mitigation and Monitoring Plan
MSDS	Material Safety Data Sheet
MVA	Mega Volt Ampere
NEPRA	National Electric Power Regulatory Authority
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
NHA	National Highway Authority
NOC	No Objection Certificate
NOx	Nitrogen Oxides
O&M	Operation and Maintenance
OCHS	Occupational and community health and safety
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Administration
Pak EPA	Pakistan Environmental Protection Agency
PCB	Poly Chlorinated Biphenyl
PD	Project Director
PEPA	Pakistan Environmental Protection Act
PESCO	Peshawar Electric Supply Company
PEQS	Punjab Environmental Quality Standards
PIMSC	Project Implementation and Management Support Consultants
PKR	Pakistani Rupee
PM	Particulate Matter
PMU	Project Management Unit
PPE	Personal Protective Equipment
PT	Potential transformer
PTW	Permit-to-Work
Punjab EPA	Punjab Environmental Protection Agency
RAP	Resettlement Action Plan

RCC	Reinforced cement concrete
RF	Resettlement Framework
RoW	Right of Way
RP	Resettlement Plan
SCADA	Supervisory Control and Data Acquisition
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SF_6	Sulfur Hexafluoride
SH	Sexual Harassment
SME	Small to medium enterprise
SO_2	sulfur dioxide
SOE	State owned entity
SOP	Standard Operating Procedure
SPM	suspended particulate matter
STG	Secondary Transmission and Grid
STI	Sexually transmitted infections
TL	Transmission Line
TMA	Tehsil Municipal Administration
UV	Ultraviolet
VAC	Violence against children
WAPDA	Water and Power Development Authority
WB	World Bank
WBG	World Bank Group
WHO	World Health Organization

Table of Contents

Annexes

List of Tables

List of Figures

1 Introduction

The Multan Electric Power Company (MEPCO) is planning to construct six new grid stations namely 132-kilovolt (kV) Arifwala-II, 132-kV Dera Ghazi Khan-III, 132-kV Layyah-II, 132-kV Khanewal-II, 132-kV Shah Jamal and 132-kV Rahim Yar Khan-III grid stations and the associated 132-kV transmission lines to connect these grid stations with the existing transmission line network (these works will be described as the proposed subproject in this document). All components of the proposed subproject are located in the Punjab province.

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This Environmental and Social Impact Assessment (ESIA) has been prepared to address the potential environmental and social (E&S) impacts of the proposed subproject, in compliance with the national/provincial regulatory requirements as well as the WB Environmental and Social Framework (ESF).

1.1 Electricity Distribution Efficiency Improvement Project

1.1.1 Background

Over the past few years Pakistan has struggled to meet its fiscal targets. One of the key fiscal risks is the underperformance of the State-Owned Enterprises (SOEs) dominated by power sector entities. Therefore, improving distribution companies' efficiencies is a prime and core requirement to reduce sector's fiscal burden, lower cost of power supply and attract investments.

Pakistan's electricity sector is in crisis due to high cost of generation, dependent on imported fuels that makes the sector vulnerable to changes in fuel prices and currency exchange rates. Higher cost of electricity supply has exacerbated cost recovery challenges for the distribution companies. This has hampered investments particularly by loss making electricity distribution companies (DISCOs) to strengthen their networks and is resulting in increased outages and interruptions, costing businesses and affecting household welfare. These inefficiencies in the sector are estimated to be costing Pakistan about 6.5 percent of its gross domestic product (GDP), according to a World Bank report[5]. Also, in terms of reliability of electricity supply Pakistan is among the lowest performing countries in the world. It is ranked at 167 out of 190 economies on getting electricity indicator in Ease of Doing Business 2019. Moreover, a significant number of households do not have access to electricity and per capita electricity consumption at 471 kilowatt-hour (kWh) is less than one-fifth of the world average according to the World Development Indicators 2017. While government is adding low-cost generation and plans to shift the generation mix towards renewable sources targeting 20 percent by 2025 and 30 percent by 2030, yet long-term financial viability of the power sector is dependent on DISCOs' efficiency improvement.

[5] https://www.worldbank.org/en/region/sar/publication/in-the-dark-how-much-do-power-sector-distortions-cost-south-asia

1.1.2 EDEIP Overview

To address some of the problems discussed above, the EDEIP aims to support the targeted DISCOs by providing financial and technical support for investments to modernize their electricity distribution networks and institutional development resulting in improved operational efficiency in the sector and reliable supply to the consumers. It seeks to help in: (i) physical strengthening of distribution networks; (ii) deployment of modern equipment, technology and information systems; and (iii) provide technical assistance, studies, consultancies and management support. Under the EDEIP, three DISCOs namely HESCO, MEPCO and PESCO have been selected.

The project development objectives for EDEIP are to improve electricity supply and operational efficiency in targeted areas of selected distribution companies and strengthen the capacity of power sector institutions to implement reforms.

1.1.3 EDEIP Components

The various components of EDEIP are explained below.

Component 1: Improving Grid Reliability

This component finances investments in Secondary Transmission and Grid (STG) and Energy Loss Reduction (ELR) programs of the DISCOs to improve reliability of electricity supply and reduce technical losses. The subprojects financed under this Component can be divided into following categories:

- New Grid Stations. Construction of new 132 kV grid stations and the associated transmission lines;
- Existing Grid Stations. Augmentation, extension, conversion, upgradation and rehabilitation of the existing grid stations and the associated transmission lines;
- Transmission Lines. Construction, rehabilitation and re-conductoring of 132-kV (and below) transmission lines with low loss conductors e.g. high-tension low sag (HTLS); and
- Energy Loss Reduction. Expansion and rehabilitation of 33-kV and 11-kV feeders.

Component 2: Modernizing Operations and Management

This component supports modernization of the DISCOs' operations and management functions using latest equipment, technology and information systems. Major activities include:

- Automation and Information Systems. This entails upgradation deployment of information systems and emergency response planning solutions. This will help improve planning, grid operations and customer services by providing access to and integrating modern information systems
- Revenue Protection Program. It comprises of installation of Aerial Bundled Cables (ABC), Advanced Metering Infrastructure (AMI), Transformer monitoring System, and other measures to pre-empt theft, reduce losses, improve recoveries, and better service delivery based on access to reliable and timely data.

Component 3: Capacity Building and Technical Assistance

This component helps build capacity of the DISCOs with particular focus on:

- Improving operations and maintenance. This covers procurement of tools, equipment, hardware, software, consulting and non-consulting services for improved operations and maintenance practices e.g., for live-line maintenance, upgrade repair workshops, inventory/asset management etc.;
- Training and capacity building. Conduct studies and assessments including preparation/updating of manuals, procedures and systems in particular for human resource management, inventory management, procurement, financial management, customer services and safeguards and assist with their implementation and conduct training programs including workshops, seminars and post graduate degrees in relevant fields;
- Project implementation support. This includes financing of: (a) consulting and other services; (b) individual experts/advisors and any incremental staff positions; (c) equipment and software; (d) financial, operational & technical audits; and (e) operating cost of Project Management Units (PMUs).

Component 4: Reform Support

This component supports the implementation of power sector reforms and seeks to improve sector governance.

1.2 Overview of Proposed Subproject

The proposed subproject is being implemented under the Component 1 of EDEIP and comprises construction and operation of six new grid stations and their associated In/Out transmission lines, as listed below (further details are provided later in the document).

- 132-kV Arifwala Grid Station and its associated 200-meters (m) long double circuit transmission line
- 132-kV Dera Ghazi Khan (DG Khan)-III Grid Station and its associated 100-m long double circuit transmission line
- 132-kV Khanewal-II Grid Station and its associated 1-kilometer (km) long double circuit transmission line
- 132-kV Layyah-II Grid Station and its associated 200-m long double circuit transmission line
- 132-kV Rahim Yar Khan Grid Station and its associated 5-km long double circuit transmission line
- 132-kV Shah Jamal Grid Station and its associated 14-km long double circuit transmission line.

See **Figure 1.1** for the locations of these proposed grid stations.

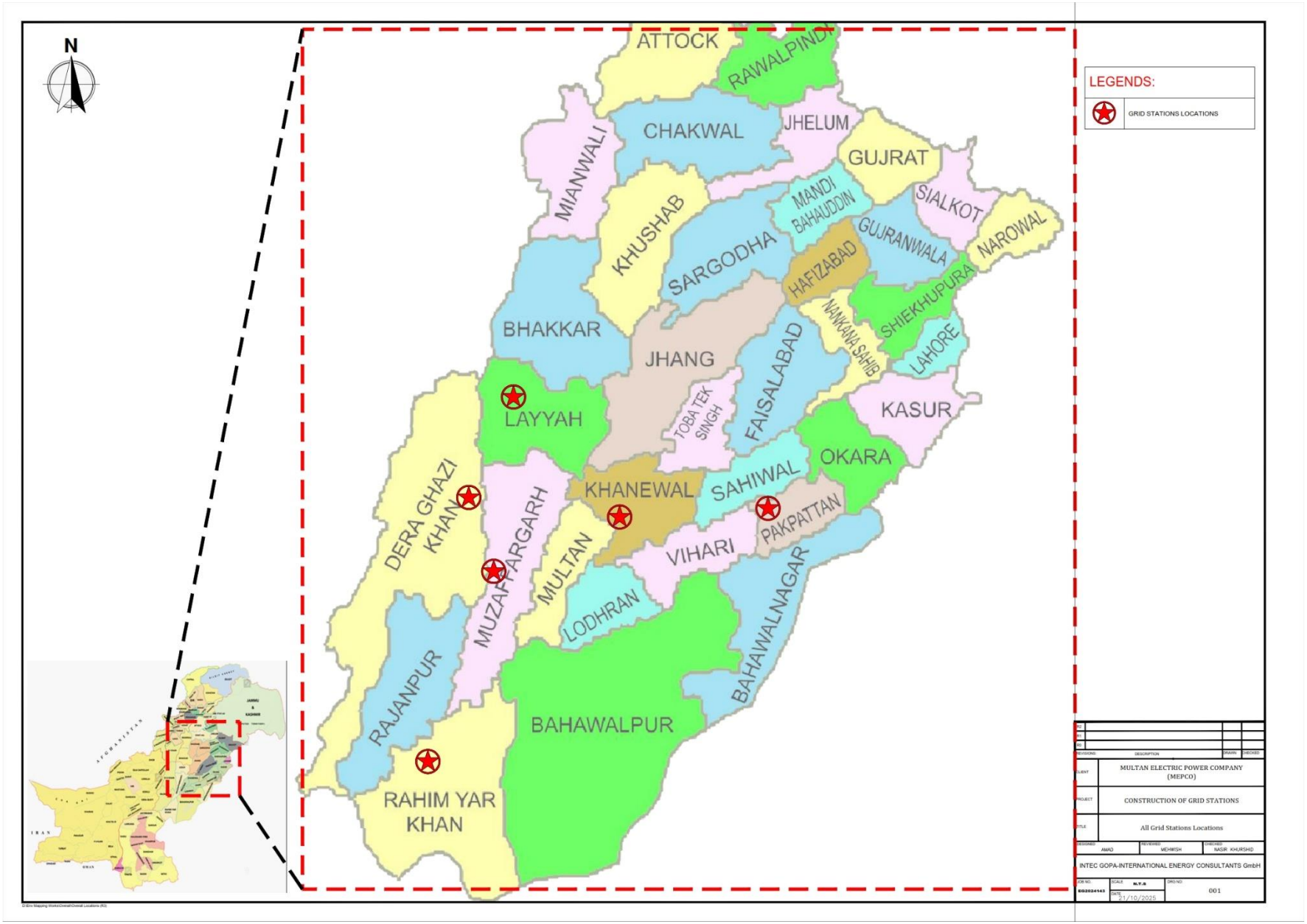

Figure 1.1: Locations of Proposed Grid Stations

The key equipment and components to be installed in each grid station will include power transformers, circuit breakers and isolators, switchgears, lightning arrestors, protection and control system, earthing system, and control panels. The key construction activities will include land clearing and leveling, excavations for foundations, concreting for foundations, erection of steel works and gantries, equipment installation, cabling and connections, construction of control building and office block, construction of boundary wall and fencing, and finally, testing and commissioning. For the transmission lines, the key equipment includes lattice steel towers, conductors, insulators and other accessories. The key construction activities for the transmission lines will include excavation for foundations of towers, concreting for foundations, tower erection, stringing of conductors, installation of insulators and other accessories, and finally, testing and commissioning.

The proposed subproject is designed to address longstanding challenges in the electricity distribution network across key districts of Southern Punjab, including Khanewal, Layyah, DG Khan, Shah Jamal, Arifwala, and Rahim Yar Khan. The proposed subproject aims to:

- Enhance the reliability and operational capacity of the regional electricity distribution network, and reducing unplanned outages and system failures.
- Reduce technical losses and power outages by modernizing infrastructure and improving load management, particularly in areas with overloaded feeders and aging systems.
- Improve voltage regulation and supply quality across urban, semi-urban, and rural areas.
- Promote inclusive economic and social development by ensuring uninterrupted and efficient electricity supply to households, schools, hospitals, agricultural farms, and small to medium enterprises, many of which currently suffer from poor voltage profiles and supply disruptions.

With the help of the above, the subproject is expected to contribute not only to enhancing energy sector efficiency but also to the broader goals of regional equity, agricultural productivity, industrial growth, and improved quality of life in underserved areas of Punjab.

1.3 Institutional and Legislative Framework for Environmental and Social Management

The key regulatory institution for the management of E&S aspects of the proposed subproject is the Punjab Environmental Protection Agency (Punjab EPA) that has been established under the Pakistan Environmental Protection Act 1997. The key provincial legislation to manage the E&S aspects of the proposed subproject is the Punjab Environmental Protection Act, 2012, which is a comprehensive legislation and provides the legislative framework for protection, conservation, rehabilitation and improvement of the environment in the Punjab province. Under this Act, MEPCO will seek environmental approvals for the proposed subproject from the Punjab EPA. The Land Acquisition Act of 1894 is also relevant for the proposed subproject since land for one of the proposed grid stations is being acquired in accordance with this Act.

In addition to the national/provincial legal requirements, the subproject will also comply with the World Bank's Environmental and Social Framework (ESF) as well as the Environmental and Social Standards (ESSs).

1.4 E&S Scoping

The E&S scoping was carried out during the preparation of this ESIA. The scoping considered all E&S impacts and issues and then considered their relevance with the proposed subproject's nature, activities involved and its environmental and social settings; see **Table 1.1**.

Table 1.1: E&S Scoping for Proposed Subproject

E&S Aspects	Relevance for Proposed Subproject	Scoping Results
Soil erosion and contamination	Soil erosion is relevant since it may be caused by the excavation activities during the grid station (GS) and transmission line (TL) construction works. Soil contamination is also relevant since it may be caused by effluent releases from construction sites and workers' camps for all subproject components.	Scoped-in
Air quality deterioration including dust and exhaust emissions	Relevant since it may be caused by excavation for GS and TL construction works; vehicle operation during construction works, and operation of construction machinery.	Scoped-in
Noise	Relevant since it may be caused by construction machinery operation and vehicle movement.	Scoped-in
Water contamination	Relevant since it may be caused by effluent releases from construction sites and workers' camps for all subproject components	Scoped-in
Damage to crops and built-up structures	Relevant since the GS and TL construction works can damage crops. TL construction works can also damage structures.	Scoped-in
Occupation health and safety (OHS) risks	Relevant since these risks may be caused by construction and operation of the proposed subproject.	Scoped-in
Community health and safety (CHS) risks	Relevant since these risks may be caused by construction and operation of all components	Scoped-in
Impacts on biological resources (flora and fauna)	Not relevant for all components since subproject area comprises populated and built-up area without any original flora and fauna or any sensitive habitats/species of concern. No wildlife protected area exists within or in the vicinity of the proposed subproject.	Scoped-out
Blocked roads and routes	Relevant particularly for TL construction works since it can block roads and routes particularly in the populated area	Scoped-in
Waste generation	Relevant since it may be caused by construction activities and camp operation.	Scoped-in

E&S Aspects	Relevance for Proposed Subproject	Scoping Results
Labor influx	Relevant for the proposed subproject since it will engage technical and non-technical personnel including construction workers.	Scoped-in
Sexual exploitation and abuse/sexual harassment (SEA/SH)	Relevant since construction and O&M activities will be carried out near communities.	Scoped-in
Child labor	Relevant since the contractors can potentially engage under age worker.	Scoped-in
Physical cultural heritage	Not relevant since no sites are known to exist that are archeologically, historically, culturally significant within the subproject sites or in their immediate vicinity. Chance Find procedures have however been included in the mitigation measures discussed later in the document.	Scoped-out
Land acquisition and resettlement	Private land is being acquired for one of the proposed grid stations. TL works can potentially cause crop damage.	Scoped-in
Damage to existing infrastructure and public utilities	Relevant since the construction works can potentially damage the existing physical infrastructure (such as roads, water channels) and also public utilities	Scoped-in

The aspects that have been scoped-in have been further assessed and their mitigation and control measures have been described later in this ESIA. The aspects that have been scoped-out have not been further discussed in this ESIA.

1.5 Area of Influence (AoI)

The AoI for each proposed grid station site will be the entire grid station site and a corridor of 500-m around it. The AoI for the associated transmission lines will be a corridor of 1,000-m wide (500-m either side of the TL centerline). The potential E&S impacts of the proposed subproject are likely to be confined to these AoIs. The AoIs of the six proposed grid stations are shown in **Figures 1.2** to **1.7**.

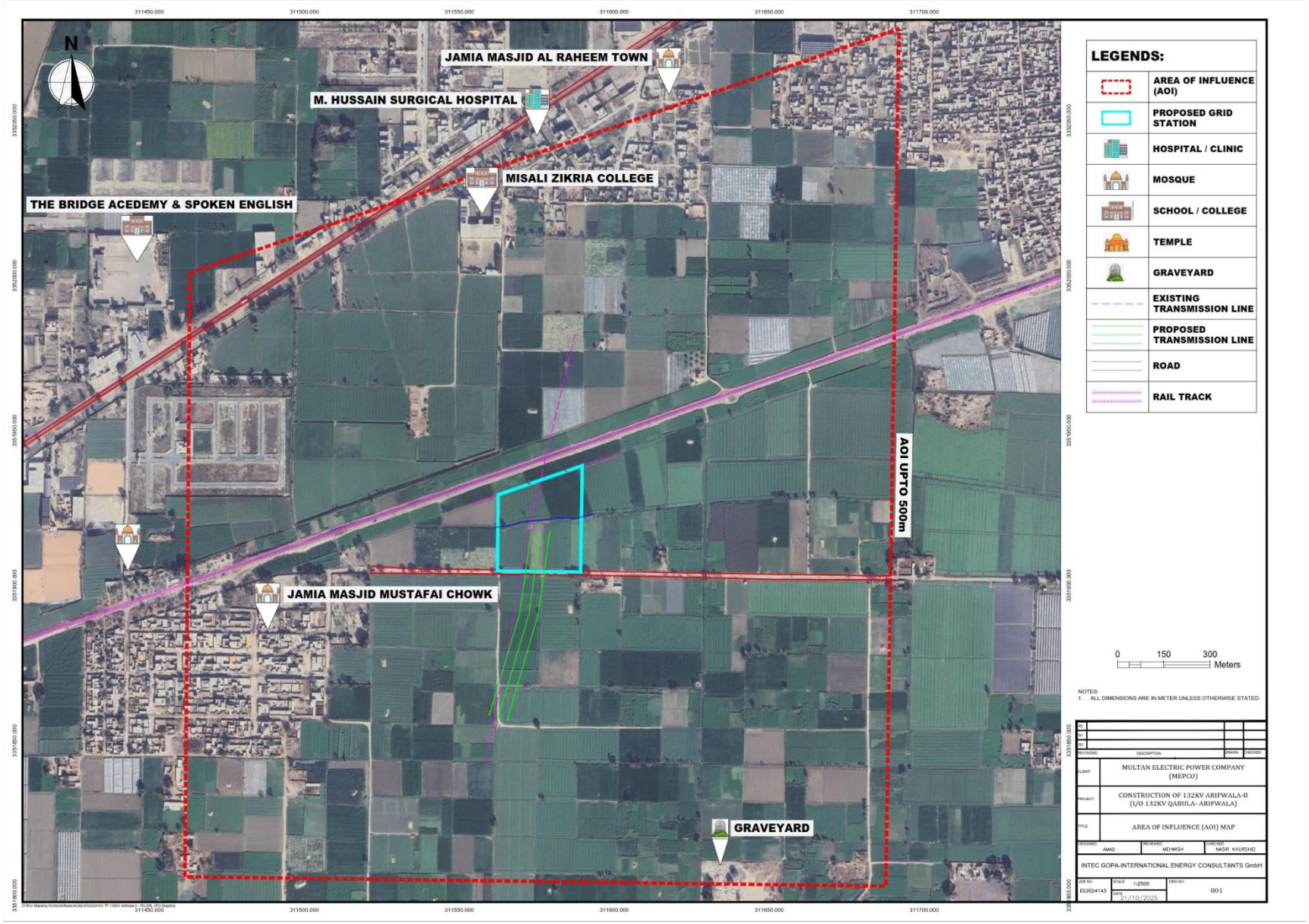

Figure 1.2: AoI of Arifwala-II Grid Station

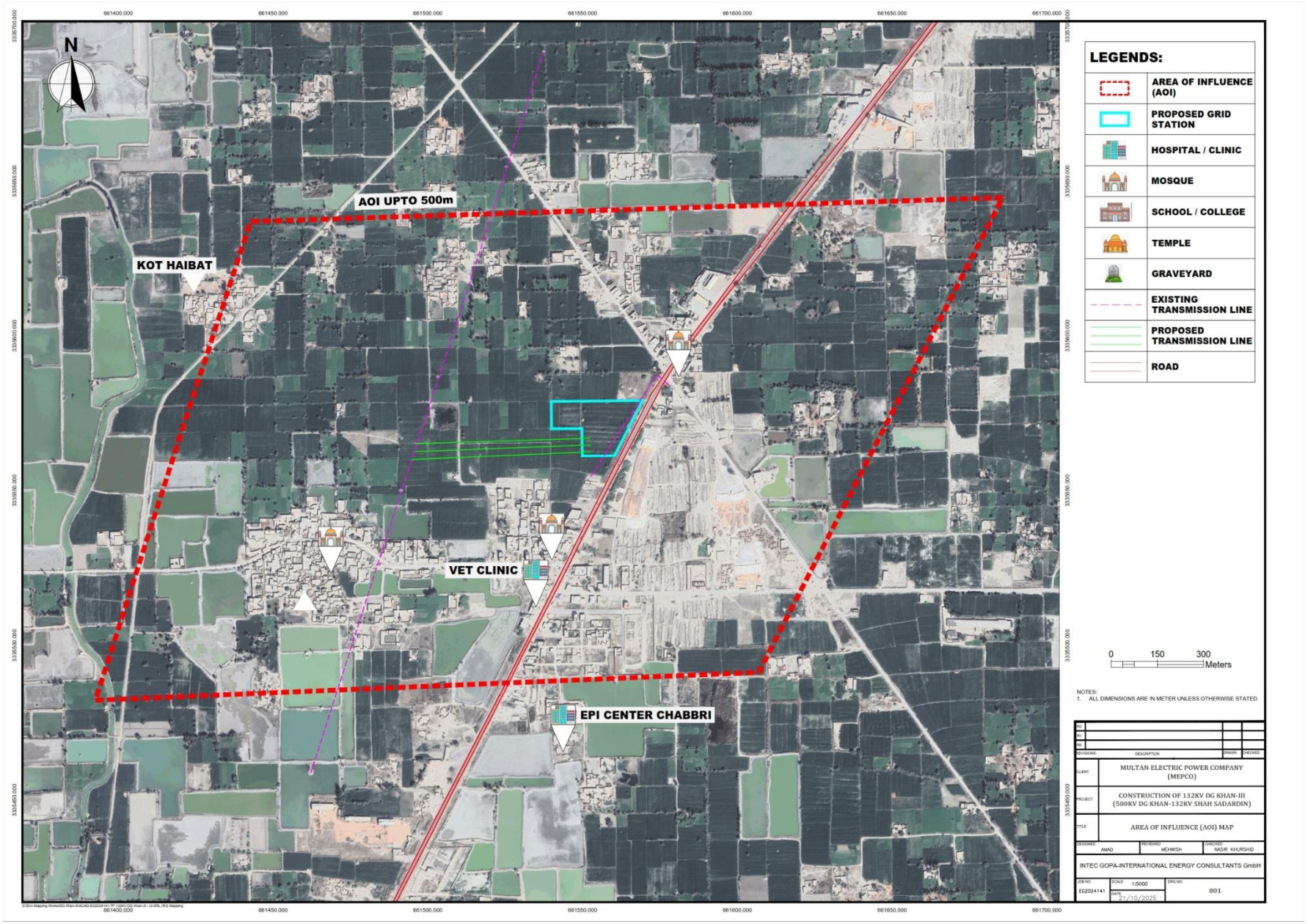

Figure 1.3: AoI of DG Khan-III Grid Station

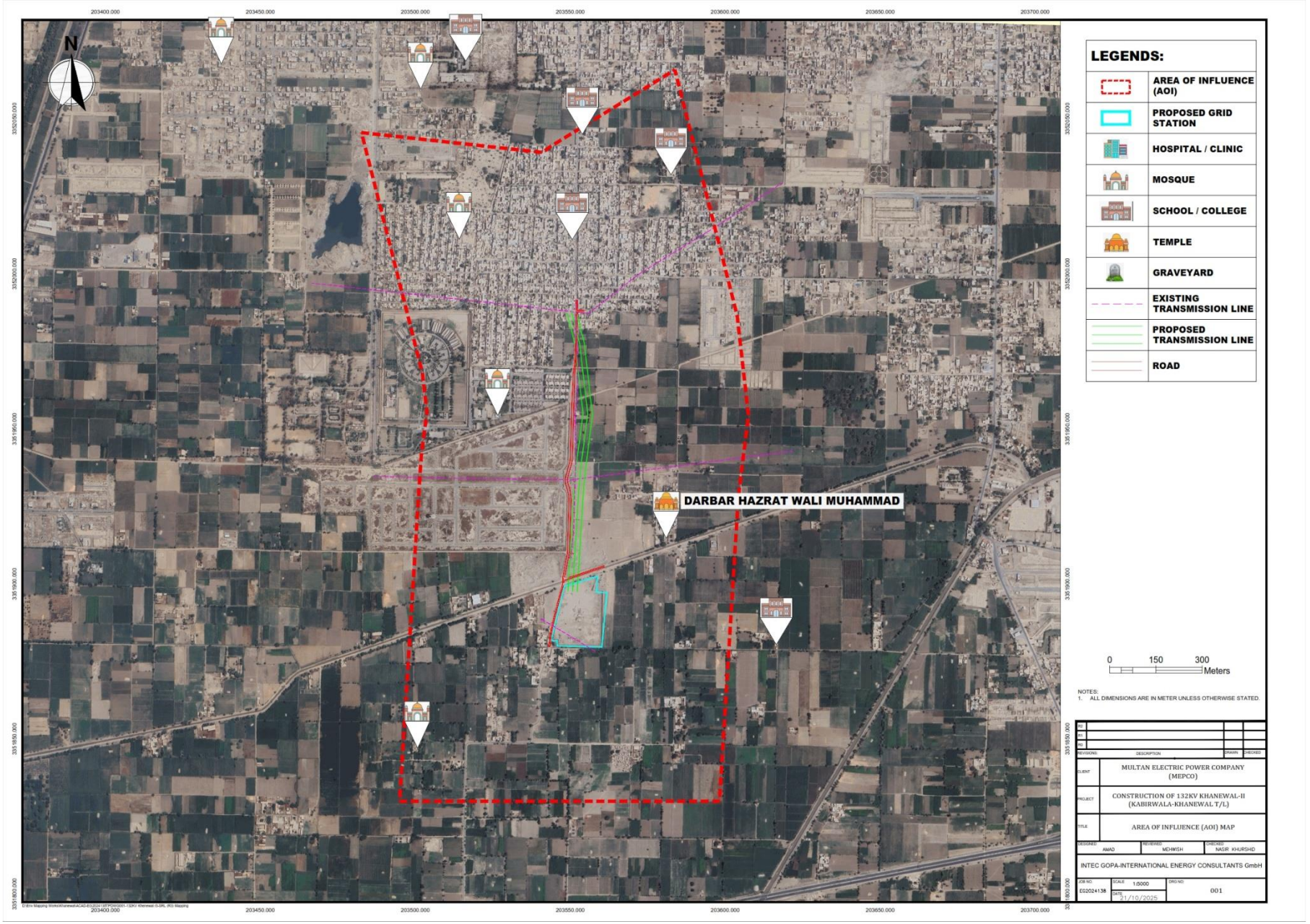

Figure 1.4: AoI of Khanewal-II Grid Station

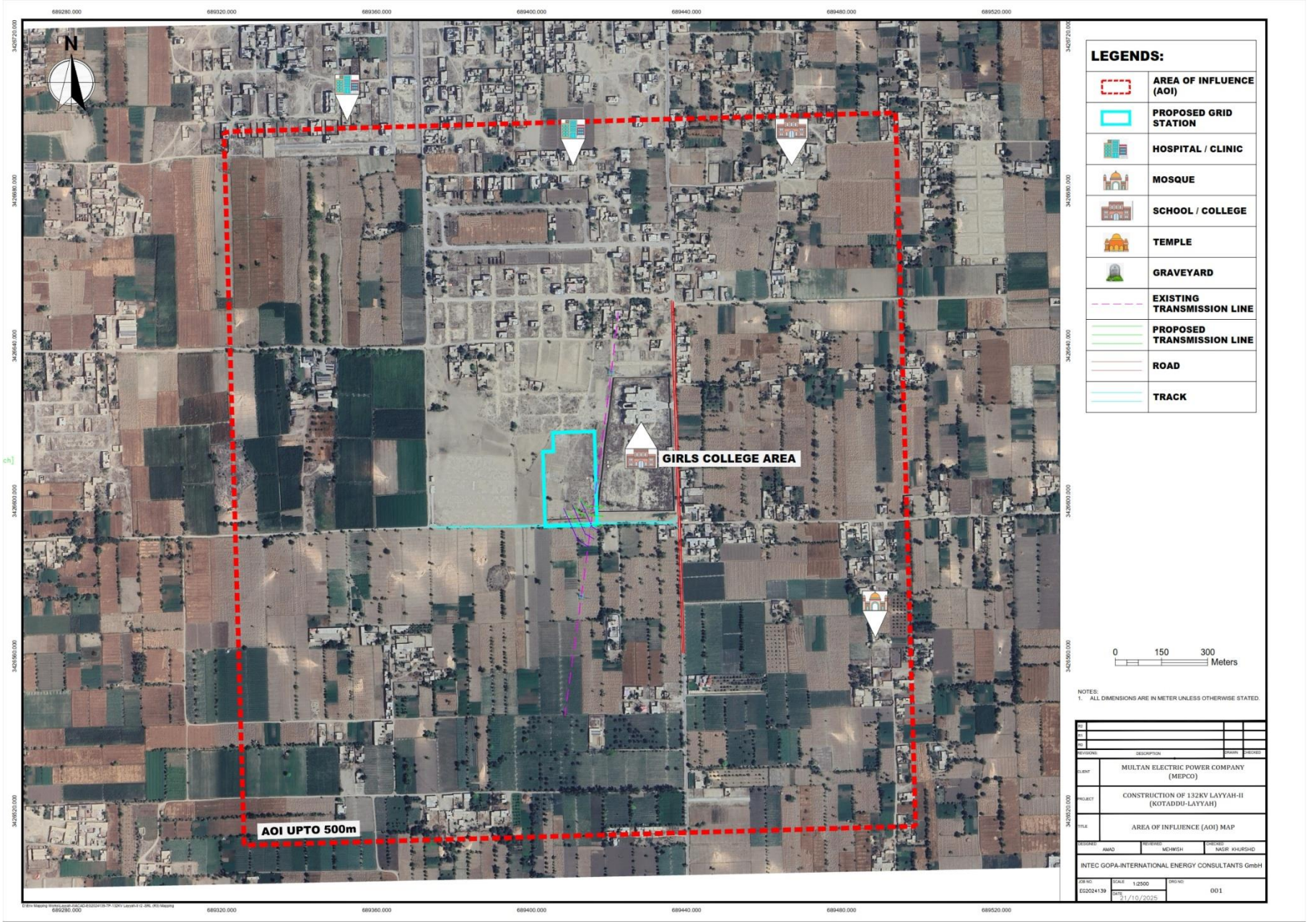

Figure 1.5: AoI of Layyah-II Grid Station

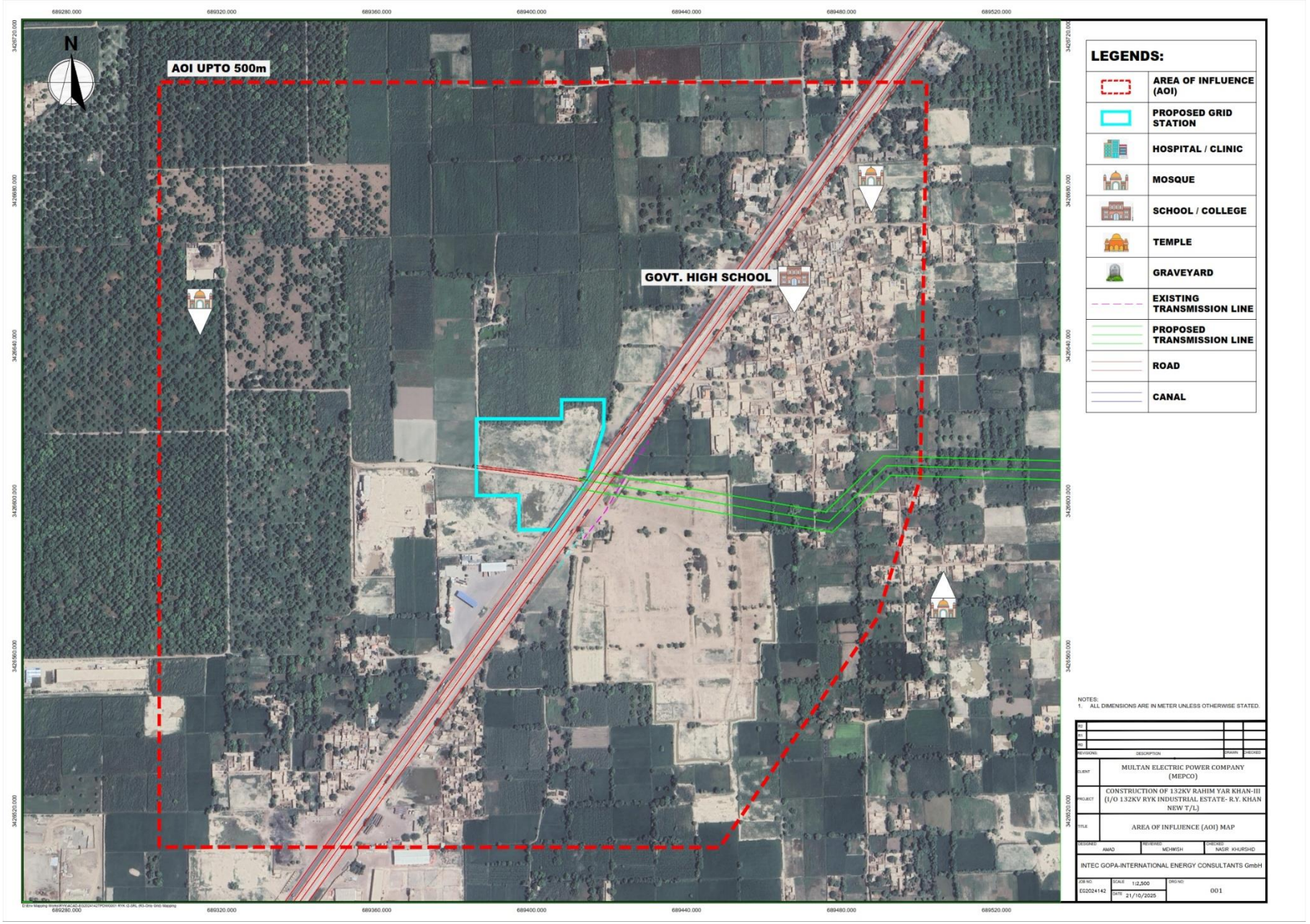

Figure 1.6: AoI of Rahim Yar Khan-III Grid Station

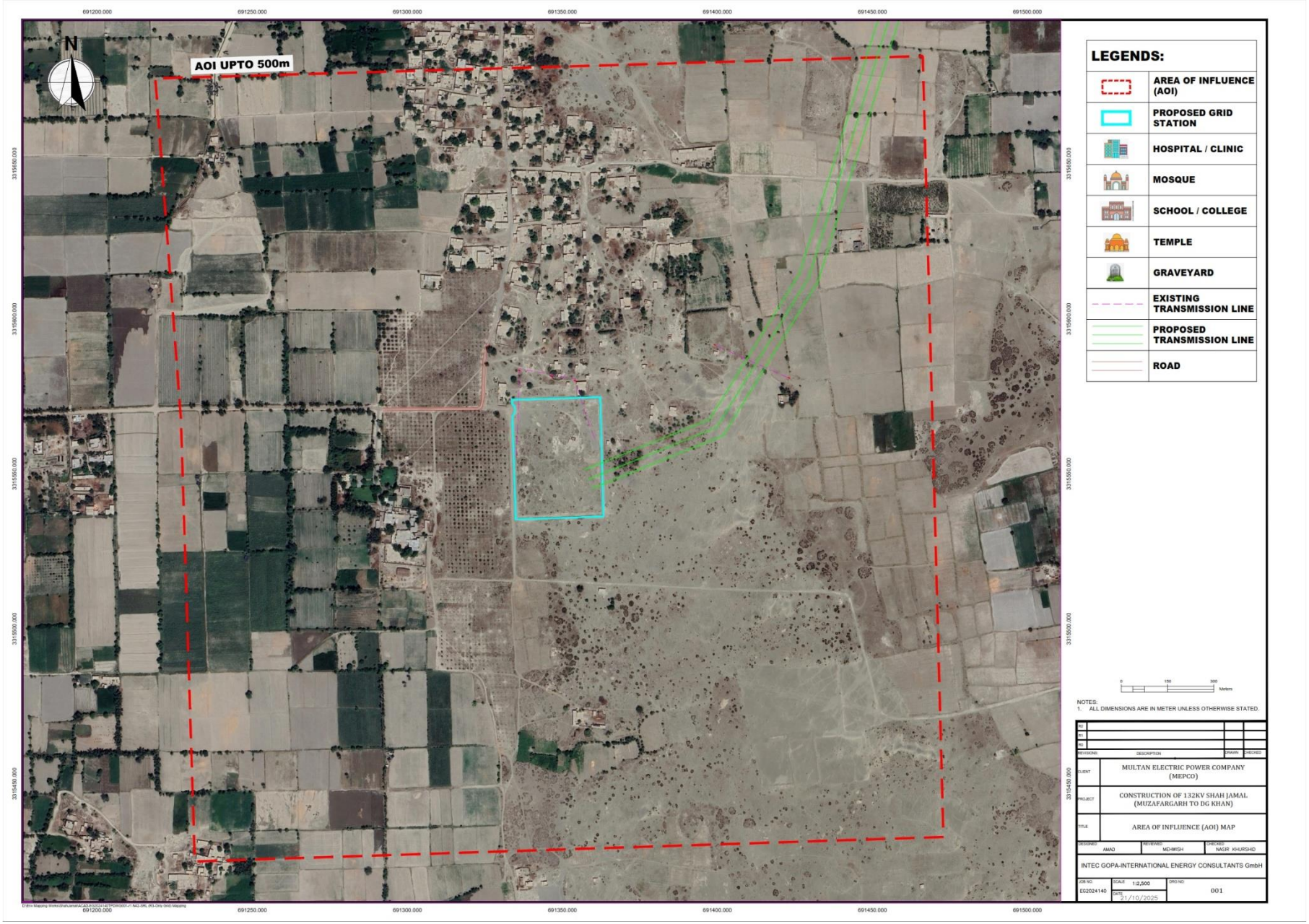

Figure 1.7: AoI of Shah Jamal Grid Station

1.6 Environmental and Social Documents for EDEIP

In compliance with the WB ESF, the following specific environmental and social documents have been prepared for the overall EDEIP:

- **Stakeholder Engagement Plan (SEP)** – to describe various modes of stakeholder engagement including consultations and grievance redress mechanism (GRM).
- **Environmental and Social Management Framework (ESMF)** to provide criteria and procedures for environmental and social assessment of various categories of the subprojects under EDEIP.
- **Resettlement Framework (RF)** – to define principles and procedures for resettlement planning and preparation of resettlement plans for subprojects potentially causing resettlement impacts.
- **Labor Management Procedures (LMP)** to describe assessment of potential labor related risks, overview of labor regulation, staff responsibility, policies and procedures.

The current ESIA has been carried out in accordance with the guidelines provided in the above-listed ESMF. Similarly, the stakeholder consultations for this ESIA have been carried out following the guidelines provided in above-listed SEP. The LMP will be applicable for all the subproject personnel including construction workers.

1.7 Environmental and Social Impact Assessment (ESIA)

1.7.1 ESIA Objectives

The present ESIA has been prepared for the proposed subproject since it can potentially cause significant and lasting negative environmental and social impacts. The ESIA has been prepared to:

- integrate the environmental and social concerns into the design and implementation of the proposed subproject in order to ensure that it is environmentally and socially sustainable;
- consider in an integrated manner, the environmental and social risks, benefits and impacts of the proposed subproject and identify measures to avoid, minimize and manage risks and impacts while enhancing benefits;
- To specify appropriate roles and responsibilities of all implementing agencies/entities and define the necessary monitoring and reporting procedures for managing environmental and social concerns related to the proposed subproject;
- To determine the training, capacity building and technical assistance needed to successfully implement the provisions of this ESIA.
- To comply with the local regulatory and WB policy requirements.

1.7.2 ESIA Study Methodology

The methodology followed in preparing the present ESIA consists of the following steps:

Review of the Subproject Details

At the onset of the study, the subproject details were obtained from MEPCO and studied carefully. Meetings were held with the concerned officials as needed. Attempts were made to obtain as much information as available at this stage on the subprojects.

Review of Relevant Legislation, Policies, and Guidelines

In order to determine the policy, legal and institutional environment for the subproject, the applicable policies, guidelines and legislations concerning the subproject's environmental and social aspects were reviewed, as listed below.

- Policies and legislations of Government of Pakistan and Government of Punjab.
- The World Bank ESF, Environmental and Social Standards (ESSs), Guidelines, Policies and Directives.

During the present study, the above legislations, regulations, and framework were studied in depth to determine their relevance and applicability to the proposed subproject, in addition to determining and specifying actions to be taken by the project proponents / implementing agencies to fulfill the associated requirements.

Review of Secondary Literature

Under this task, relevant published and unpublished reports and documents were identified and reviewed. These include among others similar environmental assessment reports particularly of donor-funded projects, project documents, environmental and social management frameworks, environmental monitoring reports, news articles, and research reports. The primary objective of this task was to determine the potentially negative environmental as well as social impacts of projects similar to the proposed subproject and the associated mitigation/management strategies that were proposed to address those impacts. Secondary data was also collected where applicable to obtain baseline conditions of the subproject area and its surroundings.

E&S Scoping and AoI Determination

During this phase, key information on the subprojects was reviewed and interaction between its activities and key environmental resources charted out. A long list of the potential environmental as well as social issues likely to arise as a result of the subproject was thus developed. Subsequently, the significant potential impacts were short listed, screening out the non-relevant and or insignificant impacts, based upon their nature and severity. Furthermore, the area of influence of the subproject activities was determined. Thus, the sectorial as well as spatial boundaries of the subproject were determined for the purpose of the environmental and social assessment.

Stakeholder Engagement

The SEP has been prepared for the EDEIP to identify various modes of stakeholder engagement including stakeholder consultations and GRM, as mentioned earlier in **Section 1.6**. During the preparation of this ESIA, stakeholder consultations were carried out with communities in and around the AoIs and also with the institutional stakeholders (government departments), in accordance with the guidelines provided in the SEP.

Collection of Baseline Data

During this phase, environmental and social data of the subproject area was collected and compiled, in order to develop a baseline of the subproject area's physical and socio-economic environment.

Impact Assessment

Once the baseline data collection was completed, impact assessment was carried out to identify potentially negative impacts of the proposed activities under the subproject. Subsequently, appropriate mitigation measures were identified to address these potential impacts. To the extent possible, the impact assessment and the associated mitigation measures were subproject- and site-specific.

1.7.3 ESIA Structure

Executive Summary: This provides a general summary of the ESIA contents and key findings, in a vocabulary that is easily understood by the public at large. It concisely covers all aspects of the document.

Chapter 1: Introduction. This Chapter describes the ESIA purpose, objectives, principles and methodology. This Chapter introduces the subproject proponents and provides other relevant information. The layout of ESIA is also described in it to facilitate its reading.

Chapter 2: Legal and Administrative Framework. This Chapter describes the relevant national/provincial environmental and social legal requirements as indicated in various legislation, regulations and guidelines relevant to the subproject and this ESIA as well as the World Bank's ESSs applicable to the proposed subproject. The Chapter also states how such requirements will be complied during various phases of the subproject.

Chapter 3: Subproject Description. This Chapter provides a simplified description of the proposed subproject. The subproject description includes background and purpose of the subproject and also components of the subproject.

Chapter 4: Environmental and Socio-Economic Characteristics. This Chapter covers the dimensions of the study area and review relevant physical, land-use, and socioeconomic conditions. This Chapter has been compiled on the basis of baseline data collection described earlier in **Section 1.7.2**.

Chapter 5: Environmental and Social Impact Assessment. This Chapter defines the impact assessment methodology and describes the potential impacts that were assessed using this methodology. Mitigation measures are also described in this Chapter to address these impacts.

Chapter 6: Environmental and Social Management Plan. This Chapter presents the implementation and monitoring mechanisms for the mitigation measures described in **Chapter 5**. This Chapter also includes institutional arrangements, training requirements, reporting requirements and also the GRM.

Chapter 7: Stakeholder Consultations. This Chapter summarizes the stakeholder engagement activities carried out during the preparation of this ESIA. The Chapter also describes the similar activities to be carried out during the subproject implementation.

2 Legal and Administrative Framework

2.1 National Framework

2.1.1 Constitutional Context

The Constitution of Pakistan provides the foundational basis for environmental protection through several key provisions. Article 9 ensures the right to life, which the courts have interpreted to include the right to a clean and healthy environment. Article 14 guarantees the dignity of individuals and the privacy of the home, which can be affected by environmental degradation. Moreover, Article 38 (d) calls for the provision of basic necessities of life, including clean water and sanitation. Following the 18th Constitutional Amendment, environmental regulations have been devolved to the provinces, giving them autonomy to enact and implement their own environmental laws and standards.

Since the late 1970s, Pakistan has progressively developed laws and institutions for environmental management. The Pakistan Environmental Protection Ordinance (1983) was the first dedicated environmental law, followed by the creation of the Pakistan Environmental Protection Agency (Pak-EPA) in 1984. The late 1980s saw major policy efforts, resulting in the Pakistan National Conservation Strategy and the establishment of provincial environmental agencies. The National Environmental Quality Standards (NEQS) were introduced in 1993.

In 1997, the Pakistan Environmental Protection Act (PEPA) replaced the 1983 Ordinance, granting broad enforcement powers to environmental agencies. Regulations for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) were published in 2000.

Before the 18th Constitutional Amendment (2010)[6], environmental legislation was shared between federal and provincial governments under the Concurrent List. Post-amendment, environmental management became the exclusive responsibility of provinces. Consequently:

- The federal Ministry of Environment was abolished and replaced by the Ministry of Climate Change to handle international environmental obligations.
- Provinces had to enact their own environmental laws, although PEPA 1997 remained in effect until provincial laws were passed.
- All four provinces have now enacted laws largely based on PEPA 1997, maintaining consistent environmental protection standards nationwide.

2.1.2 Punjab Environmental Protection Act 2012

The Punjab Environmental Protection Act, 2012 is the provincial adaptation of the Pakistan Environmental Protection Act, 1997 (PEPA), with responsibility shifted from the federal Ministry of Environment to the provincial government in 2012.

The provincial Act closely mirrors the federal PEPA, differing mainly in the designation of responsible agencies. Key Features Relevant to subproject are:

[6] Eighteenth Amendment to the Constitution of the Islamic Republic of Pakistan**,** passed in April 2010**.**

- **Section 11:** Prohibition of Excessive Discharges/Emissions;
  No person shall discharge or emit effluents, pollutants, or noise beyond the prescribed Environmental Quality Standards.
- **Section 13-I:** Environmental Clearances: Projects must submit and obtain approval for Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) before construction or operation.
- **Section 13-2b:** EIA Review: The Environmental Protection Agency (EPA) reviews and approves, requires modification, or rejects the EIA based on environmental objectives.
- **Section 15:** Handling of Hazardous Substances: Hazardous substances can only be managed with an EPA-issued license or in accordance with applicable laws and international agreements.
- **Section 16:** Regulation of Motor Vehicle Emissions and Noise: Operation of motor vehicles emitting pollutants or noise above EQS limits is prohibited.
- **Section 18:** Penalties: Violations can lead to fines up to PKR 1 million, with additional daily fines for continuing offenses.
- **Section 19:** Corporate Accountability: Directors, partners, or officers of a corporate body may be held personally liable for environmental violations committed with their consent or negligence.

MEPCO will need to obtain clearance from Punjab EPA in accordance with this Act.

2.1.3 Punjab Environmental Protection Agency (Review of IEE & EIA) Regulations, 2022

The IEE/EIA Regulations of 2022 establish the framework for the preparation, submission, and review of the IEE and the EIA. The regulations categorize development projects for IEE and EIA into two schedules (Schedules I and II). Schedule I include projects where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule II covers major projects that have the potential to affect a large number of people in addition to generating potentially significant adverse environmental impacts. Preparation of a complete EIA is required for Schedule II projects. MEPCO has determined that the sub-project will fall under Schedule II requiring EIA.

The national guidelines for undertaking EIA in accordance with the Pakistan IEE/EIA Regulations 2000 include the Policy and Procedures for Filing, Review and Approval of Environmental Assessments, 1997 and Guidelines for the Preparation and Review of Environmental Reports, 1997.

2.1.4 Environmental Regulatory Authorities

Since the proposed subproject falls in Punjab province, the Punjab Environmental Protection Agency (Punjab EPA) is the relevant environmental regulatory authority. The statutory functions of the Punjab EPA are to:

- Administering and implementing the Environmental Protection Act, its rules and regulations.
- Reviewing IEE/EIA, preparation of procedures and guidelines.
- Prepare, revise and enforce Environmental Quality Standards (EQS) for industries, municipalities, vehicular emissions.

- Establishing and maintaining laboratories, certification of laboratories for conducting tests and analyses.
- Assisting local councils, authorities and/or government agencies in execution of projects.
- Establishing a system of surveys, monitoring, examination and inspection to combat pollution.
- Conducting training for government staff and industrial company staff.
- Provide information and education to the public on environmental issues.
- Publishing annual "State of the Environment" reports.
- Undertaking surveys and qualitative and quantitative analysis of data on air, soil and water quality, and industrial, municipal and traffic emissions.

2.1.5 Land Acquisition Act of 1894

The Land Acquisition Act (LAA), 1894, is the primary legal framework governing the acquisition of private land for public purposes in Pakistan, including infrastructure development projects. The Act consists of 55 sections that outline the process for area notifications, land surveys, acquisition procedures, compensation determination, dispute resolution, apportionment of awards, penalties, and exemptions. For the proposed subproject, land required for the construction of one of the grid stations will be acquired in compliance with the provisions of this Act (the remaining five grid stations will be established over government-owned land).

2.1.6 Telegraph Act 1885

The Telegraph Act 1885 was originally enacted for the installation of telegraph poles in private lands. However, in Pakistan, this Act has traditionally been used to install transmission line towers also, without payment any compensation for the land under the tower. For the subprojects under EDEIP however, MEPCO will pay compensation for the land diminution caused by the transmission lines.

2.1.7 Other Relevant Legislation

Other relevant legislations are listed in **Table 2-1** below.

Table 2.1: Relevant National/Provincial Legislation

Legislation / Guideline	Brief Description	Relevance for the Proposed Subproject
National Environmental Quality Standards (NEQS), 2000, 2009 and 2010.	The National Environmental Quality Standards (NEQS), established under the Pakistan Environmental Protection Act, 1997, set permissible limits for various environmental parameters, including air and water quality, noise levels, emissions, and effluents from industrial and infrastructure activities. These standards serve as the national benchmark for pollution control and environmental compliance.	The NEQS are applicable during both construction and operational phases. Compliance is required for: • Ambient air quality and dust control from construction machinery and vehicle movement. • Noise levels near communities and sensitive receptors. • Effluent and waste discharge, especially at grid station construction sites and worker camps. Contractors will be required to follow NEQS through site-level environmental management and

Legislation / Guideline	Brief Description	Relevance for the Proposed Subproject
		regular monitoring, as outlined in the ESMP.
Punjab Environmental Quality Standards (PEQS) 2016	The PEQS were notified in 2016 by the Punjab Environmental Protection Agency (Punjab EPA) and are largely aligned with NEQS but allow for provincial-level enforcement and adaptation. PEQS cover parameters such as drinking water quality, ambient air, industrial emissions, noise, and vehicle exhaust.	As all six grid stations and associated transmission lines fall within Punjab Province, compliance with PEQS is legally mandatory. Project activities especially those generating dust, noise, and construction waste must remain within PEQS limits. The Environmental Monitoring Plan in the ESMP includes regular sampling and analysis to ensure adherence to PEQS, and reporting will be submitted to the Punjab EPA as part of regulatory compliance.
Environmental Tribunal Rules (the ET Rules)	Under Section 21 of the provincial Act (Environmental Tribunals) have been established to deal with cases of violation or of failure to comply with the provisions of EPA. According to the ET Rules, a tribunal is required to make every effort to dispose of a complaint or an appeal or other proceeding within 60 days of its filing.	In the context of the proposed subproject, the ET Rules serve as an accountability and enforcement mechanism in case of non-compliance with the Environmental and Social Management Plan (ESMP), environmental approval conditions, or negligence by contractors in managing environmental risks. If significant environmental harm occurs, such as unlawful waste disposal, air pollution, or damage to natural resources, the case can be brought before the Environmental Tribunal by the Punjab EPA or any aggrieved party. Therefore, strict adherence to ESMP provisions and environmental standards is critical to avoid legal proceedings under the ET Rules.
Protection of Trees and Brushwood Act (1949)	The Protection of Trees and Brushwood Act of 1949 prohibits the cutting or lopping of trees along roads and canals planted by the Forest Department unless prior permission of the Forest Department is obtained.	This Act is particularly relevant to the construction of grid stations and transmission lines, where site clearance and line alignment may involve the removal of trees or brushwood, particularly in agricultural or semi-rural areas. MEPCO and its contractors are required to: • Avoid unnecessary tree cutting during construction. • Obtain prior permission from relevant authorities (e.g., Forest Department) where tree removal is unavoidable. • Implement compensatory plantation programs as part of the ESMP. • Rehabilitate disturbed areas with native species. • Compliance with this Act is essential to minimize vegetation loss and support environmental sustainability in project areas.

Legislation / Guideline	Brief Description	Relevance for the Proposed Subproject
Employment of Children Act (1991)	Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows child labor in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth year of age. The ECA states that no child shall be employed or permitted to work in any occupation set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out.	MEPCO and its contractors will ensure that no child labor is engaged at any stage of the subproject, particularly in grid station and transmission line construction.
Punjab Restriction on Employment of Children Act, 2016	An Act to prohibit the employment of children and to restrict the employment of adolescents (15 to18 years of age) in certain occupations and processes	As above
Punjab Minimum Wages Act of 2019	This Act has been enacted to regulate minimum rates of wages for unskilled and different categories of skilled workers employed in an industry, industrial and commercial establishments.	MEPCO and its contractors will need to comply with the Punjab Minimum Wages Act to ensure fair payment to all workers involved in the project. This includes paying wages at least equal to or above the legally mandated minimum rates.
Guidelines for public consultation, 1997	The guidelines deal with approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures the incorporation of their concerns in impact assessments.	These guidelines will need to be followed for carrying out consultations for this ESIA and during the construction activities.
Antiquity Act 1975	The Pakistan Antiquities Act of 1975 ensures the protection of physical cultural resources in Pakistan. The Act is designed to protect especially notified “antiquities” from destruction, theft, negligence, unlawful excavation, trade and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan (and Provincial Governments after the introduction of the 18th Amendment to the Constitution of Pakistan) to prohibit excavation in any area which may contain articles of archaeological significance.	• During subproject planning and site selection, MEPCO assessed and confirmed any subproject components (grid stations, transmission lines, or civil works) are not located near or on archaeological sites or heritage areas. • If antiquities or archaeological sites are found, MEPCO will comply with the Act to avoid damage or disturbance. • Mitigation measures related to the protection of cultural heritage and compliance with the Antiquities Act are incorporated in the Environmental and Social Management Plan (ESMP).

Legislation / Guideline	Brief Description	Relevance for the Proposed Subproject
Industrial Relations Acts (2010)	These Acts seek to regulate formation of trade unions, regulation and improvement of relations between employers and workmen and the avoidance and settlement of any differences or disputes arising between them and ancillary matters.	• MEPCO and contractors must respect workers' rights to organize and bargain collectively and will establish clear communication channels with worker representatives or unions if they exist.
Punjab Occupational Safety and Health Act, 2019	Provides a legal framework for ensuring safe and healthy working conditions in all workplaces, including construction sites. Covers physical safety, fire hazards, chemical exposure, and worker welfare.	Applicable to all grid station and transmission line construction activities. Contractors are required to implement OHS measures in line with this Act.
Punjab Motor Vehicle Rules, 1969 (amended)	Regulates vehicle operations, emissions, licensing, and transport safety in Punjab.	Relevant to the use of trucks, cranes, and heavy vehicles during construction. Ensures safe transportation of materials and control of emissions and noise from vehicles.
Forest Act, 1927 (adopted by Punjab)	Regulates the use and conservation of forest areas, tree removal, and afforestation efforts.	Relevant in case of tree removal along TL alignments. Contractors must obtain clearance and implement compensatory plantation where necessary.
Land Acquisition Rules, 1983 (Punjab)	Detail the procedures for land acquisition under the Land Acquisition Act, 1894, including notification, survey, valuation, and compensation processes.	Applicable for the acquisition of private land under the proposed subproject.
Punjab Water Act, 2019	Regulates the extraction, usage, and conservation of water resources within the province.	Relevant for sourcing water during construction works. Requires responsible use and no harm to local water users.
Hazardous Substances Rules, 2003	Regulate the safe handling, transport, storage, and disposal of hazardous substances, including chemicals, oils, and batteries.	Applicable to hazardous substances such as transformer oil handling, chemical waste from construction, and disposal of hazardous materials.
Protection against Harassment of Women at the Workplace Act, 2010 and its amendment in 2022.	This Act prohibits harassment of women at the workplace.	This Act will be applicable for MEPCO and its consultants and contractors.
The Punjab Solid Waste Management Rules of 2016	This Act require waste generators to segregate waste into biodegradable, non-biodegradable, and domestic hazardous waste. The rules also mandate proper collection, storage, and transportation of waste, encouraging the on-site utilization of biodegradable waste through composting or bio methanation and the development of	These Rules are applicable to the subproject during construction and O&M phases

Legislation / Guideline	Brief Description	Relevance for the Proposed Subproject
	waste-to-energy plants. Waste generators must not litter, dispose of waste in water bodies, or throw used sanitary items in general waste bins, but rather in safe, prescribed materials.	
Punjab Transparency and Right to Information Act, 2013	The Act ensures transparency and right to information to the public for all public sector entities.	This Act is applicable as the proposed subproject is the public sector initiative and will need be transparent for public.
Electricity Act, 1910	This Act governs the supply and use of electrical energy and extends to whole of Pakistan.	This Act is relevant since MEPCO supplies and uses electricity.
Pakistan Penal Code, 1860	This is the main criminal code of Pakistan. It is a comprehensive code intended to cover all substantive aspects of criminal law in the Country.	The provisions of the Penal Code are applicable to the subproject in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.
Labor Laws as part of Constitution of Pakistan, 1973	These labor laws define the labor rights that must be ensured by employers.	The labor laws are relevant as they deal with employment of labor for the construction of proposed subproject.
International Labor Organization ILO) Conventions	Forced Labor Convention, 1930 (No. 29) Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87) Right to Organize and Collective Bargaining Convention, 1949 (No. 98) Equal Remuneration Convention, 1951 (No. 100) Abolition of Forced Labor Convention, 1957 (No. 105) Discrimination (Employment and Occupation) Convention, 1958 (No. 111) Minimum Age Convention, 1973 (No. 138) Worst Forms of Child Labor Convention, 1999 (No. 182)	These conventions are applicable to all workers employed by MEPCO, its consultants and its contractors.

2.2 WB Environmental and Social Standards

The relevant WB ESSs are briefly described in **Table 2.2**.

Table 2.2: **Applicable World Bank ESSs**

World Bank ESS	Brief Description and Relevance to the Subproject
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Applies to the entire subproject. Requires the preparation and implementation of an ESIA and ESMP to identify, assess, and manage environmental and social risks during construction and operation of grid stations and transmission lines. This ESIA has been prepared in accordance with this ESS.
ESS 2: Labor and Working Conditions	Ensures fair treatment, safe working conditions, and rights of all workers involved in the subproject. Requires the preparation and implementation of Labor Management Procedures (LMP), grievance redress mechanisms for workers, and enforcement of child labor and safety regulations. The LMP has been prepared for the entire EDIEP and MEPCO will implement it during the proposed subproject execution. This ESIA also includes mitigation and control measures to address labor issues and working conditions in accordance with this ESS.
ESS 3: Resource Efficiency and Pollution Prevention and Management	Relevant to the management of air emissions, noise, solid waste, hazardous materials (e.g., transformer oil), and usage of resources including water, fuels and others during construction and operation phases. This ESIA includes measures to address efficient resource usage and to manage/prevent pollution, in accordance with this ESS.
ESS 4: Community Health and Safety	Addresses public safety risks from construction activities, traffic, exposure to electromagnetic fields (EMF), and interaction with laborers. Also includes emergency response measures and awareness for local communities. This ESIA includes measures to address community health and safety risks in accordance with this ESS.
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Triggered due to land acquisition for DG Khan-III Grid Station and possible temporary land use for transmission line construction. Abbreviated Resettlement Action Plans (ARAPs) (provided under separate covers) have been prepared in accordance with this ESS.
ESS 8: Cultural Heritage	Relevant in case of accidental discovery of physical cultural resources during excavation. The ESMP includes chance find procedures to manage such findings.
ESS 10: Stakeholder Engagement and Information Disclosure	Requires continuous engagement with stakeholders, particularly affected persons, women, and vulnerable groups. A Stakeholder Engagement Plan (SEP) has been developed, and consultations have been carried out at all subproject locations, in accordance with this ESS.

2.3 Gaps between National/Provincial Regulations and WB Standards

While Pakistan has a foundational set of environmental, labor, and land acquisition laws, several areas do not fully align with the more comprehensive and inclusive requirements of the World Bank. Notable gaps include the absence of formal labor management procedures, limited focus on OHS and CHS risks, lack of structured grievance redress mechanism, lack of clear disclosure requirements, limited provisions for informal land users under the Land Acquisition Act, lack of structured stakeholder engagement throughout the project lifecycle. To address these discrepancies, MEPCO has adopted additional instruments such as the ESMF, SEP, LMP, and

ARAPs to ensure compliance with World Bank standards and promote responsible, inclusive, and sustainable project implementation.

Table 2.3 outlines the key gaps between Pakistan's national and provincial regulatory framework and the World Bank's ESSs as applicable to the proposed subproject, and also describes the measures taken by MEPCO to address these gaps.

Table 2.3: Gap Analysis with Local Legislation

Aspects	National / Provincial Regulations	World Bank Standards	Identified Gaps	Measures to Address Gaps
Environmental Assessment	Requires IEE/EIA under PEPA 1997 and provincial EPAs for certain categories. Focus is mostly biophysical.	ESS1 requires a comprehensive ESIA that includes social, health, and labor risks, with an ESMP and monitoring plan.	National laws focus more on environmental impacts, while WB requires integrated environmental and social risk management.	This ESIA address both environmental and social risks and impacts and aspects with greater focus on OHS, CHS, SEA, SH, grievance management
Labor and Working Conditions	Labor laws exist (e.g., Employment of Children Act, Minimum Wages Ordinance), but enforcement is weak.	ESS2 requires a formal Labor Management Procedure, workers' GRM, safety plans, and non-discrimination.	No requirement for LMP and worker-specific grievance mechanism.	In accordance with this ESS: • The LMP has been prepared and will be implemented during the subproject execution. • This ESIA also clearly describes risks and impacts associated with labor and working conditions.
Community Health and Safety	Covered indirectly under PEPA or OHS laws; limited guidance on EMF, fire safety, or emergency response.	ESS4 includes specific requirements to address community health and safety risks including SEA/SH, and emergency preparedness.	National law and standards do not adequately focus on CHS issues	This ESIA includes measures to address CHS issues including SEA/SH risks, in accordance with this ESS.
Involuntary Resettlement	Governed by the Land Acquisition Act (1894), which focuses on landowners, and not on informal users or tenants. No livelihood restoration provisions.	ESS5 mandates compensation at replacement cost, livelihood restoration, and inclusion of informal occupants in the resettlement planning.	The Land Acquisition Act lacks provisions for non-titleholders, economic displacement,	MEPCO has prepared ARAPs to address the involuntary resettlement impacts in accordance with this ESS.

Aspects	National / Provincial Regulations	World Bank Standards	Identified Gaps	Measures to Address Gaps
			and transitional support.	
Stakeholder Engagement	Public hearing required only for EIAs, not IEEs; often treated as a one-time event. No formal requirement of an SEP. No formal requirement of a GRM.	ESS10 requires ongoing, inclusive, and gender-sensitive stakeholder engagement and disclosure throughout the project lifecycle. ESS10 also requires a multi-tier GRM.	Stakeholder engagement is not institutionalized or gender-inclusive under national law.	In accordance with this ESS: • The SEP has been prepared and is being implemented. • Consultations have been carried out during the preparation of this ESIA. • MEPCO has established GRM to address community complaint and grievances.

3 Subproject Description

This Chapter provides a simplified description of the proposed subproject and its components, its technical specification, construction and O&M activities, and temporary facilities to be established by the contractor.

3.1 Subproject Needs and Objectives

The proposed subproject comprises construction and operation of six new 132-kV grid stations and their associated 132-kV transmission lines, as listed below.

- 132-kV Khanewal-II grid station and the associated In/Out 132-kV transmission line
- 132-kV DG Khan-III grid station and the associated In/Out 132-kV transmission line
- 132-kV Layyah-II grid station and the associated In/Out 132-kV transmission line
- 132-kV Arifwala-II grid station and the associated In/Out 132-kV transmission line
- 132-kV Rahim Yar Khan-III grid station and the associated In/Out 132-kV transmission line
- 132-kV Shah Jamal grid station and the associated In/Out 132-kV transmission line.

The existing distribution system in these districts is fully loaded with no provision for further expansion. These areas also face low-voltage problem and frequent power breakdowns, owing to lengthy 11-kV feeders and over-loaded circuits.

In line with the overall objectives of the EDEIP, the proposed subproject is designed to address the above-described longstanding challenges in the electricity distribution network across the key districts of Southern Punjab. The proposed subproject aims to:

- Enhance the reliability and operational capacity of the electricity distribution network, and reducing unplanned outages and system failures.
- Reduce technical losses and power outages by modernizing infrastructure and improving load management, particularly in areas with overloaded feeders and aging systems.
- Improve voltage regulation and supply quality across urban, semi-urban, and rural areas.
- Promote inclusive economic and social development by ensuring uninterrupted and efficient electricity supply to households, schools, hospitals, agricultural farms, and small to medium enterprises (SMEs), many of which currently suffer from poor voltage profiles and supply disruptions.

Once completed, the grid stations under the proposed subproject are expected to contribute not only to enhancing energy sector efficiency but also to the broader goals of regional development and improved quality of life in underserved areas of Punjab.

3.2 Locations of Proposed Grid Stations

The 132-kV Arifwala-II Grid Station will be constructed in an agricultural area just outside the Arifwala town, about 193-km from Multan. About five acres of government-owned land is being acquired for this grid station. About 200-m long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network. See **Figure 3.1** for the location of this grid station.

The 132-kV DG Khan-III Grid Station will be constructed in an agricultural area outside the DG Khan town, about 100-km from Multan. About four acres of privately owned cultivated land is being acquired for this grid station. About 400-m long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network. See **Figure 3.2** for the location of this grid station.

The 132-kV Khanewal-II Grid Station will be constructed in an agricultural area just outside the Khanewal town, about 60-km from Multan. About eight acres of government-owned barren land is being acquired for this grid station. About 1-km long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network. See **Figure 3.3** for the location of this grid station.

The 132-kV Layyah-II Grid Station will be constructed in Layyah town, about 130-km from Multan. About three acres of government-owned barren land is being acquired for this grid station. About 200-m long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network. See **Figure 3.4** for the location of this grid station.

The 132-kV Rahim Yar Khan-III Grid Station will be constructed in an agricultural area outside the Rahim Yar Khan town, about 260-km from Multan. About seven acres of government-owned barren land is being acquired for this grid station. About 5-km long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network. See **Figure 3.5** for the location of this grid station.

The 132-kV Shah Jamal Grid Station will be constructed outside the Shah Jamal town, about 85-km from Multan. About six acres of government-owned barren land is being acquired for this grid station. About 14-km long 132-kV double circuit transmission line will also be constructed to connect the proposed grid station with the existing transmission line network. See **Figure 3.6** for the location of this grid station.

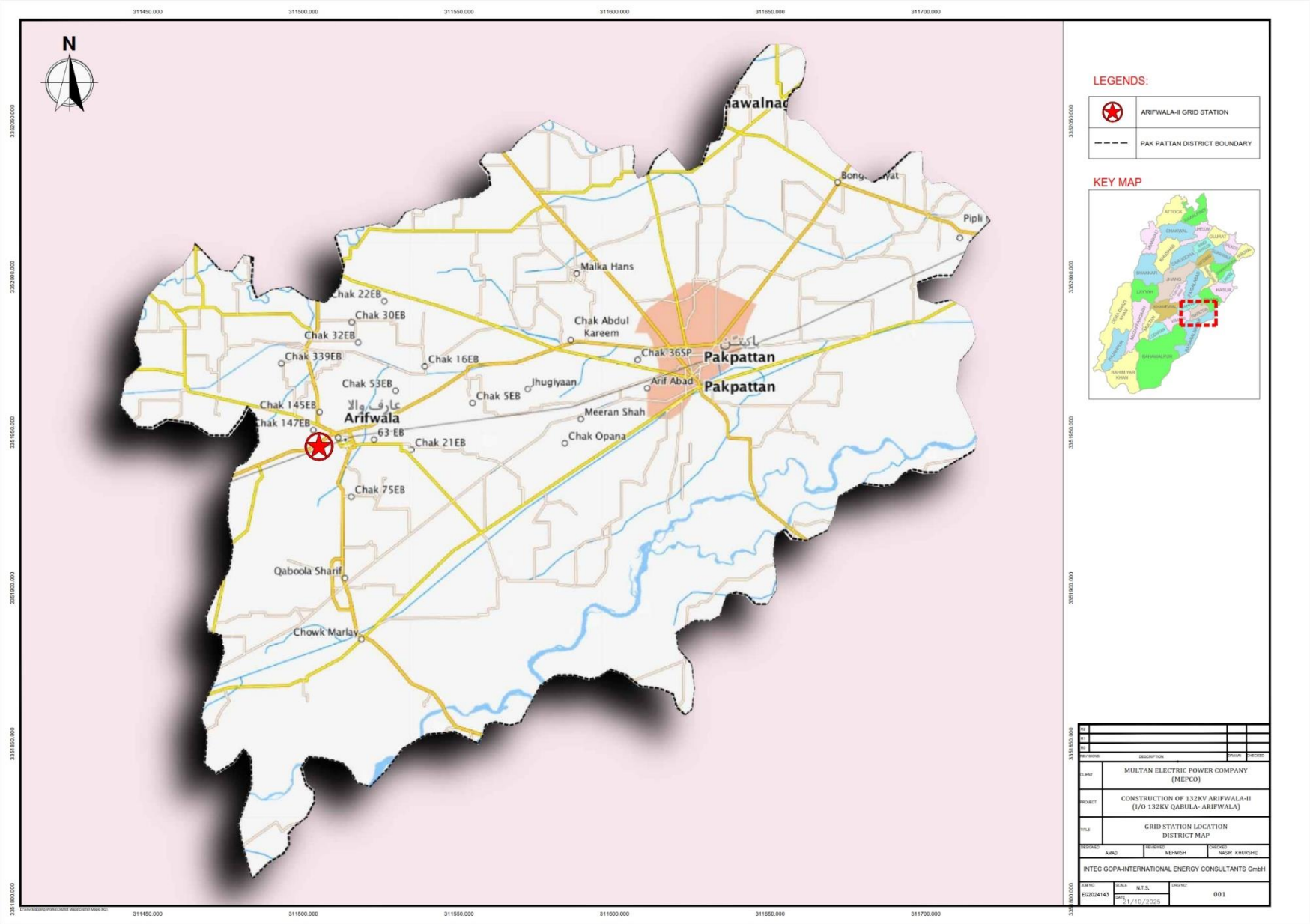

Figure 3.1: Location of 132-kV Arifwala-II Grid Station

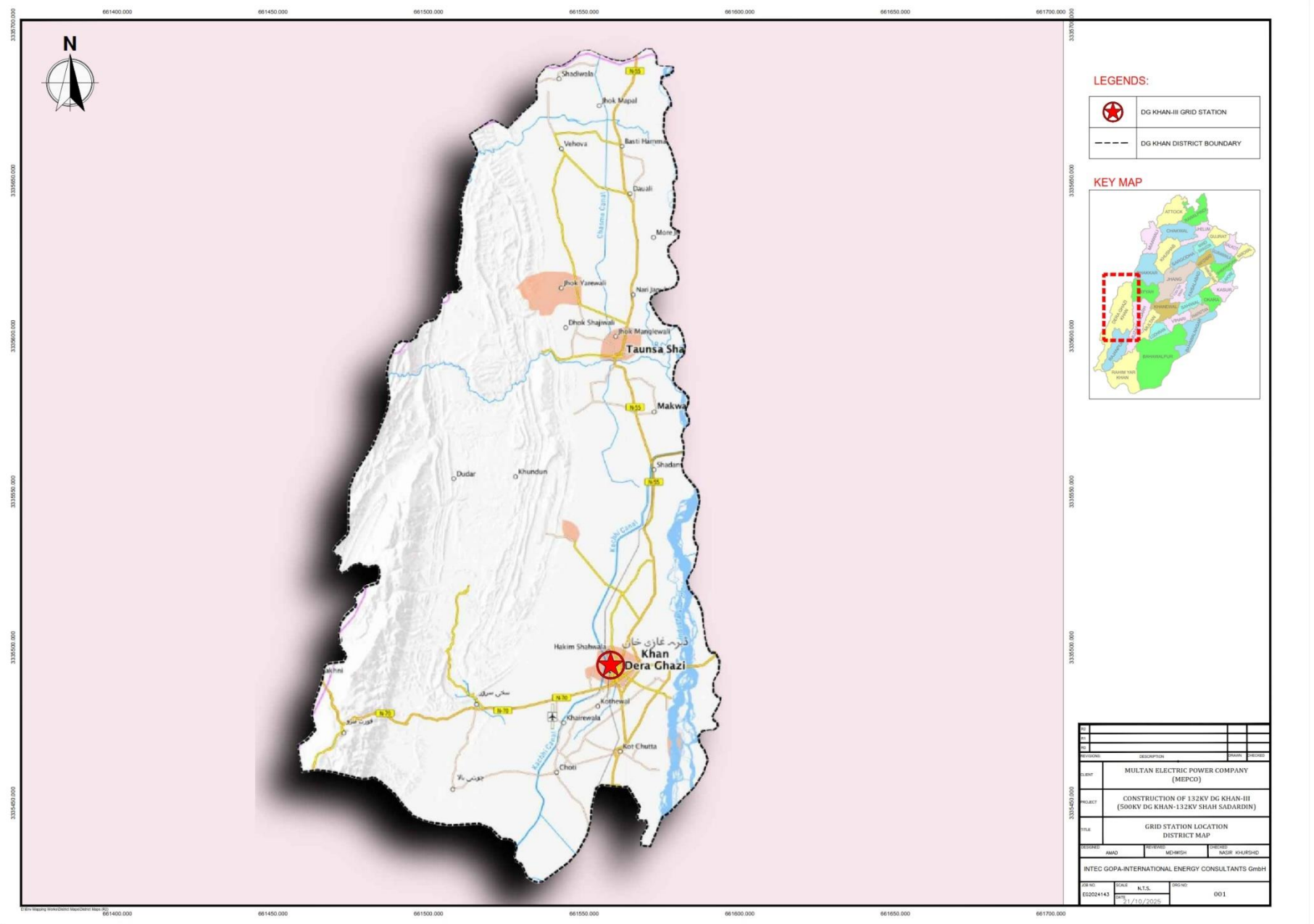

Figure 3.2: Location of 132-kV DG Khan-III Grid Station

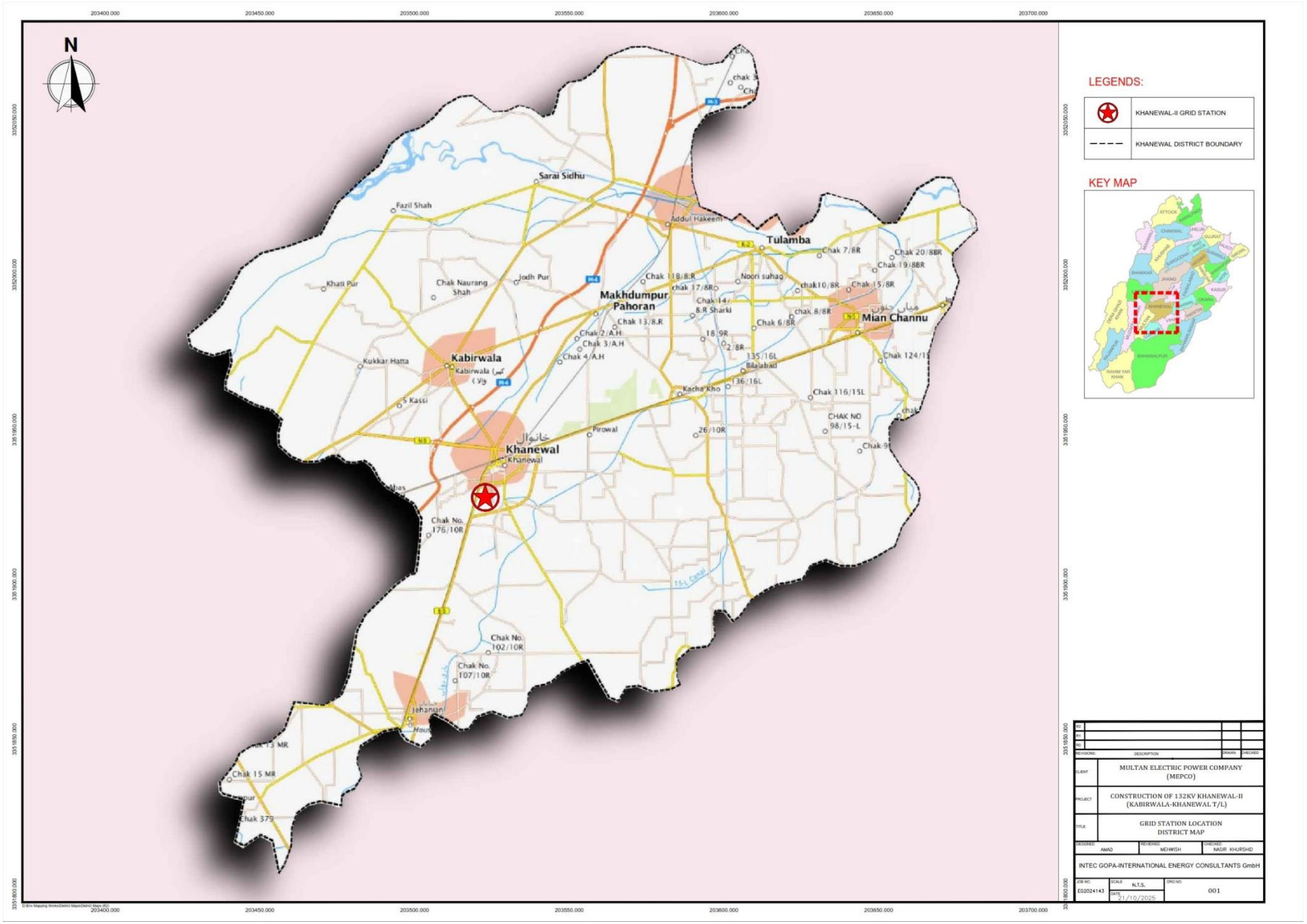

Figure 3.3: Location of 132-kV Khanewal-II Grid Station

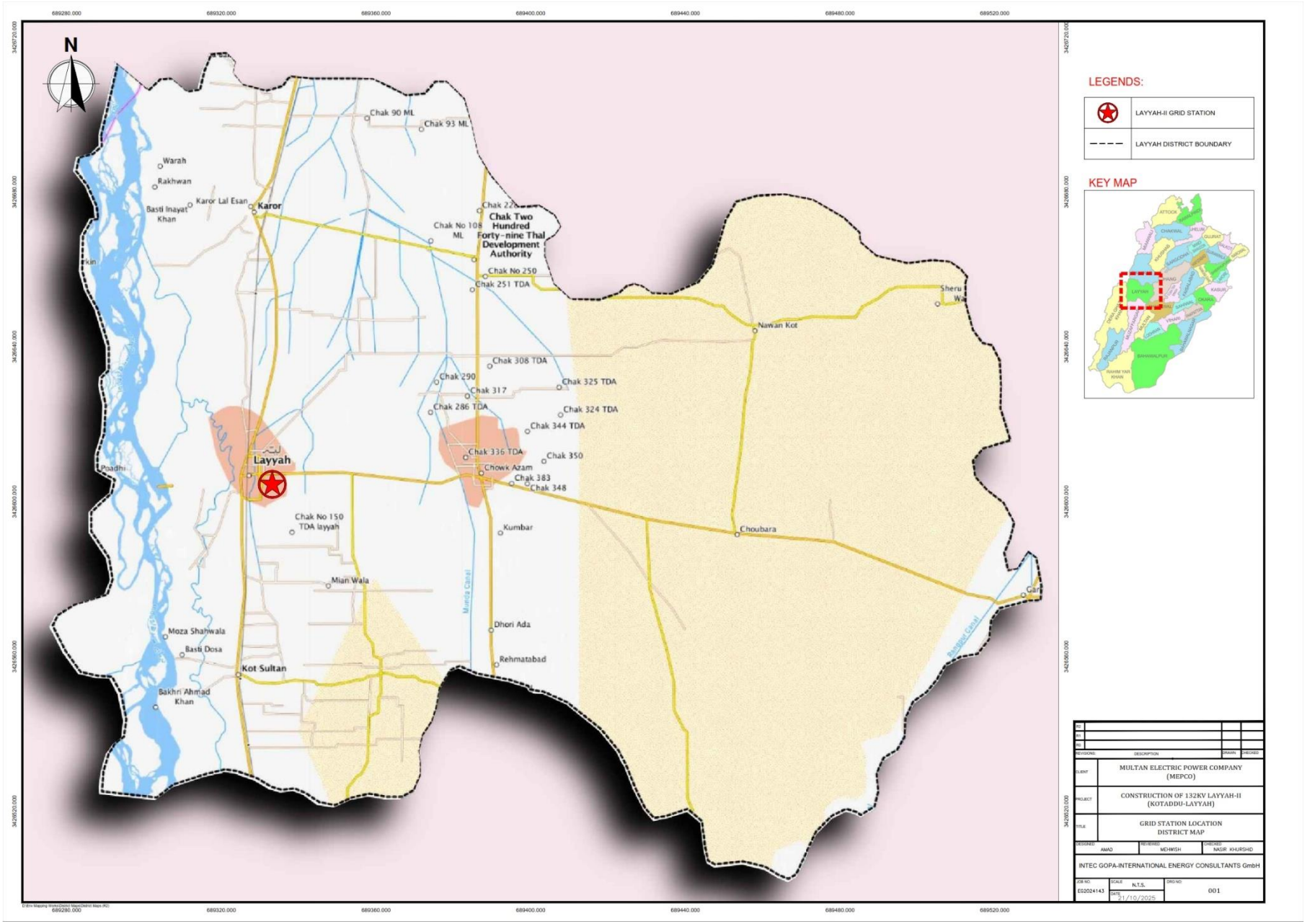

Figure 3.4: Location of 132-kV Layyah-II Grid Station

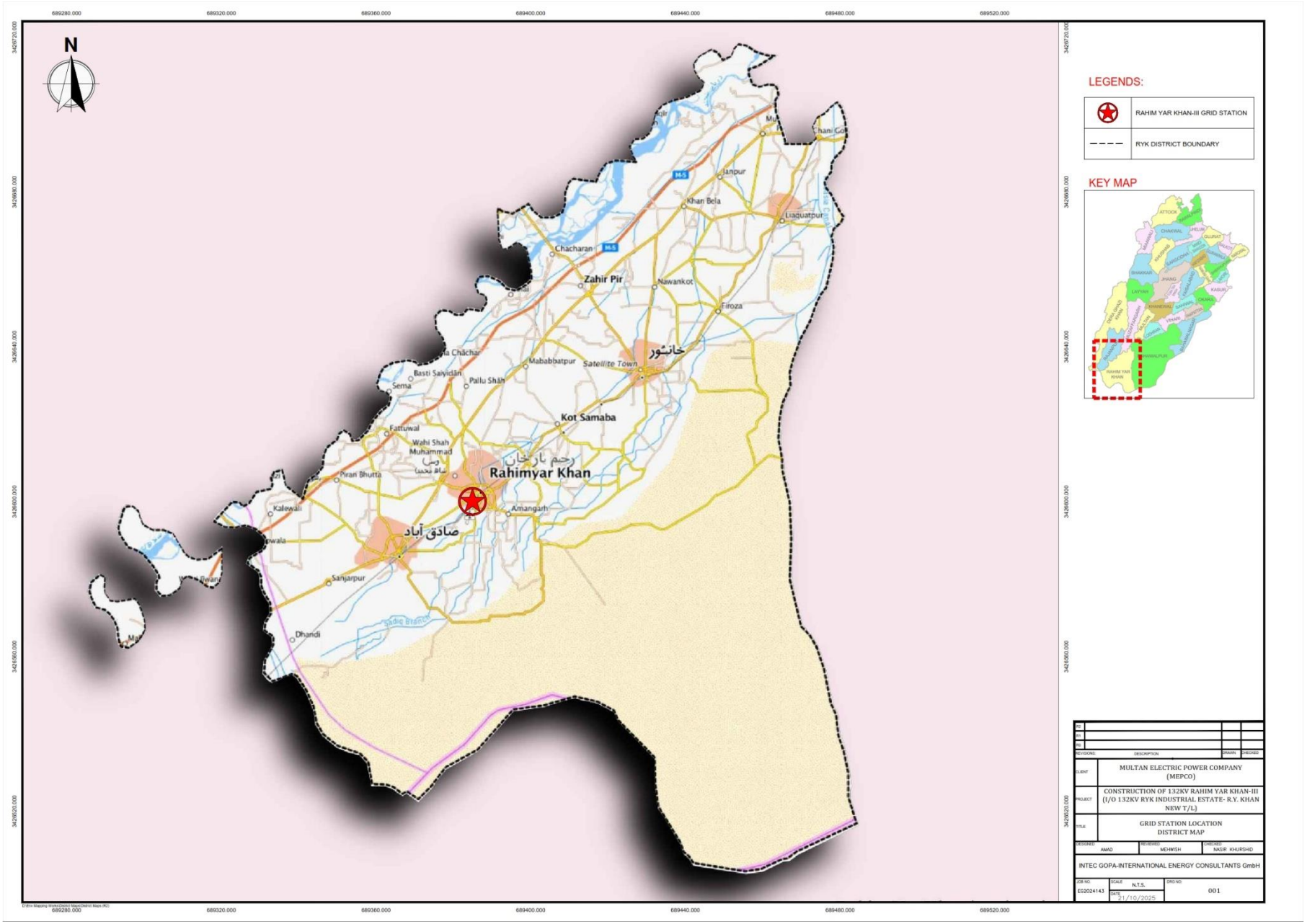

Figure 3.5: Location of 132-kV Rahim Yar Khan-III Grid Station

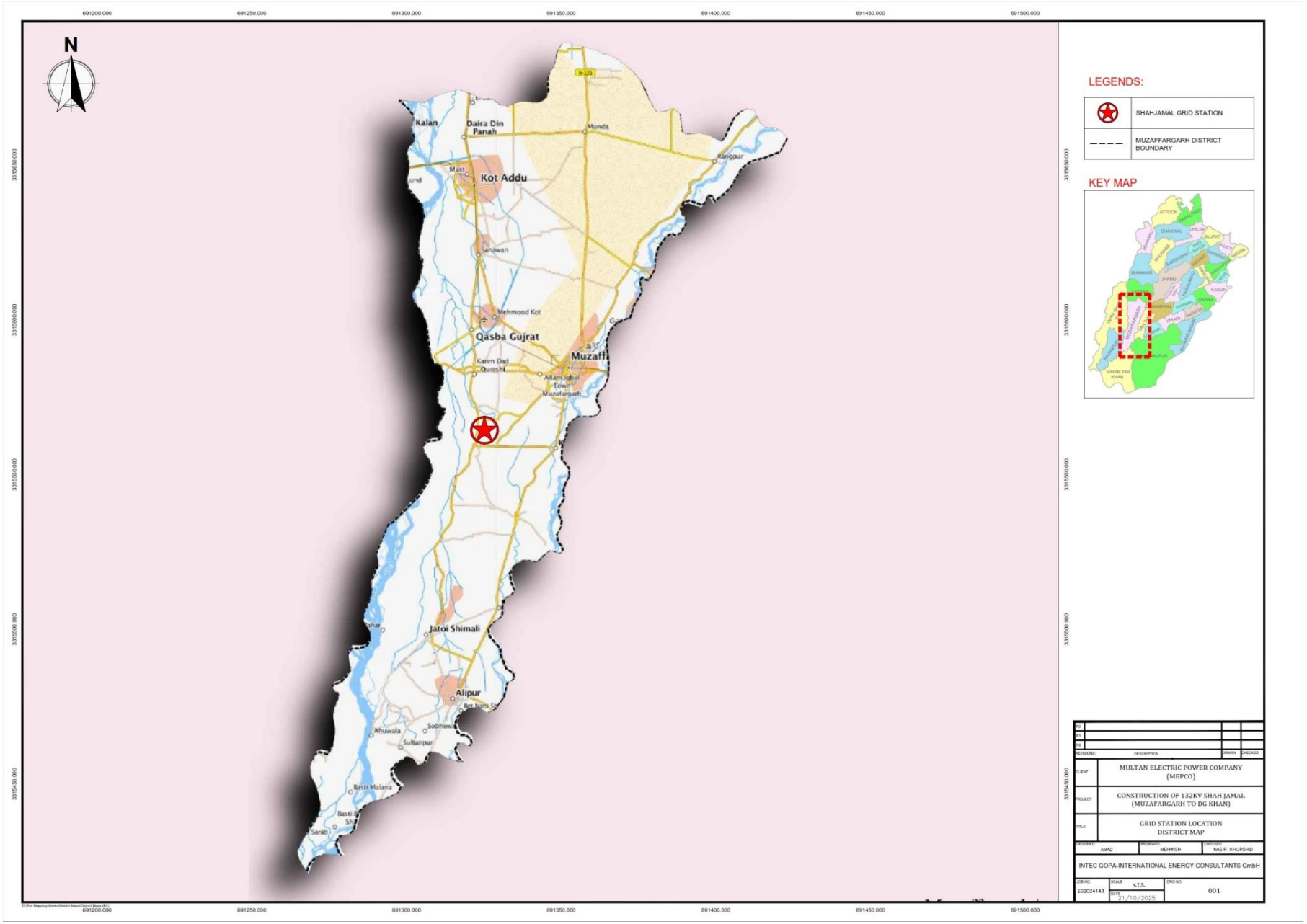

Figure 3.6: Location of 132-kV Shah Jamal Grid Station

3.3 Technical Details for Proposed Grid Stations and Transmission Lines

The basic purpose of the 132-kV grid stations is to stepdown the 132-kV voltage to the 11-kV voltage that is used for the distribution of electricity. The 132-kV grid stations receive electricity through the 132-kV transmission lines and stepdown the voltage to 11-kV. From these grid stations, the 11-kV feeders then go to the electricity consumers, where the electricity is further stepped-down to 220/440 volts (particularly for the residential consumers), which is then supplied to the consumers through electricity meters.

In line with the above-mentioned purpose of these grid stations, the key component of the grid stations is the 132-kV to 11-kV transformer (usually called the power transformer). Each grid station under the proposed subproject will have these power transformers and other equipment, as listed below.

- 40 MVA, 132/11.5kv Power Transformers along with allied accessories.
- 132-kV Lightning Arrestors along with steel supporting structure
- 132-kV Current Transformers (CTs), 200:100/5A along with steel supporting structure
- 132-kV Circuit Breaker along with steel supporting structure
- 132- kV Bus Isolators along with steel supporting structure
- 132-kV Line Isolators along with steel supporting structure
- 132- kV Line CTs (1200:600/5A) along with steel supporting structure
- 132- kV Potential Transformers (PTs) along with steel supporting structure
- 132- kV Column; 132- kV Beams; 132- kV Earth Mast
- Aluminum Conductor; Connectors (various types); Tension Strung Assembly
- Earth wire tension assembly Clamp; Earth wire; Earthing platforms
- Control Panels; Relay Panels; Capacitor Panel; Power cables, Control Cables
- Indoor Termination Kits; Outdoor Termination Kits; Aluminum pipe
- 11- kV Structure; 11- kV Lightning Arrestors; 11- kV Post Insulators
- Grounding Conductor; Earth Rods; Cartridge (various types)
- Alternate Current (AC)/Direct Current (DC) Panel; 11-kV Incoming Panel; 11-kV Outgoing Panels
- 110-V Battery charger; 110-V Battery Set
- 11-kV Bus Coupler; Disc Insulators
- 200-KVA Auxiliary Transformer (Pad Mounted)
- Sulfur hexafluoride (SF-6) Gas Cylinder 40 KG
- 11-KV Capacitor Racks; Neutral CT 50/5/A; Low tension (LT) Cable
- Steel Structure high tension (HT)-type; Steel Structure LT-type; 11-KV Capacitor Cell 200KVAR
- 2-Ton floor type Air Condition for Control Room

The In/Out 132-kV transmission lines associated with the proposed grid stations will need the following equipment/material:

- Tower Type ZM1+0; Tower Type ZM1+3; Tower Type ZM1+6; Tower Type ZM30+0; Tower Type ZM30+3; Tower Type ZM60+0; Landative Tower
- Steel Pole Type SPA; Steel Pole Type SPD; Steel Pole Type SPG
- V - Shackle for Gantry
- Aluminum Conductor Steel-Reinforced (ACSR)[7] Lynx[8] Conductor 19.53 mm diameter
- Overhead shield wire 9.78 mm diameter
- Fog type disc insulators
- Single string suspension assemblies complete with suspension clamp
- Single string tension assemblies complete with jumpers and dead-end bodies
- Compression type mid span joint for ACSR Lynx conductor
- Compression type repair sleeve for ACSR Lynx conductor
- Stock bridge vibration dampers type for ACSR Lynx conductor
- PG Clamp
- Suspension fittings for 9.78 mm diameter alumoweld shield wire
- Tension fittings for 9.78 mm diameter alumoweld shield wire
- Compression type mid span joints for 9.78mm diameter alumoweld shield wire
- Stock bridge vibration dampers for 9.78mm diameter alumoweld shield wire
- 16-mm diameter 3.0 m long copper covered ground rods.
- 10-mm diameter copper covered ground wire 1.0 m long.

The 132-kV Shah Jamal grid station will have one power transformers, whereas each of the remaining five proposed grid stations will have two power transformers. All of the outdoor electrical equipment including power transformers, circuit breakers, and lightning arrestors of each grid station will be housed in a switchyard that will be enclosed by a steel-wire fencing whereas the entire grid station periphery will typically have a brick-masonry boundary wall. Each grid station will have a control room and office block. Each grid station will also have residential quarters for the grid station employees. The layouts of the proposed grid stations are presented in **Figures 3.7** to **3.12**.

[7] ACSR is a composite cable made of a core of high-strength steel wires surrounded by layers of aluminum wires. The steel provides the necessary tensile strength for long spans between towers, while the aluminum carries the electrical current.

[8] The "Lynx" corresponds to a specific standard for the number and size of aluminum and steel strands. Lynx conductor has 30 aluminum strands and 7 steel strands of the same diameter.

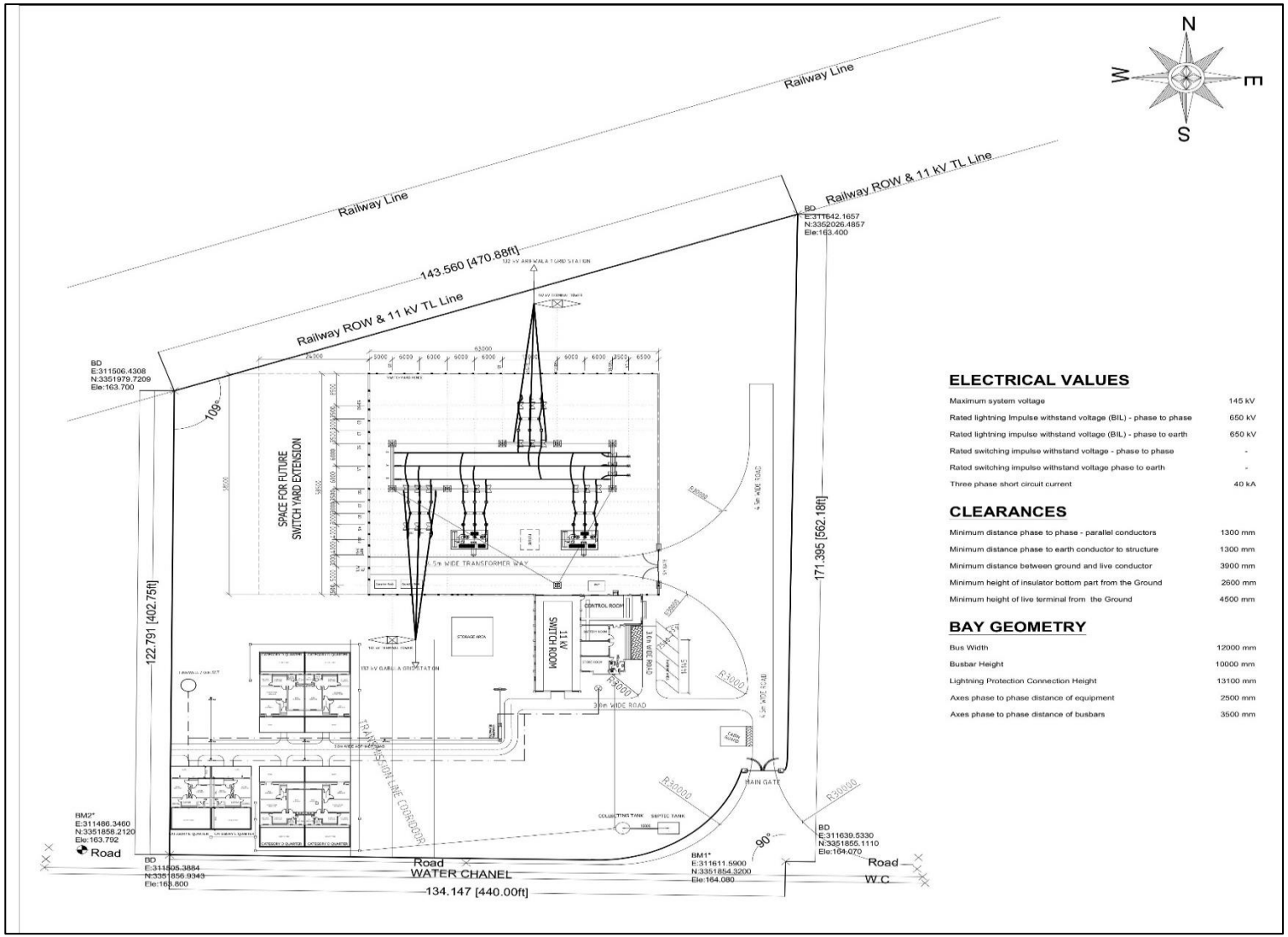

Figure 3.7: Layout of 132-kV Arifwala-II Grid Station

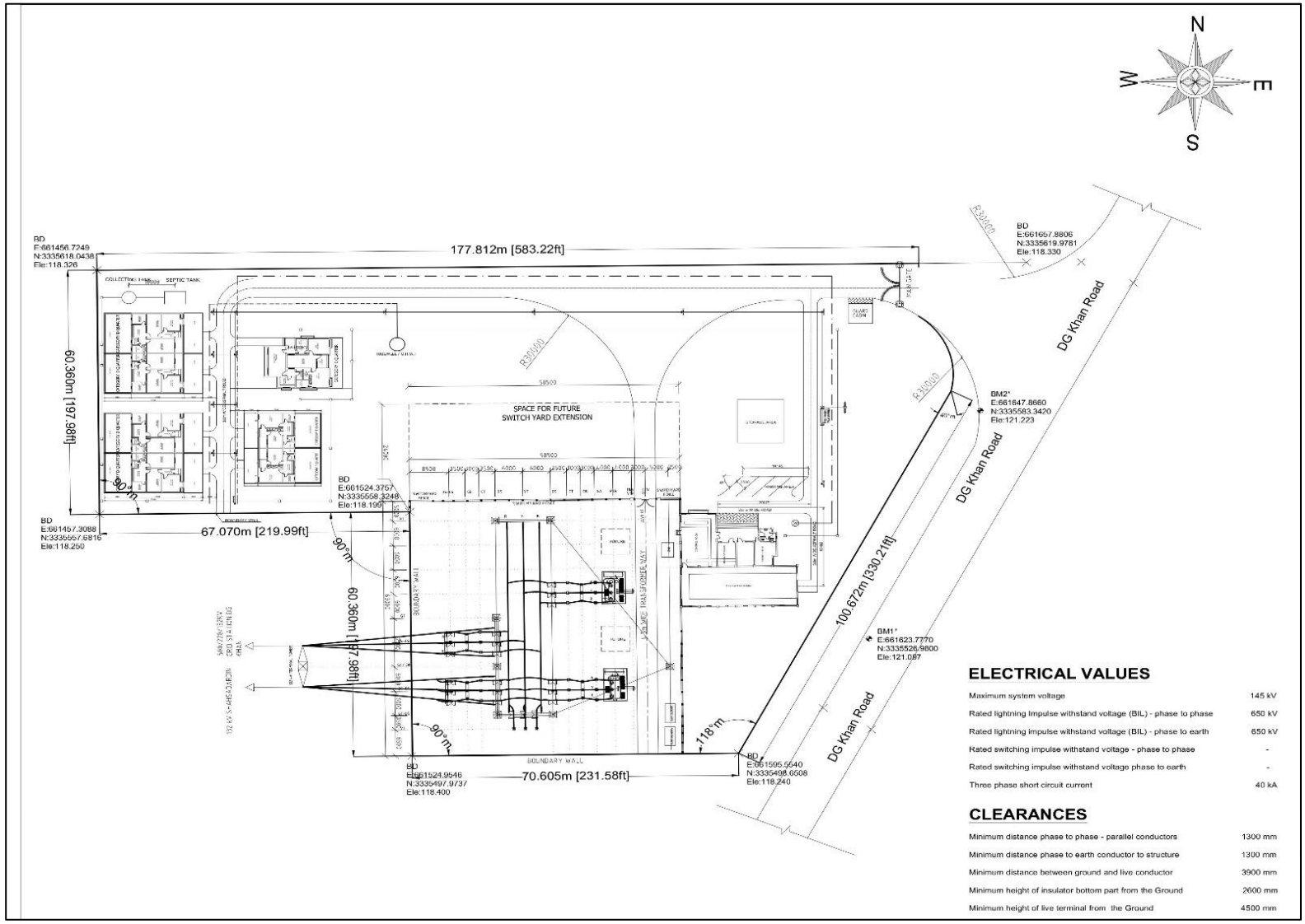

Figure 3.8: Layout of 132-kV DG Khan-III Grid Station

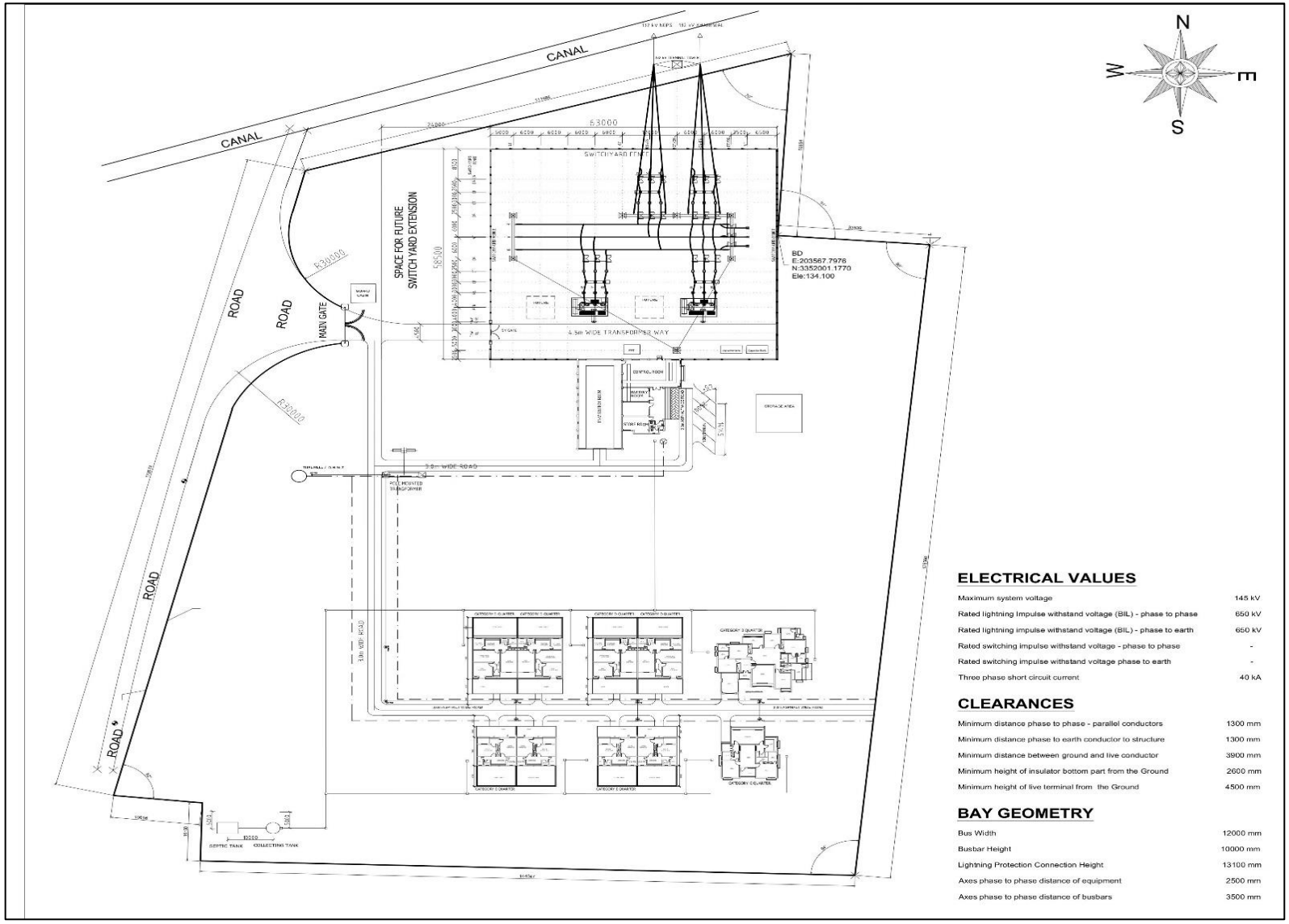

Figure 3.9: Layout of 132-kV Khanewal-II Grid Station

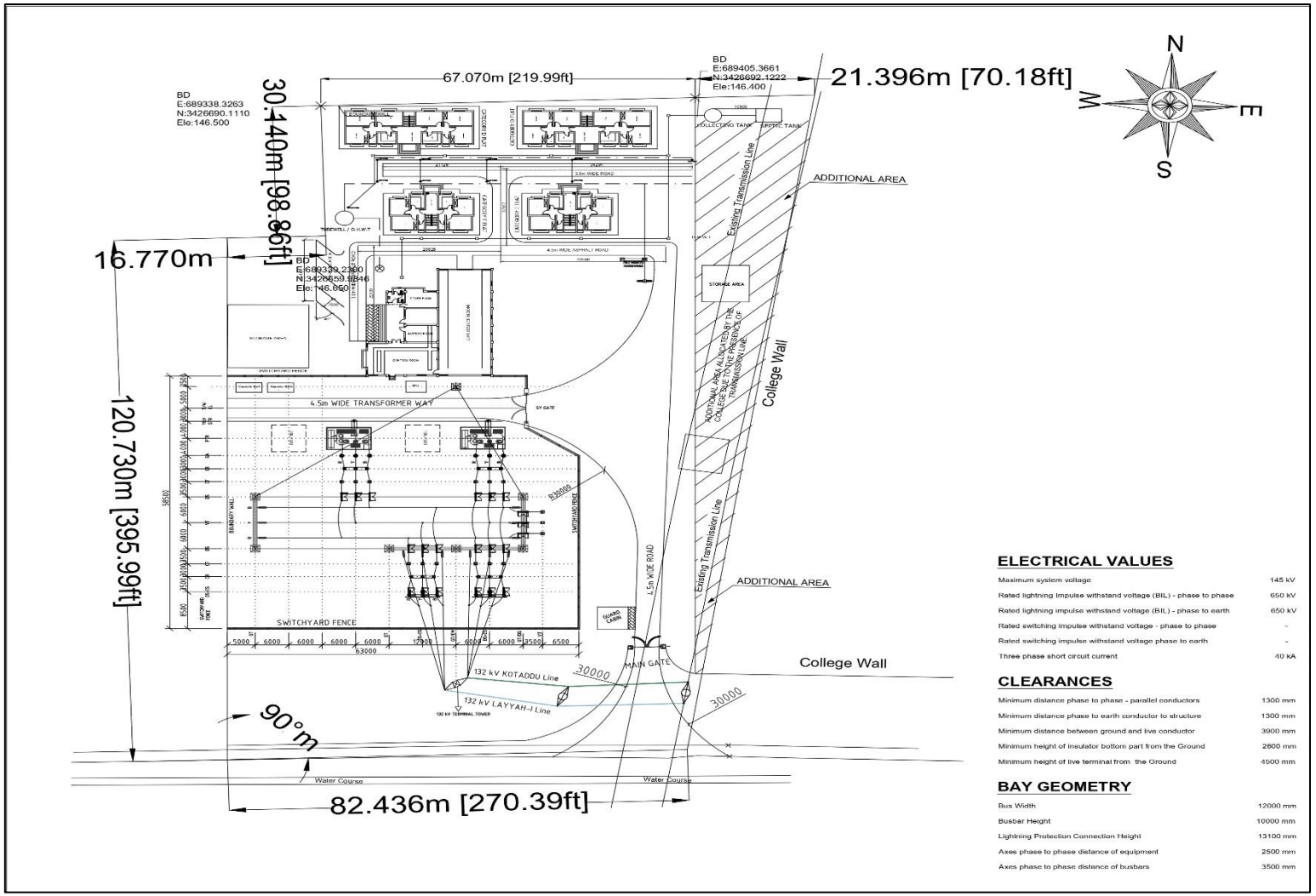

Figure 3.10: Layout of 132-kV Layyah-II Grid Station

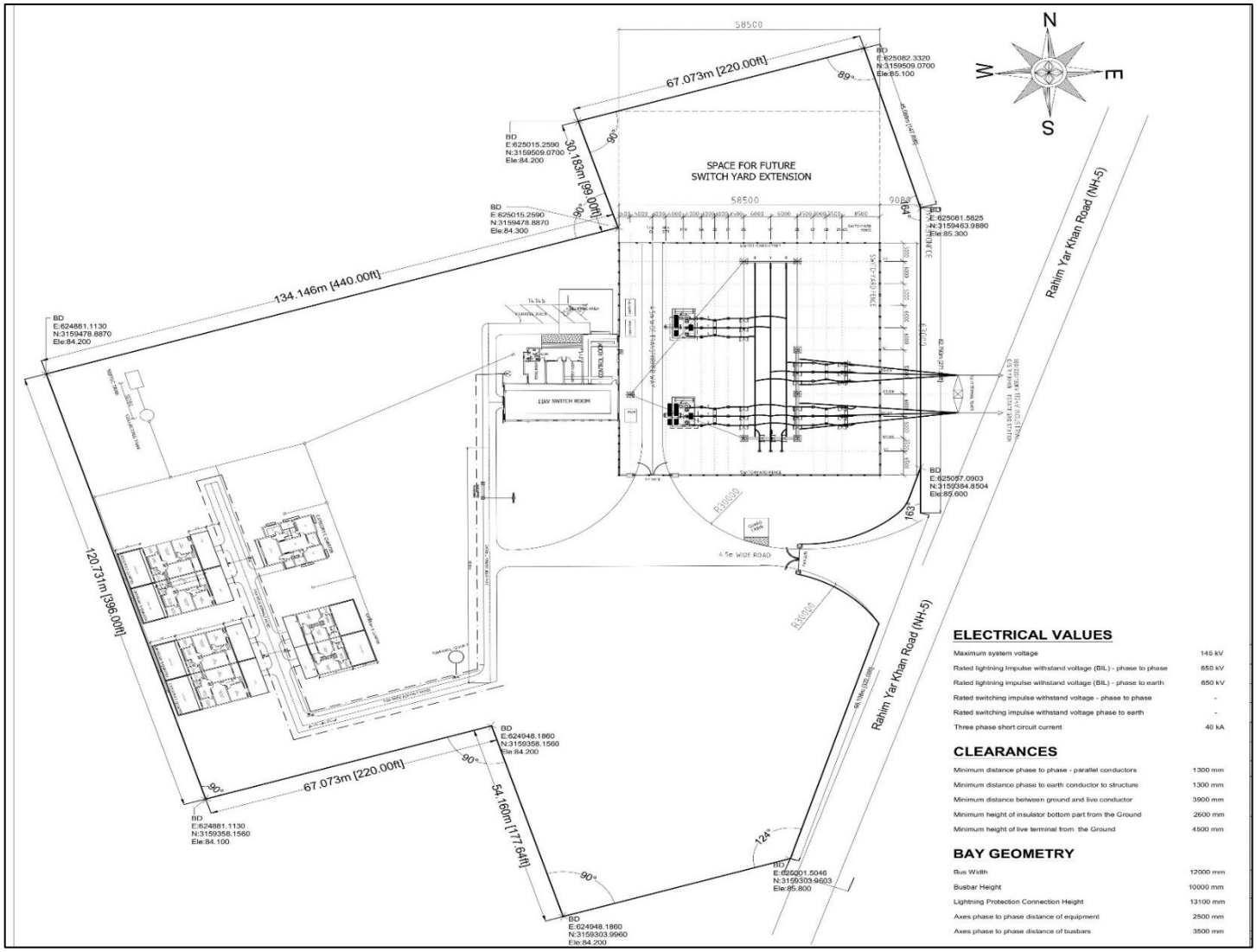

Figure 3.11: Layout of 132-kV Rahim Yar Khan-III Grid Station

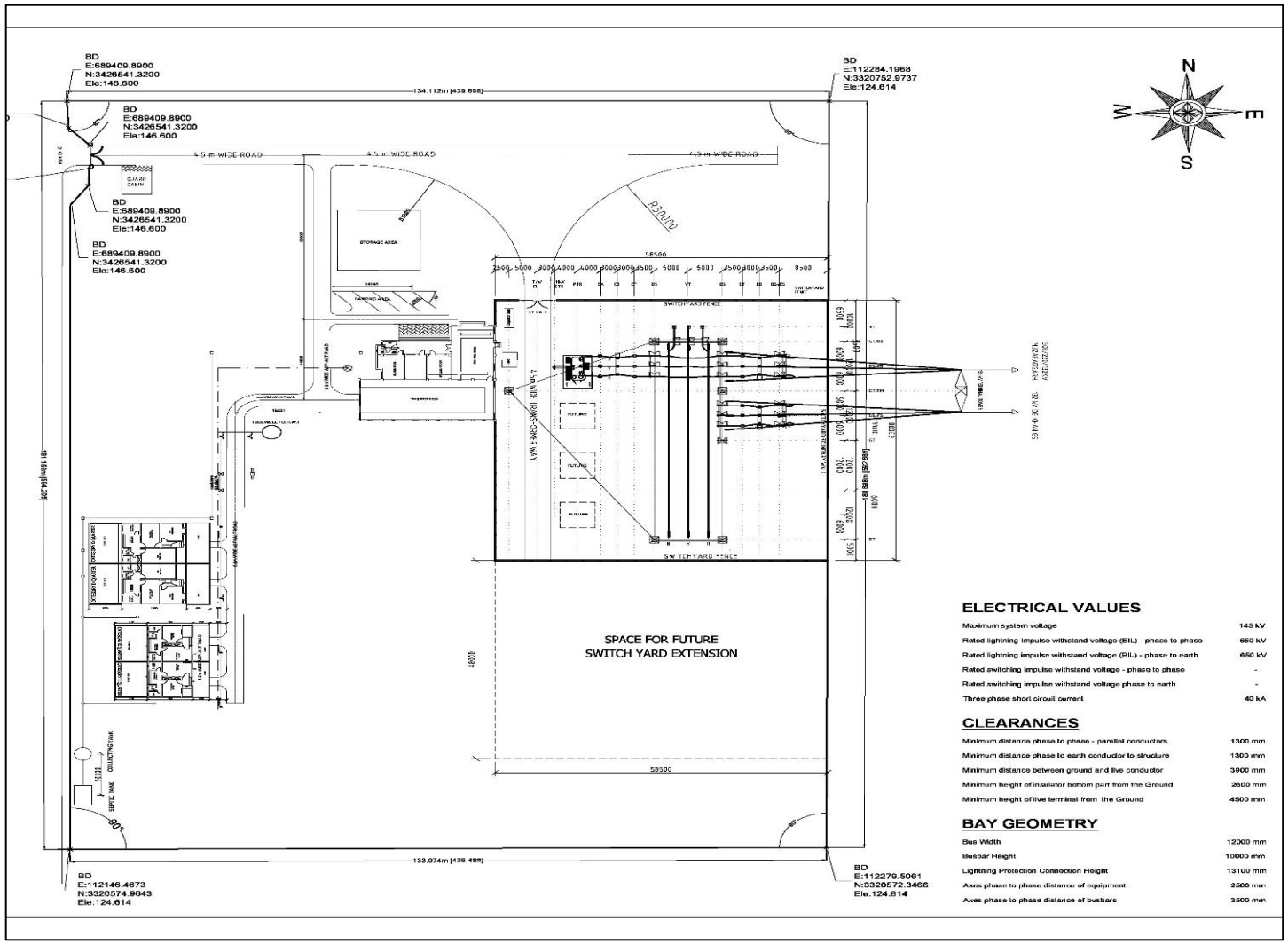

Figure 3.12: Layout of 132-kV Shah Jamal Grid Station

3.4 Construction Activities

The key steps involved in the construction of the proposed subproject as well as other requirements during the construction stage are described in subsections below.

3.4.1 Site Preparation and Civil Works for Grid Stations

A simplified description of the civil construction activities for the grid station is given below. The detailed construction sequence and methodologies will be developed by the construction contractor.

- Contractor mobilization
- Removal of existing vegetation, debris, and leveling of land to create a uniform base for civil works.
- Excavation and construction of reinforced cement concrete (RCC) foundations for power transformers, including oil pits and oil containment bunds[9].
- Disposing of excavated material at a locations approved by MEPCO.
- Construction of RCC foundation for circuit breakers, bus bars, isolators, and lightning arrestors.
- Excavation and construction of cable trenches
- Construction of foundations for office block, control building, and residential quarters.
- Construction of access road, construction of roads inside the grid station.
- Sewage disposal system
- Drainage systems to manage stormwater during construction and operation.
- Boundary walls for security and safety around the grid station perimeter.

3.4.2 Electrical Equipment Installation for Grid Stations

A simplified description of the installation activities for the grid station equipment listed in **Section 3.3** is given below. The detailed construction sequence and methodologies will be developed by the construction contractor.

- Construction of transformer bay within the switchyard
- Installation of a power transformers and its accessories
- Assembling bushings, radiators, conservator tank, and other accessories on transformer, filling transformer oil under vacuum.
- Installation of associated equipment including high-voltage circuit breakers, isolators, CTs/PTs, lightning arrestors, bus isolator, line isolators, and other equipment as listed in **Section 3.3**
- Laying of conductors inside switchyard
- Laying of power and control cables in the trenches

[9] A bund is a concrete or masonry enclosure built around or beneath a power transformer. It includes a sloped oil pit or drainage system that collects leaked transformer oil. The bund is typically lined with impermeable material to prevent soil and groundwater contamination.

- Installation of control panels, capacitor bank for power factor correction, and other equipment in control building
- Connecting bushings to bus bars, surge arresters, CTs and PTs; cable terminations; earthing connections.
- Protection and control system integration including installing and wiring of protection relays, control panels, Supervisory Control and Data Acquisition (SCADA) system connections, and communication lines.
- Testing and commissioning including insulation resistance test, transformer turns ratio test, winding resistance test, and functional tests; energizing transformer.
- Site restoration and demobilization of contractor.

3.4.3 Transmission Line Construction

A simplified description of the key activities involved in the transmission line construction is provided below.

- Contractor mobilization
- A detailed route survey to finalize the alignment, considering terrain, accessibility, environmental and social sensitivities, and right-of-way constraints. Pegging and marking of tower locations using global positioning system (GPS) and topographic tools.
- Clearance of vegetation within the right-of-way where necessary, ensuring minimal disturbance to existing land use. Construction of temporary access roads/tracks to facilitate machinery and material transport.
- Soil testing and geotechnical investigations to determine load carrying capacity of the soil.
- Excavation at each tower location, followed by the construction of RCC foundations tailored to soil type and tower load. Curing of foundations and testing before proceeding to tower erection.
- Assembling and erection of steel lattice towers or poles at each foundation site using cranes or tripods.
- Installation of insulators and hardware fittings, followed by conductor stringing across the erected towers. Tensioning and sagging of conductors as per design specifications. Stringing of earth wire (grounding wire) to protect against lightning.
- Installation of vibration dampers, warning spheres (near roads or air corridors), and anti-climbing devices. Earthing of towers to ensure electrical safety.
- Electrical and mechanical testing to ensure alignment, tension, insulation integrity, and grounding compliance. After clearance, energizing the line for operational integration.
- Site restoration and demobilization of contractor.

3.4.4 Construction Equipment

The contractor will need standard construction equipment for civil works and equipment installation. A typical list is provided in **Table 3.1**.

Table 3.1 Key Construction Equipment and Vehicles

Description	Typical Quantity per Site
Excavator	1–2
Concrete Mixer / Batching Plant	4
Crane	1
Backhoe Loader	1
Dump Truck / Tipper	2–3
Water Bowser (Tanker)	2
Roller/Compactor	2
Tower Erection Gin Pole or Crane	1
Stringing Equipment (Tensioners & Pullers)	1 set
Concrete Vibrator	2
Diesel Generator	2
Pickup/Utility Vehicles	2–4
Portable Welding Set	1–2
Firefighting Equipment	1 Set

3.4.5 Construction Material Requirements

The estimated quantities of the key construction materials and construction activities are listed below.

- 21,000 cubic meters (m^3) of excavation
- 3,000 m^3 pf plain cement concrete
- 6,000 m^3 of RCC
- 57,000 cement bags of 50 kg each
- 8,000 m^3 of crushed stone
- 4,000 m^3 of sand
- 10,000 m^3 of brick masonry work
- 600 tons of steel
- 7,000 liters of water per day for each site.

Most of the above construction materials will be procured from licensed local suppliers situated near each grid station site. Additional requirements for crushed stone and gravel will be met from reliable through private crushers/quarries operating with valid Environmental No Objection Certificates (NOCs). Similarly, cement and steel will be readily available through local distributors of major suppliers, thereby ensuring the timely availability of quality materials throughout the construction phase.

Water will be sourced from a mix of on-site boreholes, nearby tube wells, community water points, and private water tankers, depending on the availability at each location. All water abstraction activities will be carried out in compliance with the Punjab Water Act, 2019, ensuring that the rights and needs of local users are not compromised. Wherever feasible,

non-potable water will be prioritized for construction purposes to minimize pressure on community water resources. The contractor will be responsible for maintaining detailed records of water usage, ensuring that extraction remains within sustainable limits.

3.4.6 Temporary Facilities

For each grid station site, the contractor will establish workers' accommodations, material storage yards, site offices, and utility areas preferably within the boundaries of each respective grid station site. This approach minimizes external land requirements and associated social or environmental impacts. The contractor would need an area of about half an acre for each grid station site. the entire facility will be enclosed in a fencing with gated entry. All the necessary facilities will be provided in the facility including lighting, ventilation, drinking water supply, toilets (separate for men and women if necessary), firefighting equipment including fire extinguishers. The contractors would be required to prepare site layout plan and facility management plan and obtain approval from MEPCO.

Each facility will require a daily water supply of approximately 7,000 liters, mainly for domestic use, concrete curing, and dust suppression. The workers' camp will have all necessary facilities including kitchen and dining areas, recreation area, prayer area, washing and bathing areas, toilets, ensuring adequate ventilation, hygiene and cleanliness in accordance with the relevant labor laws. Sanitation will be provided via portable toilets or three-chamber septic tanks and soakage pits, depending on site-specific soil conditions and groundwater levels.

During peak construction, the daily solid waste generation is estimated at 40-50 kilograms (kg) per site,[10] primarily composed of domestic solid waste, packing material and workshop waste. This waste will be segregated and collected in designated bins/areas and disposed-off through municipal or contractor-arranged services. Hazardous waste such as used oil, lubricants, paint containers, and oily rags will be generated in small quantities. These will be stored in labeled, leak-proof containers and transported to licensed hazardous waste disposal facilities or returned to suppliers for

3.4.7 Construction Schedule

The construction of a 132-kV grid station typically takes up to 24 months; actual construction schedule will be prepared by the contractor and submitted to MEPCO for review and approval. The breakdown of this duration is given below.

- Pre-construction Phase (0-6 months):
  - Site acquisition and preparation
  - Detailed design and approvals
  - Procurement of materials and equipment
- Construction Phase (6-21 months):
  - Site development and civil works
  - Installation of electrical equipment and transmission lines
  - Building and infrastructure construction
- Testing and Commissioning (21-24 months):

[10] Basis: 70 workers per site; about 0.6 kg of domestic solid waste generated per day per capita.

- Electrical testing and commissioning of the grid station
- Integration with the existing transmission network
- Final inspections and certification
- Handover to operational teams
- Project closeout and documentation.

3.5 Operation and Maintenance (O&M) Activities

A simplified description of the O&M activities related to the grid stations and transmission lines is provided below.

- Operation Activities
  - The grid stations are manned round the clock and important parameters (such as voltage, load and power factor) are regularly monitored. Daily log sheets are filled, recording the key data.
  - Regular inspection and monitoring of transformers, switchgear, circuit breakers, relays, earthing systems, and control panels.
  - Any abnormality such as electrical faults in the system is recorded and concerned departments informed for taking remedial measures.
  - Emergency maintenance, location of faults, repairs and replacement of faulty equipment/material.
  - Conducting periodic ground inspections to detect transmission line conductor damage, loose fittings, vegetation encroachment, or tower corrosion.
  - Tightening bolts, cleaning insulators, applying anti-corrosion coatings, replacing worn-out fittings, and maintaining grounding systems.
  - Responding to faults or damage caused by storms, accidents, or equipment failure; isolating faulty sections and carrying out urgent repairs.
- Scheduled Maintenance
  - Checking/testing of transformers (further discussed below)
  - Testing of breakers
  - Testing of protection system
  - Transmission line patrolling
  - Washing/replacement of insulators
  - Carrying out repairs or replacements, as needed
  - Restoring the system to the normal operating conditions.

Maintenance 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 Water and Power Development Authority's (WAPDA's) Power Transformer Reclamation Workshop at Kot Lakhpat, Lahore.

Transformer oil testing: 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. 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, a more comprehensive test 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 carried out:

- Flash point
- Viscosity
- Moisture
- Gas contents
- Dielectric strength.

Transformer Oil Disposal: The transformer oil is mostly recycled in the transformer workshops. The unusable waste oil is disposed through contractors. MEPCO procedures include a list of approved firms for the disposal of the used transformer oil.

3.6 Manpower Requirements

The construction of the proposed subproject will require a diverse workforce of technical, skilled and unskilled workforce. The construction of a 132-kV grid station including its In/Out transmission line typically involves 60 to 70 workers. Hence for the proposed subproject involving six grid stations, a total of 360 to 420 workers would be needed.

For the O&M stage, a crew of 4-5 persons would be required in each 8-hour shift for each grid station operation. In addition, maintenance crew would also be required.

3.7 Analysis of Alternatives

In this Section, various siting and technical alternatives are discussed that have been considered during the planning and designing phase of the proposed subproject. In addition to technical and financial aspects, E&S considerations of each alternative have also been evaluated as part of this analysis.

3.7.1 No Project Alternative

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

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

The proposed project seeks to upgrade the secondary transmission and grid network of the MEPCO system. Establishing new grid stations will provide the much-needed relief to the over-loaded system, while also accommodating additional load, as described in **Section 3.1**. The establishment of new grid stations will also reduce the line losses and power breakdowns.

In case the proposed subproject is not undertaken, the MEPCO system will not be able to cope with the increasing demand, 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. MEPCO 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.

3.7.2 Siting Alternatives

The location of a new grid station site is determined by a committee comprising of professionals from planning, design, construction, operation and social formations of MEPCO. The committee selects the best site based from a number of alternatives, on the basis of the following considerations: cost; existing and projected electricity demand in the area; technically and socially acceptability; soil and atmospheric conditions; acceptable living conditions for staff members; road accessibility; and transmission line accessibility.

For each grid station location, 2-3 alternative sites were evaluated, and the most suitable one was selected. The alternative analysis of the candidate sites is presented in **Table 3.3**.

Table 3.2 Site Selection Summary for 132 kV Grid Stations

Grid Station	Site Option	Land Type	Social Aspects	Environmental Aspects	Transmission Line Length	Conclusion
Layyah-II Grid Station	Site 1	Barren government-owned land	No social issues reported	Land belongs to Forest Department, restricting development	1.5 km	Rejected due to land ownership with Forest Department
	Site 2	Government-owned barren land	No displacement or acquisition required	Minimal environmental impact; no sensitive receptors nearby	Within GS boundary	Selected for its accessibility and low environmental/social footprint
Khanewal-II Grid Station	Site 1	Agricultural land	High land acquisition cost, potential resistance from owners	Moderate vegetation loss; affects fertile soil	0.8 km	Rejected due to cost and land quality concerns
	Site 2	Barren government-owned land near existing infrastructure	Minor seasonal squatters; no permanent displacement	No vegetation loss; well-connected via existing road	1 km	Selected due to ease of access and minimal impacts
Arifwala-II Grid Station	Site 1 – Chak 79/EB	Government-owned land near residential area	High risk of community resistance due to proximity to housing	Risk of noise and dust pollution affecting nearby households	5 km	Rejected due to high potential social conflict
	Site 2 – Chak 65/EB	Near irrigation canal	No settlement, but difficult access for construction	Risk of water contamination during construction	3 km	Rejected due to construction feasibility issues
	Site 3 – Chak 61/EB	Barren and agricultural land	Cleared by Revenue Department; no social resistance	Manageable soil impact; no significant ecological sensitivity	within GS Boundary	Selected due to feasibility and consultation support
Rahim Yar Khan-III Grid Station	Site 1	Private Agricultural land	High compensation cost; community reluctance	Loss of fertile topsoil	2.8 km	Rejected due to economic and environmental losses

Grid Station	Site Option	Land Type	Social Aspects	Environmental Aspects	Transmission Line Length	Conclusion
	Site 2	Barren government-owned land	No displacement required	Minimal vegetation disturbance; site accessible by road	4.6 km	Selected for its low social risk and construction feasibility
Shah Jamal Grid Station	Site 1	Barren land without proper access	No major social issues	Environmentally acceptable, but no access	11.0 km	Rejected due to lack of road connectivity
	Site 2	Barren government-owned land with road access	No displacement or nearby sensitive population	Stable site with no vegetation loss	14.0 km	Selected due to road access and low impact
DG Khan-III Grid Station	Site 1	Private agricultural land	Requires costly acquisition and negotiation	High impact on fertile land, adjacent to Danish school	3.5 km	Rejected due to long TL economic and environmental concerns
	Site 2	Private Agricultural land	Potential displacement of residents	High impact on adjacent waterbodies, construction of road was required.	1 km	Rejected due to social vulnerability
	Site 3	Private agricultural land on Indus Highway	No community resistance; land acquisition required	Minimal ecological impact; distant from sensitive receptors (school and waterbodies)	0.4 km	Selected due to lowest overall risk among alternatives, and road accessibility

3.7.3 Technology Alternatives

As part of the project planning and design process, MEPCO considered potential technology alternatives for the construction of grid stations. The two most commonly adopted technologies for high-voltage grid stations are Air Insulated Substation (AIS) and Gas Insulated Substation (GIS). The AIS has an open-air system where equipment is insulated by atmospheric air. It requires a larger land footprint and is typically suitable for rural or semi-urban areas where land is readily available. The AIS is easier to maintain and less expensive in terms of capital cost. The GIS, on the other hand, is a compact, enclosed system where equipment is insulated using SF_6 gas. The GIS is ideal for space-constrained or urban settings due to its smaller footprint and better protection from environmental elements. Although GIS has lower visual and noise impact and requires minimal land clearance, it involves higher capital costs and uses SF_6 gas, a potent greenhouse gas with long atmospheric life. Special handling and leak prevention are necessary to avoid adverse environmental impacts.

A comparative analysis was carried out based on technical, financial, operational and E&S factors to determine the most appropriate technology for the six grid stations under the proposed subproject. A comparison between AIS and GIS alternatives is given in **Table 3.3**.

Table 3.3 Comparison of Technology Alternatives

Criteria	AIS	GIS
Insulation Medium	Atmospheric air	SF_6 (Sulfur Hexafluoride) gas
Space Requirement	Requires large open area; about 4-6 acres	Compact; requires significantly less space, about an acre
Capital Cost (without land)	Lower initial cost	Higher capital investment required
Maintenance	Easier to inspect and maintain; parts easily accessible	Requires specialized equipment and expertise
Environmental Impact	Limited greenhouse gas emissions	Risk of SF_6 gas leakage; high global warming potential .
Social considerations	Large land requirement that may have impacts on people	Reduced land requirement with less adverse impacts.
Operational Safety	Open-air design poses more exposure to environmental conditions and OHS risks to people	Enclosed design improves safety from external elements
Suitability for Site Conditions	Suitable where land is available; ideal for semi-urban or rural areas	Ideal for congested or urban environments with limited land
System Expansion	Easy to expand due to open layout	More complex and costly to expand
Technology Familiarity	Well-understood by MEPCO staff	Requires specialized training and handling of SF_6

In view of the fact that the new grid stations under the proposed subproject are being planned outside the congested urban areas, the availability of land is not a problem. Hence the additional cost associated with the GIS cannot be justified, and the conventional grid station design is the preferred option for the proposed subproject.

4 Baseline Conditions

This Chapter presents E&S baseline conditions of the proposed subproject area. This baseline description focuses the E&S aspects that have been scoped-in, as mentioned in **Section 1.4** for E&S Scoping carried out for this ESIA.

4.1 Province Overview

In the administrative setup of Punjab, the province is divided in to divisions, districts and tehsils. There are nine divisions, 36 districts and 143 tehsils in Punjab. The total population[11] of Punjab was estimated to be 127.7 million in 2023, which is about 53% of the national population. The province had an annual population growth rate of 2.4% to 2.55% in 2025 compared with the national growth rate of 1.5% to 1.9%. The main languages spoken in the province include Punjabi, Urdu and Saraiki and the dialects of Mewati and Potowari.

In 2023, the national literacy rate was about 60.6% while the literacy rates in the province was 64-66% in 2024. According to Pakistan Social and Living Standards Measurement (PSLM) survey[12], out of school children at National level is 32 percent in 2019- 20. Overall regional comparison shows that out of school children are higher in rural areas with 37 percent as compared to 22 percent in urban areas. Overall Punjab has the lowest out of school children with 24 percent while Balochistan has the highest out of school children with 47 percent.

The health facilities are available to the people in the province. In 2019[13], 389 hospitals, 1201 dispensaries, 319 rural health centers, 2510 basic health units, 17 tuberculosis (TB) centers and 280 MCH centers were providing services to the people of Punjab.

The major crops in the province are wheat, rice, sugarcane, cotton, gram, maize, jowar and bajra. In 2018-19[14], the area under cultivation of wheat was 6.49 million hectares (ha), rice 1.90 million ha, sugarcane 711000 ha, cotton 1.88 million ha, gram 856000 ha, maize 574000 ha, jowar 212000 ha, and bajra 428000 ha.

The livestock of Punjab included cattle, buffalos, sheep, goats, poultry, camels, horses, mules and donkeys. The population of cattle in the province was 13.2 million, buffalos were 16.01 million, sheep were 4.9 million, goats were 17.4 million, poultry were 481.6 million, camels were 0.2 million, horses were 0.1 million, mules were 73000 and donkeys were 1.99 million.

The civilian labor force in the province was 39.98 million in 2017-18 which included 28.76 million male and 11.22 million female. Out of total reported labor force, 37.60 million is employed and 2.39 million labor force was unemployed.

4.2 132-kV Arifwala-II Grid Station and its Transmission Line

The 132 kV Arifwala-II Grid Station and its In/Out transmission line (about 200-m long) will be constructed near Chak No. 61/EB, tehsil Arifwala, district Pakpattan, on a mix of waste and agricultural government-owned land, located around 1.5-km west of tehsil Arifwala of District Pakpattan (see **Figures 1.1** and **3.1** for the location of the proposed grid station and

[11] Bureau of Statistics, Punjab in Figures 2020

[12] Key Findings Report Pakistan Social and Living Standards Measurement Survey 2019-20

[13] Bureau of Statistics, Punjab in Figures 2020

[14] Bureau of Statistics, Punjab in Figures 2020

Figures 1.2 and **4.1** as well as maps in **Annex A** for the land-use of the area). The site is accessible via a local road linked to the Burewala-Arifwala Road.

The entire AoI of the grid station site and transmission line is agricultural in nature, with fertile fields producing wheat, fodder, and vegetables, interspersed with roadside settlements. Housing is predominantly pucca[15] and semi-pucca[16], forming compact clusters near the main road and scattered units within fields. Sensitive receptors include several mosques, a graveyard, a college, a private hospital, and several schools, all within or adjacent to the AoI.

The geology of the area is typical of the central alluvial plains of Punjab, formed by long-term deposition from the Indus River system. The subsurface consists primarily of unconsolidated alluvial deposits composed of sand, silt, clay, and occasional gravel layers. These deposits are generally deep and well-drained, with no underlying rock formations exposed at the surface. The soil at the GS site is predominantly loamy to sandy loam, moderately fertile, and commonly used for agriculture. The area is located within Seismic Zone 2a, indicating moderate seismic hazard.

The area experiences a typical hot desert climate characterized by very hot summers and mild winters. The average annual temperature is around 33°C, with temperatures soaring above 40°C during the peak summer months of June and July. In contrast, winters from December to February are mild and more pleasant, with average highs around 20–22°C and lows rarely dipping below 7°C. Rainfall is sparse but mostly concentrated in the monsoon season from June to September, with July being the wettest month. The annual average rainfall in the area is around 366 mm.

Arifwala has a well-developed irrigation network with the Mailsi Branch Canal and Eastern Sadiqia Canal being two most important canals in the area. Groundwater is also used for irrigation and household purposes in the area. The groundwater analysis was carried out as part of this ESIA indicating that most of the parameters are within the ranges specified in the PEQS for Drinking Water; see **Annex B** for the results of water quality analysis.

The air quality in the area is generally quite good with no major sources of air pollution in the area except the vehicular traffic on major roads and some small industrial units. The air quality analysis was carried out as part of this ESIA, indicating that all parameters are with the ranges specified in the PEQS for air quality; see **Annex B** for the results of air quality analysis.

[15] Pucca typically means a structure made of bricks and mortar.
[16] Semi-pucca typically means a structure made of a mixture of brick-mortar and other materials such as mud, wood, steel sheets and others.

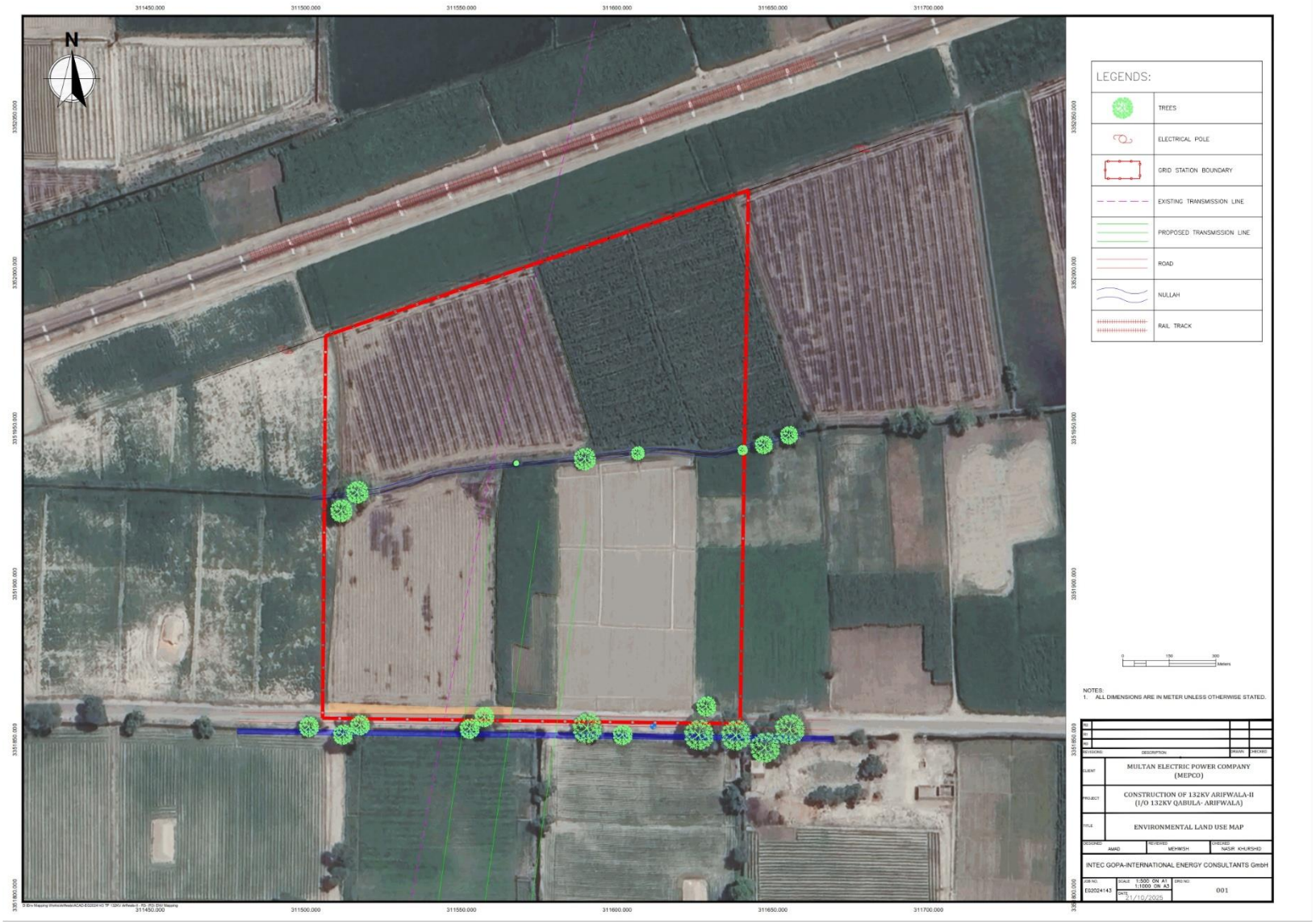

Figure 4.1 Landuse of Arifwala Grid Station Site and its Surroundings

4.3 132-kV DG Khan-III Grid Station and its Transmission Line

The 132 kV DG Khan-III Grid Station and its transmission line will be constructed on a privately-owned land in Yaro Mor, Basti Jhok Yar Shah, about 8-km north of Dera Ghazi Khan city, accessible via Indus Highway (see **Figures 1.1** and **3.2** for the location of the proposed grid station and **Figures 1.3** and **4.2** as well as maps in **Annex A** for the land-use of the area).

The area surrounding the site consists of farmland, with a few residential structures and access tracks. There are no schools, healthcare centers, or densely inhabited villages immediately adjacent to the proposed site.

The AoI of the grid station and its transmission line is predominantly rural, with extensive cultivated land forming the core land use of the area, interspersed with scattered settlements. The major crops in the area are rice, wheat, sugar cane, sesame, gram and sunflower. Housing is mostly kutcha and semi-pucca, concentrated along the Indus Highway and village roads. Sensitive receptors inside the AoI include multiple mosques, a veterinary clinic, a health center, and local schools.

The geology of the area is typical of the central alluvial plains of Punjab, formed by long-term deposition from the Indus River system. Soils in the area are predominantly coarse to medium textured alluvial soils with very low organic matter content. A majority of the soils are characterized by high temperatures accelerating decomposition and low precipitation, contributing to their poor organic matter status, which significantly impacts soil fertility. The area also faces issues with salinity and heavy metal contamination due to irrigation practices. The area is located within Seismic Zone 2a, indicating moderate seismic hazard.

Much like most parts of southern Punjab, DG Khan experiences a typical hot desert climate characterized by very hot summers and mild winters. The temperature is highest during the months of May, June and July: 39.7^{o}C, 42.4^{o}C and 40.6^{o}C respectively. However, it is lowest during the month of December and January: 19.5^{o}C and 17.4^{o}C respectively.

Like most parts of Punjab, rainfall in the DG Khan area is sparse but mostly concentrated in the monsoon season from June to September, with July being the wettest month. The annual average rainfall in the area is around 150 mm.

The major water bodies in the DG Khan district include River Indus and the canal network emanating from it. Another significant natural water resource in the region is the hill torrent system, locally referred to as Rod Kohi. These torrents are seasonal waterways that originate from the western slopes of the Suleiman Mountain Range and flow towards the plains of DG Khan and Taunsa. This canal network is a critical water source for irrigated agriculture, which is the mainstay of livelihoods in the area.

The groundwater analysis was carried out as part of this ESIA indicating that most of the parameters are within the ranges specified in the PEQS for Drinking Water; see **Annex B** for the results of water quality analysis.

The air quality in the area is generally quite good with no major sources of air pollution in the area except the vehicular traffic on major roads and some small industrial units. The air quality analysis was also carried out as part of this ESIA, indicating that all parameters are with the ranges specified in the PEQS for air quality; see **Annex B** for the results of air quality analysis.

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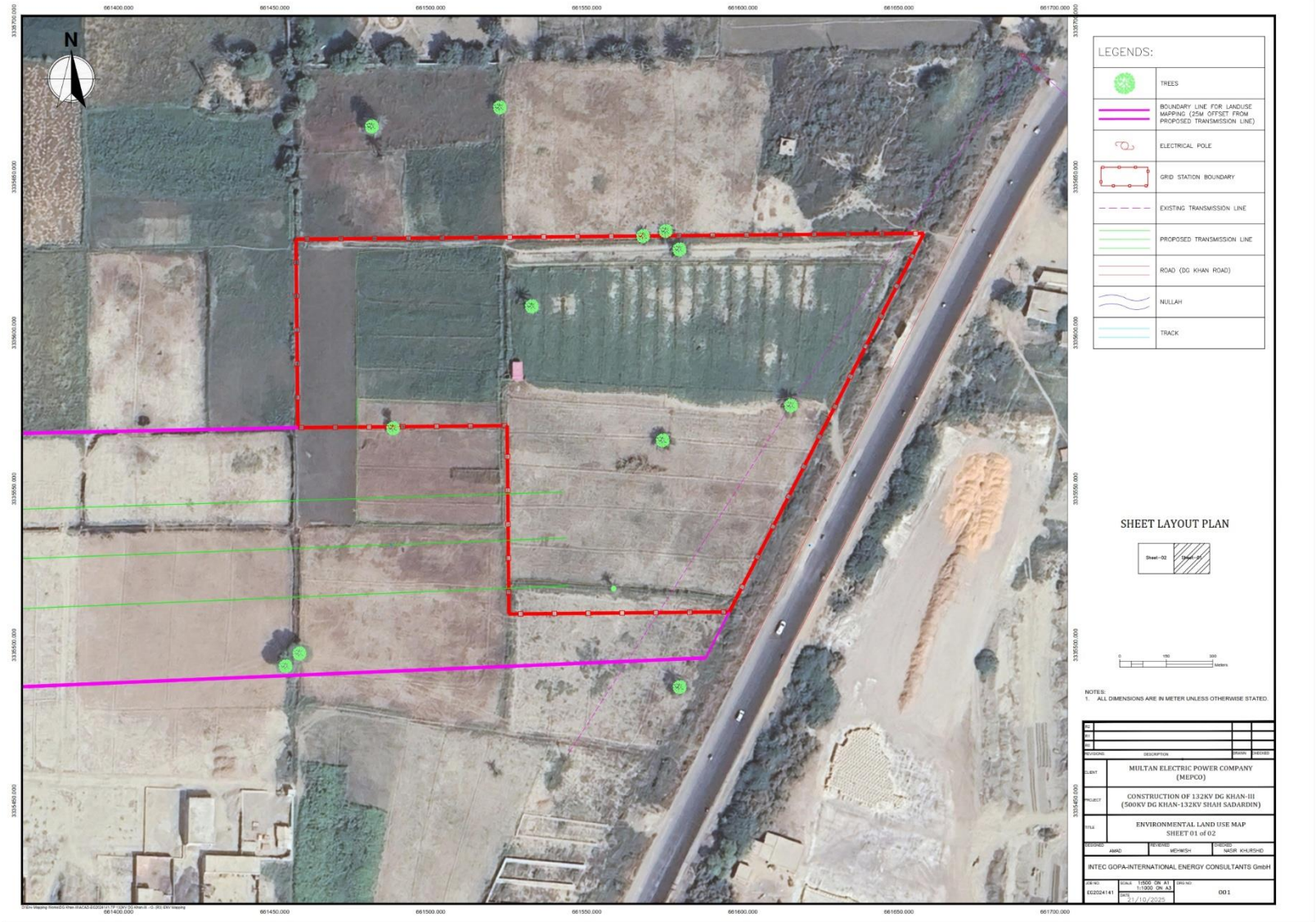

Figure 4.2 Landuse of DG Khan Grid Station Site and its Surroundings

4.4 132-kV Khanewal-II Grid Station and its Transmission Line

The 132 kV Khanewal-II Grid Station and its transmission line will be constructed on a government-owned land in Chak No. 167/10-R near District Jail Khanewal (see **Figures 1.1** and **3.3** for the location of the proposed grid station and **Figures 1.4** and **4.3** as well as maps in **Annex A** for the land-use of the area).

The area around the proposed grid station site consists of cultivation field and sparse population. There are no schools, healthcare centers, or densely inhabited villages immediately adjacent to the proposed site.

The AoI of the grid station and its In/Out transmission line is a mix of cultivated fields and semi-urban settlements. Most houses are pucca and semi-pucca, with kutcha structures scattered at the periphery. Sensitive receptors within AoI include schools, college, a mosque, and shrine. Roads are both paved and unpaved, providing access to Khanewal city, while electricity is widely available, but sanitation facilities remain basic. The area reflects a peri-urban character, where agricultural land use is gradually being transformed into semi-urban settlements.

Soils in the Khanewal district are often categorized as clay loam, sandy loam, and loam with generally normal pH and electrical conductivity (EC) levels for crop production, but are characterized by low organic matter. A significant concern is soil salinity, linked to high proportions of unfit groundwater for irrigation, which can degrade soil health. Much like most parts of southern Punjab, the area is located within Seismic Zone 2a, indicating moderate seismic hazard.

The hot and dry climate of the area leads to prolonged summers starting in April and continuing till October with May, June and July being the hottest months. The highest temperatures prevail during June with 43.49 ^{o}C being the average highest temperature while coldest temperatures prevail during January with 17.47 ^{o}C being the average lowest temperature.

Like most parts of Punjab, rainfall in Khanewal area is sparse but mostly concentrated in the monsoon season from June to September, with July being the wettest month. The annual average rainfall in the area is around 165 mm.

The main water sources in the area include groundwater and irrigation canals. The primary canal system serving the Khanewal area is the Lower Bari Doab Canal, which originates from the Ravi River at the Balloki Headworks.

The groundwater analysis was carried out as part of this ESIA indicating that most of the parameters are within the ranges specified in the PEQS for Drinking Water; see **Annex B** for the results of water quality analysis.

The air quality in the area is generally quite good with no major sources of air pollution in the area except the vehicular traffic on major roads. The air quality analysis was also carried out as part of this ESIA, indicating that all parameters are with the ranges specified in the PEQS for air quality; see **Annex B** for the results of air quality analysis.

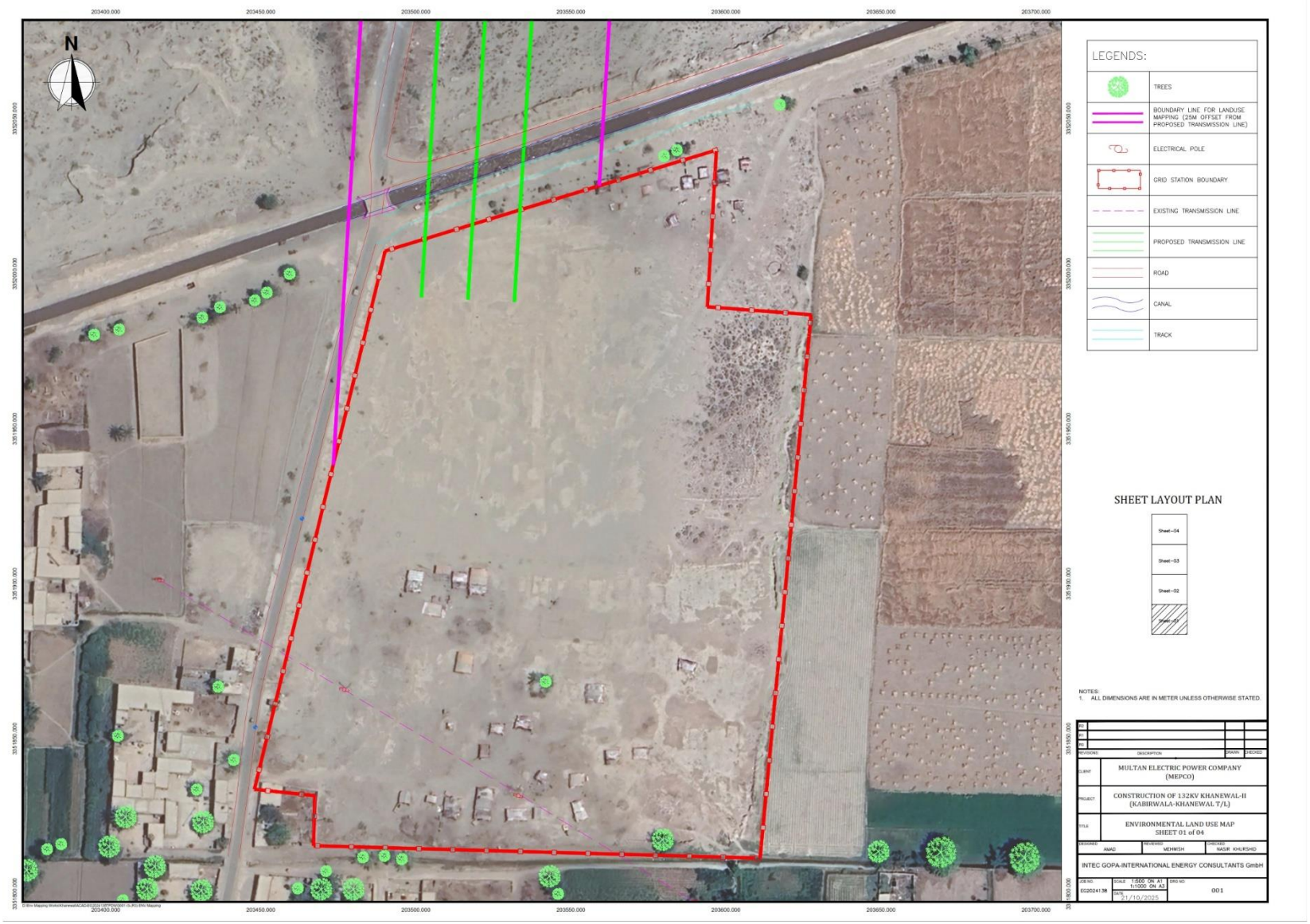

Figure 4.3 Land use of Khanewal Grid Station Site and its Surroundings

4.5 132 kV Layyah-II Grid Station and its Transmission Line

The proposed Layyah-II Grid Station will be constructed on government-owned barren land in Chak Mandi Town, near the Chowk Azam - Layyah Road, approximately 2-km south-east of Layyah city (see **Figures 1.1** and **3.4** for the location of the proposed grid station and **Figures 1.5** and **4.4** as well as maps in **Annex A** for the land-use of the area).

The site is surrounded primarily by cultivated land, without any residential structures or settlements. One notable feature in the vicinity is a government college currently under construction, situated near the grid station boundary. Access to the site is available through an existing road that branches off from the main highway.

The AoI is rural and semi-urban in nature, with cultivated land surrounding the compact housing clusters. Residential units are primarily semi-pucca and pucca, reflecting a transition from rural to peri-urban character. Sensitive receptors within the AoI include newly under construction girls' college, a mosque, while a health facility lies at the northern edge of the AoI. Roads are moderately developed, and electricity supply is present, but sanitation services remain inadequate.

Soils in the Layyah district are characterized as slightly alkaline (pH 7.1-8.4), low in organic matter and calcium carbonate, and mostly non-saline. Soil texture is predominantly sandy loam, with some loam and clay present. These soils generally have low nutrient levels in Nitrogen (N), Phosphorus (P), Potassium (K), Boron (B), Iron (Fe), and Zinc (Zn), making soil fertilization insufficient for optimum crop yields, especially for citrus. Much like most parts of southern Punjab, the area is located within Seismic Zone 2a, indicating moderate seismic hazard.

The district Layyah-II has a desert climate. The area has an annual average temperature of 25.2°C. During summers the temperature peaks at 48°C while during winters it drops to 2°C to 0°C.

Like most parts of Punjab, rainfall in Layyah is sparse but mostly concentrated in the monsoon season from June to September, with July being the wettest month. The annual average rainfall in the area is around 183 mm.

The main source of water in Layyah is groundwater and canals, which are primarily part of the Thal Canal system that draw water from the Jinnah Barrage on the Indus River.

The groundwater analysis was carried out as part of this ESIA indicating that most of the parameters are within the ranges specified in the PEQS for Drinking Water; see **Annex B** for the results of water quality analysis.

The air quality in the area is generally quite good with no major sources of air pollution in the area except the vehicular traffic on major roads. The air quality analysis was also carried out as part of this ESIA, indicating that all parameters are with the ranges specified in the PEQS for air quality; see **Annex B** for the results of air quality analysis.

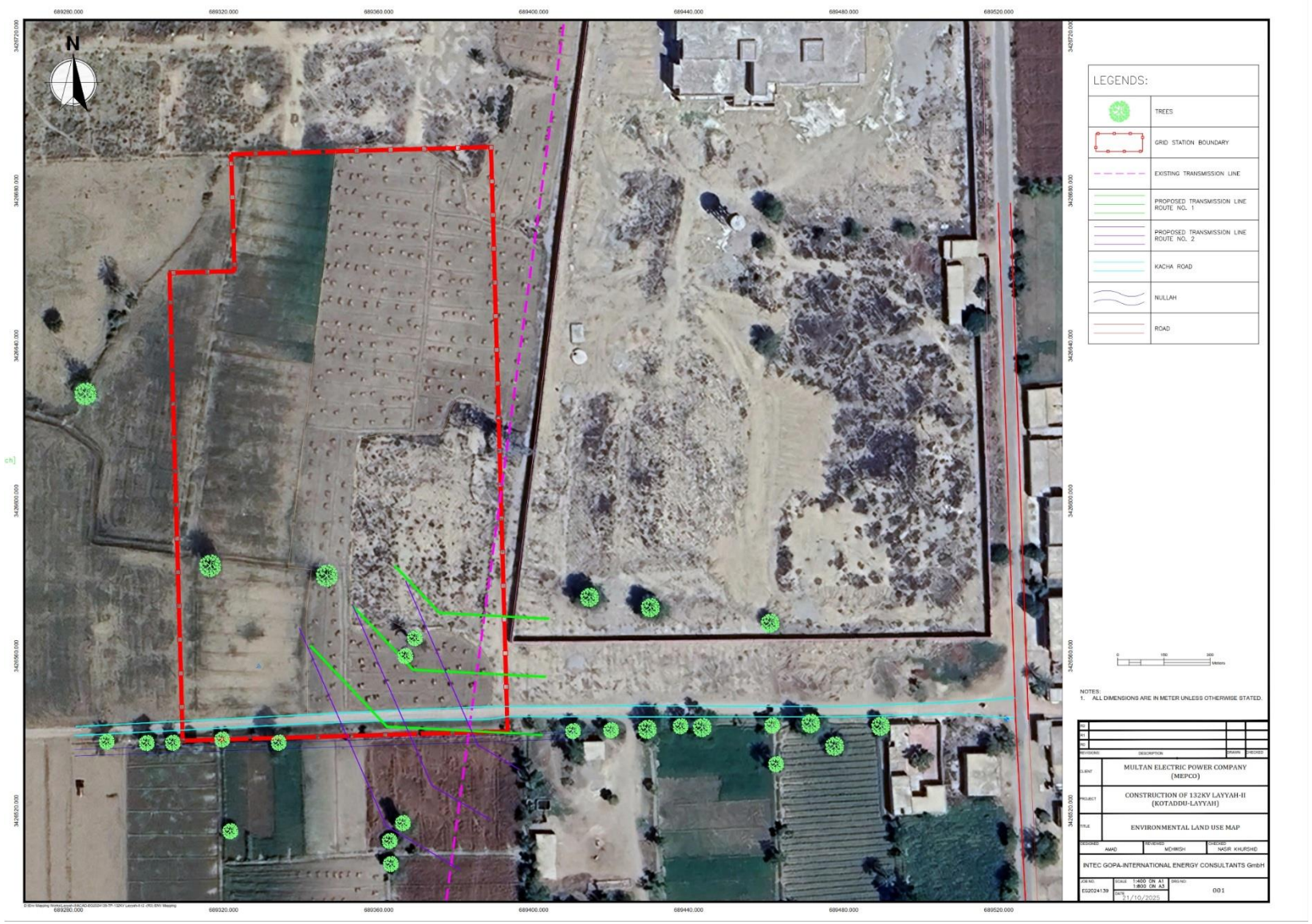

Figure 4.4 Landuse of Layyah Grid Station Site and its Surroundings

4.6 132-kV Rahim Yar Khan-III Grid Station and its Transmission Line

The proposed 132 kV Rahim Yar Khan-III Grid Station and its In/Out transmission line will be constructed on a government-owned waste land near Iqbalabad, Rahim Yar Khan (see **Figures 1.1** and **3.5** for the location of the proposed grid station and **Figures 1.6** and **4.5** as well as maps in **Annex A** for the land-use of the area). The site is located adjacent to a partially developed industrial zone and is well connected via a link road that merges with the Rahim Yar Khan Bypass and N-5 National Highway.

The AoI is characterized by intensive agricultural use, with rice, wheat, and sugarcane fields dominating the landscape. Settlements include Dera Mureed Hussain, Jhok Freed, Dera Shams, and Basti Gul, where housing is a mix of kutcha and semi-pucca structures arranged in compact roadside clusters. Sensitive receptors include a government high school, mosques, all within close proximity to the proposed site. The area is rural with roadside settlement patterns, and the N-5 National Highway runs through the AoI, providing connectivity.

The geology of Rahim Yar Khan district includes a thick sequence of different types of sediments including clay, sand and silt deposits of aeolian and fluvial origin. Soils in Rahim Yar Khan are predominantly alkaline with varying textures from sandy loam to loam, and generally have poor levels of organic matter, with deficiencies in available phosphorus being common. The region's soil also exhibits an adequate to satisfactory potassium status and is suitable for growing crops like cotton, wheat, and sugarcane, though a soil fertility lab in the city provides analysis and recommendations to manage these issues. Much like most parts of southern Punjab, the area is located within Seismic Zone 2a, indicating moderate seismic hazard.

The climate of Rahim Yar Khan district is extremely dry and hot during summer months and dry and cold yet pleasant during winter months. The annual average temperature in Rahim Yar Khan is 26.2°C. During summer season, the maximum temperature in the district reaches 48^{o}C with frequent dust and wind storms. The months of May, June and July experience scorching heat and fierce hot winds while the coldest months are December, January and February. During these winter months, mean minimum temperatures and mean maximum temperatures are 5^{o}C and 21^{o}C, respectively.

Like most parts of Punjab, rainfall in Rahim Yar Khan district is sparse but mostly concentrated in the monsoon season from June to September, with July being the wettest month. The annual average rainfall in the area is around 181 mm.

Groundwater and canals are the main sources of water in the area. The primary canals serving Rahim Yar Khan are the Panjnad Canal and the Abbasia Canal, which irrigate much of the district from the Panjnad Weir. The Sadiqia Gerbiyah canal also serves as a feeder for other inundation canals in the region. These canals are crucial for agricultural irrigation and providing water for the local population.

The groundwater analysis was carried out as part of this ESIA indicating that most of the parameters are within the ranges specified in the PEQS for Drinking Water; see **Annex B** for the results of water quality analysis.

The air quality in the area is generally quite good with no major sources of air pollution in the area except the vehicular traffic on major roads and some small industrial units. The air quality analysis was also carried out as part of this ESIA, indicating that all parameters are with the ranges specified in the PEQS for air quality; see **Annex B** for the results of air quality analysis.

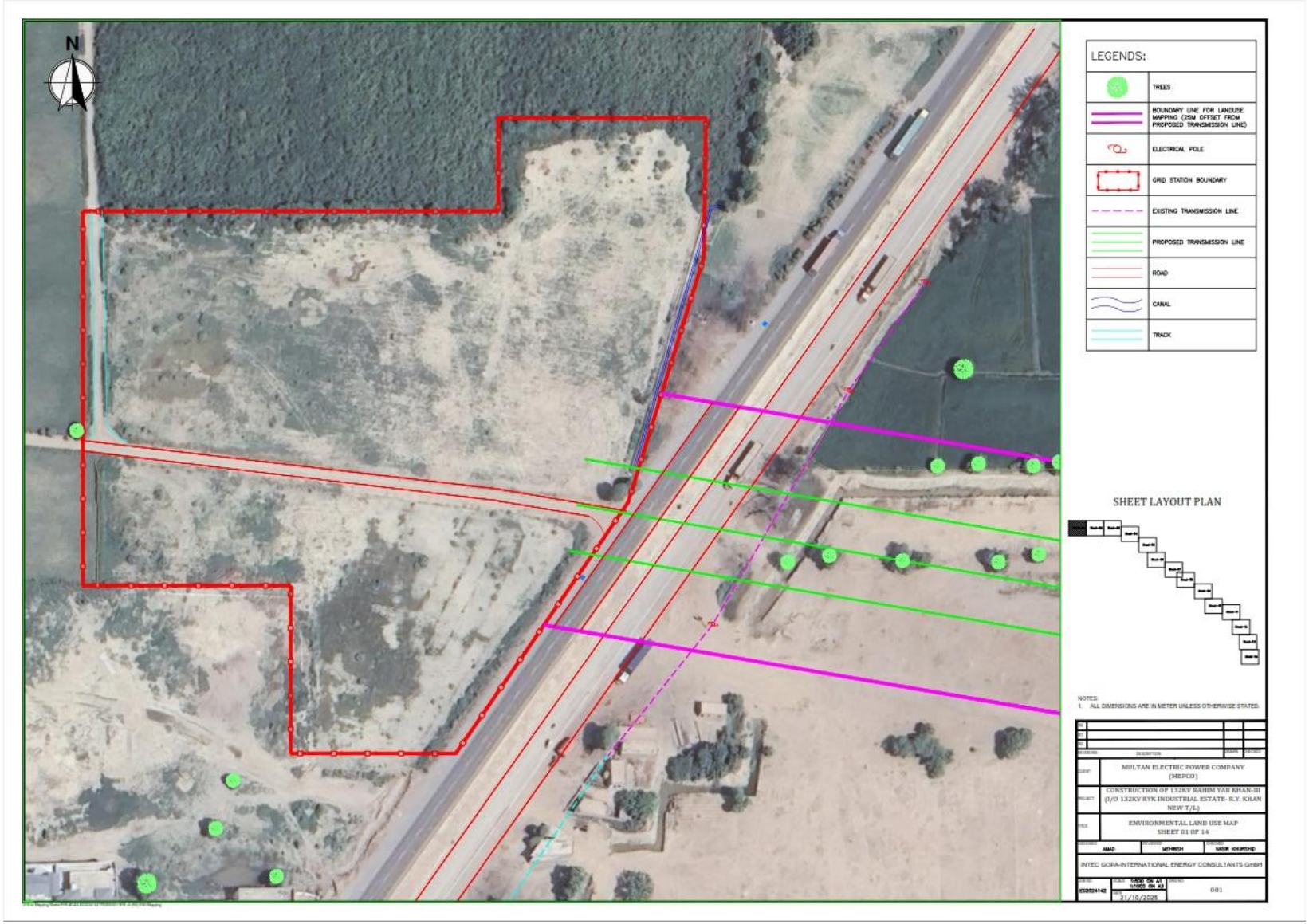

Figure 4.5 Landuse of Rahimyar Khan Grid Station Site and its Surroundings

4.7 132-kV Shah Jamal Grid Station and its Transmission Line

The proposed site for the 132-kV Shah Jamal Grid Station is located on barren government-owned land in Basti Jarh, Moza Rukh, situated along Karamdad Qureshi Road, about 3-km southeast of Shah Jamal town, District Muzaffargarh (see **Figures 1.1** and **3.6** for the location of the proposed grid station and **Figures 1.7** and **4.6** as well as maps in **Annex A** for the land-use of the area).

The site is easily accessible via a paved district road that connects to nearby settlements and the regional road network. The land is flat, devoid of any major vegetation, and does not host any settlements. The AoI of the grid station and transmission line is largely rural and agricultural, with settlements aligned along the Karamdad Qureshi – Shah Jamal road and smaller link roads. Crops such as wheat, cotton, and sugarcane dominate the land use, while settlements like Kot Lashali, Basti Ghazi Shareef, and Basti Chanar feature mostly kutcha and semi-pucca housing. Sensitive receptors are numerous, including multiple mosques, schools, and health centers. Infrastructure is basic, with paved main roads but limited sanitation and healthcare facilities.

Soils in Muzaffargarh are often characterized by high pH levels (alkaline) and are typically deficient in organic matter and available phosphorus, making them poor for certain crops. While most soils are not problematic in terms of salinity and sodicity, some areas, particularly Ali Pur and Jatoi, experience higher levels of soil sodicity. The district is also known for widespread iron deficiency in its soils. Much like most parts of southern Punjab, the area is located within Seismic Zone 2a, indicating moderate seismic hazard.

The Muzaffargarh district is typically a desert area that has extremely hot days and cold nights. Temperatures at the beginning of the year are relatively mild, with highs ranging from 19°C to 25°C and lows between 3°C and 8°C. December and January are colder, with minimum temperatures below freezing (-2°C to -3°C) and highs in the range of 10°C to 16°C. Daytime temperatures in June reach 32°C to 40°C toward the end of the month. Nights bring some break from scorching heat with lows ranging from 10°C to 23°C, which increase gradually as the month advances. Most of the days are sunny and dry, indicating a semi-arid climate in the region, although sometimes overcast but without much rainfall. Rainfall in Muzaffargarh district is sparse but mostly concentrated in the monsoon season from June to September, with July being the wettest month. The annual average rainfall in the area is around 279 mm.

The water resources in the area are primarily dependent on the Indus River system, which serves as a critical source for both agricultural and domestic use in the area. The region is well-connected through a widespread network of irrigation canals that ensure a relatively consistent supply of water to local farmers throughout the year. The Muzaffargarh Canal, originating from Taunsa Barrage, runs approximately 1.5-km from the proposed grid station site, providing a steady water source that supports the area's predominantly agrarian economy.

The water analysis was carried out as part of this ESIA indicating that most of the parameters are within the ranges specified in the PEQS for Drinking Water; see **Annex B** for the results of water quality analysis.

The air quality in the area is generally quite good with no major sources of air pollution in the area except the vehicular traffic on major roads and some small industrial units. The air quality analysis was also carried out as part of this ESIA, indicating that all parameters are with the ranges specified in the PEQS for air quality; see **Annex B** for the results of air quality analysis.

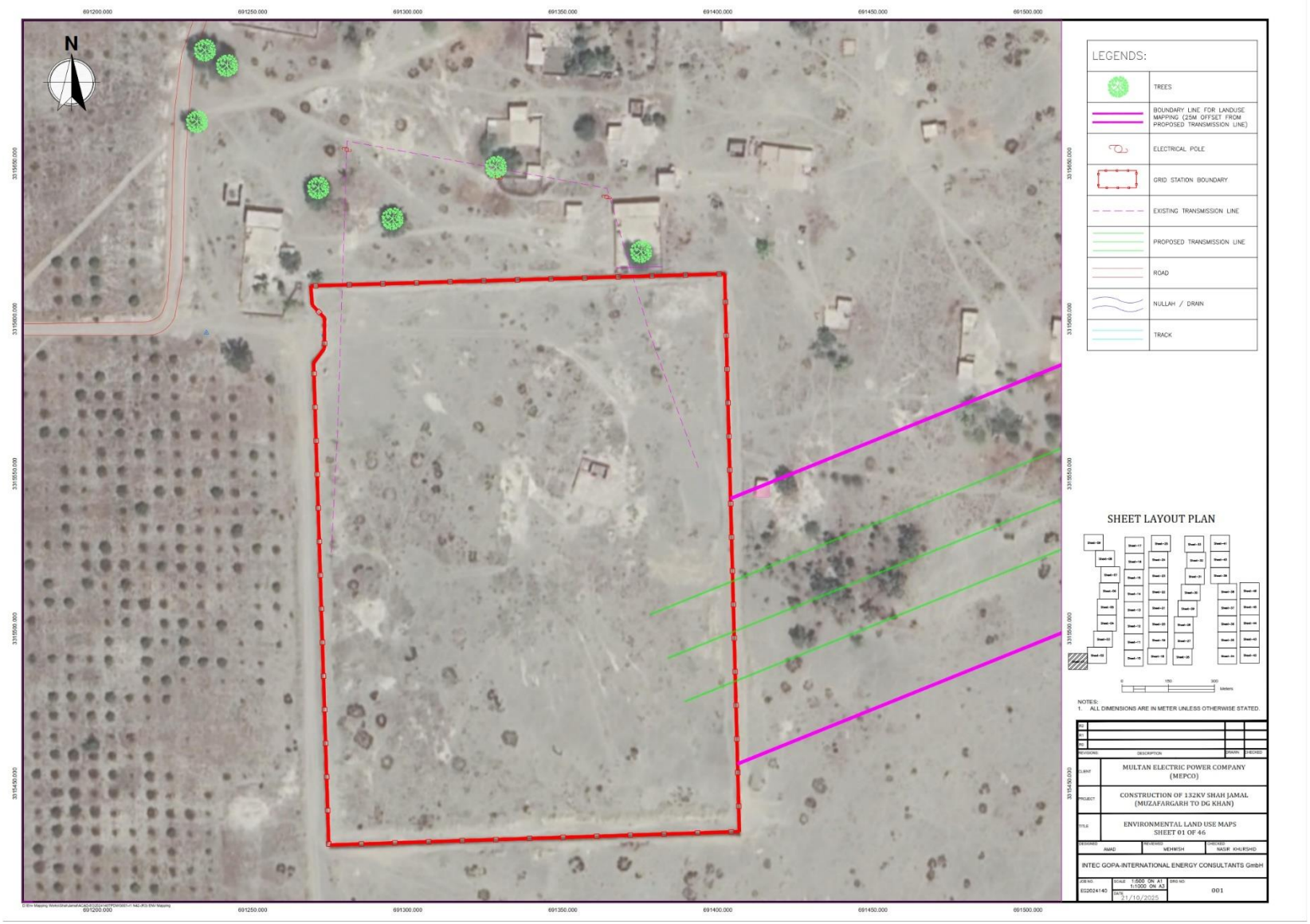

Figure 4.6 Land use Map Shah Jamal

4.8 Findings of Socioeconomic Survey

The socioeconomic survey was conducted in all the six project districts. A total of 180 respondents were selected for the collection of socioeconomic information. The sample size was selected based on simple random sampling. The sample size was equally distributed in all the six sites i.e., 30 in each project study area.

4.8.1 Age Composition

The survey results of the subproject sites show that larger percentage (33%) of respondents falls between the age of 26-35 years. Respondents in the age group of 16-25 years also participated in the survey and their views have greater significance and have better vision than other age groups. It also indicates that the respondents were mature enough to participate in the survey. The statistical analysis is given in in **Table 4.1**.

Table 4.1: Age Composition of Respondents

Age Limit	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total	%
16-25	7	8	8	6	6	7	42	23
26-35	11	10	11	8	9	10	59	33
36-45	5	4	4	7	6	7	33	18
46-55	4	5	5	6	6	3	29	16
Above 55	3	3	2	3	3	3	17	9
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**	**100**

4.8.2 Level of Education

The survey results in **Table 4.2** reveal a range of educational backgrounds, from low literacy levels to above intermediate qualifications. This variation suggests potential disparities in educational access and opportunities across different regions. The data reveals a significantly high rate of illiteracy, accounting for 57% (103 individuals) of the total sample. Basic education levels (Primary and Middle) have been achieved by 24% of respondents, while secondary and higher education (Matriculation and above) is limited to only 18% of the total population. The distribution is remarkably consistent across all six districts, with each showing a similar pattern where illiteracy is the dominant category, followed by a sharp decline at higher educational levels.

Table 4.2: Level of Education

Education	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total	%
Illiterate	17	18	17	16	17	18	103	57
Primary	5	3	4	4	5	5	26	14
Middle	3	4	3	4	2	2	18	10
Matric	3	2	4	3	3	3	18	10
Intermediate	0	2	1	1	1	1	6	3
Graduation	2	1	1	2	2	1	**9**	5
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**	**100**

Most of the respondents interviewed had educational qualifications below matriculation, with a significant number being illiterate.

4.8.3 Marital Status and Family Structure

Most of the respondents were married and only a few were reported to be unmarried (**Table 4.3**Table *4.3*). This is mainly due to the reason the respondents were of mature age and people in the region get marriage early due to local traditions. The survey results reveals that the majority of respondents are married, accounting for 159 individuals (88% of the total sample). This pattern is consistent across all districts, where married respondents significantly outnumber unmarried respondents. In contrast, unmarried respondents constitute only 21 individuals, representing 12% of the total sample. The predominance of married respondents reflects the family-oriented social structure of the project area and is an important consideration for the ESIA, particularly in understanding household composition, dependency levels, and potential social and livelihood-related project impacts.

Table 4.3: Marital Status and Family Structure

Marital Status	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total	%
Married	25	28	27	27	26	26	159	88
Unmarried	5	2	3	3	4	4	21	12
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**	**100**

The socioeconomic survey of the subproject area revealed that all respondents were married and lived in joint family systems. This family structure highlights a collective lifestyle where resources, responsibilities, and household needs are typically shared, potentially influencing water demands and consumption patterns within households. Most families across all areas have 6 to 10 members.

4.8.4 Linguistic Culture

Saraiki and Punjabi are the dominant languages across all areas. The statistical analysis is given in **Table 4.4**.

Table 4.4: Linguistic Culture

Mother Languages	Layyah	Muzaffargarh	Khanewal	Arif Wala	DG Khan	RY Khan	Total	%
Punjabi	4	5	18	20	7	6	60	33
Saraiki	23	20	8	8	15	21	95	53
Pashto	3	5	4	2	8	3	25	14
Total	**30**	**30**	**30**	**30**	**30**	**30**	**180**	**100**

4.8.5 Caste/ Ethnic Group

Mixed castes and ethnic groups were reported during the survey with the majority of the respondents being Bhatti. The other reported castes include Mahar, Sial, Surani, Rajpoot, Syed and Baloch; see **Table 4.5** for survey results.

Table 4.5: Major Caste in Subproject Area

Caste	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total	%
Mahar	1	2	4	7	4	4	**22**	12.2
Sial	4	2	5	4	0	2	**17**	9.4
Surani	2	3	2	1	2	2	**12**	6.7
Rajpoot	2	3	3	3	3	2	**16**	8.9
Bhatti	5	4	4	3	2	3	**21**	11.7
Syed	3	4	3	4	2	5	**21**	11.7
Baloch	6	7	6	3	9	7	**38**	21.1
Others	7	5	3	5	8	5	**33**	18.3
	30	**30**	**30**	**30**	**30**	**30**	**180**	**100.0**

4.8.6 Races and Tribes in the Study areas

The districts of Khanewal, DG Khan, Rahim Yar Khan, Layyah, Arifwala, and Muzaffargarh are home to a diverse mix of ethnic groups, tribes, and communities, each with its own historical and cultural significance. In these areas, the population predominantly consists of ethnic Punjabis, but the region also hosts a variety of tribes and sub-tribes, which contribute to the social fabric of the districts. Jat and Rajput are two of the most prominent groups in many of these districts, with Jats particularly concentrated in rural areas and traditionally involved in agriculture. Other major tribes include Baloch, Syeds, Pathans, and Arains, as well as various lesser-known groups like Mochis and Lohars.

In DG Khan, there is a significant presence of Baloch tribes such as the Leghari and Bugti, who have historically held a strong influence over the region. The Baloch tribes often maintain distinct cultural practices, dialects, and a strong tribal structure, with a focus on pastoralism and land ownership. In Muzaffargarh, Rajput and Jats dominate, with strong clan-based networks that have traditionally governed local socio-political dynamics. Rahim Yar Khan also has a mixture of Rajput and Baloch populations, while Layyah and Khanewal are largely home to Jat and Arain communities.

4.8.7 Monthly Income of the Respondents

The majority of respondents have monthly incomes between PKR 37,000 and 50,000. The statistical analysis is given in **Table 4.6.**

Table 4.6: Monthly Income

Monthly Income (PKR)	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total (No.)	%
Below 37,000	1	1	1	0	1	1	**5**	**2.8**
37,001 – 50,000	14	11	14	13	14	12	**78**	**42.8**
50,001 – 75,000	10	13	9	11	8	13	**64**	**36.7**

Monthly Income (PKR)	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total (No.)	%
75,001 – 100,000	4	5	5	6	5	4	**29**	**15.6**
Above 100,000	1	0	1	0	2	0	**4**	**2.2**
	30	**30**	**30**	**30**	**30**	**30**	**180**	**100**

4.8.8 Household Expenses of the Respondents

Survey results reveals that the majority of respondents (42.8%) reported monthly expenses in the range of PKR 37,001–50,000, indicating this as the most common expenditure category across all districts. This is followed by 36.7% of respondents whose monthly expenses fall between PKR 50,001–75,000. About 15.6% of respondents reported higher monthly expenses in the range of PKR 75,001–100,000. Only a small proportion of respondents fall at the lower and higher ends of the expenditure scale, with 2.8% spending below PKR 37,000 and 2.2% reporting expenses above PKR 100,000 per month. Overall, the results show that most households in the project area have moderate monthly expenses, which broadly align with their reported income levels. See **Table 4.7** for details.

Table 4.7: Household Expenses of the Respondents

Monthly Expenses	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total (No.)	%
Below 37,000	1	1	0	0	1	2	**5**	**2.8**
37,001 – 50,000	11	14	15	12	13	12	**77**	**42.8**
50,001 – 75,000	10	13	9	11	12	11	**66**	**36.7**
75,001 – 100,000	6	2	5	6	4	5	**28**	**15.6**
Above 100,000	2	0	1	1	0	0	**4**	**2.2**
	30	**30**	**30**	**30**	**30**	**30**	**180**	**100.0**

4.8.9 Ownership Status of the House

Most of the respondents (76%) in the subproject area own their houses while 24% of them reported to live in rented house, as shown in **Table 4.8**.

Table 4.8: Ownership status of House

Ownership of House	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total (No.)	%
Owned	30	31	32	25	15		**133**	**73.9**
Rented	10	9	8	10	10		**47**	**26.1**
	40	**40**	**40**	**35**	**25**		**180**	**100.0**

4.8.10 Housing Construction Pattern

The survey also revealed that all respondents reside in pacca houses, constructed with durable materials such as cement and other robust building materials. This includes a relatively stable housing structure across the community, reflecting a certain standard of living that can influence the planning and implementation of water supply infrastructure. See **Table 4.9** for details.

Table 4.9: Nature of Construction House

Ownership of House	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total (No.)	%
Pacca	5	6	10	9	12	8	**50**	**27.8**
Katcha	5	7	5	3	2	3	**25**	**13.9**
Semi pacca	20	**17**	**15**	**18**	**16**	**19**	**105**	**58.3**
	30	30	30	30	30	30	180	**100.0**

4.8.11 Source of Water

The majority of respondents reported to have boreholes. A total of 22% of the respondents rely on tubewells and 58% rely on hand pumps (see **Table 4.10**).

Table 4.10: Source of Water

	Layyah	Muzaffargarh	Khanewal	Arifwala	DG Khan	RY Khan	Total (No.)	%
Piped Network	5	4	6	11	5	5	36	20
Tube Well	7	5	8	7	7	5	39	22
Handpump	18	21	16	12	18	20	105	58
Total	30	30	30	30	30	30	180	100

All respondents expressed dissatisfaction with the quality of the current water supply, citing issues such as unpleasant odors and a noticeable smell, which they attributed to pollutants and contaminants in the water. Additionally, concerns about salinity levels further

compounded their dissatisfaction, including a significant perception of poor water quality that affects their daily lives.

4.8.12 Sewerage System

A predominant majority of households (62%) have soaking pits while only 6% of the households are connected to the piped network (see **Table 4.11**). The majority of the respondent expressed dissatisfaction with the sewerage system.

Table 4.11: Satisfaction Level with Sewerage System

Type of Sewerage System	Layyah	Muzaffargarh	Khanewal	Arif Wala	DG Khan	RY Khan	Total (No.)	%
Piped Network	2	1	2	2	1	3	11	6
Open Drains	3	4	3	2	4	3	19	11
Infields/Plots	8	8	5	8	5	4	38	21
Soakage Pits	17	17	20	18	20	20	111	62
	30	30	30	30	30	30	180	100

The respondents highlighted that the existing sewerage network is inadequate to meet public needs, and they specifically raised concerns about the insufficient depth of the drainage system, which leads to frequent blockage and overflows.

4.8.13 Irrigation Patterns and Major Crops

Participants were asked about their source of irrigation, the majority indicated they use tube wells, and canal or their agricultural fields. The primary crops grown include wheat, cotton, rice, and sugar cane.

4.8.14 Water Availability

Water scarcity is another critical issue across the subproject districts, as they are largely dependent on the Indus River for irrigation. Fluctuating water availability, compounded by poor water management practices, adversely impacts crop yields and threatens livelihoods. Additionally, many of these areas are highly vulnerable to the effects of climate change, such as shifting monsoon patterns and erratic weather conditions, which further destabilize agricultural productivity. The lack of industrialization in many parts of these districts has resulted in slow economic diversification, making them highly reliant on agriculture, which is not always a stable or sustainable source of income.

4.8.15 Education and Health Care system

In terms of social development, the subproject districts continue to lag behind in key indicators such as literacy rates and healthcare access. Though there have been improvements in urban areas, many villages still lack proper schools, healthcare facilities, and qualified professionals, resulting in low enrollment rates, high dropout rates, and poor health outcomes. The lack of adequate healthcare infrastructure leads to high infant mortality, preventable diseases, and a general lack of access to essential medical services in remote areas.

The overall socioeconomic condition of these districts exhibits slow and uneven development, where agriculture remains both a strength and a limitation. The persistent challenges of poverty, inadequate electricity distribution, poor infrastructure, and limited industrialization

perpetuate a cycle of underdevelopment. Tackling these issues requires comprehensive efforts to improve electricity supply and distribution, enhance water management systems, expand industrialization, and invest in education and healthcare, ensuring a more balanced and sustainable development trajectory for these regions.

4.9 Women Issues and Development Needs

A gender survey was carried out to assess the women condition in the area. During the survey, concerns and issues of women were identified to establish the baseline conditions. The women were interviewed by female staff to determine their access to social amenities like education and health facilities, participation in household income generating activities and decision making, project impacts on mobility of women and to record gender concerns if any and provide appropriate mitigation plan if required. Besides, during consultation separate focus group discussions were also arranged with women at selected points in affected villages to address the overall gender issues. The focus group discussions (FGDs) analyzed the existing situation of the affected communities from gender perspective, assessed the possible project impacts on women of the affected villages and recommended actions to improve gender dimensions.

4.9.1 Women Survey Finding

During the FGDs, discussions were made with the local women, information was collected related to socio-economic conditions of women, available education and health facilities, subproject related awareness, anticipated subproject impacts on mobility of women and their concerns if any. During survey, it was observed that the women in subproject affected villages mainly resides in the house and carry out household works. However, a few women were found engaged in nursing and stitching at home (see **Table 4.12**).

Table 4.12: Findings of Gender Survey

Indicator	Findings
Socio-economic Role	Majority of women are confined to domestic roles such as cooking, cleaning, and childcare. Few are engaged in home-based income-generating activities like stitching or nursing.
Education	Basic education is relatively common, but girls rarely pursue higher education or vocational training due to mobility constraints and social norms.
Health Facilities	Access to healthcare is limited. Women consult doctors occasionally, mostly for maternal or emergency needs. Distance and transport are barriers.
Mobility and Travel	Female mobility is restricted. Women seldom travel outside villages unless accompanied by male family members. Travel for education or healthcare is infrequent.
Decision-Making	Women are generally excluded from decision-making at both household and community levels. Male elders, typically household heads, hold authority.
Project Awareness	Very limited awareness about the project among women. Some expressed concern over construction activities and potential impact on privacy, safety, and daily routines.

4.9.2 Socioeconomic Roles

In the subproject districts, the majority of women (ranging from 80% to 88%) are involved in domestic household roles. A smaller percentage (7% to 15%) participate in home-based activities such as stitching or nursing. Around 5% of the women are either elderly or not active in economic roles. See **Table 4.13** for details.

Table 4.13: Women Economic Role in AoI

Sub Project Area	Domestic Household Roles (%)	Home-based Activities (%)	Elderly or Not Active (%)
Shah Jamal	80%	14%	6%
DG Khan	88%	9%	3%
Layyah	83%	12%	5%
Khanewal	82%	13%	5%
Arifwala	86%	10%	4%
Rahim Yar Khan	84%	11%	5%

4.9.3 Access to Education and Health Facilities

Figure 4.7 compares the percentage of girls enrolled in school and the availability of nearby clinics across six districts. It shows Arifwala and Shah Jamal performing relatively better in both education and health access, while DG Khan and Rahim Yar Khan show the lowest access percentages.

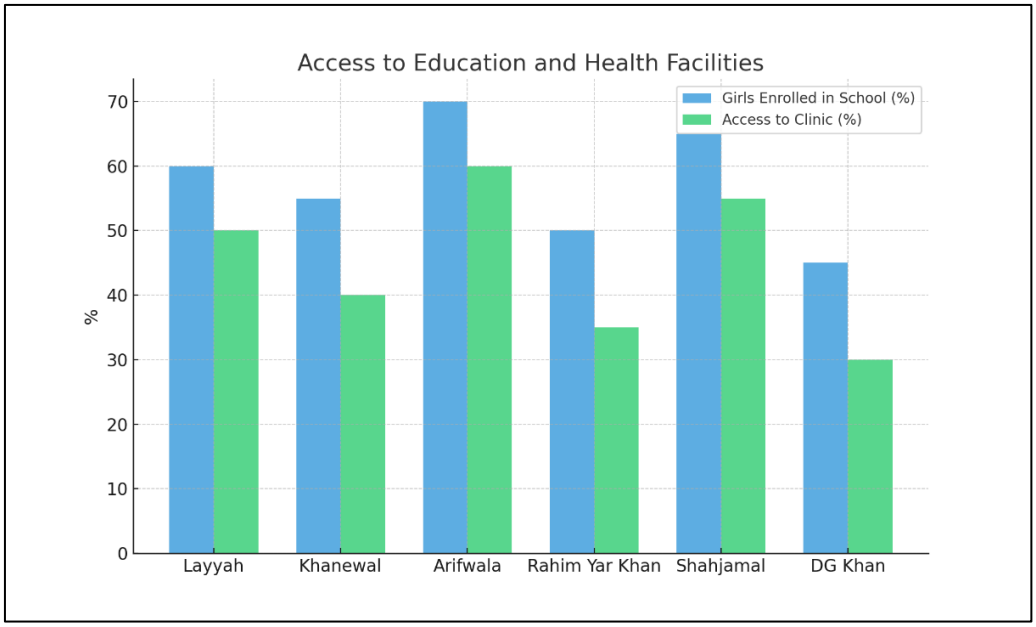

Figure 4.7: Access to Education and Health Facilities

4.9.4 Female Mobility Trends

This survey categorizes women's mobility into three areas: movement within the village, travel to nearby towns for healthcare, and travel for education. The data indicate that most women stay within their village boundaries, and very few travel for higher education or vocational training, results are shown in **Figure 4.8**.

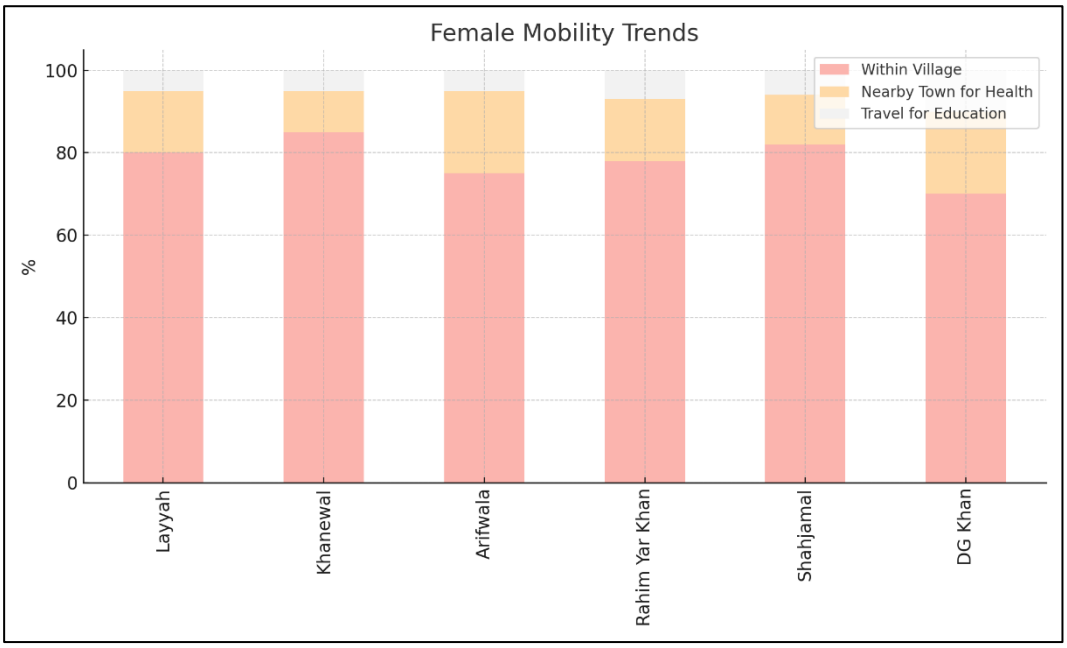

Figure 4.8: Female Mobility Trends

4.9.5 Women's Involvement in Household Decision-Making

In all six subproject districts, the majority of women (ranging from 76% to 84%) have no role in household decision-making. A smaller percentage (11% to 19%) are consulted informally, while 3-5%, mainly widows or female heads of households are actively involved in making decisions within the household. See **Table 4.14** for details.

Table 4.14: Women Role in Decision Making

Sub Project Location	No Role in Decision-Making (%)	Consulted Informally (%)	Actively Involved
Shah Jamal	80%	15%	5%
DG Khan	82%	13%	5%
Layyah	76%	19%	5%
Khanewal	78%	18%	4%
Arifwala	84%	11%	5%
Rahim Yar Khan	79%	17%	3%

4.9.6 Pressing Needs of Women

Women in the subproject areas face several socio-economic and infrastructural challenges that hinder their empowerment, health, and participation in community life. While many are engaged in domestic responsibilities or low-income home-based activities, their involvement in public, economic, and decision-making spheres remains limited.

The most pressing needs of the women of these areas identified during community consultations and field assessments include:

- Access to livelihood opportunities: Most women are confined to unpaid domestic roles or informal, home-based work such as stitching and embroidery. There is a strong need for vocational training, skill enhancement programs, access to markets, and micro-credit facilities to help them earn a sustainable income.
- Education and skill development: Low literacy levels and a lack of skills continue to restrict women's growth. Programs focused on adult literacy, digital training, and vocational skills are essential for building their capacity and self-reliance.
- Healthcare and reproductive services**:** Access to primary healthcare, especially maternal and reproductive health services, is limited in many areas. Strengthening rural health facilities and outreach programs is vital for improving women's health outcomes.
- Clean and Safe Drinking Water: Access to clean drinking water near homes is essential for reducing health risks and saving time that could be utilized for productive activities.
- Mobility and Safety: Poor transportation infrastructure, unsafe public spaces, and restrictive social norms limit women's ability to travel freely. Gender-sensitive infrastructure and community awareness can improve their mobility and confidence.
- Participation in Decision-Making: A majority of women have little or no role in household or community-level decisions. Empowerment programs and community dialogue are needed to promote women's voices in decision-making.
- Awareness of Rights and Social Services: Many women lack information about their legal rights and available government schemes. Targeted awareness campaigns can help them access support services.

4.10 Sensitive Receptors

The sensitive receptors identified during the field investigations as part of this ESIA have been shown in **Figures 1.2** to **1.7**. These receptors essentially include educational institutes, healthcare facilities, mosques, and graveyards. These receptors need a greater level of care and protection from the potential impacts of the proposed subproject and therefore require a greater level of attention and stricter mitigation and monitoring measures.

5 Potential Impacts and Mitigation Measures

This Chapter assesses the potentially adverse environmental and social impacts of the proposed subproject. Also provided in the Chapter are the recommended mitigation measures to minimize if not eliminate the potentially adverse impacts.

5.1 Significant E&S Impacts of Project Siting/Design

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

- Adherence to the appropriate electrical safety code while designing the system.
- Site selection for grid stations; route selection for transmission lines
- Type of equipment.

The design phase impacts can be readily preempted and avoided. These concerns and the measures to avoid/minimize them are discussed below.

5.1.1 Resettlement Impacts

Acquiring/purchasing land for the grid stations under the proposed subproject can potentially have resettlement impacts including loss of land and structures, physical and economic displacement, loss of livelihood, damage to crops and other similar resettlement impacts.

For the proposed subproject, five of the six grid station sites have been selected on government land while only one grid station site is located on private land. One of the grid station sites has informal settlers occupying the land. The transmission lines associated with the proposed grid stations pass through cultivated lands and the construction activities are likely to cause diminution of land under the transmission line towers and also some damages to crops. MEPCO has already prepared Abbreviated Resettlement Action Plans (ARAPs) to address these resettlement impacts in compliance with the WB ESS5.

Mitigation Measures

- The ARAPs mentioned above will be effectively implemented,
- All compensation payment and allowances will be paid to the affected persons before commencing any civil works.
- MEPCO and PIMSC will carry out regular monitoring of the ARAP implementation.
- Complete documentation will be maintained for the entire ARAP implementation process.

5.1.2 Health and Safety Risks for Workers and Communities

Improper site selection, design of equipment and systems can pose serious risks particularly the electrocution hazards for the MEPCO workers as well as the nearby communities. In particular, any breach of the minimum allowable distances from the live parts and nearby workers, communities, and objects/structures that need to be maintained in accordance with the applicable electrical safety code can lead to not only very severe risk to the MEPCO workers as well as life and property of the nearby community, it can also cause severe damage to the MEPCO equipment/system also.

Mitigation Measures

- The design of the equipment and systems will follow the appropriate electrical safety codes.
- The PMISC will ensure that appropriate electrical safety code is comprehensively applied to all systems and equipment of the subproject
- Minimum distances will be maintained between the live parts and nearby structures and objects.
- Warning signage will be used where appropriate and needed.

5.1.3 Soil Erosion and Subsidence

Grid station sites and transmission line corridors having unstable soils can unnecessarily increase the civil construction cost and also poses soil erosion and subsidence risks during the O&M phase.

Mitigation Measures

- Soil investigation will be carried out before designing the foundation of all buildings, equipment, and transmission line towers.
- Areas having unstable soil will be avoided. If unavoidable, the foundations will be designed appropriately based upon the geotechnical investigation of the area.
- Banks of canal and other water bodies will be avoided while deciding the location of the grid stations and transmission line towers.
- If any tower is to be located inside the river/stream, the foundation will be designed appropriately (eg, pile foundation).

5.1.4 Soil and Water Contamination

The design related issues related to soil and water contamination include transformer oil containing PCB, appropriate arrangements to collect leaked transformer oil, and waste disposal including toilet effluents from the grid stations. The MEPCO has discontinued buying PCB-containing transformers however the possibility of old transformers having PCB-containing oils cannot be ruled out.

Mitigation Measures

- The transformer procured during the proposed subproject will be PCB-free.
- Leaked oil collection arrangement (such as a channel and a drain pit below the transformers) will be incorporated in the design of the transformer foundations at the grid stations.

5.1.5 Aesthetic Aspects

The new developments such as grid stations can intrude in the natural landscape. Similarly, the new transmission lines can also be an eyesore.

Mitigation Measures

Tree plantation plan will be prepared for the grid stations, without compromising the safety aspects (ie, required clearances will be maintained). For this purpose, provision will be made in the site layout of the grid stations.

The transmission line routes will be selected in a systematic way with least disturbance to the aesthetic value of the area.

5.2 Significant E&S Impacts during Construction Phase

The construction phase will be by far the most significant part of the proposed subproject with respect to environmental and social considerations, since most of the impacts are likely to take place during this period. Various construction activities will invariably create environmental disturbances and social concerns, which may have impacts on the physical resources as well as people of the area.

These impacts can be readily preempted and mitigated. The mitigation measures recommended in this section will need to be incorporated in the execution of the subproject and included in the construction contracts as appropriate. These impacts and their respective mitigation measures are discussed below.

5.2.1 Soil Erosion and Degradation

The soil-related issues include soil erosion, slope stability, and soil contamination. Soil erosion is likely to be caused by the vehicular traffic on unpaved roads, land clearing for construction camp, grid station works and transmission line towers, and the subsequent construction activities. Excavation activities for constructing the foundations and borrow pits can potentially cause soil erosion in case the excavated soil that is to be used/reused for filling/backfilling is kept unprotected during rains and strong winds.

Soil may be contaminated as a result of fuel/oils/chemicals spillage and leakage, and inappropriate waste (solid as well as liquid) disposal from construction sites and camps. This is a potential impact at all of the subproject sites.

Mitigation Measures

The following mitigation measures will minimize the soil erosion and contamination:

- 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 PIMSC. 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.
    - If necessary, fill material for grid station sites will be obtained from appropriate locations approved by PIMSC. Such locations will be selected after surveying the area and ensuring that soil extraction will not have any significant impacts, such as soil erosion, loss of natural vegetation and disturbance to drainage.
    - Where the use of cultivated land is unavoidable for obtaining the fill material, the top 30 cm soil layer will be removed and stockpiled for redressing the land after removal of the borrow material. The excavation in such areas will be limited to 50 cm depth.
    - The fill material will not be obtained from any cultivation fields or orchards, except where the land owner allows doing so.
    - Areas from where the fill material is obtained or surplus soil deposited, will be landscaped to minimize erosion and hazard for people and livestock.

- Construction camps will be located in a stable and flat area, requiring minimal de-vegetation and leveling. The contractor(s) will obtain approval from the PIMSC 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 (eg, stone pitching).
- 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.
- After the completion of the construction works, the transmission line routes, campsites and other construction sites will be completely restored. No debris, surplus construction material or any garbage will be left behind.
- Photographic record will be maintained for pre-project, during-construction and post-construction condition of the sites (grid station, transmission line/feeder routes, camps and access roads).

- 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 camps, appropriate treatment and disposal system, such as septic tanks and soaking pits, will be constructed having adequate capacity. The contractor(s) will submit to the PIMSC 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 contractors.
  - The inert recyclable waste from the site (such as card board, drums, broken/used parts) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste.
  - Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination. The waste disposal plan submitted by the contractor(s) will also address the solid waste.

5.2.2 Surface Water and Groundwater Contamination

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

- Disposal of construction waste
- Disposal of solid waste from construction camps
- Release of waste effluents
- Equipment/vehicle maintenance
- Spillage/leakage of fuels, oils and chemicals.

In addition, vehicles and construction machinery operation near water bodies/water courses can potentially contaminate the surface water.

These impacts may be encountered at all of the sites during the construction phase of the proposed subproject.

Mitigation Measures

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

- The groundwater quality analysis at each of the grid station sites (and campsites if established outside the grid station sites) will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the water quality at these locations.
- Construction debris or any other solid wastes or untreated waste effluents will not be disposed-off in water bodies.
- No stockpiling of materials will be carried out at bank of water bodies.
- Construction camp will not be located within 500-m of rivers and major canals (unless it is placed inside the grid station). Location will be finalized after obtaining PIMSC approval.
- The contractor(s) will submit to the PIMSC the plans for the camp layout and waste disposal system, and obtain approval.
- Groundwater quality analysis will be carried out at the grid station sites and campsites once a month during the construction phase.

5.2.3 Air Quality Deterioration

Construction machinery and vehicles will release exhaust emissions, containing carbon monoxide (CO), sulfur dioxide (SO_2), oxides of nitrogen (NOX), and particulate matter (PM) among others. These emissions can deteriorate the ambient air quality in the immediate vicinity of the subproject sites. Furthermore, construction activities such as excavation, leveling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions. Vehicles carrying construction material are likely to result in increased suspended particulate matter (SPM) levels near the haul roads. This can be of potential importance if the vehicles pass through the areas with a high concentration of sensitive receptors, such as schools and hospitals. At the construction sites/material storage sites, the dust levels are also expected to increase due to unloading of construction materials. Poor air quality due to the release of contaminants and material haul routes can result in possible respiratory irritation, discomfort, or illness to workers and communities.

Mitigation Measures

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

- Air quality analysis at each of the grid station sites will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the ambient air quality at these locations.
- Construction camps will be established at least 500-m away from communities (except when such camps are established inside the grid stations). The contractor(s) will obtain PIMSC approval for this purpose, as mentioned earlier.
- Construction machinery, generators and vehicles will be kept in good working condition and properly tunned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. The waste water from kitchen and washing area of the construction camp may be used for water spraying.

- Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. Such stockpiles will be covered when necessary.
- Vehicles transporting soil, sand and other construction materials shall be covered with tarpaulin
- Concrete and batching plants to be controlled in line with statutory requirements, will have appropriate dust control mechanism (such as wet scrubbers) and shall not be close to sensitive receptors a minimum distance of 300-m will be ensured between batching plant(s) and the nearest community.
- The need for large material stockpiles shall be minimized by careful planning of the supply of materials from controlled sources. Stockpiles will not be located within 50-m of schools, hospitals or other public amenities and shall be covered with tarpaulin when not in use and at the end of the working day to enclose dust. If large stockpiles (>25m^3) of crushed materials are necessary, they will be enclosed with side barriers and also covered when not in use.
- Dust emissions shall be minimized through good construction practices (such as keeping stock piles down wind and away from communities) and sprinkling water over the access road.
- Developing and implementing work practices to minimize release of contaminants into the work environment including:
    - Direct piping of liquid and gaseous materials where appropriate
    - Minimized handling of dry powdered materials; enclosed operations
    - Local exhaust ventilation at emission/release points
    - Vacuum transfer of dry material rather than mechanical or pneumatic conveyance
    - Indoor secure storage, and sealed containers rather than loose storage
- Stack height of generators will be at least 3-m above the ground.
- Project vehicles will avoid passing through the communities and cultivation fields as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.
- Ambient air quality analysis will be carried out at the grid station sites and also at the sensitive receptors (such as schools and hospitals) within the AoI once every two months during the construction phase. Additional mitigation measures will be identified and implemented in case ambient air quality at these sensitive receptors is beyond the prescribed limits defined by NEQS, PEQS and other applicable standards.

5.2.4 Noise and Vibration

Various types of construction equipment and machinery such as generators, compressors, jack hammer and cutter will be used during the construction activities. These works will generate high noise levels at the subproject sites and in the subproject area.

Each construction activity has its unique noise characteristics due to use of different equipment items. The potential sources of noise during the preparation, construction, and worksite closure phases for the proposed construction works include equipment, machinery, and transportation used for the construction activities. The equipment used for construction will be the major source of noise.

Since various modern machines are acoustically designed to generate low noise levels, any high noise levels that might be generated will only be for a short duration during the construction phase.

Depending on the construction equipment used and its distance from the receptors, the community and the workers may typically be exposed to intermittent and variable noise levels. During the day, such noise results in general annoyance and can interfere with sleep during the night. In general, human sound perception is such that a change in sound level of 3 decibels (dB) is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as a doubling or halving of sound level.

Due to the various construction activities, there will be temporary noise impacts in the immediate vicinity of the subproject sites. The movement of heavy vehicles, loading, transportation and unloading of construction materials produces significant noise during the construction stage. However, these increased noise levels will prevail only for a short duration during the construction phase.

Table 5.5 below represents typical noise levels from various construction equipment. It should be noted that the values indicated in the table may differ depending on the brand and age of machinery provided/used by construction contractors.

Table 5-1: Construction Equipment Noise Ranges, dB (A)

Equipment	Peak Noise Range at 15 m	Typical Peak Sound Level in a Work Cycle[a] at 15 m	Typical 'Quieted Equipment' Sound Level[b] at 15 m	Construction Phase		
				Earth works	Structures	Installation
Batching plant	82-86	84	81		Y	
Concrete mixers	76-92	85	82		Y	
Cranes	70-94	83	80		Y	Y
Excavators	74-92	85	82	Y		
Front loader	77-94	85	82	Y	Y	Y
Water bowsers	85-93	88	85	Y	Y	Y
Graders	72-92	85	82	Y		
Bulldozers	65-95	85	80	Y		
Pavers	87-89	88	80	Y		
Pumps	68-72	76	75	Y	Y	Y
Diesel generators	72-82	81	77		Y	Y
Drilling machines (Jack Hammer/ potable jack hammer)	82-98	90	87	Y	Y	
Compressors	74-88	81	71		Y	

Equipment	Peak Noise Range at 15 m	Typical Peak Sound Level in a Work Cycle[a] at 15 m	Typical 'Quieted Equipment' Sound Level[b] at 15 m	Construction Phase		
				Earth works	Structures	Installation
Dumpers	77-96	88	83	Y	Y	
Dump/flatbed Truck	75-85	80	77	Y	Y	Y

Sources: USEPA, 1971; http://www.waterrights.ca.gov/EIRD/text/Ch11-Noise.pdf; http://www.lacsd.org/LWRP%202020%20Facilities%20Plan%20DEIR/4_6_Noise.pdf; http://newyorkbiz.com/DSEIS/CH18Construction.pdf

Notes:
a. Where typical value is not cited in literature, mean of the peak noise range is assumed
b. Quieted equipment can be designed with enclosures, mufflers, or other noise-reducing features. Where data is not available, a 3 dB reduction is assumed

Mitigation Measures

- It will be ensured that the noise levels measured at the communities near the subproject sites are kept within the acceptable limits (70 dB(A) for industrial zones day and night; 45 dB(A) night and 55 dB(A) daytime for residential areas).
- Noise levels will be measured at the key locations particularly sensitive receptors such as schools and hospitals. If the noise levels are found to be more than the prescribed limits, appropriate measures will be undertaken by the construction team such as rescheduling the works, using quieter equipment and/or erecting barriers to protect the communities from excessive noise.
- Vehicular traffic through the communities will be avoided as far as possible. Project routes will be authorized by the PIMSC.
- Vehicle speeds will be kept low, and horns will not be used while passing through or near the communities.
- Vehicles will have exhaust silencers to minimize noise generation.
- Nighttime traffic will be avoided near the communities, as far as possible.
- Movement of all subproject vehicles and personnel will be restricted to within work areas, to avoid noise disturbance.
- Working hours for construction activities within the communities will be limited to between 8 am and 6 pm (between 6 am and 8 pm during the summers).
- PIMSC will identify additional mitigation measures for the sensitive receptors as needed.
- Liaison with the community will be maintained. Grievance redressal mechanism will be put in place to address the community complaints, as stated earlier.

5.2.5 Occupation Health and Safety Risks

The construction works pose significant health and safety risks to the construction workers. These may be associated with working in confined spaces (such as trenches), working at heights (such as transmission line towers and conductors), electrocution risks associated with working at or near live wires/systems, fire and explosion risks associated with handling and storing fuels and other chemicals, and working near heavy construction machinery and moving parts. The following are the key OHS risks that are likely to be associated with the proposed subproject works:

Accident Hazards

- Falls from height, especially when standing/working on ladders;
- Slips, trips and falls, especially while carrying heavy or bulky loads;
- Cuts and injuries caused by sharp instruments and tools;
- Hazard of suffocation from asphyxiant gases released or from oxygen deficiency, during maintenance and cleaning operations;
- Burns caused by hot parts of equipment;
- Electrocution caused by coming in contact with live parts/wires
- Musculoskeletal injury (especially of back), resulting from lifting and moving of heavy loads;

Physical Hazards

- Exposure to cold and/or heat stress, as a result of rapid movement between cold and hot areas;
- Exposure to ultraviolet (UV) radiation during welding operations;

Chemical Hazards

- Exposure to various chemicals, such as: adhesives, caulking compounds, fluxes (solder), hydrochloric acid, zinc chloride, tar and solvents, various greases and inorganic lead;

Biological Hazards

- Exposure to parasites, such as hookworm, ascaris, and various mites, chiggers and ticks;

Ergonomic, psychosocial and organizational factors

- Psychological stress due to dissatisfaction at work due to issues with peers and superiors;
- General ill feeling as a result of work in confined spaces and development of ‘sick building syndrome’;

These risks will be associated with all subproject sites, and at construction camps, workshops and storage areas.

Mitigation Measures

- The contractor will prepare and implement occupational and community health and safety (OCHS) management plan, in accordance with the WB ESF, World Bank Group’s Environment, Health and Safety Guidelines as well as World Health Organization (WHO) Guidelines, ILO Code of Practice and any other internationally recognized OHS standard such as ISO 45001 or US OSHA 29 CFR 1926 or any standard specifically mentioned in the bidding documents. The Plans will include applicable safety standards and protocols, requirements of job hazard analysis, training requirements, documentation and reporting mechanism.
- The Contractor will submit to the PIMSC for approval an emergency evacuation/response plan.
- All OHS protocols will be implemented in true letter and spirit.

- The construction sites will have protective fencing to avoid any unauthorized entry.
- The project drivers will be trained for defensive driving skills.
- Vehicular speeds near/within communities will be kept low to minimize safety hazards.
- Construction camp sites will be located at least 500-m away from the nearest community. Camp site will be selected with PIMSC approval
- Firefighting equipment will be made available at the camps.
- Fire extinguishers will be provided throughout camps and work sites. Fire extinguishers will be inspected monthly and maintained as necessary.
- The construction and camp staff will be provided OCHS training.
- Work in confined space will be executed with available safety standards. Adequate monitoring and equipment shall be available to detect deficient oxygen levels.
- All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel.
- An adequate and reliable supply of safe drinking water will be made available at readily accessible and suitable places including at all camps.
- The Contractor will take samples from each supply of drinking water and arrange for analysis of these samples at EPA certified laboratory prior to its use by the Contractor's staff. The results of these tests for each supply must be submitted to the PIMSC and must demonstrate that each water supply meets national and World Health Organization (WHO) standards for drinking water.
- The Contractor will provide and maintain adequate hygienic kitchens which are sheltered and separated from the living quarters. Kitchens will include raised and washable surfaces suitable for food preparation.
- The Contractor will provide and maintain adequate hygienic dining areas for staff. Work places and camps will be provided with both natural and artificial light. Artificial lighting will be powered by generator in the event of power cuts.
- Public sensitization training will be provided to workers to avoid social conflicts between residents and the construction contractor, occurrence of any such impacts can be avoided by community sensitive planning and implementation and through effective involvement of local administration.
- Contractor will appoint adequate OHS resources to implement, monitor and report the OCHS management plan to concerned authorities and PIMSC.
- Contractor must ensure the provision of first aid facility at construction sites and camps through hiring medics and establishing a dispensary at the campsite.
- Reasonable number of first aid kits will be available on construction sites and within contractor camps.
- Site personnel will be provided appropriate type of personal protective equipment (PPE). Contractor will ensure consistent use of PPE.

Rotating and Moving Equipment

- Injury or death can occur from being trapped, entangled, or struck by machinery parts due to unexpected starting of equipment or unobvious movement during operations. Mitigation measures related to rotating and moving equipment on workers are provided below.

- Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions.
- Where a machine or equipment has an exposed moving part or exposed pinch point that may endanger the safety of any worker, the machine or equipment will be equipped with, and protected by, a guard or other device that prevents access to the moving part or pinch point. Guards will be designed and installed in conformance with appropriate machine safety standards.
- Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out -- LOTO) machinery with exposed or guarded moving parts, or in which energy can be stored (e.g. compressed air, electrical components) during servicing or maintenance.
- Designing and installing equipment, where feasible, to enable routine service, such as lubrication, without removal of the guarding devices or mechanisms.

Vibration

- Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, will be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Exposure levels will be checked on the basis of daily exposure time and data provided by equipment manufacturers.
- Other sources of vibration at construction site are rollers, compactors or any loose part of machinery exposure which may cause serious injury or workplace sickness. No equipment and machinery with loose or vibratory parts will be allowed to work. Such issues will be fixed through maintenance of the machinery on periodic basis. Use of rollers for land grading will be carried out during day times and with intermittent intervals to reduce the impacts of vibration on surrounding environment.

Electrical

- Exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools, can pose a serious risk to workers. Overhead wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms. Vehicles or grounded metal objects brought into close proximity with overhead wires can result in arcing between the wires and the object, without actual contact. Recommended actions include:
  - Marking all energized electrical devices and lines with warning signs;
  - Locking out (de-charging and leaving open with a controlled locking device) and tagging-out (warning sign placed on the lock) devices during service or maintenance;
  - Checking all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools; ·
  - Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits;
  - Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas; ·
  - Conducting detailed identification and marking of all buried electrical wiring prior to any excavation work.

Eye Hazards

- Solid particles from a wide variety of construction activities, and/or a liquid chemical spray may strike a worker in the eye causing an eye injury or permanent blindness. Recommended measures include:
    - Use of machine guards or splash shields and/or face and eye protection devices, such as safety glasses with side shields, goggles, and/or a full-face shield.
    - Specific Standard Operating Procedures (SOPs) may be required for use of sanding and grinding tools and/or when working around liquid chemicals. Frequent checks of these types of equipment prior to use to ensure mechanical integrity is also good practice. Machine and equipment guarding will conform to standards published by organizations such as Canadian Standards Association (CSA), American National Standards Institute (ANSI) and International Organization for Standardization (ISO).

Welding/Hot Work

- Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Recommended measures include: ·
    - Provision of proper eye protection such as welder goggles and/or a full-face eye shield for all personnel involved in, or assisting, welding operations. Additional methods may include the use of welding barrier screens around the specific work station (a solid piece of light metal, canvas, or plywood designed to block welding light from others). Devices to extract and remove noxious fumes at the source may also be required. ·
    - Special hot work and fire prevention precautions and SOPs will be implemented if welding or hot cutting is undertaken outside established welding work stations, including Hot Work Permits, stand-by fire extinguishers, stand-by fire watch, and maintaining the fire watch for up to one hour after welding or hot cutting has terminated. Special procedures are required for hot work on tanks or vessels that have contained flammable materials.

Vehicle Driving and Site Traffic

- Poorly trained or inexperienced vehicle drivers have increased risk of accident with other vehicles, pedestrians, and equipment. Subproject vehicles and delivery vehicles, as well as private vehicles on-site, also represent potential collision scenarios. Subproject vehicle driving and site traffic safety practices include:
    - Training and licensing vehicle operators in the safe operation of specialized vehicles such as forklifts, including safe loading/unloading, load limits.
    - Ensuring drivers undergo medical surveillance.
    - Ensuring moving equipment with restricted rear visibility is outfitted with audible back-up alarms.
    - Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction.
    - Restricting the circulation of delivery and private vehicles to defined routes and areas, giving preference to 'one-way' circulation, where appropriate.

Ergonomics, Repetitive Motion, Manual Handling

- Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery. These OHS problems must be minimized or eliminated to maintain a productive workplace. Controls may include:
    - Facility and workstation design with 5th to 95th percentile operational and maintenance workers in mind.
    - Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and work objects, and requiring multi-person lifts if weights exceed thresholds.
    - Selecting and designing tools that reduce force requirements and holding times and improve postures. ·
    - Providing user adjustable workstations.
    - Incorporating rest and stretch breaks into work processes and conducting job rotation.
    - Implementing quality control and maintenance programs that reduce unnecessary forces and exertions.
    - Taking into consideration additional special conditions such as left-handed persons.

Working at Heights

- Fall prevention and protection measures must be implemented whenever a worker is exposed to the hazard of falling more than two meters; into operating machinery; into water or other liquid; into hazardous substances; or through an opening in a work surface. Fall prevention / protection measures may also be warranted on a case-specific basis when there are risks of falling from lesser heights. Fall prevention may include:
    - Installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area.
    - Proper use of ladders and scaffolds by trained employees. ·
    - Use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal life-lines. ·
    - Appropriate training in use, serviceability, and integrity of the necessary PPE.
    - Inclusion of rescue and/or recovery plans, and equipment to respond to workers after an arrested fall.

Fire and Explosions

- Fires and or explosions resulting from ignition of flammable materials or gases can lead to loss of property as well as possible injury or fatalities to project workers. Prevention and control strategies include:
    - Fuel storage areas and generators will have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area will be equal to 120% of the total volume of fuel stored.

- Storing flammables away from ignition sources and oxidizing materials. Further, flammables storage area must be:
    - Remote from entry and exit points into camps
    - Away from facility ventilation intakes or vents
    - Have natural or passive floor and ceiling level ventilation and explosion venting
    - Use spark-proof fixtures
    - Be equipped with fire extinguishing devices and self-closing doors, and constructed of materials made to withstand flame impingement for a moderate period of time ·
- Defining and labeling fire hazards areas to warn of special rules (e.g. prohibition in use of smoking materials, cellular phones, or other potential spark generating equipment).
- Providing specific worker training in handling of flammable materials, and in fire prevention or suppression.

Corrosive, oxidizing, and reactive chemicals

- Corrosive, oxidizing, and reactive chemicals present similar hazards and require similar control measures as flammable materials. However, the added hazard of these chemicals is that inadvertent mixing or intermixing may cause serious adverse reactions. This can lead to the release of flammable or toxic materials and gases, and may lead directly to fires and explosions. These types of substances have the additional hazard of causing significant personal injury upon direct contact, regardless of any intermixing issues. The following controls will be observed in the work environment when handling such chemicals: ·
    - Corrosive, oxidizing and reactive chemicals will be segregated from flammable materials and from other chemicals of incompatible class (acids vs. bases, oxidizers vs. reducers, water sensitive vs. water based, etc.), stored in ventilated areas and in containers with appropriate secondary containment to minimize intermixing during spills. ·
    - Workers who are required to handle corrosive, oxidizing, or reactive chemicals must be provided with specialized training and provided with, and wear, appropriate PPE (such as gloves, apron, splash suits, and face shield or goggles).
    - Where corrosive, oxidizing, or reactive chemicals are used, handled, or stored, qualified first-aid must be ensured at all times. Appropriately equipped first-aid stations will be easily accessible throughout the place of work, and eye-wash stations and/or emergency showers will be provided close to all workstations where the recommended first-aid response is immediate flushing with water.

Biological Hazards

- Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. Biological hazards can be prevented most effectively by implementing the following measures: ·
    - The contractor will review and assess known and suspected presence of biological agents at the place of work and implement appropriate safety measures, monitoring, training, and training verification programs.

- Project contractor must provide good working and sanitation conditions at camp and wok sites. Disease surveillance will be carried out to identify any exposure to parasites, such as hookworm, ascaris, and various mites, chiggers, ticks and dengue.
- Measures to eliminate and control hazards from known and suspected biological agents at the place of work must be designed, implemented and maintained in close co-operation with the local health authorities and according to recognized international standards.

5.2.6 Community Health and Safety - CHS

This is a risk quite similar to the OHS risks but for the nearby communities and non-subproject personnel. These risks are usually associated with excavation and trenches, operation of construction machinery and project vehicles, traffic hazards, electrocution risks, falling objects from heights, improper waste disposal particularly hazardous wastes and exhaust emissions from vehicles and equipment.

Mitigation Measures

- OCHS Management Plan will be strictly implemented
- The construction area will be barricaded to prevent unauthorized access
- Warning signs will be placed where appropriate/needed
- The construction camps will have septic tanks and soaking pits of adequate size.
- Camps will be at least 500-m from any groundwater wells used by the community.
- The construction camps will have appropriate solid waste disposal mechanism
- The construction camps and site offices will have first-aid kits.
- The construction crew will be provided awareness for the transmissible diseases (such as Human immunodeficiency virus (HIV) / acquired immunodeficiency syndrome (AIDS), or hepatitis B and C).
- Guidelines for SEA/SH, gender-based violence (GBV) and violence against children (VAC) will be implemented
- Liaison with the community will be maintained. In particular, the nearby communities will be informed before commencing the construction works, testing and commissioning of the system. Protective fencing will be used where appropriate/possible. Awareness raising program will be implemented to educate the communities regarding the hazards associated with the grid stations, transmission lines, feeders and other electrical systems/equipment. Warning signs will be used at the appropriate locations.
- PIMSC will identify additional mitigation measures for the sensitive receptors as needed.

5.2.7 Influx of Labor

Influx of construction workers from other parts of the country can potentially cause risks and impacts such as social conflict, GBV/SEA/SH, and communicable diseases. The communities near the grid station sites and transmission line routes will be at risks associated with the influx of labor.

Mitigation Measures

- Code of conduct (CoC) for workers and employees will be enforced for the protection of local communities, gender-based violence, other social issues, flora and fauna and a

ban on tree cutting and hunting. Any violation of the CoC would lead to strict punishment including termination of employment;

- Inclusion of CoC obligations and the applicable legislation in the contracts of all employees and workers with the provision of sanctions and penalties in case of violations;
- Any employee, who continues misconduct, carries out duties amateurishly or inattentively, fails to conform to provisions of the contract and CoC, or persists in any conduct which is harmful to safety, health, or the protection of the environment will be terminated;
- Awareness among workers will be created on proper sanitation and hygiene practices to endorse proper health;
- Good housekeeping practices will be maintained at project site(s);
- Adequate personal hygiene facilities will be provided in good condition with adequate supply of clean water;
- Arrangements will be made to treat the affected workers on time to control the movement of vectors diseases;
- Workers and surrounding communities will be sensitized on awareness and prevention of HIV/AIDS and Sexually transmitted infection (STI) through training, awareness campaigns and workshops;
- Free HIV/AIDS and STI screening and provided for site workers
- Counselling sessions will be held to made the workers aware of the risks of HIV/AIDS and STI;
- The use of drugs and alcohol will not be allowed at the work/construction site;
- Carrying weapons into the workplace premises will be prohibited;
- Adequate security arrangements will be made at all construction sites and temporary facilities;
- The contractor will create awareness of construction crew to sensitize them about security situation in the project area, in coordination with private/public security agencies;
- Appropriate fencing, security check points, gates and security guards will be provided at the construction sites to ensure the security of equipment, machinery and materials, as well as to secure the safety of site staff;
- The Contractor will ensure that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft;
- To avoid conflicts with local people on employment matters, it is recommended to the contractor to employ the locals in skilled, semi-skilled, and unskilled work. This will reduce pressure on resources such as residential and health facilities;
- The contractor will proactively manage the potential impacts from labor influx and potential cultural conflicts between local communities and workers, which include following:
- Construction camps will be built in the designated areas, located minimum 500m away from any settlements;
- The Contractor’s monthly training program will cover topics related to respectful attitude while interacting with the local communities;

- World Bank Guidelines on Influx of labor[17] will be used for further guidance.

5.2.8 Gender Issues including SEA/SH Risks

This is an issue similar to the one associated with influx of labor discussed above. The presence of workers and project personnel may cause some gender issues such as intrusion in privacy, in particular because the migrant labor may not be aware of the local customs and culture.

Mitigation Measures

- The routes/places used by the women will be avoided as far as possible. If unavoidable, alternate routes to be identified for the communities, if required, especially along routes frequented by women folk, such as route to the local well or water source.
- Camp sites for construction will be 500 m away from the nearest community, as recommended earlier.
- Construction crew will avoid entering villages and settlements.
- Strict CoC will be observed by the construction crew. Local norms will be respected.
- PIMSC will identify additional mitigation measures for the sensitive receptors as needed.
- Awareness among workers will be created on proper sanitation and hygiene practices, SEA/SH issues, privacy of women, and cultural appropriateness;
- GRM will have a separate mechanism (GRC) to handle SEA/SH cases;
- A GBV/SEA/SH service provider will be identified in the subproject area;
- Accountability and response framework will be prepared and implemented for SEA/SH cases;
- Safe spaces will be established/arranged for women in all temporary and permanent facilities;
- SEA/SH awareness will be considered during the recruitment of staff;
- Communities will be informed and consulted before commencing works inside or near the communities.
- WB guidelines on GBV and Influx of Labor will be implemented.

5.2.9 Child Labor

It is not a major issue in the construction industry however below-age workers are sometimes employed at the construction camps.

Mitigation Measures

- The provisions of the ECA will be made part of the construction contracts.
- It will be ensured that no child labor is employed at any of the work site or camp site.
- The LMP prepared for EDEIP will be implemented.

[17] http://pubdocs.worldbank.org/en/863471511809509053/ESS2-FactSheet-WB-ESF.pdf

5.2.10 Damage to Public Infrastructure

Construction activities particularly transmission line works and movement of subproject vehicles can potentially cause damages to the public infrastructures such as irrigation network, local roads, culverts and bridges, and electricity network.

Mitigation Measures

- Operation of construction machinery and subproject vehicles will be avoided close to the canals and water courses.
- Any damage caused by the subproject activities will be completely repaired.
- Damage to the existing infrastructure will be minimized if not avoided altogether through astute planning.
- All damaged infrastructure will be restored to original or better condition.

5.2.11 Loss of Crops and Damage to the Cultivation Fields

Most of the subproject construction activities will be carried out in and around the cultivated area. The construction activities may potentially damage crops or cultivated fields causing financial loss to the farmers/landowners.

Mitigation Measures

- Damage to the crops will be avoided during the construction phase.
- Appropriate/adequate compensation will be paid to the grower/landowner in case of any crop loss caused by construction activities.
- Liaison with the nearby communities will be maintained in this regard.
- The grievance redressal mechanism will be maintained on a continuous basis.

5.2.12 Blocked Access

The construction activities particularly establishment of construction camps, dumping of construction materials and wastes, excavated soil, transmission line works and movement of subproject vehicles and construction equipment can potentially block the local access routes, roads and paths.

Mitigation Measures

- Efforts will be made to avoid any impacts on the local roads, routs, and accesses.
- In case of the blockage of the existing routes, alternate routes will be identified in consultation with the affected communities.
- The contractor will prepare and implement a traffic management plan to minimize impacts on the local routes.
- Community liaison will be maintained throughout the construction phase.

5.3 Significant E&S Impacts during Operation and Maintenance (O&M) Phase

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

5.3.1 Soil and water Contamination

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

- Domestic solid waste from the offices and residences in the grid stations
- Sewage from the offices and residences in the grid stations
- Wastes from the repair and maintenance activities (discarded equipment and parts, packing materials, used oils and chemicals, cotton rags and the likes).
- Leakage and spillage of transformer oil can contaminate soil.

Mitigation Measures

- The grid stations will have appropriate solid waste collection and disposal arrangements.
- 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 arrangements such as septic tanks and soakage pits.
- Waste oils and chemicals will be disposed in accordance with their respective Material Safety Data Sheet (MSDS). MSDS will be made available at the grid stations and maintenance workshops.
- Non-toxic recyclable waste (such as cardboard) will be given away for recycling.
- Toxic waste will be stored separately, 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.
- Any soil contaminated by the oil/chemical spillage will be removed and disposed-off appropriately in accordance with the MSDS of the spilled oil/chemical.

5.3.2 OCHS Risks

The O&M activities pose significant risks to the MEPCO staff. Most significant of these risks is associated with working on or near the live systems and wires. Similarly, working at heights is also a common safety risk for the workers associated with the O&M activities.

Operation and maintenance of electricity systems also pose some CHS risks. Most of the live equipment inside the grid stations is either within a double-periphery wall/fencing or within the control panels and control rooms/cable rooms, where access of the non-concerned personnel is not allowed. However, the transmission lines do pose some CHS risks particularly in the densely populated areas and sometimes houses and structures are constructed very close to these lines even under the live wires.

Mitigation Measures

- MEPCO will implement the Safety Code prepared by the National Electric Power Regulatory Authority (NEPRA) and its own safety manual.
- O&M staff will be provided essential protective gears and equipment.
- O&M staff will be provided safety training. Refresher courses will be arranged on regular basis.

- Firefighting equipment will be made available at the grid stations.
- The Emergency Response Plan (ERP) will be made available at each grid station. Its salient points will be displayed at prominent places within each grid station. The O&M staff will be given training on the ERP. The Environmental and Social Unit (ESU) will review the ERP and with respect to the environmental and social considerations, and recommend changes if needed. The ERP will include procedure to inform the nearby communities in case of fire in the grid stations.
- The communities near the grid stations and transmission lines will be educated on the risk of electrocution, and how to avoid accidents.
- Appropriate signage on safety precautions will be installed at the key locations.
- The trees under the transmission lines will be regularly trimmed in order to maintain 8 m clearance.
- Separation of live parts and pubic property/other structures/trees will be maintained
- Community liaison will be maintained to raise the public awareness about electrocution risks
- Solid waste and waste effluents from the grid stations will be treated/ managed appropriately.

5.3.3 Loss of Crops and Damage to the Cultivation Fields

The O&M activities within the grid stations will not cause any impacts on crops or cultivated fields. However, maintenance activities on the transmission lines can potentially cause some damage to crops and fields.

Mitigation Measures

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

5.3.4 Gender Mainstreaming

Gender mainstreaming will be encouraged in MEPCO. Employment opportunities will be created for women. Women friendly work environment will be established within MEPCO facilities (e.g., separate toilets, system to address sexual harassment).

6 Environmental and Social Management Plan

This Chapter describes the mechanism for implementing the mitigation measures discussed in **Chapter 5**. The Chapter includes the institutional arrangements, monitoring requirements, documentation and reporting requirements and also a training plan.

6.1 Institutional Arrangements

MEPCO will be responsible for the overall management, supervision, and execution of the project through the PMU. A full-time Project Director (PD) has been appointed to head the PMU.

The overall responsibility of E&S performance, including implementation of this ESIA (and other E&S documents and plans), will rest with the PMU. MEPCO has an existing Environmental and Social Unit (ESU), which needs to be fully staffed for the E&S management of the proposed subproject.

Details of environmental and social staff associated with various entities including consultants and contractors that may be engaged under the EDEIP are summarized below.

Environmental and Social Staff in PMU. The ESU of PMU needs to include the following staff:

- A Manager, Environmental and Social
- two Assistant Managers (one environment, and one social)
- An OHS specialist
- A gender specialist

PIMSC: The PIMSC will be responsible for (i) carrying out detailed engineering designs of the subprojects under EDEIP; (ii) construction supervision of these subprojects; (iii) preparation of E&S documents for EDEIP subprojects including this ESIA; (iv) implementation supervision of this ESIA (and other E&S documents/plans). The consultants will have adequate environmental, social, health and safety specialists to carry out the above tasks.

Contractors: Construction contractors will also have adequate environmental, health and safety specialists to implement this ESIA.

Monitoring and Evaluation Consultants (M&E Consultants). The PMU may also engage an independent organization to carry out third-party E&S monitoring during EDEIP implementation.

The roles and responsibilities of PMU's E&S staff and consultants for E&S management of the EDEIP are given in **Table 6.1**.

Table 6.1: Roles and Responsibilities for E&S Management

Organizations	Responsibilities
PMU	• Ensure that all EDEIP activities are well-managed and coordinated. • Procurement of works and goods. • Payment of compensation to the project affected households • Overall E&S management of the subprojects under EDEIP (including the proposed subproject)

Organizations	Responsibilities
E&S Staff within PMU	• Reviewing consultants' deliverables related to E&S assessment, reviewing bid documents for inclusion of ESMP measures, supervising construction activities, producing periodic monitoring reports, • Supervising PIMSC for the implementation of ESMP including mitigation measures • Carry out direct monitoring of key aspects such as OCHS and GRM • Closely coordinate with other concerned agencies including EPA, local governments, and communities to support the implementation of ESIA, ESMP and other E&S documents/plans.
PIMSC	• Prepare detailed engineering designs for subprojects • Supervise civil works, ensuring compliance with all design parameters including quality requirements • Prepare ESIA, ESMP, and other E&S documents • Ensuring inclusion of ESIA/ESMP in bidding documents • Supervise ESIA/ESMP implementation during construction • Prepare monthly E&S reports and submit to PMU • Support the E&S staff of PMU in carrying out their responsibilities • Providing training on ESMP principles and requirements to contractors, field staff, and others as needed to ensure effective implementation of ESIA • PIMSC will have adequate number of dedicated E&S staff.
Contractor	• Prepare Contractor-ESMP (C-ESMP) with site-specific mitigation measures. • implementation of mitigation and monitoring measures proposed in the ESMP and C-ESMP • Each contractor will depute adequate number of Environmental, Health, and Safety personnel fulltime at the site, who will be responsible for implementing the contractors' environmental, health and safety responsibilities, and liaising with government agencies.
M&E Consultant	• Independent monitoring of the implementation of ESIA/ESMPs and RPs • External Monitoring and evaluation.

6.2 Inclusion of ESMP in Contract Documents

MEPCO will include the following Environmental, Social, Health and Safety (ESHS) conditions in the bidding documents to ensure all the mitigation measures proposed in the ESMPs are effectively implemented:

- Past performance of the Contractor on ESHS aspects including sexual exploitation and abuse and gender-based violence;
- ESHS Staff with the Contractor;
- Mitigation measures to address construction impacts (as given in ESIA/ESMP);
- Payments for implementation of ESHS measures;
- Preparation of C-ESMP before site mobilization and its implementation during construction to manage the ESHS risks;

- Code of Conduct of Contractor's personnel.

6.3 Environmental and Social Management During Construction

6.3.1 Environmental Code of Practices (ECoP)

The ECoPs provide guidelines for E&S matters to be followed by the contractors for sustainable management of all E&S issues. These ECoPs have been prepared based on the experiences in the construction of projects, including World Bank-funded projects in Pakistan and also in conformity with the World Bank Group's (WBG's) Environment, Health and Safety Guidelines and also Good International Industry Practice. The ECoPs are presented in **Annex C** and will be included in the bidding documents to ensure their implementation.

The list of ECoPs prepared for the subproject is given below.

ECoP 1: Waste Management

ECoP 2: Fuels and Hazardous Goods Management

ECoP 3: Water Resources Management

ECoP 4: Soil Quality Management

ECoP 5: Erosion and Sediment Control

ECoP 6: Air Quality Management

ECoP 7: Noise and Vibration Management

ECoP 8: Road Transport and Road Traffic Management

ECoP 9: Labor Influx Management and Construction Camp Management

ECoP 10: Cultural and Religious Issues

ECoP 11: Workers Health and Safety

6.3.2 Construction Stage Mitigation and Monitoring Plan

The Mitigation and Monitoring Plan (MMP) for the construction stage impacts have been prepared on the basis of the impact assessment covered under **Chapter 5.** The MMP is presented in **Table 6.2**. This plan is subproject-specific, and to the extent possible, site-specific, however, contractors will be required to carry out further detailing of the key aspects, to prepare site-specific management plans as part of C-ESMP before commencing the construction activities.

6.3.3 Contractor's ESMP (C-ESMP)

The contractor will be required to prepare, obtain approval from PIMSC and then implement the C-ESMP (separately for each grid station) during the construction phase. The C-ESMP will be prepared on the basis of construction stage MMP and ECoPs, and will consist of subplans on the key E&S aspects including camp management, traffic management, OHS management, CHS management, pollution management, air quality and noise management, water resource management, spills and leakages management, waste management, hazardous substance management and others. The C-ESMP will be site- and subproject-specific and will be prepared on the basis of the prevailing conditions at the construction sites and their surroundings, contractor's plans and construction methodology.

Table 6.2: Mitigation and Monitoring Plan for Construction and O&M Phases

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
E&S Impacts of Project Siting/Design				
Resettlement Impacts	Land take for grid stations	• The ARAPs prepared for the subproject will be effectively implemented, • All compensation payment and allowances will be paid to the affected persons before commencing any civil works. • MEPCO and PIMSC will carry out regular monitoring of the ARAP implementation. • Complete documentation will be maintained for the entire ARAP implementation process.	ESMU/PIMSC	PMU
Health and Safety Risks for Workers and Communities	Improper design and siting	• The design of the equipment and systems will follow the appropriate electrical safety codes. • The PMISC will ensure that appropriate electrical safety code is comprehensively applied to all systems and equipment of the subproject • Minimum distances will be maintained between the live parts and nearby structures and objects. • Warning signage will be used where appropriate and needed.	ESMU/PIMSC	PMU
Soil Erosion and Subsidence	Improper site selection	• Soil investigation will be carried out before designing the foundation of all buildings, equipment, and transmission line towers. • Areas having unstable soil will be avoided. If unavoidable, the foundations will be designed appropriately based upon the geotechnical investigation of the area. • Banks of canal and other water bodies will be avoided while deciding the location of the grid stations and transmission line towers. • If any tower is to be located inside the river/stream, the foundation will be designed appropriately (eg, pile foundation).	ESMU/PIMSC	PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
Soil and Water Contamination	Improper design of facilities	• The transformer procured during the proposed subproject will be PCB-free. • Leaked oil collection arrangement (such as a channel and a drain pit below the transformers) will be incorporated in the design of the transformer foundations at the grid stations.	ESMU/PIMSC	PMU
Aesthetic aspects	Intrusion in natural landscape	• Tree plantation plan will be prepared for the grid stations, without compromising the safety aspects (ie, required clearances will be maintained). For this purpose, provision will be made in the site layout of the grid stations. • The transmission line routes will be selected in a systematic way with least disturbance to the aesthetic value of the area.	ESMU/PIMSC	PMU
Construction Phase Impact				
Soil Erosion and Degradation	Excavation and construction activities, running of vehicles on unpaved roads or tracks	• 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 PIMSC. 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. • If necessary, fill material for grid station sites will be obtained from appropriate locations approved by PIMSC. Such locations will be selected after surveying the area and ensuring that soil extraction will not have any significant impacts, such as soil erosion, loss of natural vegetation and disturbance to drainage. • Where the use of cultivated land is unavoidable for obtaining the fill material, the top 30 cm soil layer will be removed and stockpiled for redressing the land after removal of the borrow material. The excavation in such areas will be limited to 500 mm depth. • The fill material will not be obtained from any cultivation fields or orchards, except where the land owner allows doing so.	Contractor	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Areas from where the fill material is obtained or surplus soil deposited, will be landscaped to minimize erosion and hazard for people and livestock. • Construction camp will be located in a stable and flat area, requiring minimal de-vegetation and leveling. The contractor(s) will obtain approval from the PIMSC 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 (eg, stone pitching). • 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. • After the completion of the construction works, the transmission line routes, campsites and other construction sites will be completely restored. No debris, surplus construction material or any garbage will be left behind. • Photographic record will be maintained for pre-project, during-construction and post-construction condition of the sites (grid station, transmission line/feeder routes, camps and access roads). • Vehicles and equipment will not be repaired in the field. If unavoidable, impervious sheathing will be used to avoid soil and water contamination. • The domestic sewage from the construction camps will be connected to the city sewerage system. If such system is not available, appropriate treatment and disposal system, such as septic tanks and soaking pits, will be constructed having adequate capacity. The contractor(s) will submit to the PIMSC 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 contractors.		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• The inert recyclable waste from the site (such as card board, drums, broken/used parts, etc.) will be sold to recycling contractors. The hazardous waste will be kept separate and handled according to the nature of the waste. • Domestic solid waste from the construction camp will be disposed in a manner that does not cause soil contamination. The waste disposal plan submitted by the contractor(s) will also address the solid waste.		
Air quality deterioration	Operation of construction machinery and vehicles	• Air quality analysis at each of the grid station sites will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the ambient air quality at these locations. • Construction camps will be established at least 500 m away from communities (except when such camps are established inside the grid stations). The contractor(s) will obtain PIMSC approval for this purpose, as mentioned earlier. • Construction machinery, generators and vehicles will be kept in good working condition and properly tunned, in order to minimize the exhaust emissions. • Fugitive dust emissions will be minimized by appropriate methods, such as spraying water on soil, where required and appropriate. The waste water from kitchen and washing area of the construction camp may be used for water spraying. • Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. Such stockpiles will be covered when necessary. • Vehicles transporting soil, sand and other construction materials shall be covered with tarpaulin • Concrete and batching plants to be controlled in line with statutory requirements, will have appropriate dust control mechanism (such as wet scrubbers) and shall not be close to sensitive receptors A minimum distance of 300 meters will be ensured between batching plant(s) and the nearest community.	Contractor	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring

		• The need for large material stockpiles shall be minimized by careful planning of the supply of materials from controlled sources. Stockpiles will not be located within 50 m of schools, hospitals or other public amenities and shall be covered with tarpaulin when not in use and at the end of the working day to enclose dust. If large stockpiles (>25m^3) of crushed materials are necessary, they will be enclosed with side barriers and also covered when not in use.
		• Dust emissions shall be minimized through good construction practices (such as keeping stock piles down wind and away from communities) and sprinkling water over the access road.
		• Developing and implementing work practices to minimize release of contaminants into the work environment including:
		  • Direct piping of liquid and gaseous materials where appropriate
		  • Minimized handling of dry powdered materials; enclosed operations
		  • Local exhaust ventilation at emission/release points
		  • Vacuum transfer of dry material rather than mechanical or pneumatic conveyance
		  • Indoor secure storage, and sealed containers rather than loose storage
		• Stack height of generators will be at least 3 meters above the ground.
		• Project vehicles will avoid passing through the communities and cultivation fields as far as possible. If unavoidable, speed will be reduced to 15 km/h to avoid excessive dust emissions.
		• Ambient air quality analysis will be carried out at the grid station sites and also at the sensitive receptors (such as schools and hospitals) within the AoI once every two months during the construction phase. Additional mitigation measures will be identified and implemented in case ambient air quality at these		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		sensitive receptors is beyond the prescribed limits defined by NEQS, PEQS and other applicable standards.		
Surface Water and Groundwater Contamination	Release of contaminated water/effluents from construction sites and camps	• The groundwater quality analysis at each of the grid station sites (and campsites if established outside the grid station sites) will be conducted before mobilization of the construction crew, in order to establish baseline conditions of the water quality at these locations. • Construction debris or any other solid wastes or untreated waste effluents will not be disposed-off in water bodies. • No stockpiling of materials will be carried out at bank of water bodies. • Construction camp will not be located within 500 m of rivers and major canals (unless it is placed inside the grid station). Location will be finalized after obtaining PIMSC approval. • The contractor(s) will submit to the PIMSC the plans for the camp layout and waste disposal system, and obtain approval. • Groundwater quality analysis will be carried out at the grid station sites and campsites once a month during the construction phase.	Contractor	PIMSC, PMU
Blocked Access	Construction activities particularly transmission line works, off-road movement of vehicles	• Efforts will be made to avoid any impacts on the local roads, routs, and accesses. • In case of the blockage of the existing routes, alternate routes will be identified in consultation with the affected communities. • The contractor will prepare and implement a traffic management plan to minimize impacts on the local routes. • Community liaison will be maintained throughout the construction phase • PIMSC will identify additional mitigation measures for the sensitive receptors as needed.	Contractor	PIMSC, PMU
Noise and Vibration	Operation of construction machinery and vehicles	• It will be ensured that the noise levels measured at the communities near the project sites are kept within the acceptable limits (70 dB(A) for industrial zones day and night; 45 dB(A) night and 55 dB(A) daytime for residential areas).	Contractor	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Noise levels will be measured at the key locations such as at the Staff Colony in grid stations and sensitive receptors. If the noise levels are found to be more than the prescribed limits, appropriate measures will be undertaken by the construction team such as rescheduling the works, using quieter equipment and/or erecting barriers to protect the communities from excessive noise. • Vehicular traffic through the communities will be avoided as far as possible. Project routes will be authorized by the PIMSC. • Vehicle speeds will be kept low, and horns will not be used while passing through or near the communities. • Vehicles will have exhaust silencers to minimize noise generation. • Nighttime traffic will be avoided near the communities, as far as possible. • Movement of all project vehicles and personnel will be restricted to within work areas, to avoid noise disturbance. • Working hours for construction activities within the communities will be limited to between 8 am and 6 pm (between 6 am and 8 pm during the summers). • Liaison with the community will be maintained. Grievance redressal mechanism will be put in place to address the community complaints. • PIMSC will identify additional mitigation measures for the sensitive receptors as needed.		
OHS Hazards	Risks associated with construction works, construction machinery, working at heights and	• The contractor will prepare and implement occupational and community health and safety (OCHS) management plan, in accordance with the WB ESF, World Bank Group's Environment, Health and Safety Guidelines as well as World Health Organization (WHO) Guidelines, ILO Code of Practice and any other internationally recognized OHS standard such as ISO 45001 or US OSHA 29 CFR 1926 or any standard specifically mentioned in the bidding documents. The Plans will include	Contractor	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
	confined spaces, electrocution risk, works over/near water.	applicable safety standards and protocols, requirements of job hazard analysis, training requirements, documentation and reporting mechanism. • The Contractor will submit to the PIMSC for approval an emergency evacuation/response plan. • All OHS protocols will be implemented in true letter and spirit. • The construction sites will have protective fencing to avoid any unauthorized entry. • The project drivers will be trained for defensive driving skills. • Vehicular speeds near/within communities will be kept low to minimize safety hazards. • Construction camp sites will be located at least 500 m away from the nearest community. Camp site will be selected with PIMSC approval • Firefighting equipment will be made available at the camps. • Fire extinguishers will be provided throughout camps and work sites. Fire extinguishers will be inspected monthly and maintained as necessary. • The construction and camp staff will be provided OCHS training. • Work in confined space will be executed with available safety standards. Adequate monitoring and equipment shall be available to detect deficient oxygen levels. • All safety precautions will be taken to transport, handle and store hazardous substances, such as fuel. • An adequate and reliable supply of safe drinking water will be made available at readily accessible and suitable places including at all camps. • The Contractor will take samples from each supply of drinking water and arrange for analysis of these samples at EPA certified laboratory prior to its use by the Contractor's staff. The results of these tests for each supply must be submitted to the PIMSC and		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		must demonstrate that each water supply meets national and World Health Organization (WHO) standards for drinking water. • The Contractor will provide and maintain adequate hygienic kitchens which are sheltered and separated from the living quarters. Kitchens will include raised and washable surfaces suitable for food preparation. • The Contractor will provide and maintain adequate hygienic dining areas for staff. Work places and camps will be provided with both natural and artificial light. Artificial lighting will be powered by generator in the event of power cuts. • Public sensitization training will be provided to workers to avoid social conflicts between residents and the construction contractor, occurrence of any such impacts can be avoided by community sensitive planning and implementation and through effective involvement of local administration. • Contractor will appoint adequate OHS resources to implement, monitor and report the OCHS management plan to concerned authorities and PIMSC. • Contractor must ensure the provision of first aid facility at construction sites and camps through hiring medics and establishing a dispensary at the campsite. • Reasonable number of first aid kits will be available on construction sites and within contractor camps. • Site personnel will be provided appropriate type of personal protective equipment (PPE). Contractor will ensure consistent use of PPE. ***Rotating and Moving Equipment*** • Injury or death can occur from being trapped, entangled, or struck by machinery parts due to unexpected starting of equipment or unobvious movement during operations. Mitigation measures related to rotating and moving equipment on workers are provided below.		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions. • Where a machine or equipment has an exposed moving part or exposed pinch point that may endanger the safety of any worker, the machine or equipment will be equipped with, and protected by, a guard or other device that prevents access to the moving part or pinch point. Guards will be designed and installed in conformance with appropriate machine safety standards. • Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out) machinery with exposed or guarded moving parts, or in which energy can be stored (e.g. compressed air, electrical components) during servicing or maintenance. • Designing and installing equipment, where feasible, to enable routine service, such as lubrication, without removal of the guarding devices or mechanisms. ***Vibration*** • Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, will be controlled through choice of equipment, installation of vibration dampening pads or devices, and limiting the duration of exposure. Exposure levels will be checked on the basis of daily exposure time and data provided by equipment manufacturers. • Other sources of vibration at construction site are rollers, compactors or any loose part of machinery exposure which may cause serious injury or workplace sickness. No equipment and machinery with loose or vibratory parts will be allowed to work. Such issues will be fixed through maintenance of the machinery on periodic basis. Use of rollers for land grading will be carried out during day times and with intermittent intervals to reduce the impacts of vibration on surrounding environment.		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring

		Electrical
		• Exposed or faulty electrical devices, such as circuit breakers, panels, cables, cords and hand tools, can pose a serious risk to workers. Overhead wires can be struck by metal devices, such as poles or ladders, and by vehicles with metal booms. Vehicles or grounded metal objects brought into close proximity with overhead wires can result in arcing between the wires and the object, without actual contact. Recommended actions include:
		  • Marking all energized electrical devices and lines with warning signs;
		  • Locking out (de-charging and leaving open with a controlled locking device) and tagging-out (warning sign placed on the lock) devices during service or maintenance;
		  • Checking all electrical cords, cables, and hand power tools for frayed or exposed cords and following manufacturer recommendations for maximum permitted operating voltage of the portable hand tools; ·
		  • Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter protected circuits;
		  • Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas; ·
		  • Conducting detailed identification and marking of all buried electrical wiring prior to any excavation work.
		Eye Hazards
		• Solid particles from a wide variety of construction activities, and/or a liquid chemical spray may strike a worker in the eye causing an eye injury or permanent blindness. Recommended measures include:
		  • Use of machine guards or splash shields and/or face and eye protection devices, such as safety glasses with side shields, goggles, and/or a full-face shield.		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Specific Standard Operating Procedures (SOPs) may be required for use of sanding and grinding tools and/or when working around liquid chemicals. Frequent checks of these types of equipment prior to use to ensure mechanical integrity is also good practice. Machine and equipment guarding will conform to standards published by organizations such as Canadian Standards Association (CSA), American National Standards Institute (ANSI) and International Organization for Standardization (ISO). ***Welding/Hot Work*** • Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Recommended measures include: · • Provision of proper eye protection such as welder goggles and/or a full-face eye shield for all personnel involved in, or assisting, welding operations. Additional methods may include the use of welding barrier screens around the specific work station (a solid piece of light metal, canvas, or plywood designed to block welding light from others). Devices to extract and remove noxious fumes at the source may also be required. · • Special hot work and fire prevention precautions and SOPs will be implemented if welding or hot cutting is undertaken outside established welding work stations, including Hot Work Permits, stand-by fire extinguishers, stand-by fire watch, and maintaining the fire watch for up to one hour after welding or hot cutting has terminated. Special procedures are required for hot work on tanks or vessels that have contained flammable materials. ***Vehicle Driving and Site Traffic*** • Poorly trained or inexperienced vehicle drivers have increased risk of accident with other vehicles, pedestrians, and equipment.		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		Subproject vehicles and delivery vehicles, as well as private vehicles on-site, also represent potential collision scenarios. Subproject vehicle driving and site traffic safety practices include: • Training and licensing vehicle operators in the safe operation of specialized vehicles such as forklifts, including safe loading/unloading, load limits. • Ensuring drivers undergo medical surveillance. • Ensuring moving equipment with restricted rear visibility is outfitted with audible back-up alarms. • Establishing rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction. • Restricting the circulation of delivery and private vehicles to defined routes and areas, giving preference to 'one-way' circulation, where appropriate. ***Ergonomics, Repetitive Motion, Manual Handling*** • Injuries due to ergonomic factors, such as repetitive motion, overexertion, and manual handling, take prolonged and repeated exposures to develop, and typically require periods of weeks to months for recovery. These OHS problems must be minimized or eliminated to maintain a productive workplace. Controls may include: • Facility and workstation design with 5th to 95th percentile operational and maintenance workers in mind. • Use of mechanical assists to eliminate or reduce exertions required to lift materials, hold tools and work objects, and requiring multi-person lifts if weights exceed thresholds. • Selecting and designing tools that reduce force requirements and holding times and improve postures. · • Providing user adjustable workstations.		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Incorporating rest and stretch breaks into work processes and conducting job rotation. • Implementing quality control and maintenance programs that reduce unnecessary forces and exertions. • Taking into consideration additional special conditions such as left-handed persons. ***Working at Heights*** • Fall prevention and protection measures must be implemented whenever a worker is exposed to the hazard of falling more than two meters; into operating machinery; into water or other liquid; into hazardous substances; or through an opening in a work surface. Fall prevention / protection measures may also be warranted on a case-specific basis when there are risks of falling from lesser heights. Fall prevention may include: • Installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area. • Proper use of ladders and scaffolds by trained employees. · • Use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal life-lines. · • Appropriate training in use, serviceability, and integrity of the necessary PPE. • Inclusion of rescue and/or recovery plans, and equipment to respond to workers after an arrested fall. ***Fire and Explosions*** • Fires and or explosions resulting from ignition of flammable materials or gases can lead to loss of property as well as possible injury or fatalities to project workers. Prevention and control strategies include:		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Fuel storage areas and generators will have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area will be equal to 120% of the total volume of fuel stored. • Storing flammables away from ignition sources and oxidizing materials. Further, flammables storage area must be: o Remote from entry and exit points into camps o Away from facility ventilation intakes or vents o Have natural or passive floor and ceiling level ventilation and explosion venting o Use spark-proof fixtures o Be equipped with fire extinguishing devices and self-closing doors, and constructed of materials made to withstand flame impingement for a moderate period of time · • Defining and labeling fire hazards areas to warn of special rules (e.g. prohibition in use of smoking materials, cellular phones, or other potential spark generating equipment). • Providing specific worker training in handling of flammable materials, and in fire prevention or suppression. ***Corrosive, oxidizing, and reactive chemicals*** • Corrosive, oxidizing, and reactive chemicals present similar hazards and require similar control measures as flammable materials. However, the added hazard of these chemicals is that inadvertent mixing or intermixing may cause serious adverse reactions. This can lead to the release of flammable or toxic materials and gases, and may lead directly to fires and explosions. These types of substances have the additional hazard of causing significant personal injury upon direct contact, regardless of any intermixing issues. The following controls will be observed in the work environment when handling such chemicals: ·		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Corrosive, oxidizing and reactive chemicals will be segregated from flammable materials and from other chemicals of incompatible class (acids vs. bases, oxidizers vs. reducers, water sensitive vs. water based, etc.), stored in ventilated areas and in containers with appropriate secondary containment to minimize intermixing during spills. · • Workers who are required to handle corrosive, oxidizing, or reactive chemicals must be provided with specialized training and provided with, and wear, appropriate PPE (gloves, apron, splash suits, face shield or goggles, etc.). • Where corrosive, oxidizing, or reactive chemicals are used, handled, or stored, qualified first-aid must be ensured at all times. Appropriately equipped first-aid stations will be easily accessible throughout the place of work, and eye-wash stations and/or emergency showers will be provided close to all workstations where the recommended first-aid response is immediate flushing with water. ***Biological Hazards*** • Biological agents represent potential for illness or injury due to single acute exposure or chronic repetitive exposure. Biological hazards can be prevented most effectively by implementing the following measures: · • The contractor will review and assess known and suspected presence of biological agents at the place of work and implement appropriate safety measures, monitoring, training, and training verification programs. • Project contractor must provide good working and sanitation conditions at camp and wok sites. Disease surveillance will be carried out to identify any exposure to parasites, such as hookworm, ascaris, and various mites, chiggers, ticks and dengue. • Measures to eliminate and control hazards from known and suspected biological agents at the place of work must be designed, implemented and maintained in close co-operation		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		with the local health authorities and according to recognized international standards.		
Public health and safety issues	Risks associated with construction works, construction machinery, electrocution risk, vehicular traffic hazards, improper waste disposal, exhaust emissions.	• OCHS Management Plan will be strictly implemented • The construction area will be barricaded to prevent unauthorized access • Warning signs will be placed where appropriate • The construction camps will have septic tanks and soaking pits of adequate size if appropriate/required. • The construction camps will have appropriate solid waste disposal mechanism • The construction camps and site offices will have first-aid kits. • The construction crew will be provided awareness for the transmissible diseases (such as HIV/AIDS, hepatitis B and C). • Guidelines for SEA/SH, gender-based violence (GBV) and violence against children (VAC) will be implemented • Liaison with the community will be maintained. In particular, the nearby communities will be informed before commencing the testing commissioning of the system. Protective fencing will be used where appropriate/possible. Awareness raising program will be implemented to educate the communities regarding the hazards associated with the transmission lines, feeders and other electrical systems/equipment. Warning signs will be used at the appropriate locations. • PIMSC will identify additional mitigation measures for the sensitive receptors as needed.	Contractor	PIMSC, PMU
Influx of Labor	Risks associated with influx of labor from other parts of the country,	• Code of conduct (CoC) for workers and employees will be enforced for the protection of local communities, gender-based violence, other social issues, flora and fauna and a ban on tree cutting and hunting. Any violation of the CoC would lead to strict punishment including termination of employment;	Contractor	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
	including SEA/SH risks	• Awareness among workers will be created on proper sanitation and hygiene practices, SEA/SH issues, privacy of women, and cultural appropriateness; • GRM will have a separate mechanism (GRC) to handle SEA/SH cases; • A GBV service provider will be identified in the subproject area; • Accountability and response framework will be prepared and implemented for SEA/SH cases; • Safe spaces will be established/arranged for women in all temporary and permanent facilities; • SEA/SH awareness will be considered during the recruitment of staff; • Good housekeeping practices will be maintained at project site(s); • Adequate personal hygiene facilities will be provided in good condition with adequate supply of clean water; • Arrangements will be made to treat the affected workers on time to control the movement of vectors diseases; • Workers and surrounding communities will be sensitized on awareness and prevention of HIV/AIDS and STI through training, awareness campaigns and workshops; • Free HIV/AIDS and STI screening and provided for site workers • Counselling sessions will be held to made the workers award of the risks of HIV/AIDs and STI; • Any employees, who continues misconduct or lack of care, carry out duties amateurishly or inattentively, fail to conform to provisions of the contract, or persist in any conduct which is harmful to safety, health, or the protection of the environment, will be terminated; • The use of drugs and alcohol will not be allowed at the work/construction site;		

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• Carrying weapons into the workplace premises will be prohibited; • Appropriate site security arrangements will be made at all construction sites and temporary facilities; appropriate fencing, security check points, gates and security guards will be provided at the construction sites to ensure the security of equipment, machinery and materials, as well as to secure the safety of site staff; • The contractor will create awareness of construction crew to sensitize them about security situation in the subproject area; • The Contractor will ensure that good relations are maintained with local communities and their leaders to help reduce the risk of vandalism and theft; • To avoid conflicts with local people on employment matters, it is recommended to the contractor to employ the locals in skilled, semi-skilled, and unskilled work. This will reduce pressure on resources such as residential and health facilities; • The contractor will proactively manage the potential impacts from labor influx and potential cultural conflicts between local communities and workers, which include following: • The Contractor's regular training program will cover topics related to respectful attitude while interacting with the local communities; • Inclusion of CoC obligations and the applicable legislation will be ensured in the contracts of all employees and workers with the provision of sanctions and penalties in case of violations; • World Bank Guidelines on Influx of labor[18] will be used for further guidance.		
Gender Issues including SEA/SH risks	Presence of migrant labor	• Awareness among workers will be created on proper sanitation and hygiene practices, SEA/SH issues, privacy of women, and cultural appropriateness;	Contractor	PIMSC, PMU

[18] http://pubdocs.worldbank.org/en/863471511809509053/ESS2-FactSheet-WB-ESF.pdf

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• GRM will have a separate mechanism (GRC) to handle SEA/SH cases; • A GBV service provider will be identified in the subproject area; • Accountability and response framework will be prepared and implemented for SEA/SH cases; • Safe spaces will be established/arranged for women in all temporary and permanent facilities; • SEA/SH awareness will be considered during the recruitment of staff; • The routes/places used by the women will be avoided as far as possible. If unavoidable, alternate routes to be identified for the communities, if required, especially along routes frequented by women folk, such as route to the local well or water source. • Construction crew will avoid entering villages and settlements. • Communities 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. • WB guidelines on GBV and Influx of Labor will be implemented.		
Child labor	Employment of below age workers	• the provisions of the Child Labor Act will still be made part of the construction contracts • It will be ensured that no child labor is employed at any of the work site or camp site. • The LMP prepared for EDEIP will be implemented.	Contractor	PIMSC, PMU
Damage to Public Infrastructure	Subproject vehicles using local roads; TL works crossing canals and water courses	• Operation of construction machinery and subproject vehicles will be avoided close to the canals and water courses. • Any damage caused by the subproject activities will be completely repaired. • Damage to the existing infrastructure will be minimized if not avoided altogether through astute planning.	Contractor	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• All damaged infrastructure will be restored to original or better condition.		
Damage to crops	TL works in cultivated fields	• Damage to the crops will be avoided during the transmission line works. • Any damage caused by the construction activities or subproject vehicle/machinery movement will be compensated. • Liaison with the nearby communities will be maintained in this regard. • The grievance redressal mechanism will be maintained on continuous basis.	Contractor	PIMSC, PMU

Impacts on Sites of Historical, Cultural, Archeological or Religious Significance	Construction activities	• In case of discovery of any sites or artifacts of historical, cultural, archeological or religious significance, the work will be stopped at that site.
		• The provincial and federal archeological departments will be notified immediately, and their advice will be sought before resumption of the construction activities at such sites.
		• The existing graveyards will not be damaged. The construction work close to the graveyards will be carried out after informing/consulting the relevant communities.
		• Chance-find procedures which will be used during this Project are as follows:
		  • Stop the construction activities in the area of the chance find;
		  • Delineate the discovered site or area;
		  • Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a nightguard will be present until the responsible local authorities and relevant Department of Archaeology take over;
		  • Notify the supervisory Engineer who in turn will notify the responsible local authorities and relevant Department of Archaeology immediately (within 24 hours or less);
		  • Responsible local authorities and relevant Department of Archaeology would be in charge of protecting and preserving
			Contractor; PIMSC; PMU	PIMSC, PMU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archaeologists (within 72 hours). The significance and importance of the findings will be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historical, scientific or research, social and economic values; • Decisions on how to handle the finding will be taken by the local authorities and the relevant Department of Archaeology. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration, and salvage; • Implementation for the authority decision concerning the management of the finding will be communicated in writing by the relevant Department of Archaeology; and • Construction work could resume only after permission is given from the local authorities and relevant Department of Archaeology concerning the safeguard of the heritage.		
O&M Phase Impacts				
Soil and water Contamination	Maintenance activities, disposal of transformer oils and other wastes	• The grid stations will have appropriate solid waste collection and disposal arrangements. • The grid stations will have appropriate sewage handling system. The grid stations' sewage collection system will be connected to the Municipality operated sewerage system, if available. Otherwise, grid stations will have their own septic tanks and soakage pits. • Waste oils and chemicals will be disposed in accordance with their respective Material Safety Data Sheet (MSDS). MSDS will be made available at the grid stations and maintenance workshops. • Non-toxic recyclable waste (such as cardboard) will be given away for recycling. • Toxic waste will be stored separately, , and provided to the Municipality for safe and appropriate disposal.	Grid Station Operation (GSO)	ESU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
		• 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. • Any soil contaminated by the oil/chemical spillage will be removed and disposed-off appropriately in accordance with the MSDS of the spilled oil/chemical.		
OHS hazards	O&M activities on live equipment, working at heights	• MEPCO will implement the Safety Code prepared by NEPRA and its own OHS Management System. • O&M staff will be provided essential protective gears and equipment. • O&M staff will be provided regular safety training. Refresher courses will be arranged on regular basis. • Firefighting equipment will be made available at the grid stations. • The Emergency Response Plan (ERP), prepared by MEPCO, will be made available at each grid station. Its salient points will be displayed at prominent places within each grid station. The O&M staff will be given training on the ERP. The E&S team will review the ERP and with respect to the environmental and social considerations, and recommend changes if needed. The ERP will include procedure to inform the nearby communities in case of fire in the grid stations. • The communities near the grid stations and transmission lines will be educated on the risk of electrocution, and how to avoid accidents. • Appropriate signage on safety precautions will be installed at the key locations. • The trees under the transmission lines will be regularly trimmed in order to maintain 8 m clearance.	GSO	ESU
Public Health Concerns	Electrocution risk; EMF radiation; health concerns for	• Separation of live parts and pubic property/other structures/trees will be maintained • Community liaison will be maintained to raise the public awareness about electrocution risks	GSO	ESU

Impacts	Likely Causes for Proposed Project	Mitigation Measures	Responsibility	
			Implementation	Supervision / Monitoring
	nearby population	• Solid waste and waste effluents from the grid stations will be treated/ managed appropriately.		
Loss of crops and damage to cultivation fields	Maintenance of transmission lines	• Damage to the crops will be avoided during the transmission line patrolling. • Any damage during repair the repair and maintenance activities will be compensated. • Liaison with the nearby communities will be maintained in this regard. • The grievance redressal mechanism will be maintained on continuous basis.	GSO	ESU
Gender Mainstreaming	Gender mainstreaming needs to be carried out in MEPCO	• Gender mainstreaming will be encouraged in MEPCO. Employment opportunities will be created for women. Women friendly work environment will be established within MEPCO facilities (e.g., separate toilets, system to address sexual harassment).	Human Resource (HR) Department	ESU

6.4 E&S Monitoring

6.4.1 Compliance Monitoring

Environmental and Social staff of the Contractor are responsible for implementing the ESMP, while the environmental and social specialists of the PIMSC and PMU will be responsible for the overall monitoring of the EMSP implementation throughout the subproject implementation.

Compliance monitoring comprises of on-site inspection of the construction activities to verify that measures identified in this ESMP and that are included in the clauses for contractors are being implemented. The E&S Checklists prepared on the basis of MMP given in **Table 6.2** will be used for this purpose.

6.4.2 Effects Monitoring

A tentative monitoring plan to be implemented during the construction stage of the subproject to ensure effectiveness of the mitigation measures is given in **Table 6.3,** along with the monitoring indicators and frequency. The PIMSC will finalize/revise it before the commencement of construction works.

Table 6.3: Effects Monitoring Plan During Construction

Parameter	Means of Monitoring	Location	Frequency	Responsibility	
				Implementation	Supervision
Erosion	Visual inspection of erosion prevention measures and the occurrence of erosion	All sites	Monthly	Contractor	PIMSC, PMU
Wastewater discharges worksites, batching plants, and campsites	Spot measurement for pH Visual inspection to ensure clear water leaving the site	All sites	Weekly	Contractor	PIMSC, PMU
	Sampling and analysis of wastewater discharges for the parameters given in SEQS	All sites (including worksites, batching, camp discharges)	Quarterly	Contractor	PIMSC, PMU
Air Quality (dust)	Visual inspection	All sites	Daily	Contractor	PIMSC, PMU
Ambient Air Quality	Air quality monitoring for 24 hours for the parameters specified in SEQS	At all sites	Quarterly	Contractor	PIMSC, PMU
Noise and vibration	24-hour noise monitoring	At all sites, particularly	Monthly	Contractor	PIMSC, PMU

Parameter	Means of Monitoring	Location	Frequency	Responsibility	
				Implementation	Supervision
	(at/near construction sites, campsites, offices, colony, communities, quarry area, transportation routes)	near sensitive receptors			
Emissions from plant and equipment	Visual Inspection	All vehicles / equipment	Monthly	Contractor	PIMSC, PMU
Waste Management	Visual inspection on spoil disposal	At disposal sites	Monthly	Contractor	PIMSC, PMU
	Visual inspection for availability of dust bins at worksites and camp	At camp and work sites	Monthly	Contractor	PIMSC, PMU
	Visual inspection for collection and treatment of organic waste	At campsite	Monthly	Contractor	PIMSC, PMU
	Visual inspection for collection and treatment of recyclable and hazardous waste by the waste management contractor	At camp and work sites	Monthly	Contractor	PIMSC, PMU
Spills from hydrocarbon and chemical storage	Visual inspection to check whether fuels are stored in contained facilities Availability of spill kits at the site Visual Inspection for leaks and spills	At fuel storage sites	Monthly	Contractor	PIMSC, PMU
Traffic Safety	Visual inspection for placement of traffic signs and traffic control personnel	Near the construction sites	Monthly	Contractor	PIMSC, PMU,
Local Roads	Visual inspection to ensure local roads are not damaged	local roads	Monthly	Contractor	PIMSC, PMU,

Parameter	Means of Monitoring	Location	Frequency	Responsibility	
				Implementation	Supervision
Cultural/religious and Sites	Visual observation for cultural sites	Along the local roads	Monthly	Contractor	PIMSC, PMU,
Drinking water and sanitation	Water quality analysis for drinking water parameters specified in SEQS	At the work sites and campsite	Quarterly	Contractor	PIMSC, PMU,
Safety of workers	Usage of Personal Protective equipment; accident / incident record.	All worksites	On a regular basis	Contractor	PIMSC, PMU,
Labor engagement and GBV risks	Interaction with labors and review of GRM	All work sites	Monthly	Contractor	PIMSC, PMU
Reinstatement of Work Sites	Visual Inspection	All worksites	After completion of all works	Contractor	PIMSC, PMU,

6.5 Gender Action Plan Outline

An outline of the Gender Action Plan (GAP) for the subproject is given in **Table 6.4**; it will be finalized before the mobilization of the contractor**.**

Table 6.4: Gender Action Plan of the Project

#	Activities	Targets	Responsibility
1	Conduct public awareness campaigns on subproject benefits and potential impacts particularly on women and children	• Project brochure in Urdu/Punjabi to be disseminated in villages/communities of the subproject area of influence and within one month of the start of the subproject and orientation to women in face-to-face meetings.	PMU; PIMSC
2	Socially and gender-inclusive consultations	• Broad-based socially and gender-inclusive participatory consultation workshop(s) for relevant stakeholders on GAP objectives, one for male and one for female. • At least 25% of participants of stakeholder consultation activities should be women. • Representation of women in consultation, participation and decision-making forums to voice their opinions, needs and preferences at a location and time that increases the possibility of women's participation, 20% of participants are women's representatives.	PMU, Project Director (PD), Social and Gender Staff of PMU; PIMSC

#	Activities	Targets	Responsibility
3	Enhance the capacity of MEPCO and PMU to include a gender perspective into EDEIP subprojects	• Evidence that equal employment opportunity policy and practices are implemented, at least 10% of female staff in PMU with equal salaries by following GoP fixed minimum quota for women employment; • Evidence of the type of incentives designed to recruit women, increase their capacity, and provide career development; • Social and Gender Specialist and female staff deployed in PMU and PIMSC to assist in GAP implementation and monitoring; • PMU and MEPCO staff trained in job-related skills of which 10% are women; • Gender awareness and social inclusion training provided to 100% PMU and 50% management staff of MEPCO for clarity in gender mainstreaming and social inclusion concepts, orientation on GAP targets, roles, and responsibilities, better planning, communication, coordination, implementation, documentation, monitoring and evaluation;	PMU, Project Director, Social and Gender Staff of PMU; PIMSC
4	Include gender-disaggregated data in monitoring and evaluation and EDEIP progress reports.	• Developed a set of quantitative and qualitative sub-indicators of key indicators, and develop a system to consistently collect, retrieve and analyze the gender-disaggregated data of level of participation, immediate results of activities, benefits, and outcomes, of the EDEIP on women, men, boys, and girls (disaggregated by gender, income, marginalized and vulnerable groups)	PMU, Project Director, Social and Gender Staff of PMU (PIMSC for monitoring)

6.6 Capacity Building and Training

The proposed training plan is given in **Table 6.5**. At the construction sites, PIMSC will take the lead in implementing the capacity building plan, though the contractors will also be responsible for conducting training for their own staff and workers. The various aspects that are covered under the capacity building will include general environmental and social awareness, key environmental and social sensitivities of the area, key environmental and social impacts of the project, ESMP requirements, OHS aspects, and waste disposal.

Table 6.5: Environmental and Social Training Plan

Contents	Participants	Trainer	Schedule
Environmental and social impacts of the subproject and ESMP requirements of the Contractor; World Bank Group Environmental Health and Safety Guidelines. The contents for the second and subsequent training programs will	All the technical Staff of PMU, ESU, and relevant technical staff of MEPCO who are involved in the management of environmental and social issues associated with routine operation and maintenance of the airport. Site Engineers of the Engineer.	ESHS staff of the PIMSC; and an external training agency who has a thorough knowledge of the WB ESSs and guidelines	During the initial stages of the subproject implementation. The training will be repeated every six months.

Contents	Participants	Trainer	Schedule
cover topics related to the issues associated with on-going construction activities.			
Environmental and Social issues associated with the ongoing construction works; Workers' health and safety	Site Engineers of the Contractor, PMU, and the PIMSC; E&S staff of contractor	E&S staff of the PIMSC	On a monthly basis
Code of Conduct Occupational Health and Safety	Construction crew	Contractors ESHS Staff	Prior to the start of the construction activities and during the construction activities (To be repeated as needed.)

6.7 Grievance Redress Mechanism

6.7.1 Project GRM

MEPCO has established an EDEIP-specific grievance redress mechanism (GRM) to receive, evaluate, and facilitate the resolution of affected parties' concerns, complaints, and grievances about the environmental and social performance of the EDEIP. This GRM will be applicable to the proposed subproject as well.

A three-tier GRM has been designed to provide a time-bound, early, transparent and fair resolution of the grievances raised by affected persons (APs) and other stakeholder regarding E&S management of the EDEIP subprojects. All complaints received verbally or in writing will be properly documented and recorded in the Complaint Management Register(s). The GRM will be linked with the MEPCO's existing complaint handling system. The GRM for the EDEIP is outlined below and consists of three levels with time-bound schedules for addressing grievances.

First Tier of GRM. The PMU's project site office will be the first tier of GRM, which will offer the fastest and most accessible mechanism for resolution of grievances at the local level. A local level Grievance Redress Committee (GRC) will be formed for this purpose headed by the PD with the membership of ESU, contractors' representatives, consultants' representatives, representatives of other relevant departments, and two members from communities if applicable. At this tier, the designated E&S staff of PMU site office will make attempt to resolve the complaints within two to 10 working days, depending on the nature of grievance. The PD (or his/her representative) will convene the meetings of local GRC and conduct proceedings informally to reach an amicable settlement between the parties within 10 days of receiving a complaint (verbally or in writing) from an affected person or their representative. The report of the GRM meetings will be recorded in writing, and copies will be provided to the parties involved. Grievances will be documented with personal details (name, address, date of complaint, nature of the complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned to each complaint/grievance. Should the grievance remain unresolved or the AP not satisfied with the decision, the grievance can be lodged with the Program level grievance redress committee, led by the head of PMU.

Second Tier of GRM. The E&S staff in PMU will refer to the unresolved issues or grievances (with written documentation) to the second tier of GRM, the PMU-level Grievance Redress Committee (GRC). The PMU GRC will be established by MEPCO and will consist of the following persons: (i) a MEPCO's representative from senior management; (ii) the head of PMU will act as secretary of the GRC; (iii) Project Director of respective subproject; (iv) representative of Deputy Commissioned (DC) office (if applicable); (v) representative of PIMSC; (vi) Chief Resident Engineer of the Consultants (on-call); (vii) representative of relevant government offices (on-call); (viii) two to three representative of respective project-affected people (on-call). A hearing can be called with the GRC, if necessary, where the affected persons can present details of his/her/their concern/grievance. The GRC will meet as necessary when there are grievances to be addressed. The GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within 25 working days, depending on the nature of the grievance. If complainant is still unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the government's administrative or judicial remedies.

Third Tier of GRM: In the event that a grievance cannot be resolved directly by the second tier GRC or if complainant is dissatisfied with the decision of GRC, the affected people can seek alternative redress through the Chief Executive Officer or Board of Directors of MEPCO, district administration, the Secretary Energy and Power Department or higher-level administrative authorities, the Pakistan Citizen Portal or the court of law, as appropriate.

MEPCO will establish a separate GRC to handle SEA/SH cases. Appropriate handing of such cases will be carried out to ensure complete privacy of the complainants, details of the complaint/grievance, and the corrective actions proposed, and corrective actions taken.

Monitoring and reporting. The monitoring reports of ESMP implementation will include the following aspects pertaining to progress on grievances: (i) number of cases registered, level of jurisdiction (first, second, third tiers), number of hearings held, decisions made, status of pending cases; and (ii) lists of cases in process and already decided upon, may be prepared with details such as name with copy of National Identity Card, complaint number, date of application, date of hearing, decisions, remarks, actions taken to resolve issue(s), and status of grievance (i.e., open, pending, closed).

6.7.2 GRM for Construction Workers

The GRM described above addresses the grievances/complaints lodged by the project affected persons and other local stakeholders. But according to the lessons learned in various project contexts, there is also a need to establish a separate GRM to deal exclusively with those complaints that involve workers employed by the contractors for construction activities. Such grievances may involve wage rates and unpaid overtime works; irregular and partial payments; lack / inadequacy of living accommodations; lack of clean drinking water and sanitation facilities; lack of medical care in emergencies; and lack of protection against GBV by labor suppliers, supervisors.

The GRCs dealing with labor grievances / complaints will have members who are directly and indirectly associated with the construction works. The GRC will include a PMU official who is in charge at the worksite as the convener, resident engineer of the PIMSC, a workers' representative, and the contractor's representative. The convener will designate an official to receive the complaints and ensure the complainant does not lose his job and is not intimidated into withdrawing the complaint before the formal hearing.

To ensure impartiality and transparency, hearings on complaints will be held in a non-threatening environment and will remain open to all other workers on the site. The GRC will record the (i) details of the complaints; (ii) reasons that led to acceptance or rejection of the individual cases, as well as the number of accepted and rejected cases; and (iii) decisions agreed with the complainants. PMU will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by the World Bank and other interested entities/persons.

6.8 Reporting

MEPCO, PIMSC and contractors will prepare periodic reports on the status of ESMP implementation and these reports will be submitted to World Bank for their review and feedback. Details of these reports and their content are given in **Table 6.6**.

Table 6.6: ESMP Monitoring and Compliance Reports

#	Title of the Report	Contents of the Report	Frequency of Report Preparation	Report to be prepared by
1	ESHS Monitoring Report	The compliance status of the subproject with environmental and social mitigation and monitoring measures. Besides, the report also covers: • environmental incidents; • health and safety incidents, • health and safety supervision: • Usage of PPE by workers • worker accommodations • Training conducted and workers participated • Workers' grievances • Community grievances • Chance-find (if any)	Monthly	Contractor
2	ESMP Monitoring Report	The compliance status of overall subproject with ESMP requirements; non-compliances; Effects Monitoring Report; training provided; GRM data; summary of ESHS monthly reports; corrective actions determined; corrective actions taken; availability of E&S personnel at site.	Quarterly	PIMSC
3	Incident Reports	Incident investigation reports for all major incidents covering details of the incident, root cause analysis, and actions taken to address the future recurrence of this event	Initial investigation report within 24 hours Detailed Investigation Report within ten days	Contractor; PIMSC

6.9 ESMP Implementation Cost

The total indicative cost of the ESMP implementation is estimated to be about **PKR 15 million** (see **Table 6.7**). It can be revised during the subproject implementation as needed.

Table 6.7: Cost Estimates for ESMP Implementation for Six Grid Stations

Sr. No.	Description of Item	Unit	Item Total (PKR)
A	**Contractors Budget**		
1.	Contractors' preparation of C-ESMP including OHS Plans		Included in construction cost
2	Contractors ESHS Staff		Included in construction cost
3.	Waste Management (procurement and operation of composters, bailers, and waste management contractors)		Included in construction cost
4	Dust Management (procurement and operation of sprinklers)		Included in construction cost
5	Site/OHS facilities for workers (PPE)		Included in construction cost
6	Training of Workers on Code of Conduct (including GBV/SEA/SH/HIV/AIDS)		Included in construction cost
7	Health facilities at the camp including a fully equipped ambulance, doctor and nurses		Included in construction cost
8	Wastewater treatment facilities (incl. mobile toilets at worksites)		Included in construction cost
9	Compensation for crop damage		Included in construction cost
10	Spot monitoring for dust and hazardous gases in tunnels		Included in construction cost
11	Environmental Monitoring during construction by a third party (drinking and wastewater quality, air quality, and noise) (PKR 1 m per grid station)	LS	6,000,000
B.	**Consultants' Budget**		
1	ESHS Staff for the PIMSC	LS	Included in EDEIP management cost
C.	**MEPCO's Budget**		
2	Capacity building of subproject E&S staff (PKR 1 m per grid station)	LS	6,000,000
	Subtotal (A+B+C)		**12,000,000**
D.	**Contingency**		
	Contingency (25% of A+B+C)		3,000,000
	Total (PKR)		**15,000,000**

7 Stakeholder Consultations

This Chapter describes the process and outcomes of the consultations carried out with various groups of stakeholders during preparation of the present ESIA. Also provided is a framework for the consultations to be carried out during project implementation. Finally, information disclosure requirements for the ESIA are described at the end of the Chapter.

7.1 Stakeholder Engagement Plan

As described in **Section 1.6**, an SEP has been prepared to describe objectives, process and outcome of the stakeholder engagement already carried out during the EDEIP preparation and to be carried out during the EDEIP implementation – in accordance with the WB ESS 10. The key aspects of the SEP are summarized below.

The overall objective of the SEP is to define a program for stakeholder engagement, including public information disclosure and consultation, throughout the entire project cycle. The SEP outlines the ways in which the project team will communicate with stakeholders and includes a mechanism by which people can raise concerns, provide feedback, or make complaints about the project and any activities related to the project. The involvement of the local population is essential to the success of the project in order to ensure smooth collaboration between project staff and local communities and to minimize and mitigate environmental and social risks related to the proposed activities.

The stakeholder engagement and consultation activities for the proposed subproject have been carried out in accordance with the guidelines provided in the SEP. These activities are described in the following sections.

7.2 Objectives of Consultations

Both national and provincial environmental regulations and the World Bank's ESS10, mandate that meaningful consultations are conducted with stakeholders as a core element of the ESIA process. The consultations carried out during the preparation of this ESIA have been designed to meet these legal and policy requirements, while also fulfilling the engagement commitments outlined in the SEP. These consultations were aligned with the subproject's inclusive, gender-responsive, and transparency-driven approach. The consultations aimed to achieve the following specific objectives:

- Inform affected communities and stakeholders about the proposed subproject, its components, and potential E&S impacts in an accessible and culturally appropriate manner.
- Solicit views, concerns, and feedback from local communities, including women, vulnerable groups, and informal land users, regarding potential risks associated with the subproject.
- Obtain and incorporate local knowledge and priorities into the ESIA and ESMP, ensuring context-specific and community-informed mitigation strategies.
- Promote participation, transparency, and accountability by providing a platform for two-way communication between MEPCO and stakeholders.
- Support the design and implementation of the EDEIP's GRM, ensuring that it is accessible, responsive, and inclusive.

7.3 Stakeholder Identification and Analysis

The SEP prepared for the EDEIP defines three groups of stakeholders: i) affected parties, ii) interested parties; and iii) vulnerable groups. The affected parties for the proposed subproject include individuals, groups or other entities within the subproject's AoI, who are impacted or likely to be impacted directly or indirectly, positively or adversely, by the proposed subproject activities. The interested parties are the individuals / groups who may have an interest in the subproject. They include individuals or groups whose interests may be affected by the subproject and who have the potential to influence the subproject's outcomes in any way. Vulnerable groups include people who may be disproportionately impacted by the subproject or further disadvantaged as compared with any other groups due to their vulnerable status and that may require special engagement efforts to ensure their equal representation in the consultation and decision-making process associated with the subproject. This group may include elderly citizens, disabled citizens, women, ethnic and religious minorities, and poor.

Table 7.1 identifies various categories of stakeholders for the proposed subproject. Consultations have been carried out with these categories of the stakeholders of the proposed subproject.

Table 7.1: Stakeholder Categories for Proposed Subproject

Affected Parties	Interested Parties	Vulnerable Groups
Persons that are affected by acquiring the grid station sites; nearby communities within the AoIs	• EPA Punjab • Irrigation Department • Revenue Department • Agriculture Department • Thal Development Authority, Layyah • Social & Labor Welfare Department • National Highway Authority • Academia • National Grid Company of Pakistan, • Non-Government Organizations (NGO) and Civil society organizations (CSOs)	Children, women, elderly and poor households residing within the AoIs of the GSs

7.4 Consultation Process

Consultations were carried out with all three categories of stakeholders listed in **Table 7.1**. The consultations with the local communities (affected parties including vulnerable groups) were carried out through village meetings and focus group discussions (FGDs). Separate meetings were carried out with the women of the area (vulnerable groups. Consultations with the departments and other organizations (interested parties) were conducted through separate one-to-one meetings.

7.4.1 Community Consultations

Extensive community consultations were carried out in all six subproject locations during July-September 2024 and then during January 2025, to ensure inclusive participation of communities in the ESIA process. A total of 44 consultation sessions were held in which 353 community members participated. See details in **Table 7.2**. The participants included local

residents, landowners, farmers, shopkeepers, women representatives, laborers, and vulnerable groups residing in the AoI.

Table 7.2: Summary of Community Consultations

Sr. No	Date	Location	Number of Participants	Respondents
1.	30-07-2024	GS Site Khanewal	15	Local Community in AoI
2.	30-07-2024	GS Site Khanewal	14	Women of the squatters at GS
3.	30-07-2024	GS Site Khanewal (Batian wala)	14	Local Women in AoI
4.	30-07-2024	GS Site Khanewal (Khokhar Chowk)	8	Local Community in AoI
5.	30-07-2024	GS Site Khanewal (Dera Haji M. Nawaz)	11	women of the local community
6.	30-07-2024	GS Site Khanewal (Masjid Bagh e Madina)	13	Local Women
7.	01-08-2024	GS Site Layyah	08	Local Community in AoI
8.	01-08-2024	GS Site Layyah	08	Local Women in AoI
9.	01-08-2024	Layyah (Chak 139/A)	05	Local Community in AoI
10.	01-08-2024	Layyah (Dera Aziz Mirani)	07	Local Women in AoI
11.	02-08-2024	GS Site DG Khan	10	Local Community in AoI
12.	02-08-2024	GS Site DG Khan	08	Local Women in AoI
13.	05-01-2025	GS Site Shah Jamal	10	Local Community in AoI
14.	05-01-2025	GS Site Shah Jamal	6	Local Women in AoI
15.	06-01-2025	GS Site Arifwala	08	Local Community in AoI
16.	06-01-2025	GS Site Arifwala	08	Local Women in AoI
17.	09-01-2025	GS Site Rahim Yar Khan	09	Local Community in AoI
18.	09-01-2025	GS Site Rahimyarkhan	05	Local Women in AoI
19.	29-07-2024	TL Shah Jamal	08	Local Community in GS AoI
20.	29-07-2024	TL Shah Jamal	06	Local Community in TL AoI
21.	02-08-2024	TL Shah Jamal	04	Local Community in TL AoI
22.	02-01-2025	TL Shah Jamal (Kuhana Qureshi)	07	Local Community in TL AoI
23.	02-01-2025	TL Shah Jamal (Khajjar Wala)	05	Local Community in TL AoI
24.	03-01-2025	TL Shah Jamal (Basti Jalhari)	07	Local Community in TL AoI
25.	03-01-2025	TL Shah Jamal (Basti Jalhari)	10	Local Women in TL AoI

Sr. No	Date	Location	Number of Participants	Respondents
26.	05-01-2025	TL Shah Jamal (Basti Malookay Wala)	05	Local Community in TL AoI
27.	05-01-2025	TL Shah Jamal (Khajji Wala)	06	Local Community in TL AoI
28.	05-01-2025	TL Shah Jamal (Basti Baksh Wala)	09	Local Community in TL AoI
29.	05-01-2025	TL Shah Jamal (Mouza Ali Daah)	07	Local Community in TL AoI
30.	05-01-2025	TL Shah Jamal (Bahadur Mara)	11	Local Community in TL AoI
31.	05-01-2025	TL Shah Jamal (Pir Wala)	07	Local Community in TL AoI
32.	18-09-2024	TL Rahim Yar Khan	07	Local Community in TL AoI
33.	29-09-2024	TL Rahim Yar Khan	07	Local Community in TL AoI
34.	18-09-2024	TL Rahim Yar Khan (Dera Shams)	09	Local Community in TL AoI
35.	29-09-2024	TL Rahim Yar Khan (Shah Khan Korai)	07	Local Community in TL AoI
36.	29-09-2024	TL Rahim Yar Khan (Dera Ch Bashir Ahmad)	11	Local Community in TL AoI
37.	07-01-2024	TL Khanewal	05	Local Community in TL AoI
38.	08-01-2024	TL Layyah	06	Local Community in TL AoI
39.	07-01-2025	TL Arifwala	04	Local Community in TL AoI
40.	06-01-2025	TL Arifwala (Dera Rai Ashraf)	05	Local Community in TL AoI
41.	06-01-2025	TL Arifwala (Jamia Madina Masjid)	12	Local Community in TL AoI
42.	08-01-2024	TL DG Khan	05	Local Community in TL AoI
43.	08-01-2024	TL DG-Khan (Basti Channan)	09	Local Community in TL AoI
44.	08-01-2024	TL DG-Khan (Mouza Mir Haji)	07	Local Community in TL AoI
		Total Participants	**353**	

Community members generally expressed support for the subproject, recognizing the need for reliable electricity supply, improved voltage stability, and reduced load-shedding, which would benefit households, agriculture, education, and small businesses. Key concerns raised by the communities included potential land acquisition and compensation issues, employment opportunities for local people during construction, safety of nearby residents, possible disturbance from construction activities such as noise, dust, and traffic congestion, and protection of agricultural land and water resources. Special attention was given to the perspectives of women, who highlighted the importance of uninterrupted electricity for

domestic chores, education of children, and healthcare facilities. Overall, the consultations reflected a positive community attitude towards the subproject, provided that their concerns are adequately addressed through proper implementation of ESMP. Details of community consultations are described in **Table 7.3**, whereas **Table 7.4** provides details of women consultations. Further consultation details and some photographs are provided in **Annex D**.

Table 7.3: Summary of Community Consultations

Sr. No.	Concerns/Expectations	Response	Action to be Taken	Responsibility
Khanewal II Grid Station Site				
1	Community members expressed concern that tower installations in cultivated fields would damage standing crops and reduce yields.	Compensation for crop and land value loss will be included in the ARAP.	ARAPs will be implemented for appropriate compensation.	PMU, MEPCO
2	There is a fear that tower installations in the middle of fields will decrease the resale and investment value of land.	Compensation for land value loss will be included in the ARAP.	ARAPs will be implemented for appropriate compensation.	PMU, MEPCO
3	Employment opportunities should be provided to the local communities	Priority will be given to local workers.	Contractors will follow the local hiring policies.	PMU, MEPCO, Contractor
4	The risk of electrocution or tower collapse in bad weather.	All safety measures will be taken to address the safety risks. Public awareness sessions on safety will be conducted.	Design of subproject will ensure that all safety codes are implemented. Community awareness training will be conducted.	PMU, MEPCO, Contractor
5	Residents cited prior experiences of other projects, where contractors did not coordinate or consider community needs.	Appropriate mitigation measures are included in the ESIA/ESMP. A GRM will be established to record and resolve complaints.	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, Contractor
Layyah II Grid Station Site				
1	Employment opportunities should be provided to the local communities	Priority will be given to local workers.	Contractors will follow the local hiring policies.	PMU, MEPCO, Social Expert, Contractor
2	Towers and trenches may pose safety hazards.	All work areas will be barricaded and signposted.	COHS will be implemented.	PMU, MEPCO, Environment Expert, Contractor

Sr. No.	Concerns/Expectations	Response	Action to be Taken	Responsibility
3	Machinery operation may increase noise and air pollution.	Appropriate mitigation measures are included in the ESIA/ESMP. A GRM will be established to record and resolve complaints.	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, Environment & Social Experts, Contractor
4	Women are not asked about impacts on their mobility or routines.	Female social mobilizers will engage women in consultations.	Separate meetings will be conducted with women during subproject implementation	PMU, MEPCO, Social Expert, Contractor
5	Routes used by villagers and animals may be blocked.	Appropriate mitigations are included in ESIA and ESMP	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, Environment & Social Experts, Contractor
DG Khan III Grid Station Site				
1	Locals are unclear about whether their land is being acquired or not.	ARAP has been finalized in consultation with stakeholders.	ARAP disclosure and implementation will be ensured.	PMU, MEPCO, Social/Environment Experts
2	Households fear that compensation payments may be delayed indefinitely.	Compensation payments will be paid before the start of construction works	ARAP will be fully implemented.	PMU, MEPCO, Social Expert
3	Affected parties, especially women, are not consulted during project planning.	Women consultations have been carried out during ESIA preparation	Similar consultations will be carried out during subproject implementation.	PMU, MEPCO, Social Expert
4	Concerns over forced relocation without prior notice or alternatives.	Prior notice will be given in case of physical relocation	ARAPs will be implemented	PMU, MEPCO, Social Expert
5	Dust, noise, and tree cutting near homes are a concern.	Appropriate mitigations are included in ESIA and ESMP	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, Social/Environment Experts

Sr. No.	Concerns/Expectations	Response	Action to be Taken	Responsibility
Rahim Yar Khan III Grid Station Site				
1	Machinery and materials may block access routes.	Appropriate mitigations are included in ESIA and ESMP	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, Contractor
2	The timing of construction may coincide with harvest periods.	Efforts will be made to schedule the works in a manner to avoid damage to standing crops. Compensation will be paid for any crop damage.	ARAP will be implemented.	PMU, MEPCO, Contractor
3	High-voltage lines near residential areas are a major worry.	All safety measures will be taken to address the safety risks. Public awareness sessions on safety will be conducted.	Design of subproject will ensure that all safety codes are implemented. Community awareness training will be conducted.	PMU, MEPCO, Contractor
4	Absence of information about construction schedule: Residents feel uninformed.	Construction schedule will be shared well in advance.	Consultations will be continued with the communities in accordance with this ESIA	PMU, MEPCO, Contractor
5	Community members do not know where to file concerns.	GRM will be activated and communicated to locals.	GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, Contractor
Jamal Shah Grid Station Site				
1	Construction activities may block access to schools, religious institutions, and clinics.	Appropriate mitigations are included in ESIA and ESMP	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, PIMSC, PIMSC, Contractor
2	Noise and dust pollution: Heavy equipment and civil works are expected to cause environmental nuisance.	Appropriate mitigations are included in ESIA and ESMP	ESMP will be implemented. GRM will be established and kept	PMU, MEPCO, PIMSC, PIMSC, Contractor

Sr. No.	Concerns/Expectations	Response	Action to be Taken	Responsibility
			operationalized throughout the subproject implementation.	
3	Community members are concerned about children playing near energized structures.	All safety measures will be taken to address the safety risks. Public awareness sessions on safety will be conducted.	Design of subproject will ensure that all safety codes are implemented. Community awareness training will be conducted.	PMU, MEPCO, PIMSC, PIMSC, Contractor
4	Local customs and gender sensitivities may be violated by outside laborers.	Workers' CoC included in ESMP will be strictly enforced.	ESMP implementation will be ensured	PMU, MEPCO, PIMSC, PIMSC, Contractor
5	No clear timelines have been shared. Community meetings have not been held to inform about construction phases.	Consultation process has been implemented to address these concerns	Consultations will be continued with the communities in accordance with this ESIA	PMU, MEPCO, PIMSC, PIMSC, Contractor
Arifwala II Grid Station Site				
1	Demand for vocational and income generation support: Especially by women and youth.	Vocational training programs will be considered under ARAP.	Budget for training included in ARAP.	PMU, MEPCO, PIMSC, Social/Environment Experts
2	Potential for tension due to unfamiliarity with local customs.	Workers' CoC included in ESMP will be strictly enforced.	ESMP implementation will be ensured	PMU, MEPCO, PIMSC, Social/Environment Experts
3	Informal users are unsure if they are entitled to any compensation.	Compensations will be provided in accordance with ARAP and WB standards	ARAP will be fully implemented.	PMU, MEPCO, PIMSC, Social/Environment Experts
4	Dust, vehicle fumes, and stagnant water.	Appropriate mitigations are included in ESIA and ESMP	ESMP will be implemented. GRM will be established and kept operationalized throughout the subproject implementation.	PMU, MEPCO, PIMSC, Social/Environment Experts
5	Lack of regular updates or communication from MEPCO.	Consultation requirements are included in ESIA	ESIA implementation will be ensured.	PMU, MEPCO, PIMSC, Social/Environment Experts

Table 7.4 Summary of Consultations with Women

Location	Participants	Concerns Raised by Women	Actions Proposed / Taken	Responsibility
Khanewal	Local women, Informal settlers, CBOs	We fear being evicted from our homes without being asked or informed.	No eviction will occur without prior consultation. ARAP ensures that both titleholders and informal settlers are consulted, recorded, and compensated as per World Bank policy.	MEPCO, PMU, Contractor, PIMSC
		Our children walk to nearby schools; will heavy vehicles and machinery put them at risk?	Traffic safety measures (signage, flagmen, speed controls) will be implemented. Children's access routes will be safeguarded, and construction near schools will be scheduled outside peak school hours.	
		If workers are deployed, will there be poor sanitation causing health problems in our community?	Contractors will provide adequate sanitation (separate toilets for workers (men and women) and waste management at the site. Regular checks will ensure no contamination of local areas.	
		As informal settlers, we are worried we will not be included in compensation or support.	Informal settlers are eligible for livelihood restoration and relocation assistance under ARAP. Affected households will be documented and consulted during planning.	
		"We did not receive information about this project before. Why were we not told earlier?"	The SEP is in place. Community meetings, brochures, and awareness sessions will be held before construction to ensure women and vulnerable groups are informed.	
		We are concerned about our privacy with large numbers of male laborers working near our homes.	Contractors will ensure labor camps are located away from residential areas. CoC and worker sensitization trainings will be enforced to respect community privacy and cultural values.	
		Will construction activities disturb the shrine or disrespect our religious practices?	The subproject will avoid any disturbance to the shrine. Access will remain open, and construction activities will be planned to avoid noise/dust during prayer or religious gatherings.	

Location	Participants	Concerns Raised by Women	Actions Proposed / Taken	Responsibility
Shah Jamal	Local women, youth groups	With heavy vehicles and construction works around the grid station site, how will we safely access markets, schools, and health centers during construction?	The contractor will be required to prepare a traffic management plan. Heavy vehicle movement will be restricted during school and peak commuting hours, safe pedestrian crossings will be marked, and warning signs will be installed. This will help ensure safe movement for women, children, and other community members.	Contractor, PIMSC, MEPCO, PMU
		With the arrival of outside male workers, we fear problems of harassment, loss of privacy, and further restrictions on our mobility. How will you address this?	Labor camps will be established away from community settlements, and workers will follow a strict CoC prohibiting harassment or inappropriate interaction with local women. The project will appoint a community liaison officer, including a female focal point, so women can safely report any issues.	
		Transmission line installation may continue for months and cover a large area. We are worried about accidents involving children and women, especially near open trenches and machinery.	ESMP includes measures to address these concerns.	
		Construction will generate a lot of dust. This can cause breathing problems for children and elderly and also disturb our household activities.	ESMP includes measures to address these concerns.	
Rahim Yar Khan	Female teachers, women elders	We are worried dust from excavation and vehicle movement. This can affect children, elderly, and our household activities	ESMP includes measures to address these concerns.	Contractor, MEPCO, PIMSC
		During construction, especially with heavy machinery and vehicles, we are worried about high noise levels disturbing	ESMP includes measures to address these concerns.	

Location	Participants	Concerns Raised by Women	Actions Proposed / Taken	Responsibility
		our children, elderly, and daily household activities. How will you manage this		
		With the arrival of outside male workers, we feel insecure about privacy and women's safety. How will you ensure a safe environment for us	All workers will be strictly briefed on respectful behavior, cultural sensitivity, and a CoC prohibiting harassment. Labor camps will be located away from community houses, and perimeter fencing with warning signage will be installed around active sites. A GRM, including a female focal person, will also be available so women can report issues safely.	
		Construction traffic and road blockages may make it harder for us to reach health centers and schools for our children. How will you ensure our access is not affected?	The project will ensure that construction traffic is managed carefully. Diversions, if any, will be temporary and alternate routes will be communicated in advance. Movement of heavy vehicles will be restricted during school timings and peak hours to ensure safe access to schools and health facilities.	
Arifwala	Women farmers, BHU health staff	Construction will generate noise and dust, which may disturb households, children, and elderly people. How will this be controlled?	ESMP includes measures to address these concerns.	MEPCO, PMU, PIMSC, Contractor
		We are worried that construction of transmission lines and access roads may damage our crops and reduce our income. How will this be addressed?	Any verified crop losses will be compensated in line with project policy. Contractors will avoid unnecessary disturbance to cultivated land and ensure proper documentation of damages.	
		We are confused about who will be eligible for compensation – only landowners or also sharecroppers and tenants?	Compensation eligibility covers landowners, tenants, sharecroppers, and all affected persons as per the ARAP. Separate sessions will be held with men and women to clarify entitlements.	
		With the arrival of male workers from	Labor camps will be located within GS boundary.	

Location	Participants	Concerns Raised by Women	Actions Proposed / Taken	Responsibility
		outside, women fear harassment and loss of privacy. How will you ensure our safety?	Workers will follow a strict CoC and receive training on cultural sensitivity. Perimeter fencing, signage, and a female focal person in the GRM will strengthen community safety.	
Layyah	Women entrepreneurs, NGOs	Construction will generate noise and dust, which may disturb households, children, and elderly people. How will this be controlled?	ESMP includes measures to address these concerns.	MEPCO, PMU, Contractor
		We are worried that construction of transmission lines and access roads may damage our crops and reduce our income. How will this be addressed?	Any verified crop losses will be compensated in line with project policy. Contractors will avoid unnecessary disturbance to cultivated land and ensure proper documentation of damages.	
		We are confused about who will be eligible for compensation – only landowners or also sharecroppers and tenants?	Compensation eligibility covers landowners, tenants, sharecroppers, and all affected persons as per the Resettlement Framework. Separate sessions will be held with men and women to clarify entitlements.	
		With the arrival of male workers from outside, women fear harassment and loss of privacy. How will you ensure our safety?	Labor camps will be located away from settlements. Workers will follow a strict Code of Conduct and receive training on cultural sensitivity. Perimeter fencing, signage, and a female focal person in the GRM will strengthen community safety.	
DG Khan	Affected HH and Local Community	We are worried about noise and dust during construction, which may disturb our families, especially children and elderly. How will this be controlled?	ESMP includes measures to address these concerns.	MEPCO, Contractor, PIMSC
		We fear harassment and loss of privacy with the arrival of outside male workers. How will our safety be ensured?	Labor camps will be located within GS boundary. Workers will be bound by a CoC and trained on cultural sensitivity. Fencing, signage, and a female focal	

Location	Participants	Concerns Raised by Women	Actions Proposed / Taken	Responsibility
			person in the GRM will help safeguard women.	
		Women may face more restrictions on movement due to construction vehicles and labor presence. How will this be managed?	Heavy vehicle movement will be limited during school and peak hours. Safe pedestrian crossings, warning signage, and traffic control measures will be put in place to minimize mobility impacts.	
		We are concerned that construction activities and workers may affect our drinking water sources.	Contractors will arrange separate water supply for workers and will not be allowed to use or discharge into community water sources. Measures will be taken to prevent contamination of wells, hand pumps, or canals.	
		Our children play near roads and fields. With machinery and heavy traffic, how will their safety be ensured?	Construction sites will be fenced, speed limits will be enforced near villages, and safety awareness sessions will be conducted with families. Security staff will monitor active sites near settlements.	
		Our animals often cross the road to reach grazing areas and clinics. With heavy machinery and trucks, we fear accidents and loss of livestock	Traffic management plans will include designated crossing points for animals. Vehicle speeds will be restricted near villages and clinics. Drivers will be instructed to give way to animals, and warning signage will be installed in livestock movement areas.	

7.4.2 Departmental Consultations

Departmental consultations were conducted with key line departments and local institutions in all six subproject districts, as listed in **Table 7.1**. The consultations aimed to obtain official perspectives on the potential E&S impacts of the subproject and to ensure institutional alignment with regulatory requirements. Overall, the departments acknowledged the importance of strengthening the power distribution system through the construction of new grid stations, citing its role in reducing line losses, ensuring reliable electricity supply, and supporting agricultural and industrial growth.

Specific concerns raised by departments included proper land acquisition and compensation processes, minimization of impacts on agricultural land and irrigation channels, tree plantation within and around the substation sites to offset any loss of vegetation, and ensuring dust, noise, and traffic management during construction. Departments also emphasized the need

for local employment opportunities, safety measures for workers and nearby communities, and timely coordination with local authorities before initiating construction activities.

In response, the project team assured that compensation will be provided as per legal frameworks and the World Bank requirements, design adjustments minimize impacts on productive land and irrigation structures, plantation programs will be implemented within substations and along internal roads, and all construction-related impacts will be mitigated through the ESMP. A summary of consultations with these stakeholders is given in **Table 7.5.**

Table 7.5: Summary of Departmental Consultations

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
Rahim Yar Khan			
1	EPA – Assistant Director, Suraj Kumar	How will the project ensure compliance with PEQS during construction, particularly with respect to dust emissions, noise levels, and vehicular/machinery exhaust?	The project will strictly adhere to PEQS throughout the construction phase. ESMP as part of this ESIA includes mitigation measures to address all significant impacts of the proposed subproject.
		Environmental monitoring reports should be submitted to EPA during construction.	Quarterly reports will be submitted to EPA.
		How will solid waste and wastewater generated during construction be managed to prevent environmental degradation, hazardous waste should be disposed-off via approved contractors.	ESMP includes appropriate mitigation and monitoring measures to manage solid waste and waste effluents.
		Ensure emergency response for spills/leaks.	ESMP includes appropriate mitigation and monitoring measures to address spills and leakages.
2	Social Welfare Department – Deputy Director, Muhammad Uzair	Will the project ensure employment opportunities for local labor during both construction and operational phases? Communities are worried that outside labor might be hired instead of locals.	The project will ensure that local labor is given priority in hiring, in line with the LMP and World Bank requirements. Contractors will be instructed to advertise jobs locally first, and semi-skilled/unskilled labor will be primarily sourced from nearby communities.
		What measures will the subproject take to avoid child labor and bonded labor, which are unfortunately common in construction sectors in Punjab?	The subproject will comply with all labor laws including ECA.
		How will workers' rights, wages, and health and safety be ensured? Communities raised concern about fair treatment of workers.	The subproject will comply with all labor laws. CHS concerns will be addressed through appropriate measures given in ESMP. GRM for workers will be established.
3	KFUEIT, Professors	Concern about Electromagnetic Fields (EMF)	EMF levels will fully comply with WHO/ICNIRP exposure guidelines. Monitoring will be conducted during

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
	Dr. Arif, Dr. Asim Riaz, Rana Mujahid	impacts on nearby population and workers.	construction and operation. No adverse health risks are expected.
		Possible tree cutting and biodiversity loss due to project activities.	No large-scale tree cutting is anticipated, except for minimal clearance if unavoidable. Compensatory plantation will be carried out.
		Suggestion for green belt plantation around the grid station.	A green belt of native species will be developed inside the grid station boundary and colony areas to enhance aesthetics.
		Request for internships and research opportunities for KFUEIT students (engineering/environmental).	MEPCO will consider offering internships to students.
4	Agriculture Department Assistant Director, Muhammad Asghar Shahbaz	Protection of irrigation channels and fertile land during GS and TL works.	Appropriate mitigation measures are included in the ESMP.
		Safeguards against soil erosion, waterlogging, and loss of topsoil.	Appropriate mitigation measures are included in the ESMP.
		Demand for awareness among farmers about project impacts and safety.	Awareness and sensitization campaigns for local farmers are included in the ESMP, covering project safety measures and long-term benefits.
Muzaffargarh (Jamal Shah)			
5	Social Welfare Department – Assistant Director, Mian Amir	The Assistant Director emphasized that unemployment is a serious issue in the surrounding villages, and community members are concerned that outsiders may be engaged while locals are left behind. He requested that the project provide job opportunities for nearby villagers, particularly for unskilled and semi-skilled categories during the construction phase.	The project will ensure that local labor is given priority in hiring, in line with the LMP and World Bank requirements. Contractors will be instructed to advertise jobs locally first, and semi-skilled/unskilled labor will be primarily sourced from nearby communities.
		The Assistant Director further highlighted the need for skill development of local youth so they can benefit not only from temporary construction jobs but also from longer-term opportunities in technical and vocational fields. He suggested organizing training or awareness sessions linked to safety, construction practices, and employability skills.	ESMP includes training and awareness raising programs for local population.

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
6	132 kV Muzaffargarh GS – Deputy Manager, Mian Sajid Naveed	Mr. Naveed highlighted that construction and operation of the 132 kV Muzaffargarh Grid Station may pose OHS risks for both skilled and unskilled workers. He noted risks such as accidents from heavy machinery, exposure to electrical hazards, inadequate PPE usage, and lack of emergency preparedness. He emphasized the need for strict preventive measures.	ESMP includes measures to address COHS risks.
		He further stressed the importance of specialized training in electrical safety for all workers, particularly those directly engaged in construction and grid operations. Without such training, workers may be exposed to high-voltage risks and unsafe practices.	A training program is included in the ESMP.
7	GS – Executive Engineer, M. Yaqoob Khasmani	Mr. Khasmani raised concerns about the transmission line during construction and operation. He emphasized that poorly managed line entry/exit could lead to technical faults, safety risks, and delays in commissioning.	The MEPCO team assured that proper design, alignment, safety clearances, and phased energization will be ensured to avoid disruptions.
		He also highlighted possible environmental and social impacts along the TL route such as dust, noise, land disturbance, and access restrictions.	ESMP includes measures to address these concerns.
		What are arrangements for an emergency response mechanism in case of accidents, faults, or hazards during TL stringing or operation? He noted that effective communication between National Transmission and Despatch Company (NTDC) (now National Grid Company), MEPCO, and contractors is critical for immediate response.	The project team confirmed that an Emergency Preparedness and Response Plan (EPRP) will be operationalized. Dedicated focal persons from NTDC and MEPCO have been nominated for real-time coordination. Emergency drills, contact rosters, and quick reporting procedures will be in place to ensure timely management of any incidents.
DG Khan			
8	Agriculture Department – Officer, Rana	The Assistant Director highlighted that the grid station site involves	ARAP has been prepared for the grid station site. Appropriate

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
	Muhammad Suhail	acquisition of private agricultural land, which could reduce cultivable area for local farmers. He raised concern over possible loss of livelihoods for households directly dependent on agriculture.	compensation will be paid to the persons losing land or crops.
		He also raised the issue that surrounding agricultural lands may be indirectly affected during construction due to dust, soil disturbance, and potential access restrictions to irrigation channels or farm roads.	ESMP includes measures to address these concerns.
9	Agriculture Extension Department – Director, Dr. Gulam M. Buzdar	Is there any possible disturbance to crops, irrigation schedules, and soil fertility due to construction of the Grid Station and Transmission Line? Awareness and engagement with farmers are critical so they understand the project benefits and safety precautions.	ESMP includes measures to address these concerns.
		Farmers should be guided on safe use of pesticides and fertilizers near transmission lines and be informed about electrical safety precautions (e.g., avoiding machinery close to TLs).	ESMP includes measures to address these concerns.
10	Forest Department – Staff/SSDO, Ghulam Murtaza / Jamshed Iqbal	The officials raised concerns about possible tree cutting and forest land disturbance during construction of the Grid Station and associated Transmission Lines. They emphasized that even small-scale tree removal can have cumulative ecological impacts in arid areas like DG Khan.	The project team clarified that no forest land will be used for the Grid Station or Transmission Line alignments. Only six private trees are expected to be cut, and a compensatory plantation program has been included in the ESMP. Plantation of native drought-resistant species will be carried out in and around the GS and colony.
		The Department recommended that the project should not only compensate for cut trees but also enhance biodiversity by developing greenbelts and habitat support around the GS boundary.	Tree plantation will be carried out along the GS boundary wall and inside the residential colony.
11	Revenue Department – Staff, Mr. Jahanzaib	The Revenue staff stressed the importance of ensuring fair compensation to all affected landowners whose private agricultural land will be	ARAP has been prepared that includes appropriate compensation payments to the affected persons.

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
		acquired for the Grid Station and Transmission Line towers. They emphasized that land rates should reflect market value and be transparent to avoid disputes.	
		Concern was raised about the need for timely disbursement of compensation to avoid hardship for affected households, especially farmers who depend on seasonal cropping cycles.	ARAP will be implemented before commencing the civil works.
Layyah			
12	EPA – Assistant Director, Muhammad Arshad EPA – Inspector, Zulqarnain Ahmad	Concern was raised about dust emissions during excavation, material handling, and vehicle movement, as well as noise pollution from construction machinery and potential wastewater discharge from construction camps and workshops. EPA stressed that these may cause air quality deterioration and nuisance to nearby receptors if not properly managed.	ESMP includes measures to address these concerns.
		EPA emphasized the importance of compliance monitoring and requested that the project proponent submit periodic compliance reports during construction and operation.	E&S monitoring is included in the ESMP. Regular reports will be prepared and shared with EPA.
13	Social Welfare Department – Assistant Director, Saima Seemab	Raised concern about the lack of women employment opportunities in large infrastructure projects, noting that women in the area are usually excluded from direct or indirect project benefits.	The subproject will offer equal opportunities to men and women.
		Also emphasized the need to prevent child labor and exploitation during construction.	ESMP includes measures to address these concerns.
14	Agriculture Department – Director, Mohammad Shoaib Tiwana	Will the project require acquisition of agricultural land, or will the construction disturb surrounding agricultural fields and irrigation patterns in Layyah?	No agricultural land will be acquired for the Layyah Grid Station, and there are no surrounding agricultural fields that will be disturbed. The site is located on barren/non-agricultural land; therefore farmers and crop production will not be affected.

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
			Irrigation channels and watercourses remain unaffected.
		Is there any expected impact on soil fertility, crop yield, or agricultural livelihoods in the project area?	Since no agricultural land is being used, there will be no adverse impact on soil fertility, crop yield, or farmers' livelihoods.
		What measures will be taken to support environmental sustainability in the absence of agricultural impacts?	The project includes a greenbelt development plan within the GS boundary using native trees and plants, which will contribute to micro-climate improvement and biodiversity enhancement.
Arifwala / Pakpattan			
15	EPA – Deputy Director, Dr. Aroosha Maqbool	Requirement of EPA approval prior to construction.	MEPCO will fulfill the EPA approval requirements.
		Need for environmental monitoring reports.	Monitoring results will be reported to EPA.
16	Agriculture Department – Deputy Director, Riaz Ahmed	The GS will be constructed on government-owned degraded land. How will the project ensure that nearby agricultural lands are not negatively impacted during construction, especially in terms of soil compaction, dust deposition, or irrigation disruption?	ESMP includes measures to address these concerns. Damages to cultivated lands or crops will be minimized and compensated.
		What safeguards are planned to prevent contamination of soil and water in adjacent agricultural fields due to accidental oil spills, waste, or construction runoff?	ESMP includes measures to address these concerns. Appropriate measures are included in ESMP to control spills and leakages.
		Will the subproject affect the use of fertilizers, pesticides, or other agrochemicals on nearby farms?	The subproject will not cause any such impacts.
Khanewal			
17	EPA – Assistant Director, Sarfraz Anjum	How will environmental compliance (dust, noise, wastewater) be ensured during construction, especially near productive agricultural lands?	ESMP includes measures to address these concerns.
		Will there be periodic inspections and reporting to ensure mitigation measures are effective around the GS and nearby farmlands?	Monitoring and reporting requirements are detailed in ESMP
18	Labor Welfare Department – Assistant Director,	As per occupational health and safety requirements under Section 33-O of the Punjab Factories Act, 1934, workers must be provided with	ESMP includes provisions to ensure that all workers are provided with PPE such as helmets, gloves, boots, masks, ear protection, and high-visibility jackets as per job

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
	Ch. Muhammad Shahbaz	necessary Personal Protective Equipment (PPE). How will PPE distribution and compliance be ensured?	requirements. Contractors will be responsible for ensuring PPE availability and replacement when damaged. Supervisors will monitor PPE usage daily, and safety induction training will be mandatory before any worker is allowed on site.
		What provisions will be made for medical aid, health checkups, and hygiene for construction workers?"	ESMP includes measures to address these concerns.
		Adequate and separate washrooms (latrines and urinals) be provided and maintained in a clean and sanitary condition for both male and female workers. How will the project ensure that sanitary facilities are available for laborers at construction sites and later in colonies?"	ESMP includes measures to address these concerns.
		The Punjab Minimum Wages Ordinance requires fair wages for all categories of workers. How will the project ensure timely and fair payment of wages, particularly for unskilled laborers and women workers, and avoid labor exploitation?	LMP will ensure fair wages, contracts, and grievance mechanism. All contractors will be required to strictly follow the Punjab Minimum Wages Ordinance and other labor laws.
19	Agriculture Department – Assistant Director, Kashif Nazir	Since the proposed grid station is surrounded by agricultural land, what measures will be taken to prevent soil and water contamination from construction activities (such as oil spills, wastewater discharge, or improper waste disposal) that could adversely affect crop productivity and soil fertility in the adjoining fields?	ESMP includes measures to address these concerns.
		What safeguards will be in place to prevent damage to irrigation channels, watercourses, or standing crops during construction activities, especially the movement of heavy machinery and transportation of materials?	ESMP includes measures to address these concerns.

Sr. No.	Description of Stakeholder	Concerns and Suggestions	Response Provided
		How will the project ensure that agrochemicals (fertilizers, pesticides, etc.) used in nearby farmland are not contaminated or restricted due to the project's construction and operation?	ESMP includes measures to address these concerns.

7.5 Future Consultations

Stakeholder engagement and consultations are on-going activities and will continue to be carried during the project construction and O&M phases, in accordance with the SEP. An indicative framework is presented in **Table 7.6** listing these consultations; it will be finalized before commencing the construction activities/site mobilization.

Table 7.6: Consultation Framework

Description	Target Stakeholders	Timing	Responsibility
• Stakeholder consultations as part of the preparation of each subproject-specific E&S ESMP, ESIAs and RPs	• Affected communities • Secondary stakeholders	During preparation of each ESIA/ESMP/RP	PIMSC/MEPCO
• Public awareness sessions to share the ESMPs, ESIAs, and RPs with the communities and other stakeholders. • Location: various places in project area	• Communities within subproject area, general public; and line departments/ agencies.	During the preparation of ESIA/ESMP; to be continued thereafter	PIMSC/ MEPCO
• Consultations with the communities during each ESMP and RP implementation • Location: various places in project area	• Communities at/around subproject area	During implementation of subproject activities.	PIMSC/ MEPCO
• Establishment of Grievance Redress Mechanism (GRM) • Location: various places in project area	• Communities at/around subproject area	Before commencement of subproject activities.	PIMSC/ MEPCO
• Grievance redress • Location: various places in project area	• PMU staff; consultants; relevant line departments; and communities.	Subproject implementation Stage	PIMSC/ MEPCO
• Informal consultations and discussions. • Location: various places in project area	• Communities at/around subproject area	Subproject implementation Stage	PIMSC/ MEPCO; contractor
• Consultations with the communities during internal monitoring • Location: various places in project area	• Communities at/around subproject area	Construction Stage	PIMSC/ MEPCO
• Consultations with the Communities during the Independent Monitoring (if required) • Location: various places in project area	• Communities at/around subproject area	Construction Stage	Independent monitors
• Consultation workshops to review ESIA/ESMPs/RPs implementation, any outstanding issues and grievances, views	• Communities at/around subproject area; relevant line	Six-monthly during	PIMSC/ MEPCO

Description	Target Stakeholders	Timing	Responsibility
and concerns of communities; and actions needed to address them. • Location: site offices in project area.	department; relevant NGOs	implementation phase	

7.6 Disclosure Requirements

The present ESIA and its Urdu translation of its executive summary will be disclosed at the MEPCO website. These will be made available at the MEPCO office, contractor's site office and worksites.