September 2026

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

220 KV

DOUBLE CIRCUIT TRANSMISSION LINE

VIA LILO ARRANGEMENT FROM EXISTING NPQ

DHABEJI CIRCUIT TO SITE NEUTRAL HYBRID POWER PLANT.









EMC Pakistan Private Limited

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Executive Summary

ES1 – Introduction

This Environmental and Social Impact Assessment (ESIA) has been prepared for the proposed 220 kV Double Circuit Transmission Line via LILO arrangement from the existing NPQ Dhabeji Circuit (in District Malir) to the Site Neutral Hybrid Power Plant (located in District Thatta). The project is being developed by K-Electric to allow for the evacuation of energy generated from the proposed Site Neutral Hybrid Power Plant, that will develop wind and solar energy resources. The ESIA has been conducted in accordance with the Sindh Environmental Protection Act, 2014 and the Sindh EPA Environmental Assessment Regulations, 2021, identifying potential environmental and social impacts and recommending commensurate mitigation and management measures.

ES2 – Project Description

The project involves the construction of a 13.4 km transmission line to loop in and loop out (LILO) from the existing NPQ–Dhabeji Circuit to the SITE Neutral Hybrid Power Plant in Dhabeji, Sindh. The transmission corridor will pass mainly through barren and semi-arid land with minimal settlements, using lattice steel towers and associated gantries. The project is being developed by K-Electric to allow for the evacuation of energy generated from the proposed Site Neutral Hybrid Power Plant, that will develop wind and solar energy resources.

ES3 – Legal & Institutional Review

The project is required to comply with the Sindh Environmental Protection Act, 2014 and the Sindh EPA Environmental Assessment Regulations, 2021, under which it is categorized as a Schedule III project, requiring a full Environmental and Social Impact Assessment. In addition to provincial requirements, the project will adhere to relevant national laws, Sindh Environmental Quality Standards, and applicable international guidelines, including the IFC Environmental and Social Performance Standards and EHS Guidelines. Compliance with these regulatory and institutional requirements provides the basis for environmentally sound planning, implementation, and monitoring of the project.

ES4 – Analysis of Alternatives

The report evaluates project alternatives including the "No Project" option, transmission line configurations, particularly overhead versus underground systems, to ascertain the most feasible alternative moving ahead. The selected overhead transmission line option is based on environmental suitability, technical feasibility, ease of construction and maintenance, and cost efficiency under the prevailing barren site conditions. The "No Project" scenario was also considered and rejected, as it would fail to address increasing electricity demand, system constraints, and associated socio-economic benefits.

ES5 – Baseline

The project area is characterized by arid to semi-arid conditions, sparse vegetation, limited ecological sensitivity, and low population density within the Right of Way (ROW).

Baseline surveys captured data on:
- Physical Environment: Topography, geology, soil, climate, air quality, noise level and hydrology.
- Biological Environment: Flora, fauna, and bird migratory routes along the transmission line corridor.
- Social Environment: Land use, population, infrastructure, and community characteristics within Malir and Thatta district.

ES6 – Impact Assessment & Mitigation Measures

Impacts during construction include air and noise pollution, waste generation, traffic disruption, occupational health and safety risks and limited ecological disturbance. Operational impacts include EMF exposure, risks to birds, and visual intrusions. All impacts are addressed with detailed mitigation strategies:

- Dust suppression and noise control
- Waste segregation and safe disposal
- Use of bird diverters and EMF monitoring
- Emergency preparedness and OHS protocols

ES7 – Stakeholder Consultations

Stakeholder consultations were carried out to inform relevant stakeholders about the proposed transmission line project and to record their views and concerns. The consultation process included meetings with departmental stakeholders, and representatives of relevant authorities along the project alignment in Thatta and Malir districts.

ES8 – Environmental & Social Management Plan

The Environmental and Social Management Plan (ESMP) developed to ensure that all potential environmental and social impacts of the project are effectively managed throughout construction and operation. It defines clear mitigation measures, monitoring requirements, roles and responsibilities, and reporting mechanisms.

ES9 – Conclusion

The ESIA concludes that the proposed transmission line project is environmentally acceptable, with impacts that are limited, temporary, and manageable. With proper implementation of the recommended mitigation measures and the Environmental and Social Management Plan, no significant long-term adverse effects are expected. The project supports renewable energy integration and improved power reliability and is recommended for approval subject to full regulatory compliance and effective environmental oversight.

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1 Introduction

EMC Pakistan (Private) Limited has been engaged by K-Electric to conduct the Environmental and Social Impact Assessment (ESIA) for the proposed 220 kV Double Circuit Transmission Line via Loop-In Loop-Out (LILO) arrangement from the existing NPQ Dhabeji Circuit (in District Malir) to the Site Neutral Hybrid Power Plant (in District Thatta). The project is being developed by K-Electric to allow for the evacuation of energy generated from the proposed Site Neutral Hybrid Power Plant, that will develop wind and solar energy resources.

The project involves the construction of 13.4 km transmission line and associated infrastructure within the administrative districts of Thatta and Malir, Sindh. In accordance with the Sindh Environmental Protection Act, 2014 and the Sindh EPA Environmental Assessment Regulations, 2021, an ESIA is required prior to commencement of construction. This ESIA has been prepared for submission to the Sindh Environmental Protection Agency (SEPA) for review and approval, where International best practices, including relevant World Bank and IFC guidelines, have also been considered.

1.1 Background – Energy Demand and Renewable Integration

Karachi is Pakistan's largest metropolitan city and economic hub, experiencing sustained growth in population, industrial activity, and electricity demand. To meet this increasing demand while reducing reliance on fossil fuels, significant investments are being made in renewable energy projects, particularly wind and solar power, in Sindh Province.

The effective utilization of renewable energy requires a robust and reliable transmission network capable of evacuating power from generation sites and integrating it into the existing grid. Limitations in transmission capacity can constrain renewable energy dispatch and adversely affect grid stability. The proposed 220 kV transmission line is therefore a critical infrastructure component to support grid reinforcement, renewable energy integration, and long-term energy security for the region.

1.2 Project Overview

The proposed project involves the construction of a 220 kV double circuit transmission line via Loop-In Loop-Out (LILO) arrangement from the existing NPQ Dhabeji Circuit to the Site Neutral Hybrid Power Plant. The transmission line will have an approximate length of 13.4 km and will traverse portions of Thatta and Malir districts. The project is designed to evacuate power generated from wind and solar facilities and integrate it into KE's transmission network. The project is being developed by K-Electric to allow for the evacuation of energy generated from the proposed Site Neutral Hybrid Power Plant, that will develop wind and solar energy resources

The project scope includes:

- Erection of lattice steel transmission towers;
- Stringing of conductors and installation of insulators;
- Construction of step-up and step-down gantry arrangements at interconnection points;
- Temporary construction facilities, material transportation, and site storage; and
- Implementation of environmental, health, and safety measures during construction and operation.

The proposed transmission line will traverse a 30-meter-wide corridor including the horizonal clearances from both sides and Right-of-Way (ROW) to be acquired on structure pylon basis i-e area covered by tower / pole, mainly through barren, semi-arid land with minimal human settlements or ecological sensitivity. The project does not include new access road development; construction materials and tower components will be transported using existing road routes.

A map of the project site is also provided below in Figure 1.1.

As can be seen from the map above, the proposed transmission line will pass through mostly barren lands, ultimately tying into KE's existing network near the existing Dewan cement. The only major road in the area, is the one leading to the Dewan cement factory, after which the only access to the project is through dirt roads.

1.3 Project Proponent

The project proponent is K-Electric Limited, Pakistan's only vertically integrated electric utility, responsible for generation, transmission, and distribution of electricity in Karachi and surrounding areas. K-Electric plays a key role in ensuring reliable power supply and advancing the integration of renewable energy into the regional grid.
K-Electric operates under licenses issued by the National Electric Power Regulatory Authority (NEPRA) and is committed to compliance with national environmental regulations as well as international environmental and social standards applicable to infrastructure development.[1]

[1] Retrieved from https://www.ke.com.pk/our-company/who-we-are/

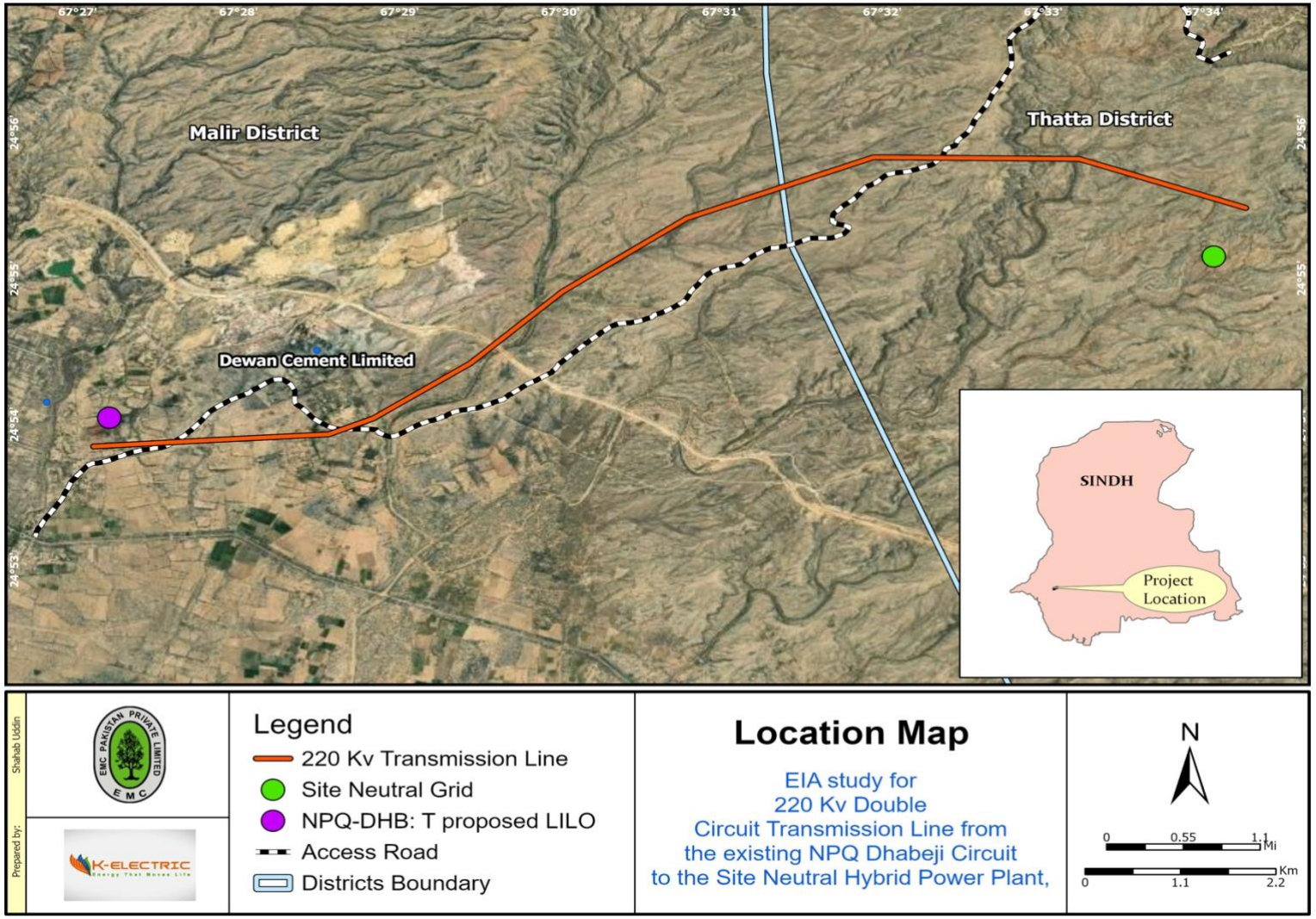


Figure 1.1 Project Location Map

1.3.1 Vision

To restore and maintain pride in KE, Karachi and Pakistan.

1.3.2 Mission

Brightening lives by building the capacity to deliver uninterrupted, safe and affordable power to Karachiites.

1.3.3 Corporate Health, Safety, Environment and Quality

The company aims to maintain a high international standard to ensure quality, safety and reliability in its operations. KE prioritize their values that rooted in a strong commitment to 100% safety. This commitment encompasses health and safety risks in all aspects of KE operations, including offices, generation plants, transmission and distribution networks, travel on company business, and even at home.[2]

1.3.4 Corporate Social Responsibility (CSR)

K-Electric's CSR strategy is focused on creating sustainable social, environmental, and economic value for communities across Karachi. Through a portfolio of high-impact, scalable initiatives, KE addresses critical community needs related to safety, education, health, inclusion, environmental sustainability, and livelihoods. Flagship programmes such as the Roshni Baji Programme and the KHI Awards reflect KE's commitment to community empowerment, women-led engagement, and civil society strengthening. Complementing these are targeted interventions in education, digital inclusion, public health, emergency response, clean water, renewable energy, and environmental conservation. KE also actively promotes employee volunteerism through a structured platform, reinforcing collective responsibility and partnerships for sustainable development.

Key Community Interventions:

Roshni Baji Programme

The Roshni Baji Programme is K-Electric's flagship women-led community engagement initiative designed to promote public safety, resilience, and social inclusion at the grassroots level. Launched in 2021, the programme has onboarded 260 trained community women who act as trusted ambassadors within their neighborhoods. Through door-to-door outreach and localized engagement, Roshni Bajis disseminate critical messages on electrical safety, energy conservation, and disaster preparedness, reaching over one million households to date. The programmes innovation and impact were recognized with S&P Global Award.

2 https://www.ke.com.pk/sustainability/hseq/

KHI Awards

The KHI Awards is a flagship CSR platform established by K-Electric to recognize, support, and scale the work of social organizations contributing to Karachi's socio-economic development. Since its inception in 2021, four award cycles have been successfully completed, supporting an average of 40 winning organizations annually and providing approximately PKR 45 million in rebates each year. The initiative strengthens the social sector across diverse thematic areas, including education, health, inclusion, sustainability, livelihoods, and social services.

School Safety Programme

The School Safety Programme aims to instill safety awareness and responsible energy-use behaviors among school children across Karachi. Implemented in partnership with ITA, Concern for Children, and Resource Linked, the initiative has reached over 165,000 students, trained 466 teachers, and covered 474 schools. By integrating early education with practical safety messaging, the programme contributes to reducing safety incidents and fostering long-term behavioral change among young learners.

IT & Science Labs

K-Electric has established 13 IT and 1 Science Labs across Karachi to promote digital literacy, STEM education, and equitable access to technology for students from underserved communities. These labs provide hands-on exposure to computers, science equipment, and modern learning tools, enhancing learning outcomes and building future-ready skills. The initiative supports inclusive education and bridges the digital divide through partnerships with credible education organizations.

Access to Clean Water

K-Electric facilitates access to safe drinking water, hygiene, and sanitation to improve public health outcomes in underserved communities. In collaboration with Saylani Welfare International Trust and Rotary International, water purification plants have been installed across 21 locations in Karachi. This initiative addresses water scarcity challenges and promotes safe water practices, particularly in low-income and high-risk areas.

Heatwave Relief Camps

Since 2021, K-Electric has organized heatwave relief camps across Karachi in collaboration with Saylani Welfare International Trust. Through these camps, over 90,000 drinking water bottles and ORS sachets have been distributed to communities affected by extreme heat, providing timely relief and mitigating health risks associated with heat exhaustion and heat-related emergencies.

Karachi Kay Liye Paish Qadam – Employee Volunteer Programme

Karachi Kay Liye Paish Qadam is K-Electric's structured employee volunteer programme that promotes a culture of social responsibility and civic engagement. More than 500 employees have registered for the programme, with 454 employees actively participating between July 2023 and June 2025. Volunteer activities span education, health, environmental sustainability, and humanitarian support, reflecting KE's commitment to collective impact and employee-led community engagement.

First Aid & CPR Training

K-Electric builds community and institutional resilience by strengthening the capacity of frontline workers and community responders through First Aid and Cardiopulmonary Resuscitation (CPR) training. The initiative equips participants with essential lifesaving skills, enhancing emergency preparedness and enabling timely and effective response during medical emergencies, accidents, and disasters. Over 400 frontline workers were trained on 1st aid with CPR.

Access to Health Facilities

K-Electric supports access to essential healthcare services through free medical camps and partnerships with reputable health institutions. These interventions focus on preventive healthcare, early diagnosis, and treatment for vulnerable populations, benefiting approximately 50,000 patients to date and contributing to improved health outcomes in underserved communities.

1.4 Need for ESIA

The proposed transmission line project is governed by the Sindh Environmental Protection Act, 2014, which mandates environmental approval prior to construction or operation of projects likely to cause environmental impacts. As per Section 17 of the Act:

"No proponent of a project shall commence construction or operation unless he has filed with the Agency an Initial Environmental Examination or Environmental and Social Impact Assessment and has obtained approval in respect thereof."

Under the Sindh EPA Environmental Assessment Regulations, 2021, the project falls under

Schedule III – Projects Requiring an Environmental Impact Assessment
Category (A) – Energy
Sub-Category (4) – Transmission Lines above 132 kVA and Distribution Projects

1.5 Objective of ESIA

The primary objective of this ESIA is to identify, assess, and evaluate the potential environmental and social impacts associated with the construction and operation of the proposed 220 kV transmission line. The study aims to recommend appropriate

mitigation measures to avoid, minimize, or manage adverse impacts and to enhance positive outcomes.

Specific objectives include:

- Establishing baseline environmental and socio-economic conditions along the project corridor;
- Identifying potential impacts during pre-construction, construction, and operational phases;
- Assessing project alternatives, including routing and design considerations;
- Conducting stakeholder consultations and documenting concerns;
- Propose mitigation and management measures to minimize adverse impacts
- Developing an Environmental and Social Management Plan (ESMP) to ensure compliance and effective implementation of mitigation measures.

1.6 Approach & Methodology

The ESIA has been conducted using a systematic and structured methodology that includes:

- Review of applicable national and provincial environmental legislation and guidelines;
- Collection and analysis of primary and secondary baseline data;
- Field surveys along the transmission line alignment;
- Delineation of the project's Corridor of Influence (COI);
- Identification and assessment of environmental and social impacts;
- Stakeholder consultations with relevant authorities and local communities; and
- Development of mitigation, monitoring, and management measures.

With this agenda, a scoping workshop was carried out by the different departments of KE along with the consultant commissioned for carrying out the ESIA of the project. This scoping process was conducted by EMC Pakistan (Pvt.) Ltd. on behalf of K-Electric and forms the first formal step in the environmental and social due diligence process in accordance with the Sindh Environmental Protection Act, 2014 and the SEPA (Review of IEE and EIA) Regulations, 2021.

1.6.1 Literature Review

Before mobilization, a desktop study was conducted, involving the collection and review of guidelines, data, and reports relevant to the project. This included: (a) an examination of applicable environmental legislation (b) analysis of Google Earth satellite imagery; (c) relevant design information provided by the client and design consultant

This review encompasses various aspects, including previous studies, regional environmental data, socio-economic analyses, and documentation of similar projects in Pakistan and internationally.

1.6.2 Review of Environmental Laws an Institutional Requirements

A thorough review of environmental laws and institutional requirements is essential to ensure compliance with legal frameworks governing environmental and social impacts in Pakistan. This review includes national, provincial, and local regulations that pertain to the construction. All such laws and legislations related to the proposed project have been discussed in detail in **chapter 3** of this ESIA.

1.6.3 Delineation of Corridor of Influence (COI)/ Area of Impact/ Influence (AOI)

The delineation of the corridor of influence is a crucial step in the ESIA process, defining the spatial area where the project may have direct or indirect environmental and social impacts. This corridor encompasses not only the physical footprint of the project but also the surrounding areas that may be largely affected by its activities.

The Area of Influence (COI) for this project includes the main project site(s) and associated facilities, such as contractor camps, temporary material storage areas, and vehicle parking areas, where project impacts are expected to occur. Environmental and social risks and impacts were assessed for all relevant stages of the project cycle, including pre-construction, construction, and operational phases.

For the purposes of the assessment, the AOI chosen for the project is 50 m from each side of the transmission line, where the same is depicted in Figure 1.2 below.

1.6.4 Analysis of Alternatives

The ESIA process mandates for the assessment of each potential alternative available for the project that could be developed to meet the objectives, and from this assessment, to recommend the most environmentally, socially, and economically feasible option.

To select the most viable design for the project, and route for the transmission line, the analysis of different alternatives was carried out.

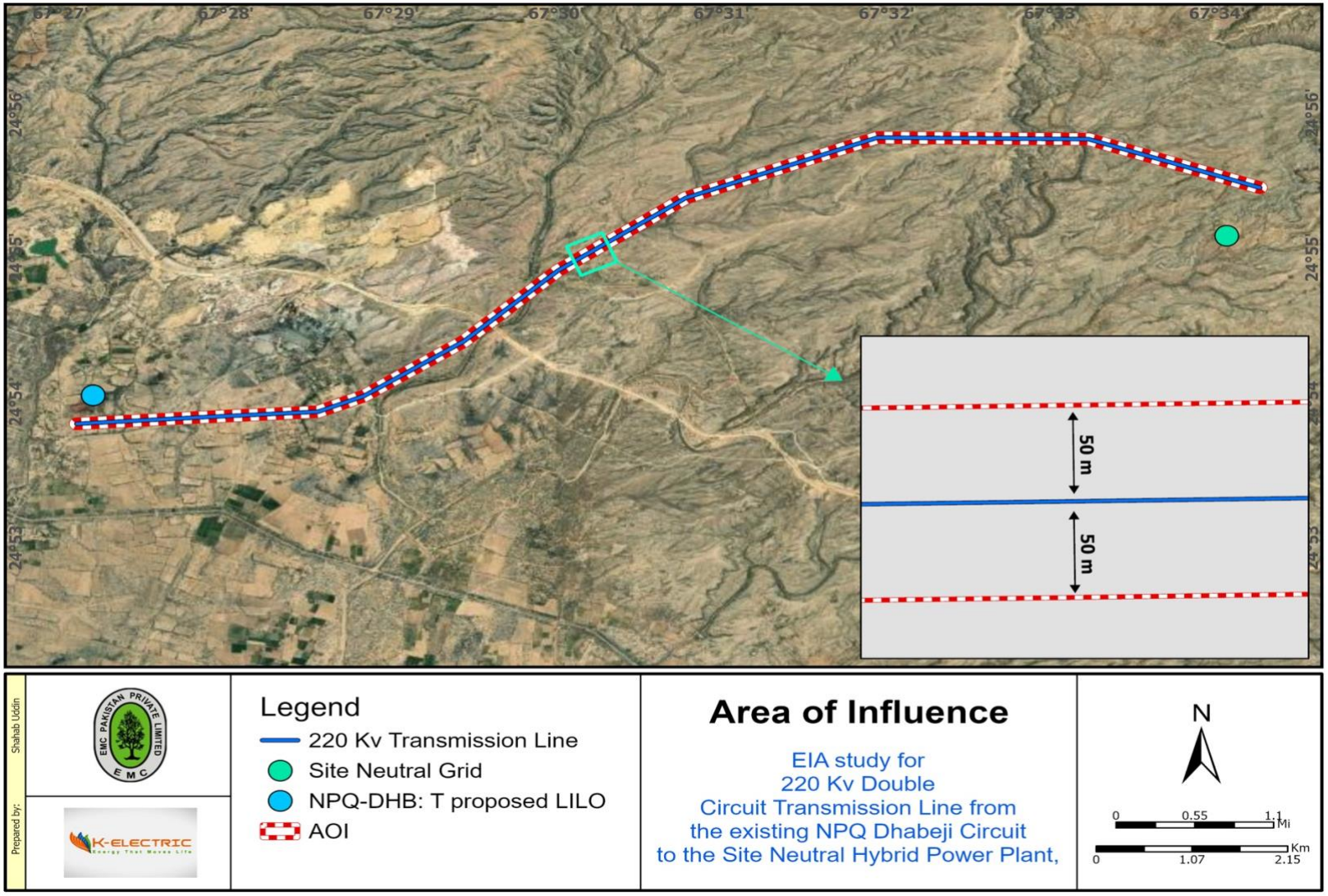


Figure 1.2 - Area of Influence for Project

1.6.5 Environmental & Social Baseline Surveys for the Project

Baseline surveys are essential for establishing the current environmental and social conditions within the project area. These surveys provide a reference point against which potential impacts can be assessed, enabling the identification of significant changes resulting from project activities. Prior to the start of field activities, comprehensive checklists, proformas, and maps were developed covering the following main parameters:

A) Physical Environment

The information required for the establishment of the physical baseline included the following parameters:

- Land Resources (including land use pattern, soil composition, soil erosion, etc.)
- Water Resources & Flow Patterns (including available surface and groundwater resources, and natural streams, hydrology, geology, flood risk, seismicity, etc.)
- Climate data (including temperature, rainfall, humidity, wind speed, and direction, etc.)
- Ambient air quality and noise levels monitoring data

B) Ecological Environment

Information collected through primary (field surveys) and secondary data sources for the establishment of the ecological baseline included the following main parameters:

- Flora (trees, shrubs, herbs, grasses, and overall vegetation including valuable or rare trees and their losses due to implementation of the project, etc.)
- Fauna (mammals, reptiles, amphibians)
- Agriculture and livestock
- Avifauna surveys were carried out for a year
- Endangered species (flora and fauna)

C) Socio-Economic Environment

- Identifying significant cultural and historical sites within the project area, ensuring that potential impacts on heritage are recognized and addressed.
- Mapping existing land uses within the project area, including agriculture, residential areas, and natural habitats, to assess potential conflicts with project activities.
- Identifying key stakeholders, including community leaders, local organizations, and government authorities, to facilitate effective engagement throughout the ESIA process.

1.6.6 Stakeholder Consultation

Extensive stakeholder identification and consultations were also conducted for the project. The project stakeholders were identified during the inception/ scoping stage

and meetings were conducted with them to receive feedback on the anticipated environmental and social issues related to the project impacts and suggested mitigation measures. Given that there were no settlements or structures identified within the COI, meetings were carried out with relevant departments to discuss the issues/ constraints and get their views and feedback to mitigate the potential environmental and social impacts associated with the implementation and operation of the project.

1.6.7 Impact Assessment & Mitigation Measures

The impact assessment process for the project involved evaluating potential environmental and social impacts, identifying both negative and positive effects to develop appropriate mitigation measures aimed at minimizing adverse outcomes. Baseline data, stakeholder consultations, and expert input were analyzed to identify impacts associated with project activities such as construction, operation, and decommissioning. Each identified impact was assessed for significance, considering factors like magnitude, duration, and likelihood of occurrence, which helped prioritize the impacts requiring mitigation.

The assessment also included a detailed evaluation of the nature, extent, location, timing, and duration of potential impacts. Severity was determined by correlating the impacts to the project's location, design, construction. Based on predictions and public consultations, the ESIA team screened adverse environmental impacts for inclusion in mitigation measures and the Environmental and Social Management Plan (ESMP).

1.6.8 Environmental and Social Management Plan

An ESMP has also been prepared to ensure the adequacy and effectiveness of the proposed measures by clearly identifying the roles and responsibilities of the agencies responsible for implementation, monitoring, and auditing of ESMP activities, existing and suggested framework, necessary approvals, training needs and the required further studies. It includes an organizational setup, a monitoring mechanism, monitoring plan along with frequency of monitoring activities, and method for data collection and environmental monitoring, ecological and social mitigation measures were introduced as part of the ESMP.

With this agenda, a scoping workshop was carried out by the different departments of KE along with the consultant commissioned for carrying out the ESIA of the project. This scoping process was conducted by EMC Pakistan (Pvt.) Ltd. on behalf of K-Electric and forms the first formal step in the environmental and social due diligence process in accordance with the Sindh Environmental Protection Act, 2014 and the SEPA (Review of IEE and EIA) Regulations, 2021.

1.6.9 Documentation & Review

This is the final step of the ESIA study. The data generated during and for the study was compiled and examined by experts. Sections of this report were prepared as the study progressed, by consultation with experts. The report was finally reviewed by Team Leader, who analyzed the information, assessed the potential environmental

impacts in the light of national and international guidelines, and examined the alternatives in the light of observations on the field as well as meetings with the stakeholders.

1.7 Report Organization

This report contains nine chapters, where the contents of each chapter are described as follows:

- **Chapter 1** – "Introduction" describes introduction, location of project, objective, purpose of the ESIA, along with the methodology.
- **Chapter 2** – "Project Description" furnishes an overall description of the project, including its background, features, and key components, timeframe, and cost.
- **Chapter 3** – "Legal and Administrative Framework" elaborates upon the current legal framework including national and provincial requirements which are applicable to the proposed project in the context of the environment and sustainable development.
- **Chapter 4** – "Analysis of Alternatives" provides details on alternate technologies, routes, and operations considered for the proposed interventions
- **Chapter 5** – "Baseline Environmental Conditions" comprises a detailed narrative of the existing "baseline" conditions of the project area, with respect to its physical, biological, and socio-economic environment
- **Chapter 6** – "Impacts Assessment & Mitigation Measures" elaborates upon the likely impacts of the project on the physical, biological, and socio-economic environment during the construction and operational stages, and proposes measures to mitigates the adverse impacts
- **Chapter 7** – "Stakeholder Consultations" provides a summary of the consultations carried out with relevant stakeholders for the project along with their suggestions and observations on the project
- **Chapter 8** – "Environmental and Social Management Plan" outlines the mechanism to be adopted for the implementation of measures and monitoring of environment during all stages of project implementation
- **Chapter 9** – "Conclusion & Recommendations" summarizes the findings of the assessment and provides recommendations accordingly.

2 Project Description

This chapter presents an overview of the proposed project, covering the project type, design considerations, construction activities, and implementation approach. It describes the key technical components of the 220 kV transmission line and explains how the infrastructure will support the reliable integration of renewable energy into K-Electric's transmission network.

The project involves the construction of a 13.4 km transmission line to loop in and loop out (LILO) from the existing NPQ–Dhabeji Circuit to the SITE Neutral Hybrid Power Plant in Dhabeji, Sindh. The transmission line will traverse a 30-meter-wide corridor, including horizontal clearances on both sides. The Right-of-Way will be acquired on a structure or pylon basis, limited to the area occupied by towers or poles. The route primarily passes through barren and semi-arid land with minimal human settlement and low ecological sensitivity.

The line will be supported by lattice steel towers, including one terminal gantry at the SITE Neutral Hybrid Power Plant and two crossing gantries to pass over the existing 500 kV NTDC transmission line. No new access roads are proposed, as construction materials and tower components will be transported using existing road networks. During peak construction, approximately 50–60 workers will be employed and accommodated in rented housing near Dhabeji city rather than in on-site camps.
The construction period is estimated at 16 months. Upon completion, operation and maintenance of the transmission line will be managed by K-Electric's Transmission Department.

2.1 Need for the Project

K-Electric's transmission network is experiencing increasing demand due to rapid urbanization, industrial growth, and the planned integration of renewable energy sources. The proposed Site Neutral Hybrid Power Plant, comprising wind and solar photovoltaic generation, requires a dedicated and reliable transmission corridor to evacuate power efficiently and safely into the existing grid.

The existing network in the Dhabeji area has limited capacity to accommodate additional power injection without system reinforcement. Without the proposed 220 kV Double Circuit LILO transmission line, renewable power generated at the Site Neutral Hybrid Power Plant cannot be reliably integrated, potentially leading to curtailment, grid instability, and operational constraints.

The proposed transmission line will strengthen the grid by enhancing power transfer capability, improving system reliability, and ensuring uninterrupted evacuation of renewable energy. The project is therefore essential to support sustainable energy development, meet growing electricity demand in Karachi and adjoining areas, and improve overall grid resilience.

2.2 Project Cost

The total project cost for the construction of the 220 kV Double Circuit Transmission Line and associated infrastructure will be finalized following contractor selection and detailed engineering, where it is currently estimated at PKR 5 Billion. The estimated budget will cover tower supply and erection, conductor stringing, construction of gantry step-up and step-down arrangements, material transportation, environmental management measures, and compliance with regulatory requirements.

2.3 Project Timeline

The construction and commissioning of the proposed transmission line are expected to be completed within an estimated 16-month period, subject to timely approvals, availability of right-of-way clearances, and favorable site conditions.

2.4 Project Location

The proposed transmission line will extend approximately 13.4 km and pass through the administrative districts of Thatta and Malir in Sindh. The project area is located at approximately **24°55′9.02″ N** latitude and **67°34′3.53″ E** longitude. The alignment will connect the existing NPQ–Dhabeji Circuit to the SITE Neutral Hybrid Power Plant through a Loop-In Loop-Out (LILO) arrangement.

The transmission line route traverses predominantly barren and sparsely populated terrain, ultimately integrating with K-Electric's existing transmission network near the Dewan Cement facility. The Right-of-Way will mainly pass through open and government-owned land, with limited crossings of existing infrastructure such as roads, utility corridors, and other transmission lines. No permanent residential settlements are located within the proposed ROW.

Access to the project area will be provided through existing road networks. The only major paved road in the vicinity leads to the Dewan Cement factory, beyond which access to the transmission line alignment will primarily be via unpaved dirt roads.
The location of the project is also depicted in the **Figure 2.1**.

The alignment shown for the project is where the transmission line corridor will be set up, where the location of each tower along the route is subject to the pylon routing procedure provided as an annex to this report.

Crossings & Existing Infrastructure

The proposed transmission line will cross critical existing infrastructure, including the 500 kV NTDC transmission line and the K-IV water supply pipelines. These crossings were identified during route surveys and have been incorporated into the project design. Two dedicated crossing gantries are proposed to safely cross the existing 500 kV NTDC transmission line.

All crossings will be executed using approved engineering designs and will comply with applicable vertical and horizontal clearance requirements in accordance with K-Electric, NTDC, and relevant safety standards. Construction activities in the vicinity of these facilities will be closely coordinated with the concerned authorities, and controlled work practices will be implemented to prevent damage and avoid any disruption to power transmission and water supply services.

The crossing maps is attached in the **Figure 2.2**:

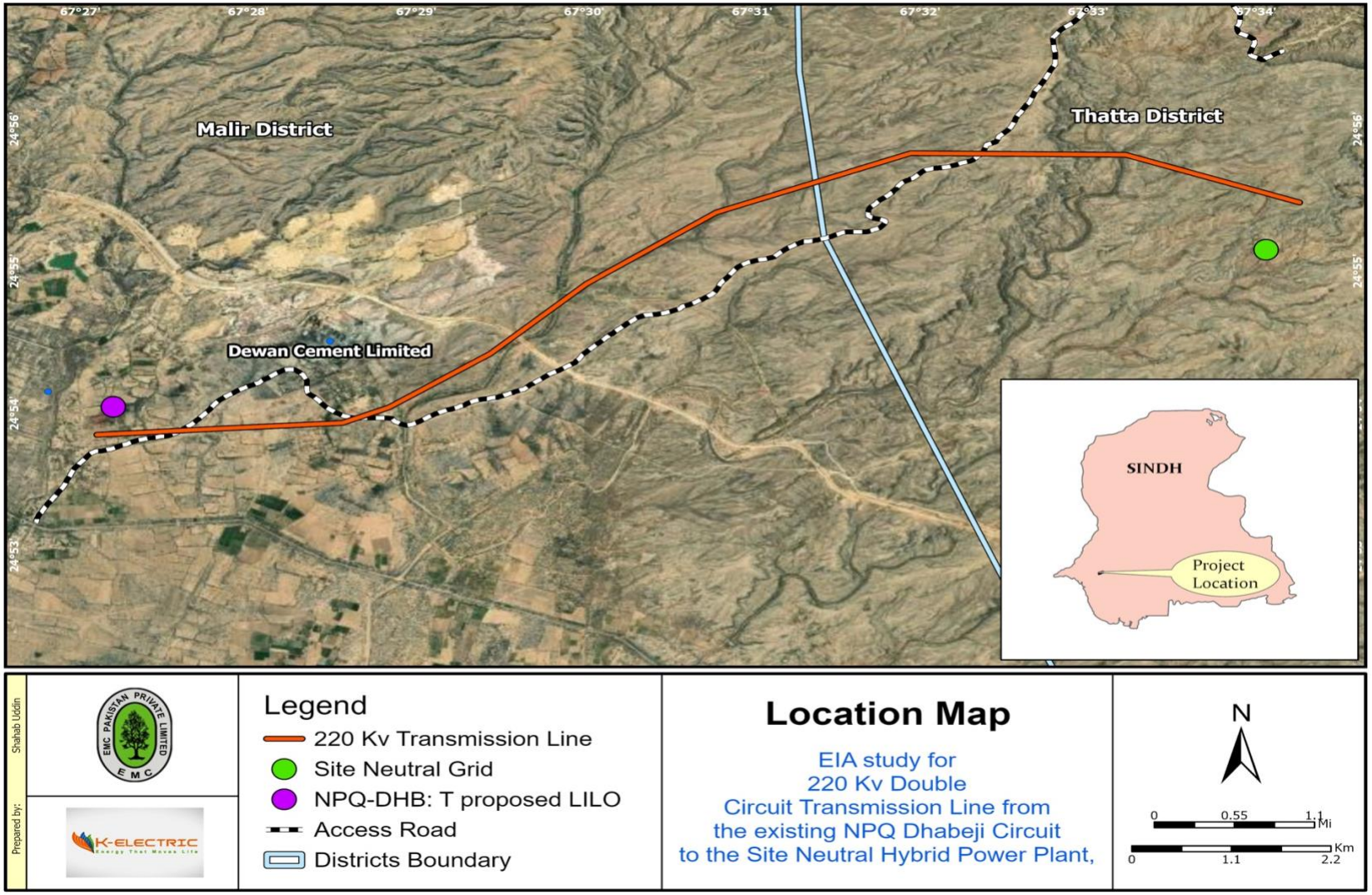


Figure 2.1 - Project Location Map

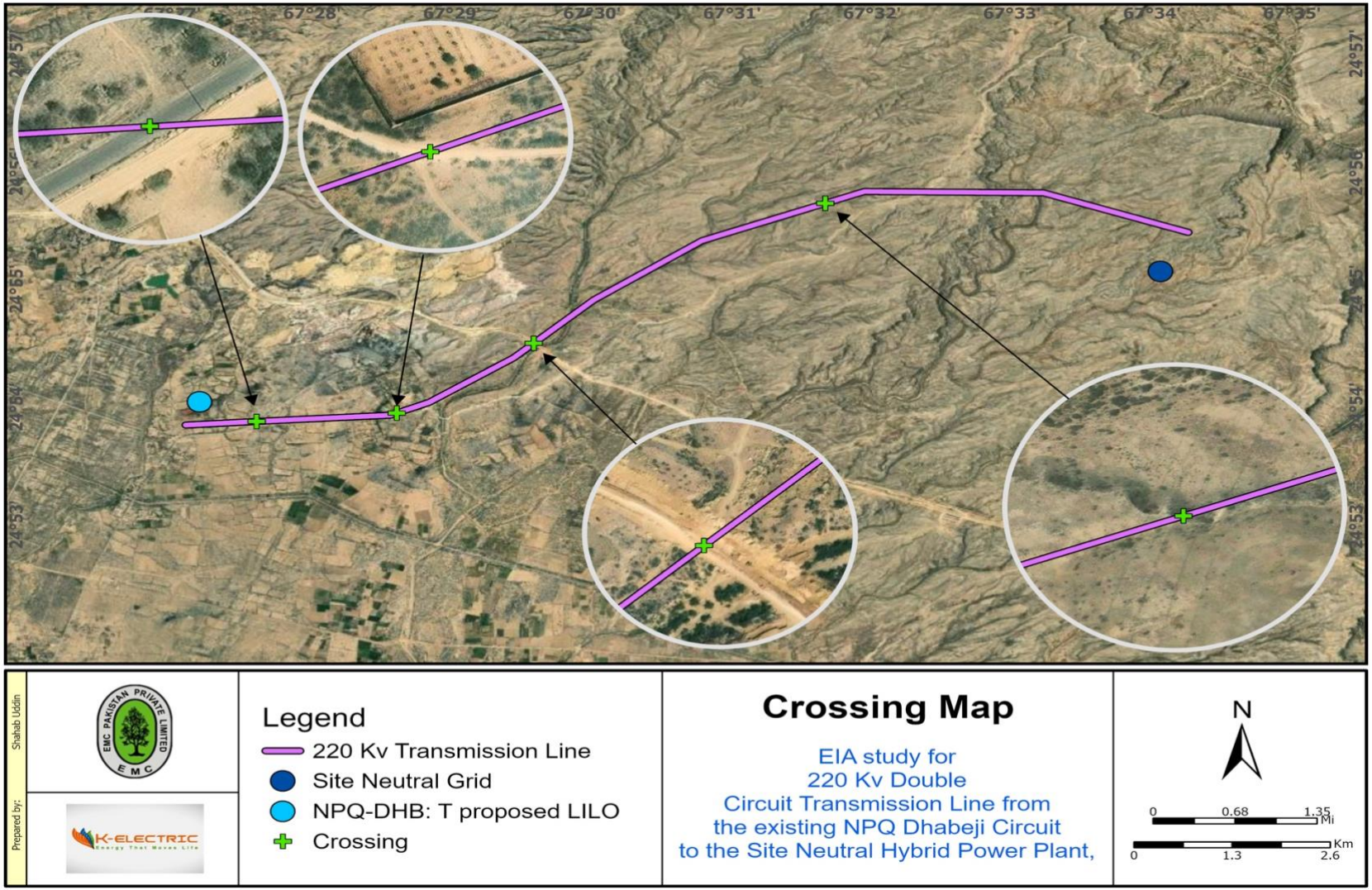


Figure 2.2 - Map of Transmission Line Crossings

As can be seen from the map above, the proposed transmission line will pass through mostly barren lands, ultimately tying into KE's existing network near the existing Dewan cement. The only major road in the area, is the one leading to the Dewan cement factory, after which the only access to the project is through dirt roads.

2.5 Land Ownership

The final ownership and land-use status of each proposed tower location and access route will be confirmed during detailed design through review of land ownership records, field verification and consultation with affected landowners and land users.

The project does not presently envisage acquisition of the entire transmission line Right-of-Way. Permanent land requirements are expected to be principally associated with tower foundations and gantry footprints, while temporary land requirements may arise from construction access, working areas, conductor stringing, material storage and equipment movement.

Avoidance of private land, houses, cultivated areas, trees and livelihood assets will be prioritized during tower micro-siting. However, the current preliminary alignment does not provide sufficient evidence to conclude that no land-related impact will occur.

Potential impacts may include:

- permanent occupation of tower-pad areas;
- temporary restriction of access;
- crop damage;
- removal or pruning of trees;
- disturbance of grazing or informal land use;
- damage arising from construction access; and
- temporary loss of use during stringing and erection activities.

Where impacts cannot be avoided, K-Electric's applicable land acquisition and compensation procedure will be implemented. Asset inventories and valuations will be undertaken with participation of affected parties, and written agreements will address compensation, access arrangements, construction timing and reinstatement obligations.

No contractor will be permitted to occupy land or commence work at a tower location until the required ownership verification, agreements, compensation and environmental and social clearance have been completed. The locations of the towers and other project interventions shall be finalized so as to minimize land acquisition and other such impacts, in line with the pylon routing procedure attached to this report.

2.6 Major Components of the Project

2.6.1 Overhead Transmission Line

The project involves the construction of a 13.4 km transmission line to loop in and loop out (LILO) from the existing NPQ–Dhabeji Circuit to the SITE Neutral Hybrid Power Plant in Dhabeji, Sindh.

Tower Specifications

Approximately 55 lattice-type structures will be installed along the alignment. The tower and gantry types include 2T, 2TS, 2TLA, 2T-OFF, crossing gantries, including suspension, tension, angle, and terminal towers. Towers will be designed to withstand site-specific wind loads, seismic forces, and operational stresses in accordance with K-Electric and international design standards. Tower spacing and heights will be optimized based on terrain, conductor sag, and statutory clearance requirements.

2.6.2 Erection & Testing

Erection of Poles

The erection of the transmission line towers will employ a mechanical approach, focusing on precision and safety. Heavy-duty equipment such as tensioners, pullers, and reel rewinders will be utilized to manage the placement and tension of the conductors accurately. This equipment ensures that the conductors are installed with the proper tension to prevent sag and maintain alignment.

The erection process for the transmission line towers will follow a systematic sequence to ensure structural integrity and operational safety. Erection of pole activity is to be performed by following activities:

- Site Mobilization - During Site mobilization contractor shall shift the necessary tools and machinery at work place.
- Site Preparation - Before starting work, contactor shall inspect all the tools and machinery properly in the presence of supervisor.
- Material (Monopole) Shifting - Contractor shall shift mono poles in parts as per instructions of safety department.
- Foundation preparation - Foundation will be prepared by assessing the geology and terrain of the area to ensure stability and load bearing capability of the site.
- Tower assembly - In this phase, sections of the lattice towers are pre-assembled on the ground as pre-assembling of the towers before erection saves time and is more efficient.
- Erection
  - Contractor shall arrange crane near the pole location and Pole Sections to be properly anchored with the crane and then to be suspended in the air.
  - First/Lower Section of the pole to be put on the already installed anchor bolts and tightened.
  - The 2nd section of pole to be put and installed on the first section.
  - After the erection of main body, cross arm shall be erected.
- Inspection - After installation of monopoles contractor shall inspect properly from the supervisor before inspection of Consultant & Client.

- Installation of Accessories - Sign Plates, Anti-birds, Anti-climbing Shall be installed after the completion of stringing activities.

Stringing Works for TL

- Site mobilization of stringing team with proper equipment and machinery under supervision of site engineer.
- Shifting of conductor, Insulators, OPGW and all allied hardware.
- Assembly of insulators with hardware and hanging on cross arms.
- Selection of slack or tension method for pulling as per site conditions. In any case abrasion of conductor with ground shall not be happened.
- Travelers will be installed in such a manner, that the vertical position of conductor / OPGW in sheave to be at same elevation as when clamped in the final position.
- Pulling shall be done as per selected slack or tension method.
- After pulling sagging and dead ending will be done.
- Clipping In and installation of Spacer Dampers.
- Testing of grounding.

Testing & Commissioning

After the completion of works, final checking of the line shall be done to ensure that all foundation works, erection of poles, and stringing have been done according to the specifications. After checking the line shall be tested for insulation. If any defect is found as a result of such a test shall be rectified. Testing and commissioning methods are helpful for finding crushed insulation, stray wire strands corrosive contaminants around the conductors, terminal spacing problems, and tolerance errors in the conductor.
Following are the procedures to perform the tests.

1. HIPOT Test Procedure.
2. Continuity Test Procedure.
3. Phase Sequence Test Procedure.
4. OTDR Test Procedure.

1. HIPOT Test Procedure

- HIPOT test makes surety of no current will flow from one point to another point.
- HIPOT testers usually connected one side of the supply to safety ground (earth ground) and another side of the supply is connected to the conductor being tested.
- Time duration for the HIPOT test is one minute.
- To set the current limit, if the actual leakage current of the conductor is known then HIPOT test current can be predicted.
- Connect the ground lead of the HIPOT tester to a suitable grounding electrode conductor
- Attach the high voltage led to one of the isolated phase conductors.

- Switch on the HIPOT tester, set the meter to pre-decide DC voltage, push the test button on meter and after one minute observe the resistance reading.
- At the end of the one-minute test, switch HIPOT tester from high potential test mode to the voltage measuring mode to confirm that the phase conductor and voltage of HIPOT tester reading zero volts.
- Repeat this test procedure for all circuit phases conductor, testing phase to ground each phase to phase when test is completed, disconnect the HIPOT tester from circuits and confirm that circuits are clear to be energized.

2. Continuity Test Procedure.

- The continuity test checks the surety of current flows easily from one point to another point.
- Purpose of continuity test measurement is to check the continuity of protective conductors and main supplementary equipotential bonds.
- Continuity test also clears dis-connectivity of conductor between jumpering, termination, and joining by phase wise.
- During the continuity test applied voltage at one point be to be the same at another point.
- Continuity test measures the resistance between two points in ohms.

3. Phase Sequence Test Procedure

- After performing the HIPOT test and continuity test conductor phase sequence test is to be applied on each circuit.
- To check the red phase other two (yellow and blue) are grounded.
- Same checking procedure for the next two phases.

4. OTDR Test Procedure.

- To check out the continuity, length, and attenuation of OPGW by using the optical time domain reflectometer is used.
- OTDR test procedure shows the total distance range of the OPGW drum length from the start point to the ending point.
- OTDR test results pulse width, dead zones and averaging time.

2.6.2.1 Anti-Climbing Devices & Sign Plates

Anti-climbing devices and sign plates installation procedure will be applied after completion of project punch list and final inspection, where the steps to be followed are described below:

- Sign plates installed inside the line at mid of each pole which shows the phase sequence
- There will be a three-phase sign plates sequence likewise RYB (Red, yellow and blue)
- After installation of phase/sign plates, danger plates will be installed at each location
- Danger plate shows T/Line voltage to avoid climbing on the pole

- Anti-climbing device installed at 8 heights around the pole
- To avoid climbing on pole anti climbing devices are used.

2.6.2.2 Conductor & Ground Wire Details

The transmission line will utilize Approximately 330 km of phase conductor, along with insulators, hardware, and approximately 15 km of OPGW, will be transported to site using trailers. The transmission line will utilize 4 × 500 mm² AAC phase conductors. Maximum conductor sag will be calculated after finalization of Profile and Plan (P&P) drawings. RTV-coated disc type insulators will be used, and 10 mm diameter grounding conductors will be installed for tower earthing. OPGW (Optical Ground Wire) will be installed to provide grounding, lightning protection, and communication capability for system monitoring.

2.6.2.3 Gantry Step-Up and Step-Down Arrangements

Step-up and step-down gantries will be provided at designated connection points where the proposed transmission line interfaces with the existing circuit and the Site Neutral Hybrid Power Plant. These gantries will ensure safe conductor transition, maintain required electrical clearances, and support reliable grid interconnection. The arrangement will include crossing gantries for the 500 kV NTDC transmission line and a terminal gantry at the Site Neutral Power Plant Grid Station, all designed and constructed in accordance with K-Electric technical standards and applicable safety requirements.

2.7 Site Development Plan

The proposed project will be developed in a phase wise manner to ensure systematic progress and adherence to timelines and quality standards, where the project is divided into the following key phases:

2.7.1 Pre-Construction Phase: Assessments & Approvals

This initial phase involves site assessments, environmental impact studies, and obtaining the necessary permits and approvals from relevant authorities. A detailed survey of the topography along the proposed transmission line route will be conducted, and consultations with local communities will ensure transparency and address any concerns. Furthermore, prior to the commencement of construction, the following activities shall be completed:

- GIS based environmental and social constraints mapping
- Joint engineering, ecological, and social field verification
- Identification of affected landowners and land users (if any)
- Ecological review of proposed tower locations and spans
- Identification of priority spans for bird flight diverters
- Preparation of final tower and access route schedules

2.7.2 Construction Phase: Infrastructure Development

During the construction phase:

Construction will involve tower foundations, tower erection, conductor stringing, gantry construction, and implementation of environmental and safety measures.

2.7.3 Post-Construction Phase: Transitioning to Operations

After commissioning, the project will enter the operational phase with routine inspections, maintenance, and monitoring to ensure safe and reliable operation.

2.8 Project Construction Workforce & Construction Camps

All dealings with workers, management of camp sites, and working conditions, will be in line with local legislations, international legislations ratified by Pakistan, and the provisions of IFC's PS2 – labor and working conditions.

2.8.1 Project Workforce

Estimating manpower demand is essential for effectively deploying personnel for the project. This initiative will involve a range of labor types, including professional, administrative, skilled, and unskilled labor.

Approximately 50–60 workers will be engaged during peak construction. A Code of Conduct will be enforced for all workers.

A Code of Ethics, which includes guidelines for Gender-Based Violence (GBV) awareness, has been established for all laborers. This code will guide their interactions with surrounding communities and among themselves, promoting a respectful and harmonious working environment. Adherence to this Code of Conduct is mandatory for all workers at the construction camps. This code of conduct is attached to this report as appendix.

2.8.2 Construction Camps

Temporary construction camps may be established by the contractor at approved locations, ensuring that no land acquisition or resettlement impacts occur. The camps will be designed to accommodate approximately 50–60 workers during the execution phase and will comply with K-Electric's environmental, health, and safety requirements. Adequate facilities for accommodation, sanitation, drinking water, waste management, and first aid will be provided to ensure safe and hygienic living conditions for the workforce throughout the construction period.

2.9 Utilities Consumption

2.9.1 Water Demand & Source

Water will be sourced from approved suppliers. Estimated consumption during construction is based on workforce size and basic needs.

2.9.2 Wastewater Generation

Wastewater generated during construction will be treated through septic systems before disposal.

2.9.3 Solid Waste Generation

Due to the construction activities, waste will be generated at the construction sites and contractor camps. The excavated materials will be reused where applicable for construction purposes. Solid waste generated during construction and camp operations shall be safely disposed of in the operating landfill sites.

2.9.4 Electricity

Electricity during construction will be supplied through generators where required.

3 Review of Pertinent Legislations

This chapter provides an overview of the policy framework and legislation that applies to control the environmental ramifications arising from the proposed project implementation and operation. The project needs to comply with all the applicable environmental policies, laws, guidelines, and acts of the Government of Pakistan and the Government of Sindh.

3.1 Summary of Relevant Strategies, Policies, Acts & Legislations

A summary of the major relevant strategies, policies, Acts, and legislation pertinent to the project in the realm of environment and social is provided below:

Table 3.1 - National Laws & Legislations

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
1.	**The Electricity Act, 1910**	The Electricity Act, 1910 is a federal legislation in Pakistan that governs the generation, transmission, and distribution of electricity. It establishes the legal framework for the electricity sector, including licensing requirements, safety standards, and operational regulations. The Act also provides provisions for the regulation of electric supply companies and the rights and duties of consumers. The electricity Act, 1910 is amended through the electricity (Amendment) Ordinance, 1979. Penalty of three years imprisonment or five thousand fines or with both is prescribed for dishonest abstraction or consumption of energy.	The Electricity Act, 1910 is relevant to the project as it sets the regulatory framework for obtaining necessary licenses and permits for electricity generation and distribution.	Ensure that the project acquires the relevant approvals from the relevant departments for electricity transmission under the project
2.	**Electricity Rules, 1937**	These rules regulate the generation, transmission, supply and use of energy in Pakistan. The Act prescribes the conditions and procedures of issuance of licenses. General precautions for the safety of the public are mentioned. Construction, insulation and earthing of apparatus are prescribed to be done to prevent danger. Additional rules for electric tractions are also given	Relevant to the project as it prescribes conditions for obtaining license and practices to prevent electrical danger.	Ensure that the project acquires the relevant approvals from the relevant departments for electricity transmission under the project

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
3.	**National Climate Change Policy, 2021**	Pakistan developed its first National Climate Change Policy (NCCP) in 2012, which was updated in 2021. The focus of the NCCP-2021 is on adaptation and mitigation, with a major emphasis on nature-based solutions.	Relevant as it defines the different ways projects must inbuild sustainability into their design and development	Ensure that the project includes precursors for sustainability and sustainable development
4.	**National Climate Change Policy, 2021**	The policy highlights the vulnerabilities of various sectors to climate change and outlines appropriate adaptation measures. These measures cover sectors such as water, agriculture, forestry, coastal areas, biodiversity, and other vulnerable ecosystems. Despite Pakistan's small contribution to global greenhouse gas (GHG) emissions, its role as a responsible member of the global community in combating climate change is emphasized, particularly through mitigation efforts in energy, transport, forestry, and agriculture. Additionally, the policy incorporates disaster preparedness, capacity building, institutional strengthening, technology transfer, and international cooperation as important components.	Focuses on reducing GHG emissions, particularly in the energy and transport sectors, contributing to Pakistan's climate change commitments.	Ensure that the project is developed, prioritizing minimal GHG emissions and employing methods to reduce these to the extent possible
5.	**National Gender Policy Framework, 2022**	Ministry of planning, development and special initiatives, Government of Pakistan has launched National Gender Policy Framework on 8th March 2022 with an objective for year 2022-25 to accelerate progress towards equality between women	The policy is applicable to the project to ensure and encourage inclusion of all genders in all stages of the project and eliminate, discrimination, violence	Ensure no discrimination is carried out in the employment of persons for the project

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		and men by bringing gender equality goals and women's perspectives to the center of policy related decision making in all sectors. The Government of Pakistan aims to achieve a gender-responsive society where women and men equally contribute to, and benefit from development, and this shall be done through promotion of gender perspective in all policies and programs, understanding the prospective impact on women and men respectively, before rolling out the programs.	against women and girls in all its manifestations and removal of socio-cultural impediments that hinder travelling to desired places.	
6.	**Pakistan Climate Change Act, 2016**	The Prime Minister of Pakistan established Pakistan Climate Change Council which coordinates and supervises the enforcement of the provisions of the Act, monitor implementation of the international agreements relating to climate change, approve and monitor implementation of comprehensive adaptation and mitigation policies, strategies, plans, programs, projects and other measures formulated by the authority to meet Pakistan's international obligations, monitor the implementation of National Adaptation Plan and its constituent provincial and local adaptation action plans, approves guidelines for the protection and conservation of renewable and non-renewable resources, species, habitats and	The Act is applicable to proposed project as the proposed project involves the solid waste management activities that may contribute to generation of greenhouse gases.	Requires compliance with local EPA and its requirements

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		biodiversity adversely affected or threatened by climate change.		
7.	**Antiquities Act, 1975**	The Antiquities Act, 1975 (amended in 1990) states the following: "Ancient" is any object that is at least 75 years old. All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology. The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise. All new construction within a distance of 200 feet from protected antiquities is forbidden. No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and	Although no antiquity site has been identified within the proposed. However, the law will be applicable to the Project mainly due to its two provisions: According to the law, any construction activity within 61 m or 200 ft. of protected antiquities, are prohibited. The provisions of this Act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the construction of proposed Project.	Should there be an identified antiquity lying within 200 feet of one of the project sites, then approval must be obtained from the culture and heritage department. Further during project execution, on account of discovery of any archaeological remains, antiquities department to be intimated promptly.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		classification as monuments of national or world heritage.		
8.	**Pakistan Penal Code, 1860**	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions, and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the Project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.	Requires adherence to the law of the land, where it defines the need to comply with aspects affecting the environment and other humans.
9.	**Protection against Harassment of women at the workplace Act, 2010**	The Protection Against Harassment of Women at the Workplace Act (2010) refers to sexual harassment at the workplace.	This Act will be applicable to the Project if women are employed for the construction of the proposed Project.	Ensure that women are not harassed at workplaces.
10.	**Labor Laws as part of Constitution of Pakistan, 1973**	The Constitution of Pakistan contains a range of provisions with regards to labor rights, in particular: Article 11 of the Constitution prohibits all forms of slavery, forced labor and child labor. Article 17 provides a fundamental right to exercise the freedom of association and the right to form unions. Article 18 proscribes the right of its citizens	The labor laws are relevant as it would deal with employment of labor for the construction of proposed Project. Following are the major labor laws which are applicable to the Project:	Requires that the labor regulations defined therein are complied with during project implementation.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		to enter upon any lawful profession or occupation and to conduct any lawful trade or business. Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and Article 37(e) makes provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment. Labor law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labor laws. The labor laws are a comprehensive set of laws in Pakistan dealing with the following aspects: Contract of Employment. Termination of Contract. Working Time and Rest Time. Working hours.	Sindh Workers Compensation Act 2015 Sindh Minimum Wage Act 2015 Sindh Terms of Employment (Standing Orders) Act 2015 Sindh Bonded Labor System (Abolition) Act 2015 Sindh Payment of Wages Act 2015 Sindh Occupational Safety & Health Act 2017 Sindh Factories Act 2021	

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		Paid Leave. Maternity Leave and Maternity Protection. Other Leave Entitlements. Minimum Age and Protection of Young Workers. Equality Pay Issues. Workers' Representation in the Enterprise. Trade Union and Employers Association Regulation; and Other Laws.		
11.	**Land Acquisition Act, 1894**	The primary law for acquisition of land for public purposes in Pakistan is the "Land Acquisition Act (LAA), 1894" (hereinafter referred as the Act). The land acquired under the Act vests in the province, and it is only thereafter that the province may transfer it to someone else. The Sindh Amendment 2009 of LAA 1894 specifically related to Section 16, Section 23, Section 24, and Section 28-A.	No physical displacement envisaged, however, land acquisition will be determined once the right of way of the transmission line is finalized, where priority will be given to using state land, that is free from all encumbrances.	No physical displacement envisaged, however, land acquisition will be determined once the right of way of the transmission line is finalized, where priority will be given to using state land, that is free from all encumbrances.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
12.	**National Disaster Management Act, 2010**	National Disaster Management Act, 2010 was passed by Parliament of Pakistan in 2010. The Act applies to whole Pakistan. The Act was passed in backdrop of 2010 Floods in Pakistan and strengthens Disaster Management system.	This Act is applicable as proper mitigation measure will be adopted by technical consultant during design stage to offset any chances of flooding during torrential rains.	Requires that the project design consider the previous intake and data on any national disasters.
13.	**Building Code of Pakistan, 2007**	The provision of Building Code of Pakistan shall apply for engineering design of building like structure and related components. The construction in violation of the building code shall be deemed as violation of professional engineering work. Moreover, a certificate for the proposed action will be obtained from Provincial Building Control Authority.	These codes shall be used in structural design of building area components constructed under this proposed Project.	Requires that the codes defined therein are used in the construction of any buildings constructed for the project.
14.	**Gender Equality as part of the Constitution of Pakistan, 1973**	The Constitution of Pakistan contains a range of provisions regarding gender equality, in particular, provides the principle of equal rights and equal treatment to all citizens/ persons, without any distinction including on the basis of sex: Article 3 calls upon the State to eliminate all forms of exploitation. Article 4 provides for the right of individual to enjoy the protection of law and to be treated in accordance with the law. This applies to the citizens as well as "to every other person	The articles of laws Constitution of Pakistan are relevant as it would deal with employment of male and female labor having different religion, political affiliation, sect, colour, caste, creed, ethnic background for the construction of proposed Project.	Requires that women are not discriminated against for jobs during project implementation.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		for the time being within Pakistan" without distinction. This article also clearly states that certain rights cannot be suspended. Article 25 ensures equality before the law and equal protection of the law and states that there shall be no discrimination on the basis of sex alone. Articles 25(3) and 26(2) allow the state to make special provisions for the protection of women and children. Articles 26 & 27 provide for equal access to public places and equality of employment in the public and private sector. Articles 11 & 37 (g) prohibit trafficking in human beings as well as prostitution. Article 32 makes special provisions for the representation of women in local Government. Article 34 directs the state to take appropriate measures to enable women to participate in all spheres of life and social activities. Article 35 asks the state to protect the marriage, the family, the mother, and the		

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		child. Article 37 (e) directs the state to make provisions for securing just and humane conditions of work ensuring that children and women are not employed in vocations unsuited to their age or sex, and for ensuring maternity benefits for women in employment. Articles 51 & 106 provide for the reservation of seats for women in the legislatures.		
15.	**The Criminal Law (Third Amendment Act, 2011)**	The Criminal Law (Third Amendment) Act 2011 was passed by the Parliament in 2011 and assented by the President on 16th December 2011. The Act amended relevant sections in the Pakistan Penal Code and Code of Criminal Procedures. The Amendment criminalized a number of customary practices such as giving women or girls in marriage for settling a dispute), forced marriage, marriage with the Holy Quran and depriving women of inheriting property. All these offences are made non-compoundable and non-bailable under this Act.	This Act is applicable as the proposed project may involve the numbers of staff/worker having different religion, political affiliation, sect, colour, caste, creed, ethnic background.	Requires that workers of all different backgrounds, religions, cultures are treated the same without any discrimination.

Table 3.2 - Pertinent Provincial Legislations

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
1.	**Sindh Strategy for Sustainable Development, 2007**	The Sindh Strategy for Sustainable Development (SSSD) proposes a ten- year sustainable development agenda for Sindh. Its purpose is to highlight the ecological, economic and social issues of the province and to provide recommendations and strategic actions to address them. The strategy promotes the sustainable use of natural resources to achieve the objectives of poverty alleviation and social development through the participation of the people of Sindh. It is a live document, which should evolve with the changing scenario. The strategy would be reviewed and revised every three years, incorporating lessons learned during implementation.	The project supports sustainable development by enabling energy generated from renewable resources to be off taken and incorporated into the energy mix available in the local grid.	Ensure that development carried out includes incorporation of sustainability to the extent possible
2.	**Sindh Drinking Water Policy, 2017**	This policy is to provide safely managed drinking water whose supply is adequate, well maintained and sustainable; and to enhance public awareness about health,	There will be numerous workers working under the project, both during the construction and the	Requires that people employed under the project are provided with clean drinking water for safe

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		nutrition and hygiene related to safe drinking water. The basic objective of this policy is to introduce legislative measures and regulations to create an enabling framework for safely managed drinking water supply, regulation of water usage, extraction, treatment transportation and distribution.	operation stage, along with living at the site, where it will need to be ensured that people have potable water available to them.	consumption
3.	**Sindh Water Policy 2023**	The Sindh Water Policy outlines a comprehensive strategy aimed at addressing the pressing challenges surrounding water resources and their sustainable use. With increasing concerns over water scarcity, pollution, and climate change, this policy document seeks to establish a forward- looking framework that promotes efficient water management, conservation, and equitable distribution. The overarching goal of this policy is to ensure a secure water supply for present and future generations while preserving aquatic ecosystems and fostering socio-economic development.	Ensures the project's water usage is efficient and aligned with policy goals.	Ensures the project's water usage is efficient and aligned with policy goals.
4.	**1st Sindh Labour**	1St Sindh Labour Policy was introduced in 2018. The Major focus of the 1st Sindh labour policy, 2018 is to ensure the health	The policy is applicable to the project since labor will be employed for the project at	Ensure that labor dealing and handling is in line with the

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
	Policy, 2018	and safety of workers at workplace with guaranteeing living wages for all. As labour laws are mostly male centric, but this policy will address women labour issues, which include equal opportunities and equal remuneration in line with the International Labour Organization (ILO) conventions.	various stages.	requirements of the policy.
5.	**The Sindh Prohibition of Employment of Child Act, 2017**	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 Prohibition of Child Employment Act (PCEA) 2017 disallow child labor in Sindh. The PCEA defines a child as a person who has not completed his/her fourteenth years of age, and an adolescent means a person who has completed fourteenth year of age but has not completed eighteenth years of his age. No child shall be employed or permitted to work in any establishment including construction, but an adolescent can be employed or permitted to work under strict guidelines provided in the PCEA and rules. An adolescent shall not be employed in any	Ensure that children are not employed for works to be carried out under the project.	Does not permit child labour during project construction or operation.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		hazardous work included in the schedule to the PCEA.		
6.	**Sindh Minimum Wages Act, 2015**	To provide the regulation of minimum rates of wages and various allowances for different categories of workers employed in certain industrial and commercial undertakings and establishments.	This Act will be applicable to the Project to ensure that the minimum wages and allowances should be given to the Project labor (skill and unskilled employed for the construction of the proposed Project.	Requires that the project ensure that workers are not paid below the defined minimum wage.
7.	**Sindh Environmental Protection Act, 2014**	Sindh Environmental Protection Agency as a part of Sindh Act No. VIII of 2014 prepared Sindh Environmental Protection Act (SEPA), 2014 which was passed by the provincial assembly of Sindh on 24th February 2014 and asserted by the Governor of Sindh on 19th March 2014 and notified on 20th March 2014. It is a fairly comprehensive legislation and provides legislative framework for protection, conservation, rehabilitation, and improvement of the environment. It contains concrete action plans and programs for the prevention of	The proposed Project is located in Sindh so it falls under the jurisdiction of the SEPA that will be the responsible authority for governing the environmental compliance of the project with local guidelines.	Prior to project construction, an Environmental Impact Assessment must be conducted against which an approval has to be obtained from the department.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		pollution and promotes sustainable development. Act has 11 parts with 37 Sections followed by sub-sections and clauses. Part VI is related to the environmental examinations and assessments while part X is related to the public participation.		
8.	**Sindh Environmental Assessment Regulations, 2021**	These regulations set out: • Key policy and procedural requirements for filing an EIA. • The purpose of environmental assessment. • The goals of sustainable development. • The requirement that environmental assessment be integrated with feasibility studies. • The jurisdiction of the Provincial EPA and Planning & Development (P&D) Departments. • The responsibilities of proponents. • Duties of responsible authorities. • Provides schedules of proposals that the Project requires either EC, IEE, or an EIA. • The environmental screening process of the projects under schedule I, II and III; and	Defines the categories for different projects, where the type of study/ assessment required (Checklist, IEE, EIA) against each category of project is defined to fulfil local environmental compliance.	As per the categories defined, the following project falls into the category of an EIA based on: **Schedule III – Projects Requiring an EIA:** **A. Energy**

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		The procedure for the environmental approval for filing the case with the Sindh EPA for the granting of the NOC.		**Transmission Lines above 132 kVA and distribution projects.**
9.	**Sindh Environmental Quality Standards, 2016**	SEPA has formulated the Sindh Environmental Quality Standards (SEQS) as per Clause (g) of sub-section (1) of Section 6 of SEPA Act 2014. The SEQS were promulgated in 2016 which includes standards for liquid effluent, industrial gaseous emissions, ambient air, drinking water quality, noise levels and standards for motor vehicle exhaust, diesel vehicle, and petrol vehicles.	Defines acceptable standards for the construction and operation of different projects in Sindh with respect to ambient air quality, vehicular and exhaust emissions, drinking water quality, and effluent quality.	All projects to be implemented in Sindh must conform to SEQS during all the phases i.e., construction and operation.
10.	**Sindh Solid Waste Management Act, 2021**	The Sindh Solid Waste Management Act, 2021 enacted to establish a board for collection and disposal of all solid waste, to arrange effective delivery of sanitation services, to provide pollution free environment and to deal with other relevant matters. The Board established under the Act headed by the Chief Minister or his nominee and	This Act is applicable as the main Act of the implementing agency of the project. It will define the boundaries in which the project must take place, and continue operations in.	No requirements, only defines the ambit of SSWMB's operations.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		constitutes of thirteen other ex-officio members of other relevant departments.		
11.	**Sindh Cultural Heritage (Preservation) Act, 1994**	This provincial Act empowers the Government of Sindh to preserve and protect any premises or objects of archaeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected. Karachi alone has over 200 buildings declared as "Protected Heritage" by the Government of Sindh.	If a site is declared as a protected heritage, then no work may take place within 200 feet of that area.	None of the sites protected under this law has been identified within the RoW/ZoI of the proposed Project.
12.	**Sindh Wildlife Protection, Preservation, Conservation and Management Act, 2020**	The Sindh Wildlife Protection, Preservation, Conservation & Management Act was enacted in September, 2020. The Act was passed to make provisions for protection, conservation, preservation, and sustainable use of wildlife for establishment, management and maintenance of protected areas in the Province of Sindh. The Act introduces the establishment of a Council for protection and the Conservation of Wildlife, and other measures which guarantee and protect the rights and ensure safety of wildlife in the Province of Sindh.	Project is located in Dhabeji and there is no any protect or wildlife sites.	Ensure work done is in line with the policies and provisions of the Act

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
13.	**Sindh Factories Act, 2021**	The Act deals with regulations related to Project Area workers and workplace EHS requirements. The Factories Act also provides regulations with provision for general health and safety of the work force in their work area. Conditions are specified for clean workplace, toilets, waste handling, provision of drinking water quality, worker health and hygiene etc. Under the Act, no occupier of a factory shall be allowed to start manufacturing process unless he has obtained factory registration certificate from the Directorate of Labor. The Act does not allow a child below the age of 14 years to work in a factory in any case. The new Law restricts the employment of contractual labor in manufacturing process. The amendment 2021 is specifically related to the provision of safe transportation facility to women workers, working hours and working periods of seasonal and whole year factories.	This Act is applicable for the Project workers as well as belonging community including men, adults, women, adolescent working in and near the construction industry (during construction phase).	Requires that the occupational health and safety, along with labor regulations defined therein are complied with during project implementation.
14.	**Sindh Bonded Labour System**	The Act is gender sensitive; an anti-discrimination clause is added to each new proposed Law in accordance with ILO requirement viz: "No discrimination shall be	This Act is applicable as the proposed project may involve the numbers of staff/worker having different religion,	Bonded labour will not be allowed or utilized for the project

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
	(Abolition) Act, 2015	made on the basis of sex, religion, political affiliation, sect, colour, caste, creed, ethnic background in considering and disposing of issues relating to the enforcement of this Act". In all proposed Laws the cognizance has been changed from that of the Judicial Magistrate to the Presiding Officer Labor Courts who is a Session Judge.	political affiliation, sect, colour, caste, creed, ethnic background.	
15.	**Sindh Differently Abled Persons (Employment, Rehabilitation and Welfare) (Amendment) Act, 2017**	The Act provides for the employment, rehabilitation, and welfare of differently able persons. The definition of "differently able" is any persons who on account of injury, disease, or congenital deformity, is challenged for undertaking any gainful profession or employment in order to earn his livelihood and includes a person who is blind, deaf, physically challenged or mentally challenged. In the Sindh Differently Able Persons (Employment, Rehabilitation and Welfare) Act, 2014 was amended and job quota was increased from two percent to five percent. The Act also waived admission fees at public educational institutions for people with disabilities as well as 75% of tuition fee, along with establishing reserved seats.	This Act is applicable as the proposed project will involve serious occupation health and safety issues during construction phase and may cause serious injury to worker/staff causing permanent disability and differently able.	Requires differently abled persons are not discriminated against during project implementation for jobs and are accordingly accomodated during project implementation works.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		Pakistan is a signatory of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD).		
16.	**Sindh EPA Hazardous Substances Rules, 2014**	The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. General safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are also described in these rules.	This rule is applicable to the proposed Project due to involvement of hazardous waste handling, use and disposal during different construction activities at the construction stage.	A separate approval must be obtained from the Sindh EPA if there is any permanent use of any of the hazardous substances that are listed in the Rules.
17.	**Sindh Occupational Health & Safety Act, 2017**	The Act makes provisions for occupational safety and health conditions at all workplaces in the province for the protection of workers during work. Under the Act, an Occupational Safety and Health Council will be established in Sindh with secretary of Sindh government's Labor and Human Resources Department as its chairperson. The proposed council lays down penalties in case of death and injury due to violation. In case of death sub-section 01 of section 38 will accord 2 years' imprisonment or a fine of PKR 100,000 or both. Similarly, in case of injury the	The Act applies in any Project situation where worker's rights and protections are enforced. This law is applicable to construction and Project workers and will be complied during construction and operation phases.	Requires that the occupational health & safety regulations defined therein are complied with during project implementation.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		imprisonment may extend to six months or a fine up to PKR 20,000 or both.		
18.	**Sindh Resettlement & Rehabilitation Policy, 2023 (R&R Policy)**	The Sindh R&R Policy aims to provide a structured framework for addressing involuntary resettlement resulting from development projects in Sindh. It's primary objective is to ensure fair and timely compensation, proper relocation, and the restoration of livelihoods for project- affected persons (PAPs). The main requirements under the policy are: 1. **Resettlement Planning:** ○ **Resettlement Action Plan (RAP):** Develop a comprehensive RAP detailing the extent of displacement, compensation strategies, relocation sites, and support for livelihood restoration. 2. **Eligibility Criteria:** ○ **Affected Persons:** Recognize all individuals experiencing loss of land,	No physical displacement envisaged, however, land acquisition will be determined once the right of way of the transmission line is finalized, where priority will be given to using state land, that is free from all encumbrances.	No physical displacement envisaged, however, land acquisition will be determined once the right of way of the transmission line is finalized, where priority will be given to using state land, that is free from all encumbrances.

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		assets, or access due to project activities, regardless of legal land ownership status. 3. **Compensation Framework:** ○ **Replacement Cost:** Compensate lost assets at full replacement cost without depreciation. ○ **Timely Disbursement:** Ensure compensation is provided before displacement occurs. 4. **Relocation Assistance:** ○ **Housing and Infrastructure:** Provide suitable housing options and access to essential services at relocation sites. ○ **Transitional Support:** Offer interim assistance to cover the period between displacement and the restoration of livelihoods. 5. **Livelihood Restoration:** ○ **Skill Development:** Facilitate training programs to enhance employment opportunities for PAPs. ○ **Financial Assistance:** Provide support to re-establish businesses or agricultural activities. 6. **Consultation and Participation:** ○ **Stakeholder Engagement:** Conduct meaningful consultations with PAPs,		

Sr. No	Policy/Plan	Description	Relevance of the project	Regulatory Requirement from Project
		ensuring their input influences resettlement decisions. ○ **Information Disclosure:** Provide clear and accessible information about resettlement plans and entitlements. 7. **Grievance Redress Mechanism (GRM):** ○ **Accessible Channels:** Establish multiple avenues for PAPs to voice concerns or complaints. ○ **Timely Resolution:** Ensure grievances are addressed promptly and transparently. 8. **Monitoring and Evaluation:** ○ **Internal Monitoring:** Regularly assess the implementation of resettlement activities to ensure compliance with the RAP. ○ **External Audits:** Engage independent parties to evaluate the effectiveness of resettlement measures. The policy underscores the importance of minimizing displacement and, when unavoidable, ensuring that affected individuals receive adequate support to rebuild their lives with dignity. It aligns with international best practices and legal frameworks to uphold the rights and well-being of displaced populations.		

3.2 World Bank and IFC Guidelines

The principal World Bank publications that contain environmental and social guidelines are listed below:

- World Bank Group General Environment, Health, and Safety (EHS) Guidelines
- World Bank Group EHS Guidelines for Power Facilities
- Social Analysis Sourcebook

In addition to the EHS Guidelines, IFC/World Bank sector specific EHS guidelines will also be used. These EHS guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These General EHS Guidelines will be used together with the relevant Industry Sector EHS Guidelines (Infrastructure Sector) which provide guidance to users on EHS issues.

3.2.1 World Bank Guidelines on Environmental & Social Aspects

The principal World Bank publications that contain environmental guidelines are listed below:

- Environmental Assessment Operational Policy 4.01. Washington, DC, USA. World Bank 1999;
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991;
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991; and
- Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998.

The first two publications listed here provide general guidelines for the conduct of an IEE/EIA, and address the IEE/EIA practitioners themselves as well as project designers. While the Source book in particular has been designed for the Bank projects, and is especially relevant for the impact assessment of large-scale infrastructure projects, it contains a wealth of information which is useful to environmentalists and project proponents.

3.2.2 IFC Performance Standards on Environmental and Social Sustainability and E&S Guidelines

Alongside local legislations, the project will also aim to abide by the IFC's Environmental & Social Guidelines, where these include:

- The IFC's Performance Standards on Environmental & Social Sustainability
- The IFC's General Environmental, Health, & Safety Guidelines
- The IFC's Industry Specific Environmental, Health, & Safety Guidelines for Electric Power Transmission & Distribution

A further breakdown into these guidelines, along with their applicability, and requirements from the project is provided below:

IFC's Performance Standards

The Performance Standards provide a framework to project developers for the management of environmental and social risks and impacts so that development opportunities are enhanced. The Performance Standards and their applicability to the project is highlighted below:

Table 3.3 - Project Screening as per IFC Standards

IFC PS	Applicability (Yes/No) and justification
IFC PS 1 Assessment and Management of Environmental and Social Risks and Impacts	PS1 applies to all projects that have environmental and social risks which require management and mitigation in line with the guidelines provided therein. Given that the project is expected to have various environmental and social impacts during its different phases, PS1 will be applicable.
IFC PS2 Labor and Working Conditions	PS2 lays down the requirements associated with ensuring a safe workplace, conducive to the fair treatment, non-discrimination, and equal opportunity of different types of workers involved. Given the project will involve, both directly and indirectly, a various number of laborers, the guidelines of PS2 will be applicable.
IFC PS3 Resource Efficiency & Pollution Prevention	PS3 aims to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities and by promoting the more sustainable use of natural resources. PS3 will be applicable given that the project will involve the use of non-renewable resources, e.g. water, and that there will be areas where pollution prevention measures can be implemented.
IFC PS4 Community Health, Safety, & Security	PS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. PS4 will not be applicable as there is no immediate community within the AOI of the

	project that stands to affected from project activities (given the current route).
IFC PS5 Land Acquisition & Involuntary Resettlement	PS5 lays out guidelines for addressing impacts that may arise associated with project related land acquisition and/or involuntary resettlement of persons and their assets (including physical displacement and economic displacement). PS5 is not applicable (as per the information available at this stage) as the land for the transmission line is not privately owned, and neither does it have any persons that reside on the land along the RoW or use it for any economic purposes e.g. agriculture.
IFC PS6 Biodiversity Conservation & Sustainable Management of Living Natural Resources	PS6 underscores the importance of protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources to ensure sustainable development. PS6 is not applicable to the project as there was no direct impact on biodiversity observed, e.g. no migratory bird pathway identified, no tree removal deemed necessary, and no critical or important habitats identified in the AOI of the project area.
IFC PS7 Indigenous Peoples	PS7 recognizes that Indigenous peoples are distinct from mainstream groups and are often the most marginalized and vulnerable, requiring specifically targeted interventions for mitigating project impacts and inclusion in projects. PS7 is not applicable as no Indigenous Persons exist in the project area, nor were identified during the visits carried out to the site.
IFC PS8 Cultural Heritage	PS8 recognizes the importance of cultural heritage for current and future generations, where the standard aims to ensure that cultural heritage is protected during any project implementation operations. PS8 is not applicable as there is no identified antiquity within the project AOI.

IFC EHS General Guidelines

The IFC's EHS General Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. These General EHS Guidelines are designed to be used together with relevant Industry Sector EHS Guidelines which provide guidance on EHS issues in specific industry sectors. The sectors covered in these guidelines include:

1. **Environmental**
   a. Air Emissions & Ambient Air Quality
   b. Energy Conservation
   c. Wastewater & Ambient Air Water Quality
   d. Water Conservation
   e. Hazardous Materials Management
   f. Waste Management
   g. Noise
   h. Contaminated Land

2. **Occupational Health & Safety**
   a. General Facility Design & Operation
   b. Communication & Training
   c. Physical Hazards
   d. Chemical Hazards
   e. Biological Hazards
   f. Radiological Hazards
   g. Personal Protective Equipment (PPE)
   h. Special Hazard Environments
   i. Monitoring

3. **Community Health & Safety**
   a. Water Quality & Availability
   b. Structural Safety of Project Infrastructure
   c. Life & Fire Sfety
   d. Traffic Safety
   e. Transportation of Hazardous Materials
   f. Disease Prevention
   g. Emergency Preparedness & Response

4. **Construction & Decommissioning**
   a. Environment
   b. Occupational Health & Safety
   c. Community Health & Safety

IFC EHS Guidelines for Electric Power Transmission & Distribution

The EHS Guidelines for Electric Power Transmission & Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

4 Analysis of Alternatives

4.1 Introduction

The screening of alternatives is a part of the ESIA process to select the best among all possible project options. The alternatives of a project are defined as the options that can help to meet the objectives of a project by different means including an alternative project site, technology or material, design or inputs.

Alternatives to the proposed project components include:

- The "no project" alternative
- Transmission line alternative

4.2 "No Project" Alternative

1. This project by nature is meant to be an accessory to the main project, i.e., the hybrid renewable energy project being established in Dhabeji from where energy will be off taken by the proposed transmission line. Coupling this with the overall rising prices of diesel being imported along with the dwindling natural gas reserves of the country, renewable energy projects are foreseen as the only sustainable solution to the energy shortfall being faced in the country. Hence, as such, the No Project Alternative is not foreseen as a viable option.
2. Route Alternatives – Whilst KE has carried out surveys and highlighted a tentative route for the transmission line, the ultimate responsibility for route finalization rests with the contractor. A set of guidelines in this regard, in line with the World Banks' mitigation hierarchy, have been prepared for adherence to by the contractor. These guidelines include ensuring that no land acquisition or involuntary resettlement are carried out, along with ensuring to avoid critical habitats and cultural heritage sites and graveyards.
3. Technical Alternatives – Deliberating on the use of and between overhead transmission lines and underground transmission lines, tower design & configuration alternatives (including tower type, height, span) to finalize the technically most feasible and acceptable option with minimal or easily manageable environmental & social impacts.

K Electric is responsible to supply electricity to Karachi and few parts of district Lasbela, Balochistan and District Thatta Sindh. However, due to growing population, expanding towns and increasing demands have put tremendous pressure on the K Electric's generation and distribution infrastructure. This project will not only help reduce the load shedding, it will also generate job opportunities, both during construction and operation phases, and provide energy to the industries such as in special economic zone (SEZ) and thus augment the economic growth of the country. By opting the No Project alternative, all the aforementioned benefits cannot be achieved. Therefore, No Project alternative is not a suitable option.

4.3 Transmission Line Alternatives (Technical)

4.3.1 Overhead Transmission Line v Underground Transmission Line

Positives

Overhead Transmission Lines

The initial costing for the installation of overhead T/L is cheaper than the installation of Underground transmission lines. Overhead T/L is a cost-effective choice in terms of both labor work and material usage and transfer for remote areas. Moreover, in the event of faults or damage (such as storm damage or broken lines), overhead lines are easier to inspect and repair. This reduces the downtime and cost of maintenance. Overhead T/L are also beneficial for quicker turnaround as their installation is faster because only stringing of wires between poles is required for their installation. In addition, given that the area is uninhabited and sparsely vegetated, overhead transmission lines will have minimal environmental disruption compared to the extensive excavation required for underground cables. Overhead lines are ideal for areas with barren land, as they can easily traverse long distances without requiring complex groundwork.

Underground Transmission Lines

Underground lines also serve several benefits in terms of aesthetics of the project site as these are invisible and do not interfere with the natural beauty of the landscape, their lesser vulnerability to weather conditions such as storms, high winds, or lightning, which makes them reliable and resilient in harsh environmental conditions and are protected from accidents like accidental cuts or fires. They also reduce the risk of tampering or vandalism, which can be a concern for overhead lines.

Negatives

Overhead Transmission Lines

While the project area is uninhabited, the visibility of overhead lines could still have an impact on the landscape. Overhead transmission lines can be vulnerable to weather events, such as strong winds, lightning, or ice storms. In the case of significant storms, there may be temporary outages. Overhead lines require significant right-of-way for installation and maintenance. However, since the land is barren and uninhabited with few areas being used for agriculture and cropping, this may not be a major issue in this specific case.

Underground Transmission Lines

Underground transmission lines, although provide aesthetic benefits but their installation and maintenance (fault detection and repair) are a complex process which is not only time consuming but also costly. The process involves extensive excavation, cable laying, and restoration of the land, making it a much more expensive option than overhead lines. Locating faults requires digging, which leads to longer downtime and

higher maintenance costs. Specialized equipment and skilled labor are also needed. The installation of underground lines requires significant time and effort, particularly in remote and barren locations. This could delay the project timeline.

Conclusion

Given the specific conditions of the site near Dhabeji, an overhead transmission line (OHTL) is the better choice as it will pose relatively lower environmental impact as there will be no need for extensive excavation. Moreover, the project location is not expected to have severe weather conditions thus, the concern of damage from weather event is also lower. Other than the environmental benefits, overhead transmission lines are also cost-effective and easy to install and maintain.

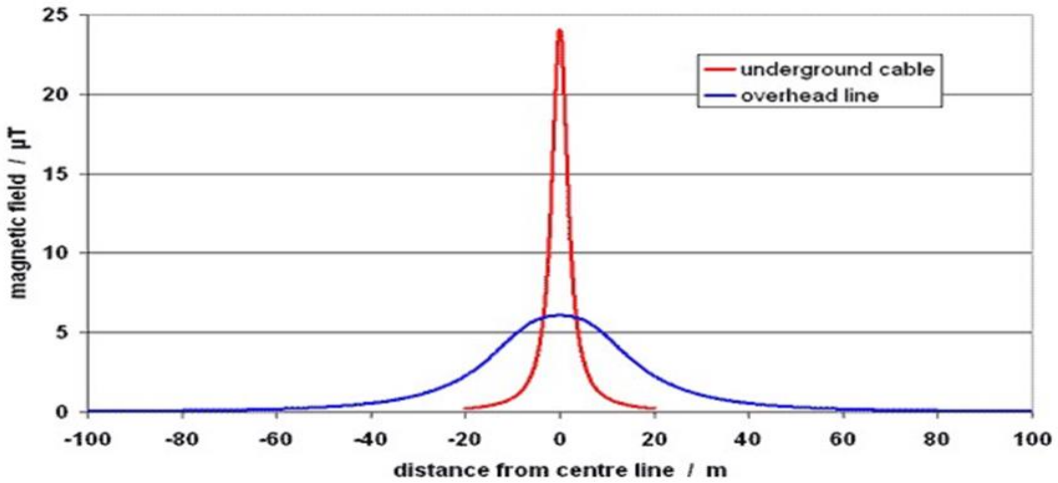


Figure 4.1 EMF effect comparisons between Underground and Overhead Transmission Lines
Source: http://www.emfs.info/sources/underground

4.4 Route Selection & Tower Siting Alternatives

The initial route was selected on the basis of technical feasibility, connectivity requirements, terrain, existing infrastructure and the objective of avoiding major settlements. Final route optimization will continue during detailed design through tower-level micro-siting.

The alternatives assessment will consider the following hierarchy:

1. avoidance of protected areas, settlements, structures, cultural sites and other exclusion areas;
2. avoidance of private land, crops, trees and livelihood assets wherever practicable;
3. avoidance of drainage channels, unstable ground and flood-prone areas;
4. avoidance of locations or spans showing concentrated bird activity or repeated target-species use;
5. reduction in the number and footprint of towers in sensitive locations;
6. adjustment of tower heights, span lengths and tower types;
7. modification of access routes and working areas; and

8. mitigation or compensation where impacts cannot reasonably be avoided.

For each tower identified as being within or near a sensitive receptor, the design team will document:

- the identified constraint;
- the alternative locations or designs considered;
- consultation undertaken;
- environmental, social, technical and safety considerations;
- the selected option; and
- the reason for selection.

The alternatives assessment will remain active until the design is finalized.

The proposed response to each of the constraints encountered, in line with GIIP, is highlighted below:

Table 4.1 - GIIP Alternative Analysis Recommendations

Constraint	Preferred response	Secondary response	Last-resort measure
House or occupied structure	Shift tower/span to avoid	Increase span or alter tower type	No encroachment within required safety clearance
Cultivated land	Shift to field boundary or uncultivated land	Schedule outside cropping period	Compensate crop and temporary access loss
Mature tree	Shift tower/access route	Restrict pruning	Compensatory planting and valuation
Drainage channel	Relocate tower outside channel and bank	Increase foundation protection	Site-specific hydraulic and erosion controls
Concentrated bird activity	Shift tower or high-risk span	Modify conductor configuration	Diverters and intensified monitoring
Private land	Use government/open land	Negotiate voluntary agreement	Apply formal land procedure
Cultural or religious receptor	Avoid	Establish agreed buffer	Specialist assessment and authority approval

5 Description of the Environment

5.1 General

This section provides baseline data (physical, biological, and socio-economic parameters) related to the project area. Information provided is both quantitative and qualitative, based on primary and secondary data sources, collected during site visits and desk studies.

The baseline information with relevant stakeholder consultation is required for scoping of potential environmental and social issues associated with the implementation of the project. On the basis of the baseline information, project interventions are assessed, and mitigation measures are proposed. The baseline information also helps to indicate specific issues to be monitored during project execution. A map of the project site is provided below:

5.2 Study Area

The project area falls under the jurisdiction of Thatta and Malir districts. The proposed transmission line route passes through the Thatta Division, encompassing Gujjo and Dhabeji towns along with their respective union councils, and extends into the Malir Division, covering Gadap Town and nearby sub-divisions and union councils. This alignment connects both administrative regions while traversing a mix of rural and semi-urban areas within the project corridor.

The macro environment and the route of the Transmission Line is shown in the **Figure 5.1.**

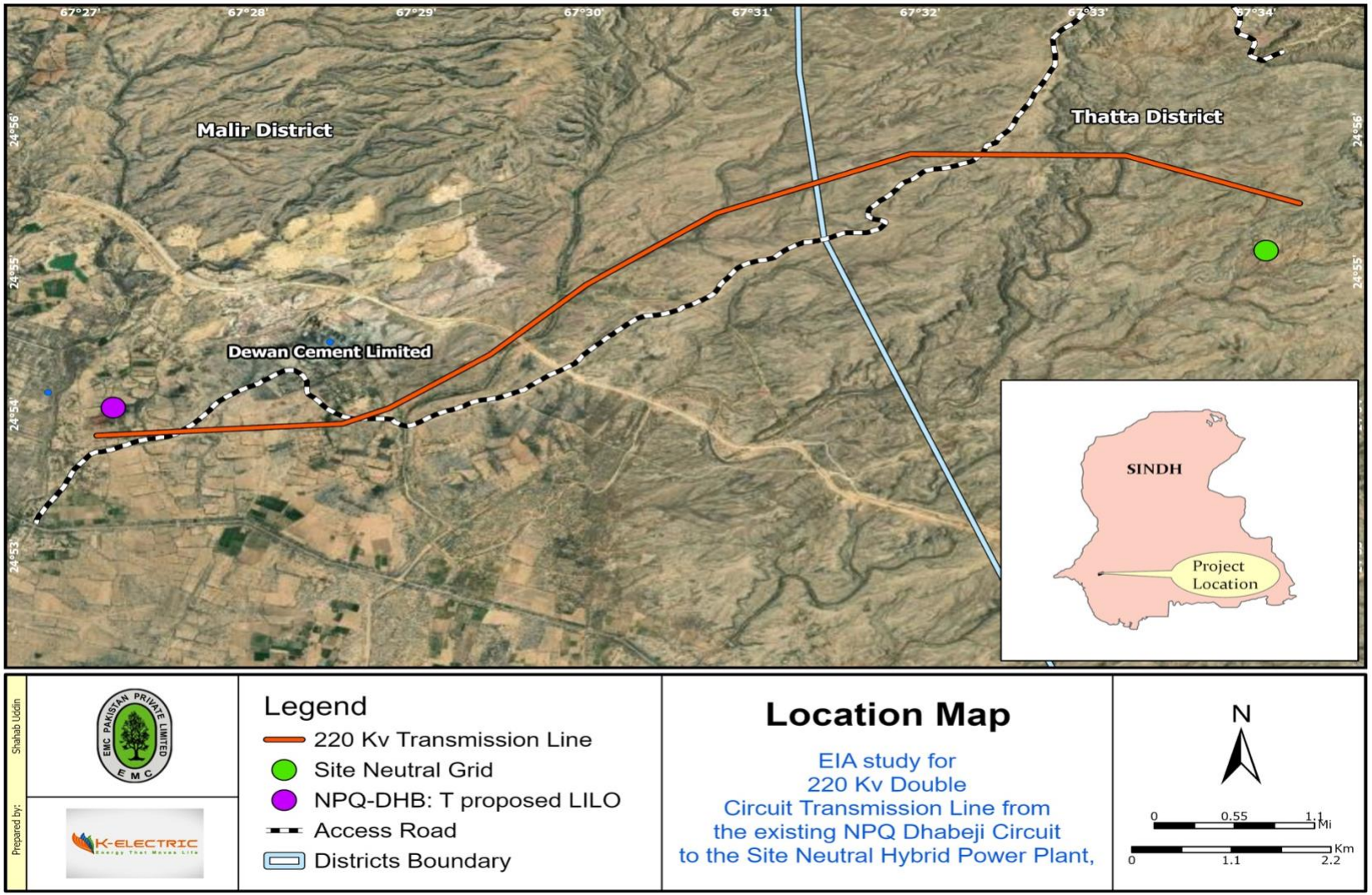


Figure 5.1 - Project Location

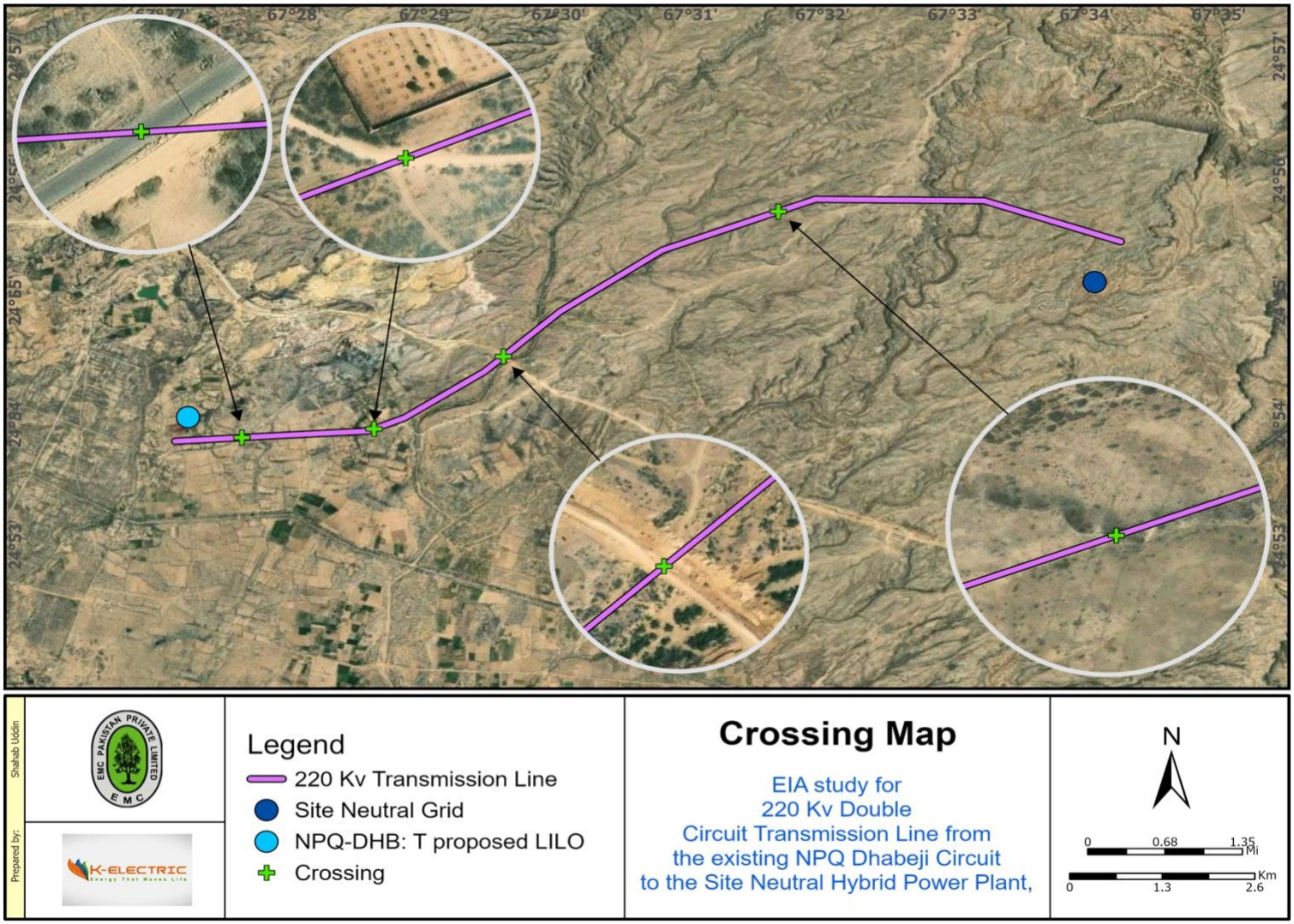


Figure 5.2 - Crossings along Transmission Line Route

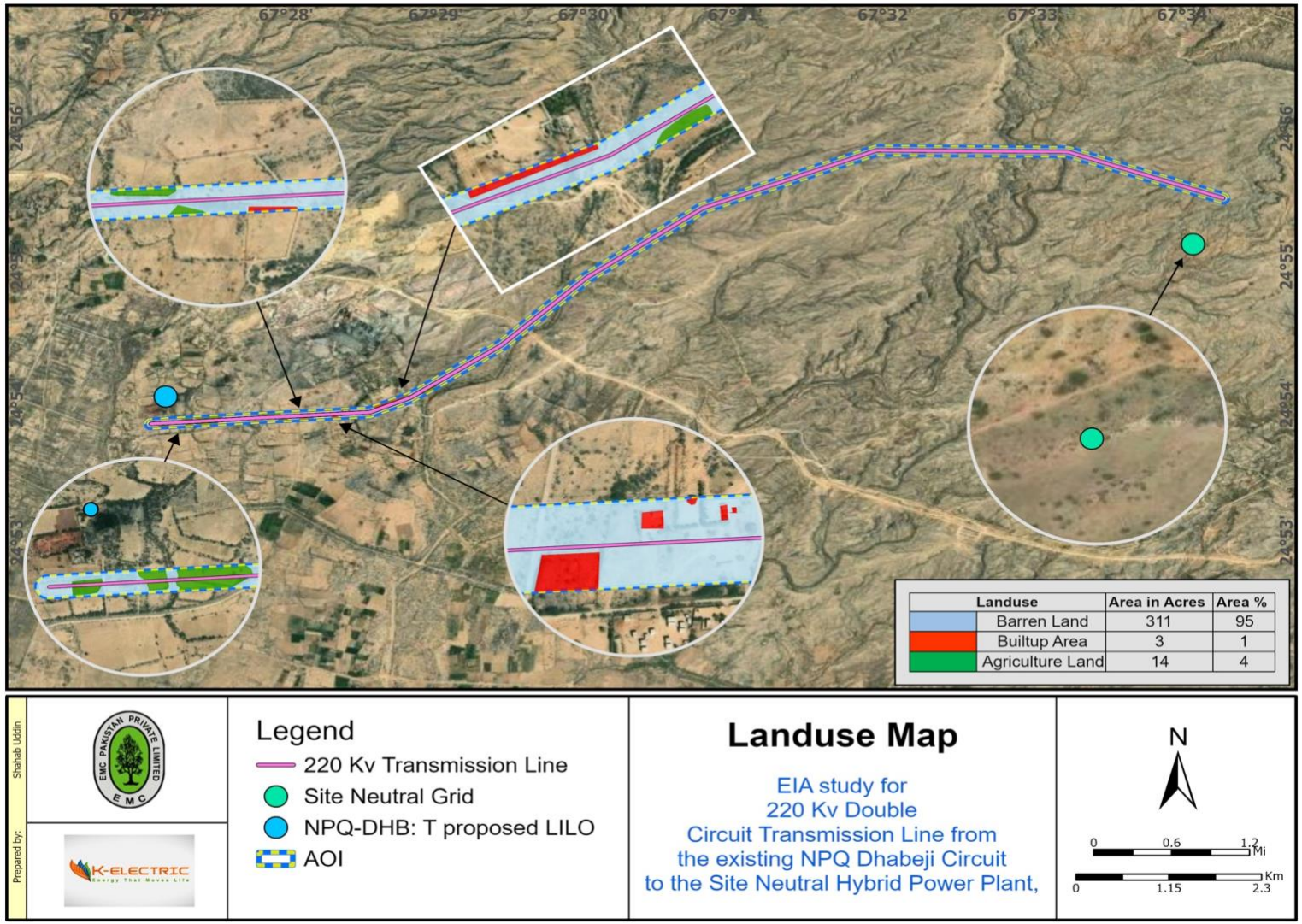


Figure 5.3 – Land-Use Map

Pictorial Views of Project Area















5.3 Physical Environment

The project area lies within the southern coastal plain of Sindh, which is characterized by flat, saline, loamy-sandy soils. In terms of water resources. There are no significant surface water bodies along the route, while slightly saline groundwater is accessed through boreholes.

The project area experiences high temperatures, dust storms, and occasional monsoon winds, and the ESIA will further assess the implications of wind loading, heat exposure, and moderate seismicity (Zone 2A) on project design and overall safety.

5.3.1 Land Use

The land use pattern along the RoW of the transmission line is pre-dominantly vacant, i.e., there are no persons or activities found taking place within the RoW (no occupation/ residence, no commercial activities formally or informally). At the time of the visit, the area was found to have portions where rain-fed vegetation had grown, however, this was only in sparse patches of land.

There is also no direct road or route that traverses the entire length of the RoW, requiring the team to take detours and diversions to travel effectively between the two end points of the transmission line, ensuring that most of the RoW is covered. Major crossings along the RoW for the project include:

- One point where the transmission line crosses the corridor of the K-IV project (where underground pressurized pipelines have been laid for the project), where the transmission line would pass over this project.
- One point where the KE transmission line would cross a transmission line in place by the National Transmission & Dispatch Company (NTDC), where a gantry will be set up to allow for the step down and step up of the KE transmission line to effectively cross the NTDC transmission line.

Alongside this, the transmission line RoW will also pass nearby from a shrine and the Dewan cement plant. Further details on the shrine are attached below in the cultural heritage section. A map of the items that the transmission line crosses is provided above in Figure 5.2, along with a land use map in Figure 5.3. Detailed Land use maps are also provided in the annexures attached to this report.

5.3.2 Topography

The topography map of the project area, located within Thatta and Malir districts, illustrates varying elevation levels along the proposed 220 kV double circuit transmission line route from the existing NPQ Dhabeji Circuit to the Site Neutral Hybrid Power Plant. The elevation ranges approximately from 30 meters to over 230 meters above mean sea level, indicating a gradual rise in terrain from the southwest (Thatta side) towards the northeast (Malir side). The southwestern section of the route predominantly consists of flat to gently sloping plains, while the northeastern section transitions into undulating and hilly terrain with higher elevation contours.

The topography along the alignment will influence numerous major factors including, the final alignment, pylon placement, foundation design, construction access, drainage management, and the extent of any potential environmental impacts. Steep or uneven terrain may require greater excavation, slope cutting and longer or specially designed foundations, increasing the risks of soil erosion, slope instability, sediment runoff and vegetation clearance, while low-lying depressions and natural drainage channels may be susceptible to flooding, scouring and obstruction of surface-water flows. Ridge-top locations may also increase visual impacts and expose towers to stronger winds, whereas valleys may require longer spans and may coincide with ecological movement corridors or concentrated bird activity. Accordingly, slope, elevation, drainage features, erosion susceptibility and ground stability should be incorporated into the GIS constraints map and pylon micro-siting procedure, with towers and access routes preferentially located on stable, gently sloping ground outside watercourses, flood pathways, unstable slopes and visually or ecologically sensitive landforms.

A map of the topographical conditions of the project site is given below.

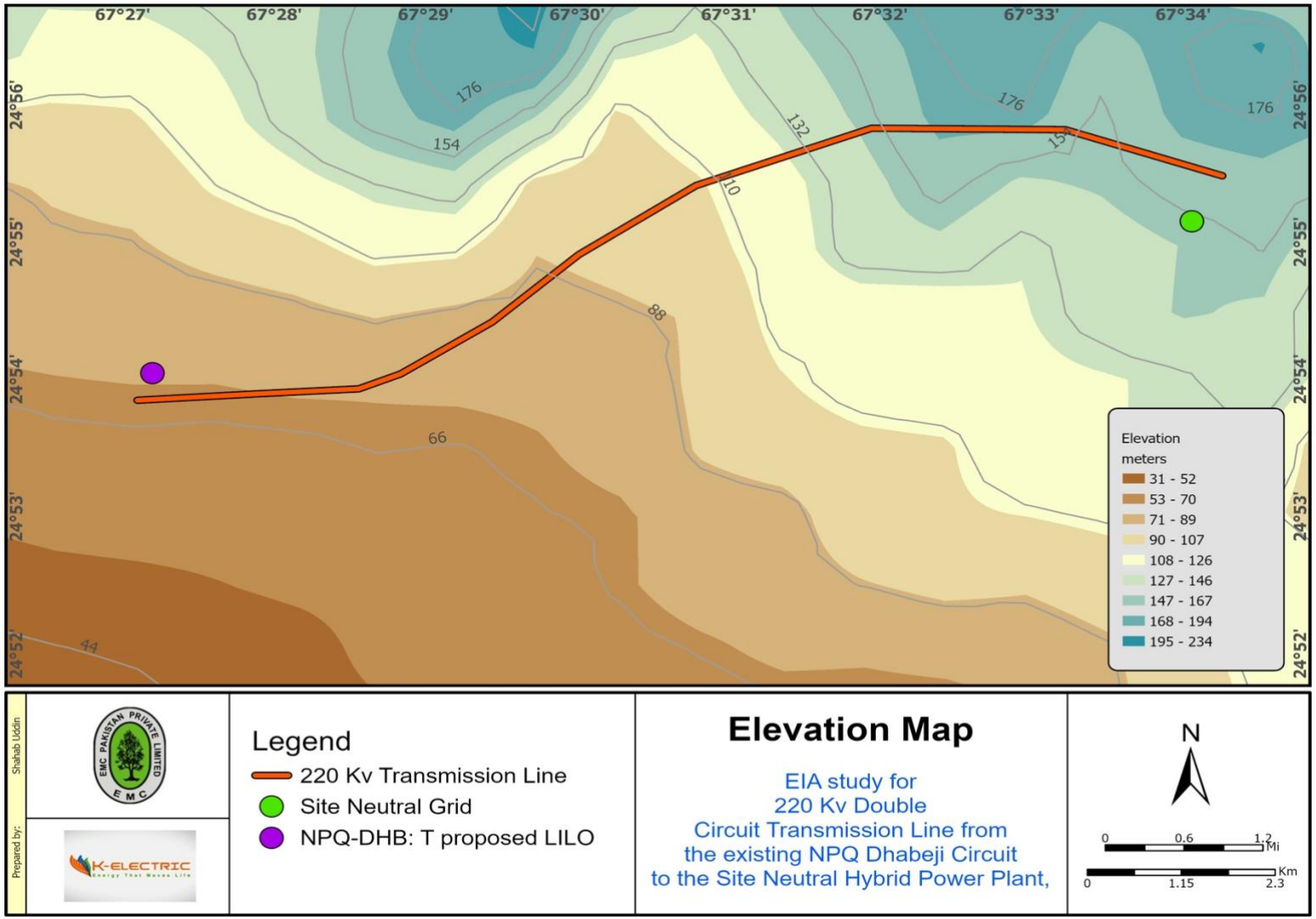


Figure 5.4 - Topographical Elevations Map

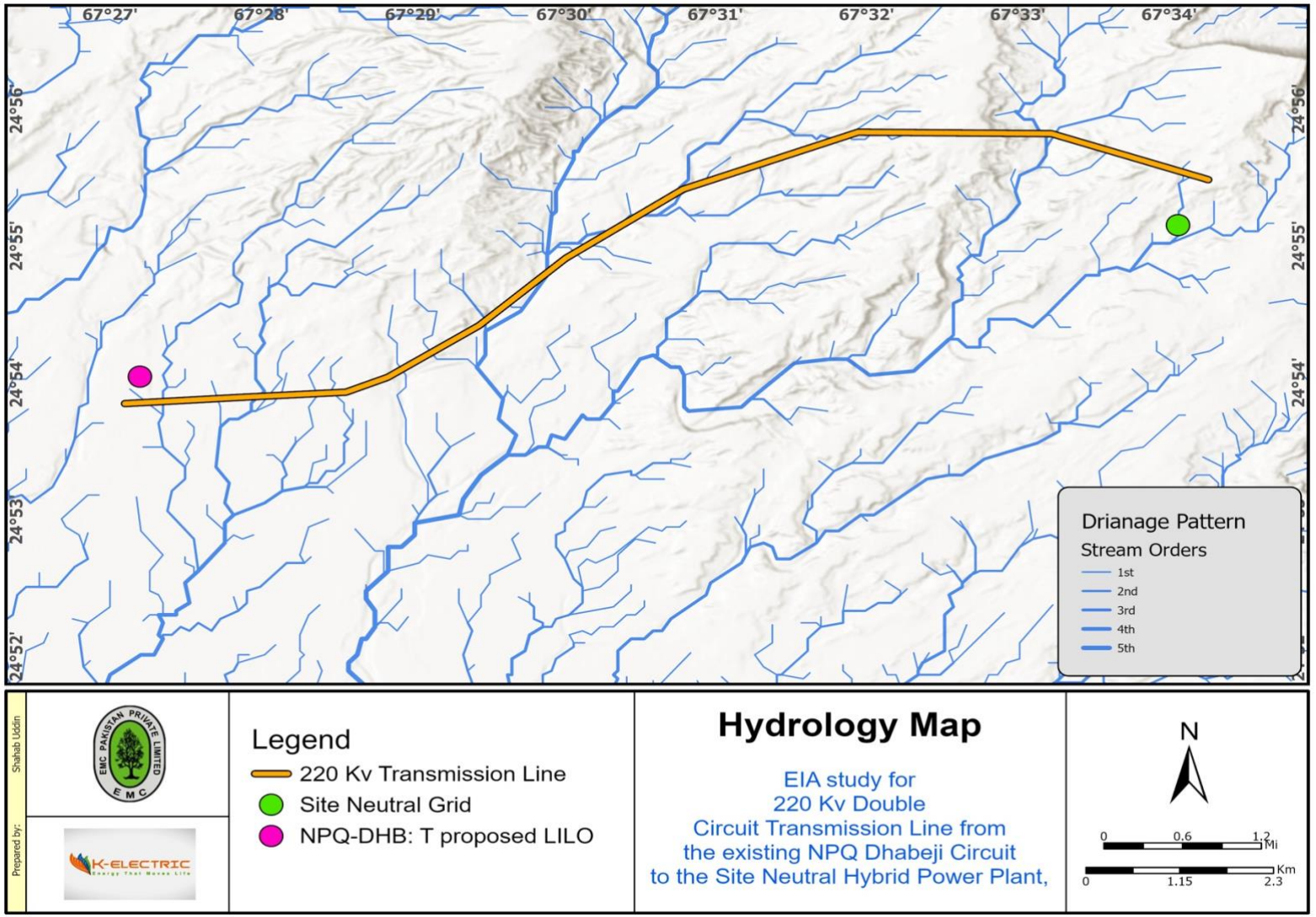


Figure 5.5 - Hydrology Map

5.3.3 Hydrological Resources

The hydrological setting of the area is primarily governed by the climatic conditions, geomorphology, and underlying lithology, which together influence the availability, movement, and quality of both groundwater and surface water resources. The hydrological conditions of the project area indicate a low to moderate groundwater potential with limited surface water availability. Both resources are constrained by the semi-arid environment and saline intrusion near the coastal zone. The barren nature of the land, minimal human settlements, and absence of major water bodies contribute to the overall low vulnerability of the project corridor to hydrological impacts.

Ground Water Resources

Groundwater in the project area occurs mainly within the alluvial and sub-coastal aquifers, which consist of unconsolidated sand, silt, and clay deposits. The depth to groundwater table varies significantly, generally ranging between 40 and 80 meters below ground surface, depending on the topographic elevation and seasonal fluctuations. The recharge of groundwater is primarily dependent on limited rainfall infiltration and, to a lesser extent, subsurface inflow from adjoining areas. Due to the arid climatic conditions and minimal recharge, groundwater availability in this region is relatively poor. The quality of groundwater is mostly brackish to saline, particularly in areas close to the coastline, as a result of marine water intrusion and high evaporation rates. Consequently, groundwater in most parts of the project corridor is not suitable for drinking or agricultural purposes without prior treatment or desalination.

At present, there are no major groundwater abstraction activities observed along the proposed transmission line route, and the project's construction and operational activities are not expected to exert significant pressure on local groundwater resources. Water required during construction will be sourced from authorized private suppliers to avoid depletion of local aquifers.

Surface Water Resources

The project area falls within a semi-arid zone where perennial surface water bodies are largely absent. There are no major rivers, lakes, or streams traversing the proposed transmission line alignment. Occasional seasonal runoff may occur during monsoon periods, resulting in temporary surface water accumulation in low-lying areas or natural depressions. These ephemeral flows are typically short-lived and do not form a permanent surface water network.

The hydrological characteristics along the transmission line route will influence tower siting, foundation design, construction scheduling and the management of surface water during both construction and operation. Consequently, the routing and pylon micro-siting process should incorporate hydrological constraints by avoiding watercourses, flood-prone areas and natural drainage pathways wherever practicable, while ensuring that appropriate setbacks, erosion and sediment control measures, and drainage management practices are integrated into the project design and

construction methodology. A Hydrological Map of project area and surroundings is provided in Figure 5.5.

5.3.4 Flood Risk

The flood risk classification of the project site is based on topography, hydrology patterns, and elevation data, categorizing the area into three zones: high (red), moderate (yellow), and low (green) flood risk. The proposed transmission line alignment, shown by the blue line, primarily passes through areas classified as low to moderate flood risk, thereby minimizing potential exposure to flood hazards.

The western portion of the route, located within District Malir near the NPQ–Dhabeji side, traverses barren lands with low flood susceptibility due to relatively higher elevation and established drainage features. Moving eastward, the central part of the alignment intersects a few moderate-risk zones associated with natural drainage channels and seasonal streams; however, these crossings are limited and manageable through proper design interventions.

The eastern section, within District Thatta, comprises slightly undulating terrain with ephemeral streams and local depressions, where flood risk remains low to moderate. Importantly, no part of the proposed alignment lies within major riverine floodplains, such as that of the Indus River.

Flood risk map of the project area is provided in the **Figure 5.7.**

5.3.5 Geology

Geologically, Thatta is formed of volcanic and sedimentary rocks of quaternary and tertiary and has the same composition as that of the Indus plain and the eastern desert zone of Pakistan containing the deserts of Cholistan, Nara and Thar. The soils are silt, clayey wet and saline. The natural vegetation found in the district can be divided into two categories-mangroves in the coastal or delta zone, and tropical thorns in the rest of the district. In terms of use, the lands in the district can be divided into five major categories; lands not available or fit for agriculture, those under arable agriculture, forests, rough grazing lands and areas under human settlements. River Indus bisecting the district (from Sujawal) from north to southwest, Kohistan or hill zone in the north and Northwest, areas put under year-round cultivation along river Indus through canals and tube wells, and coastal belt and delta area, are four broader topographical divisions of Thatta. Keenjhar Lake is another important physical feature and surface water resource of the district. District Thatta possesses a diversity of environmental features and resources since it carries all the environmental features of the province. The district has desert, hills/gravel rocks, rangelands, water bodies, delta, tidal flats, creeks, lakes, mangrove and riverine forests and irrigated agricultural lands.

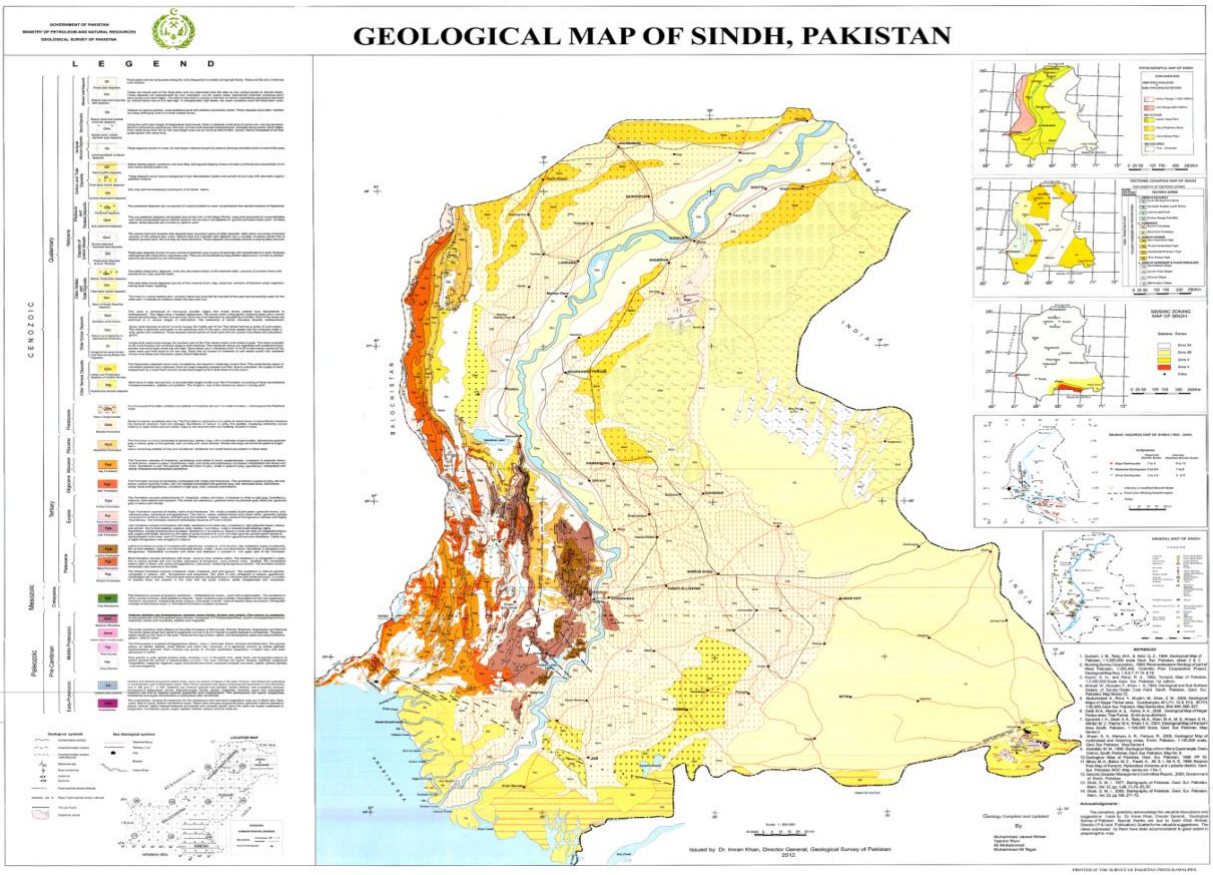


Figure 5.6 - Geological Map of Sindh

The geology map of the project area, which traverses through Thatta and Malir districts, reveals a diverse geological composition primarily dominated by Neogene sedimentary rocks, with limited occurrences of Paleogene formations and Quaternary deposits. The alignment runs mostly through Neogene sedimentary zones, indicating a landscape formed by consolidated sandstone, siltstone, and claystone sequences, typical of the Sindh Basin's middle to late Tertiary period.

In the Thatta region, the subsurface geology is largely represented by Quaternary alluvial sediments, which include unconsolidated sand, silt, and clay deposits derived from riverine and coastal processes. These layers are relatively soft and may require foundation reinforcement for heavy tower structures. Moving northwest into Malir district, the terrain transitions into Neogene sedimentary formations characterized by rocky outcrops and elevated ridges, offering a more stable base for structural installations.

The geological conditions along the transmission line route will influence the stability, constructability and long-term performance of tower foundations, as well as the environmental impacts associated with excavation and earthworks. Variations in bedrock, soil composition, weathered materials and geotechnical conditions may affect foundation requirements, excavation methods and the suitability of construction access, while areas of weak, fractured or unstable geology may increase the risk of ground settlement, slope failure and erosion. Geological characteristics also

determine the availability of suitable construction materials and the potential for groundwater interaction during excavation. Accordingly, geological and geotechnical considerations should be integrated into the routing and pylon micro-siting process to avoid unstable ground where feasible, optimize foundation locations, minimize excavation requirements and ensure that appropriate engineering and environmental mitigation measures are incorporated into the project design.

A map of the geological conditions along the transmission line route is provided below in Figure 5.8.

5.3.6 Soil Morphology

The soil morphology map of the project area, covering parts of Thatta and Malir districts, indicates that the region is predominantly characterized by lithosols, a soil type typically found in semi-arid and hilly terrains. These soils are shallow, coarse-textured, and stony, often overlaying hard rock or consolidated material. Lithosols exhibit low moisture retention capacity and limited organic content, making them less suitable for intensive agriculture but stable for infrastructure development, such as transmission line foundations.

In the Thatta side, the soil appears slightly more developed with occasional patches of cultivated land, reflecting alluvial influence from nearby plains. In the Malir district, the terrain transitions into rocky and rugged surfaces, where the lithosols become more dominant and less cohesive due to erosion and slope processes.

A map of the soil conditions along the RoW is provided below in Figure 5.9.

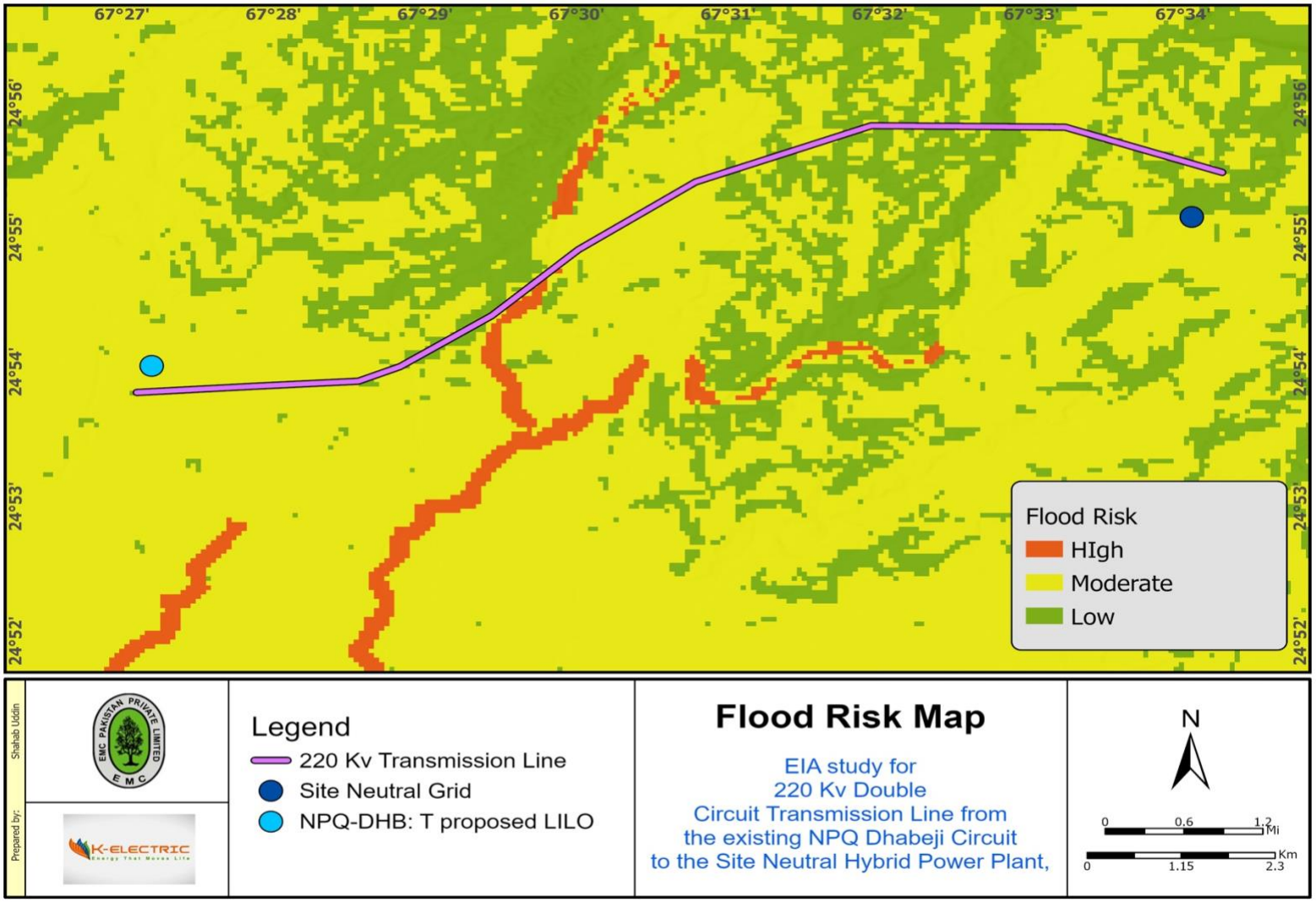


Figure 5.7 - Flood Risk Map

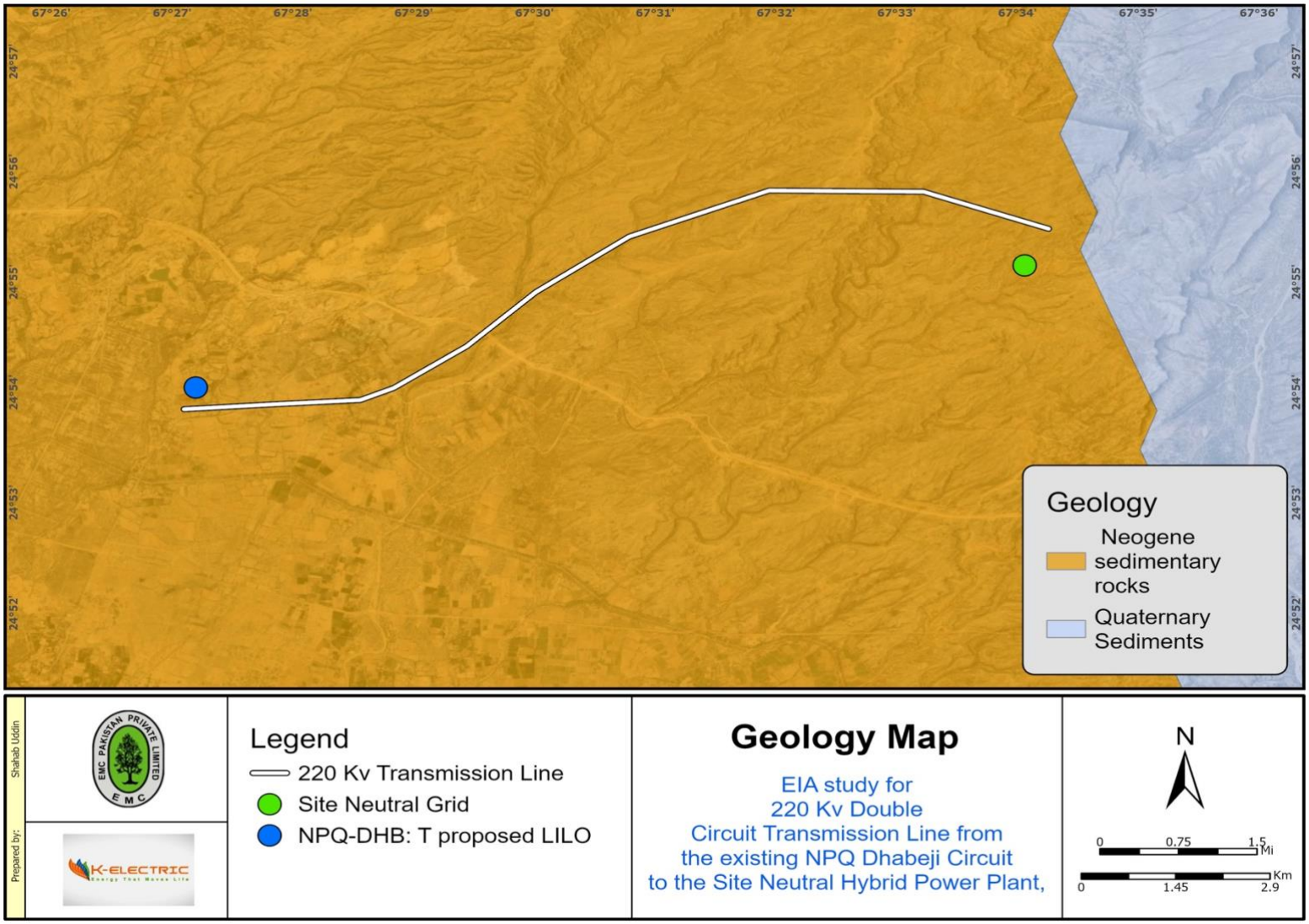


Figure 5.8 - Geology Map

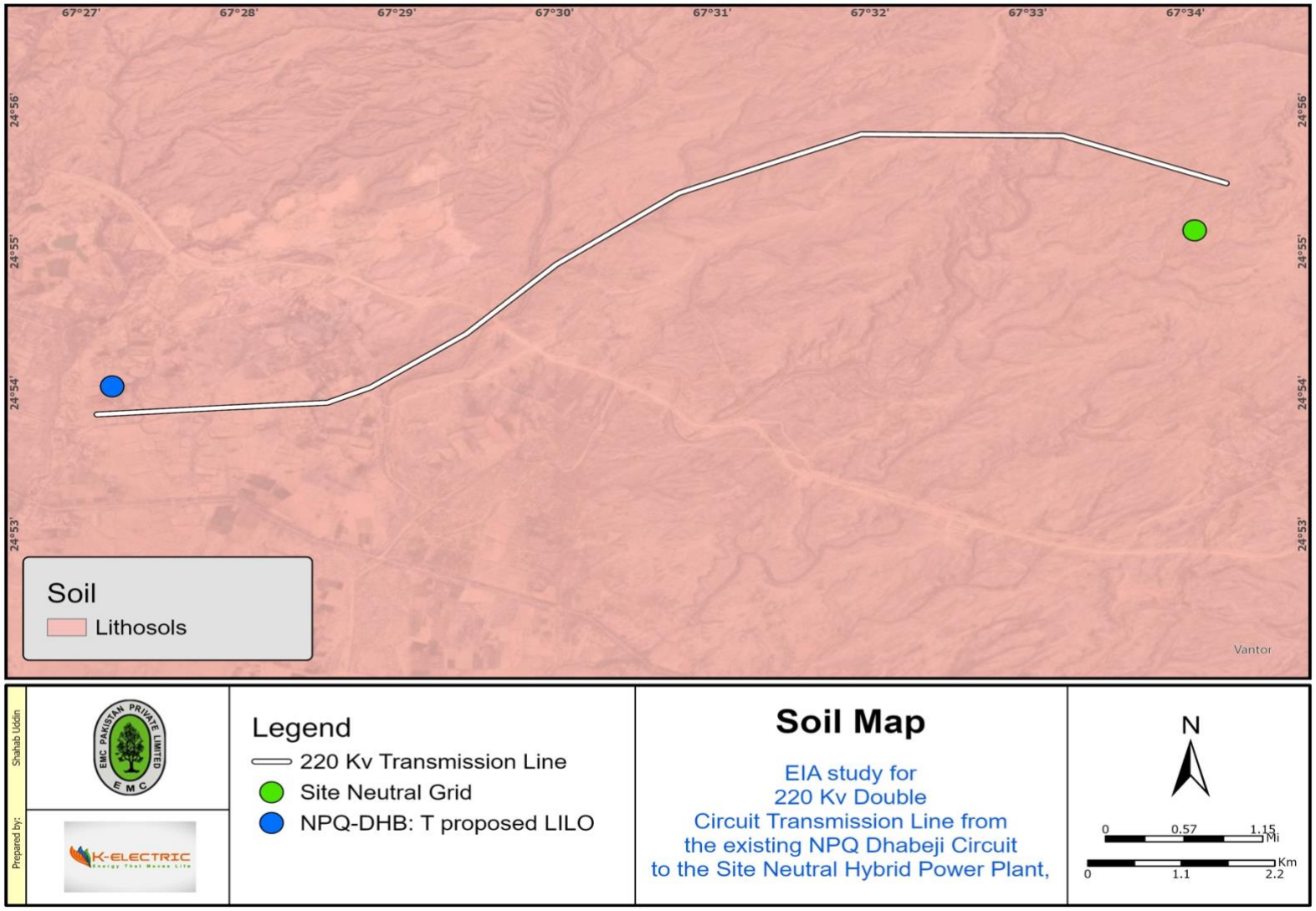


Figure 5.9 - Soil Map

5.3.7 Seismicity

Seismic activity in the region is the result of the triple junction as well as the Karachi Arc, located in southeastern Pakistan, as a large fold and thrust belt that shows Neogene thin-skinned eastward movement (Sarwar and DeJong, 1979; Schelling, 1999). Seismic activity in and around the region shows that the Karachi Arc has been active since long in prompting the eastward movement of the delta. It is possible that the movement is related to the rebound that takes place after mass shift. Sarwar has suggested that the eastward creep of Karachi Arc is directly related to active subsidence of the Hyderabad graben that underlies it and also defines the northern and southern limits of the Karachi Arc.[3] It may be added that subsidence such as that on Southern coast of Sindh, occurs naturally as a result of plate tectonic activity above active faults, and in places where fluid is expelled from underlying sediments and is common at river deltas that may have receded. Earthquakes arise and result from the release of the force along the growth fault plane. As a result, many different growth faults are created as sediment loads shift basinward and landward.

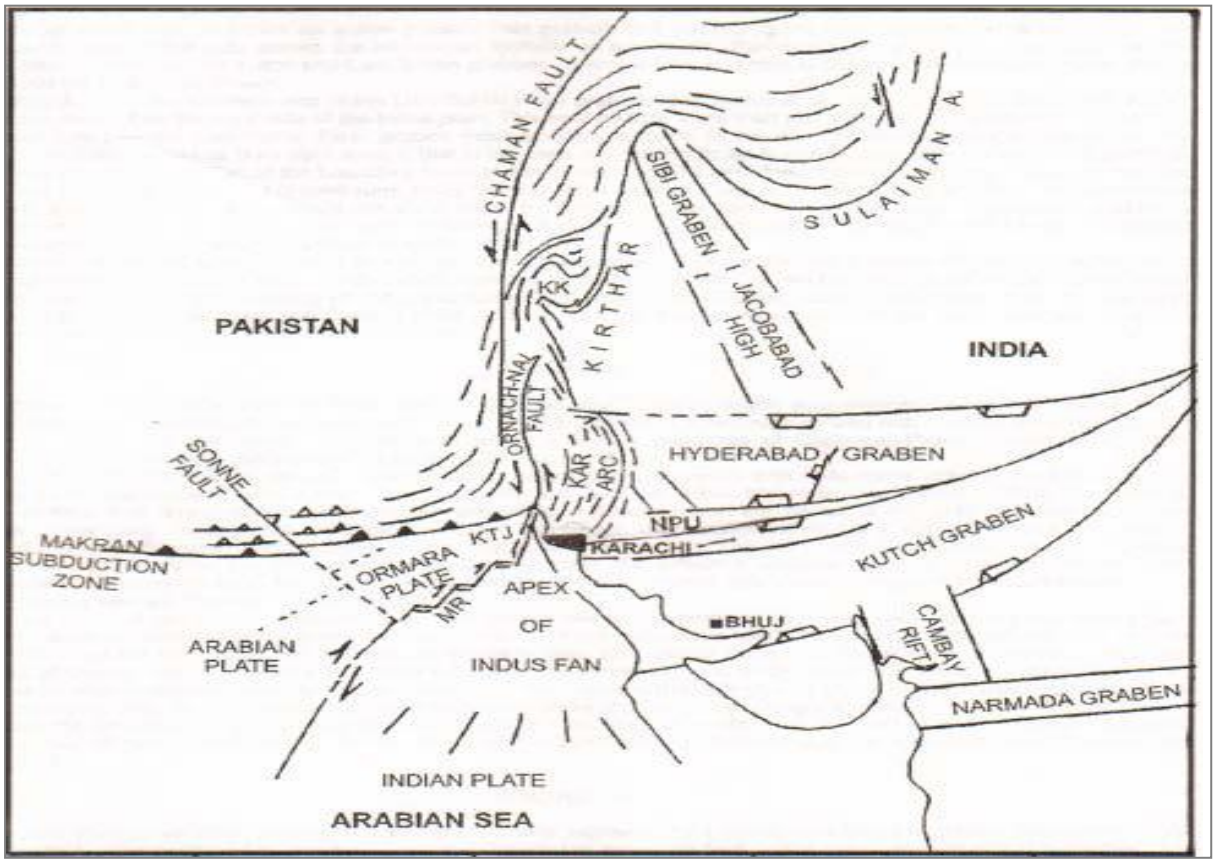


Figure 5.10 - Tectonic Plates Schematic Map

According to a map created by the Pakistan Meteorological Department, the country is divided into 4 zones based on expected ground acceleration. The areas surrounding Quetta, those along the Makran coast and parts of the NWFP, and also along the

[3] (Sarwar, G., 2004. Earthquakes and the Neo-Tectonic Framework of the Kutch-Hyderabad-Karachi Triple Junction Area, Indo-Pakistan. Pakistan Journal of Hydrocarbon Research, 14, 35-40).

Afghan border fall in Zone 4. The rest of the NWFP lies in Zone 3, with the exception of southern parts of this province, which lie in Zone 2. The remaining parts of the Pakistani coastline also lie in Zone 3. The remaining parts of the country lie in Zone 2. According to this classification, the Project site would be placed in Zone 2A.

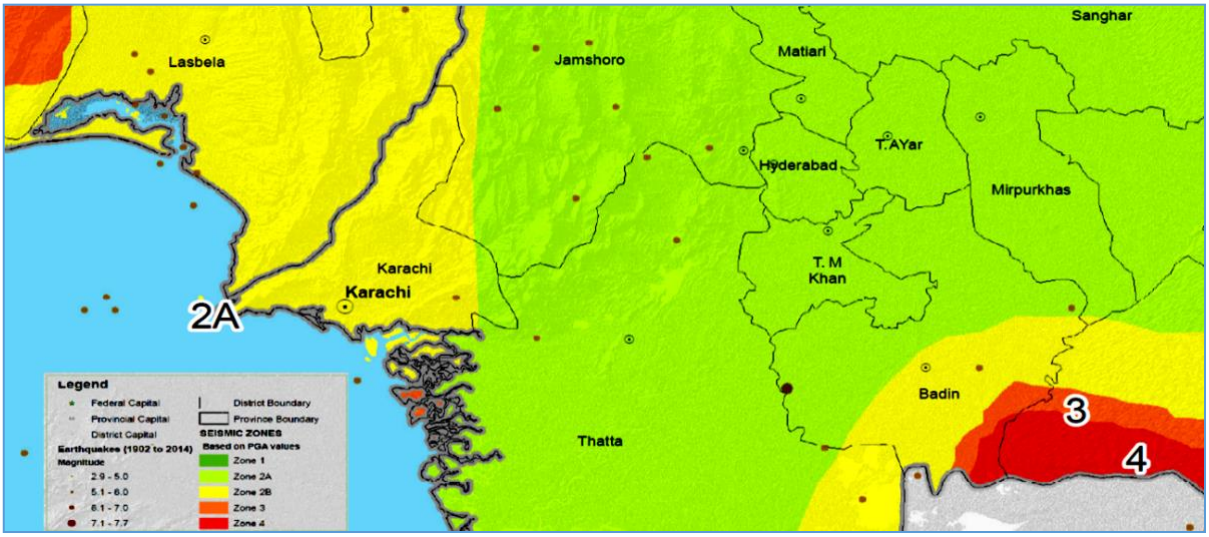


Figure 5.11 - Seismic Zones of Karachi & Thatta[4]

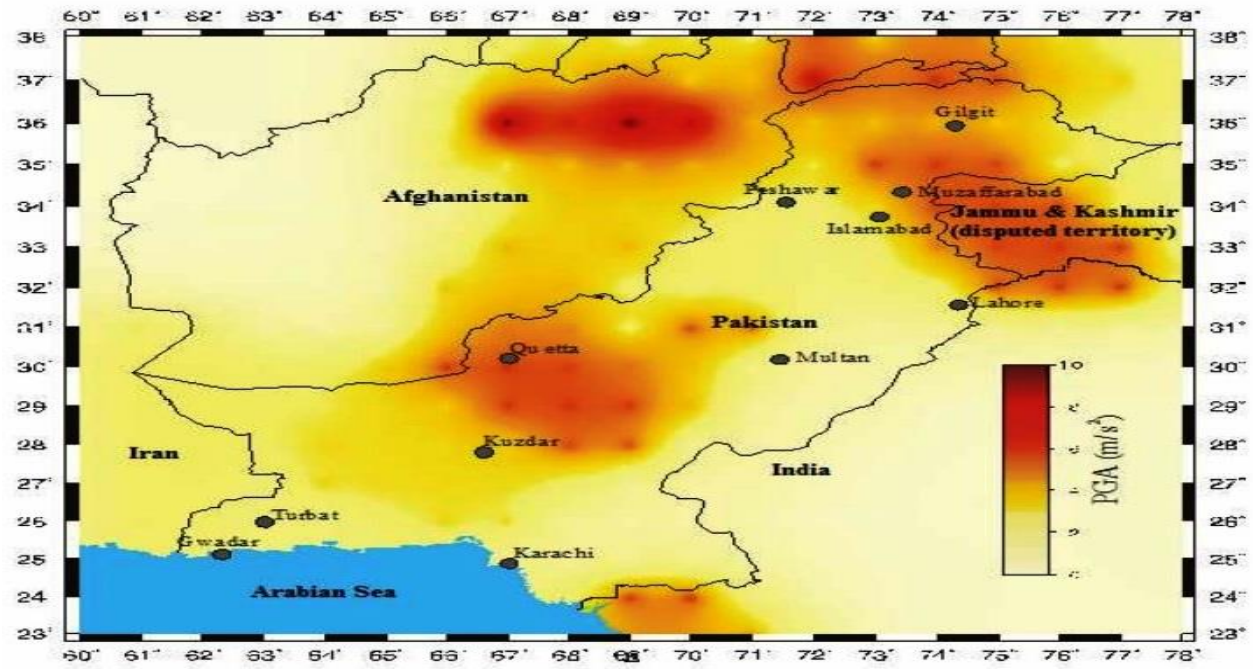


Figure 5.12 - Seismic Hazard for Pakistan in terms of Peak Ground Acceleration (PGA)5

[4] Map data source(s): PMD, GSP, Pakistan Engineering Council – Prepared by Al hasan Systems Private Limited

[5] PMD Seismic Monitoring and Early Tsunami Warning Centre - http://seismic.pmd.gov.pk/seismicnew/map2.html

5.4 Climate

This section touches upon the climatic conditions and trends within the districts where the project is proposed, along with the different areas along the route of the transmission line.

5.4.1 District Thatta

In Thatta, the summers are sweltering, muggy, arid, and windy; the winters are short, comfortable, and dry; and it is mostly clear year round. Over the course of the year, the temperature typically varies from 11°C to 39°C and is rarely below 8°C or above 42°C.

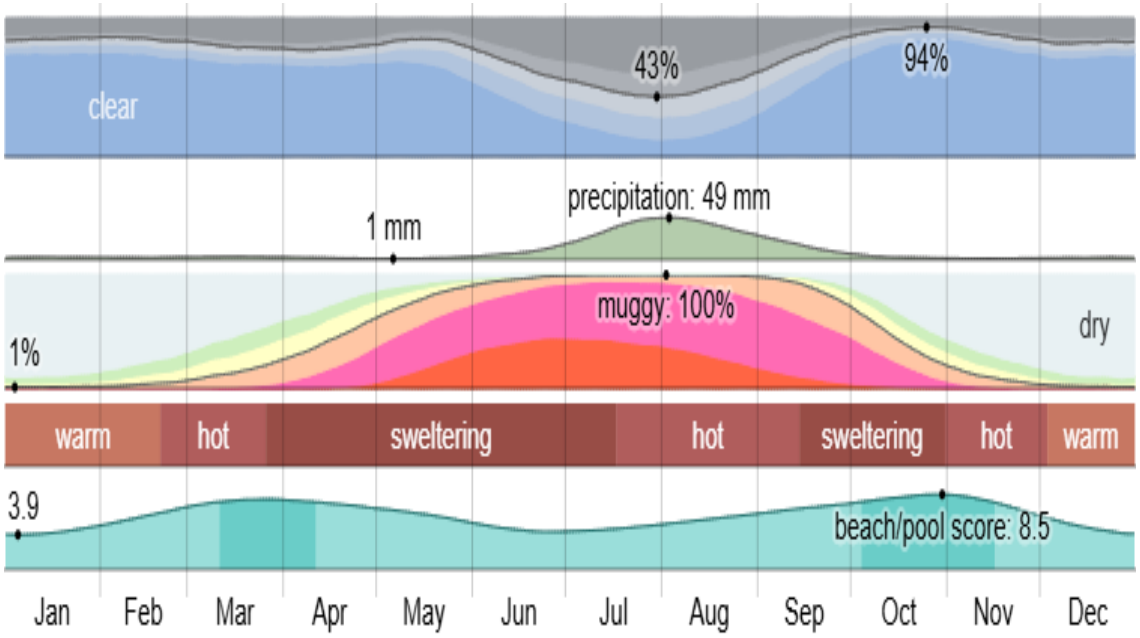


Figure 5.13 – Average Yearly Climate Conditions (District Thatta)

Temperature

In Thatta, the summers are sweltering, muggy, arid, and windy; the winters are short, comfortable, and dry; and it is mostly clear year-round. Over the course of the year, the temperature typically varies from 11°C to 39°C and is rarely below 8°C or above 42°C. The hot season lasts for 3.0 months, from April 3 to July 5, with an average daily high temperature above 36°C. The hottest month of the year in Thatta is June, with an average high of 37°C and low of 29°C.

The cool season lasts for 2.0 months, from December 10 to February 10, with an average daily high temperature below 28°C. The coldest month of the year in Thatta is January, with an average low of 12°C and high of 26°C.

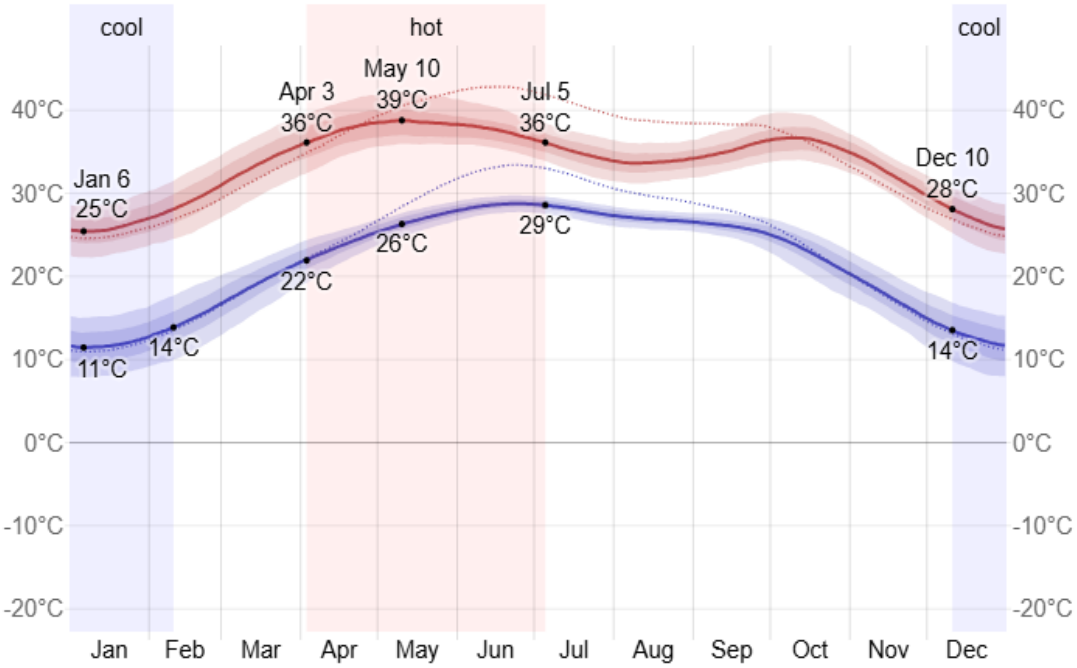


Figure 5.14 - Maximum & Minimum Temperatures (District Thatta)

Precipitation

The rainy period of the year lasts for 2.9 months, from June 24 to September 20, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain in Thatta is August, with an average rainfall of 42 millimeters.

The rainless period of the year lasts for 9.1 months, from September 20 to June 24. The month with the least rain in Thatta is November, with an average rainfall of 1 millimeter.

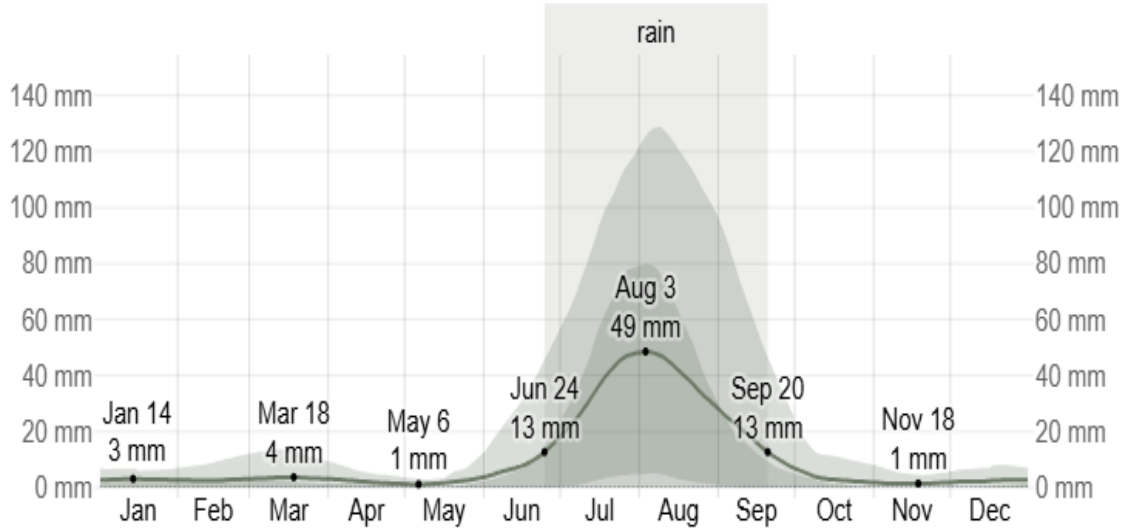


Figure 5.15 - Annual Average Precipitation (District Thatta)

Humidity

Thatta experiences extreme seasonal variation in the perceived humidity.

The muggier period of the year lasts for 6.8 months, from April 1 to October 27, during which time the comfort level is muggy, oppressive, or miserable at least 26% of the time. The month with the muggiest days in Thatta is July, with 30.9 days that are muggy or worse. The month with the fewest muggy days in Thatta is January, with 0.4 days that are muggy or worse.

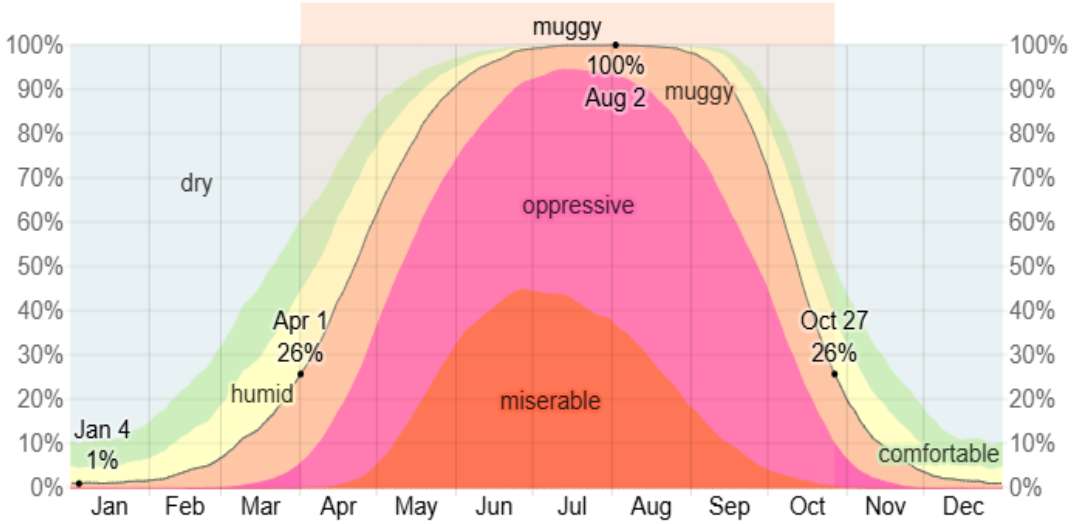


Figure 5.16 - Annual Average Humidity Levels (District Thatta)

Wind

The average hourly wind speed in Thatta experiences extreme seasonal variation over the course of the year. The windier part of the year lasts for 5.0 months, from April 15 to September 15, with average wind speeds of more than 5.0 meters per second. The windiest month of the year in Thatta is June, with an average hourly wind speed of 6.9 meters per second.

The calmer time of year lasts for 7.0 months, from September 15 to April 15. The calmest month of the year in Thatta is November, with an average hourly wind speed of 3.1 meters per second.

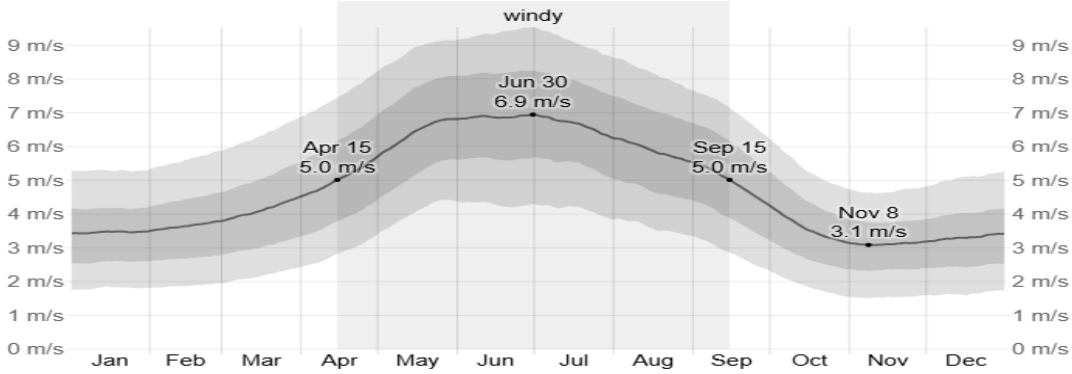


Figure 5.17 - Average Annual Wind Speeds (District Thatta)

The wind is most often from the west for 8.9 months, from February 10 to November 8, with a peak percentage of 93% on May 8. The wind is most often from the north for 3.1 months, from November 8 to February 10, with a peak percentage of 65% on January 1.

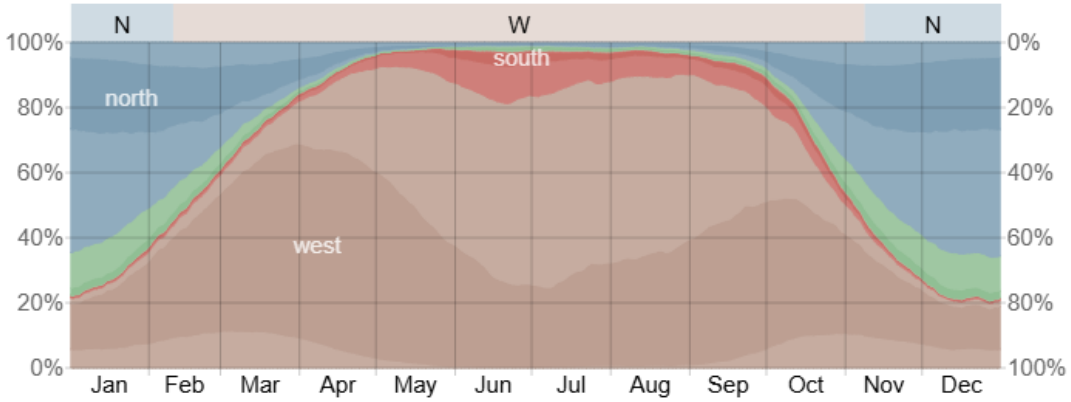


Figure 5.18 - Average Annual Wind Direction (District Thatta)

Cloud Cover

In Thatta, the average percentage of the sky covered by clouds experiences extreme seasonal variation over the course of the year. The clearer part of the year in Thatta begins around September 8 and lasts for 9.1 months, ending around June 12. The clearest month of the year in Thatta is October, during which on average the sky is clear, mostly clear, or partly cloudy 92% of the time. The cloudier part of the year begins around June 12 and lasts for 2.9 months, ending around September 8. The cloudiest month of the year in Thatta is July, during which on average the sky is overcast or mostly cloudy 52% of the time.

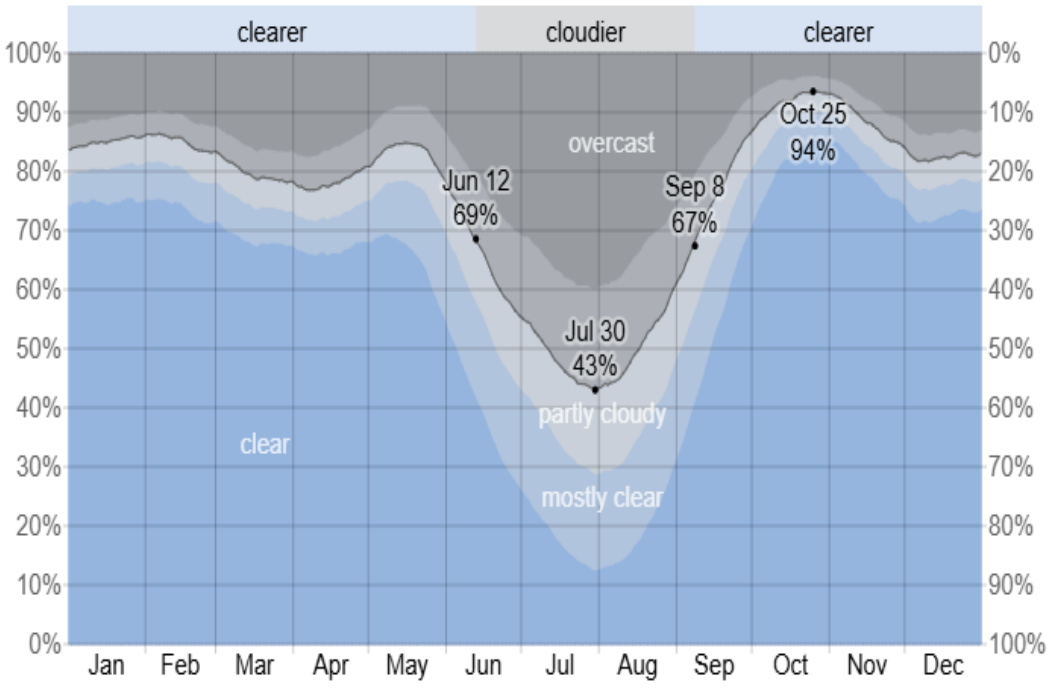


Figure 5.19 - Average Annual Cloud Cover (District Thatta)

5.4.2 District Malir, Karachi

In Malir, Karachi, the summers are hot, oppressive, arid, and windy; the winters are short, comfortable, and dry; and it is mostly clear year-round. Over the course of the year, the temperature typically varies from 12°C to 35°C and is rarely below 9°C or above 38°C.

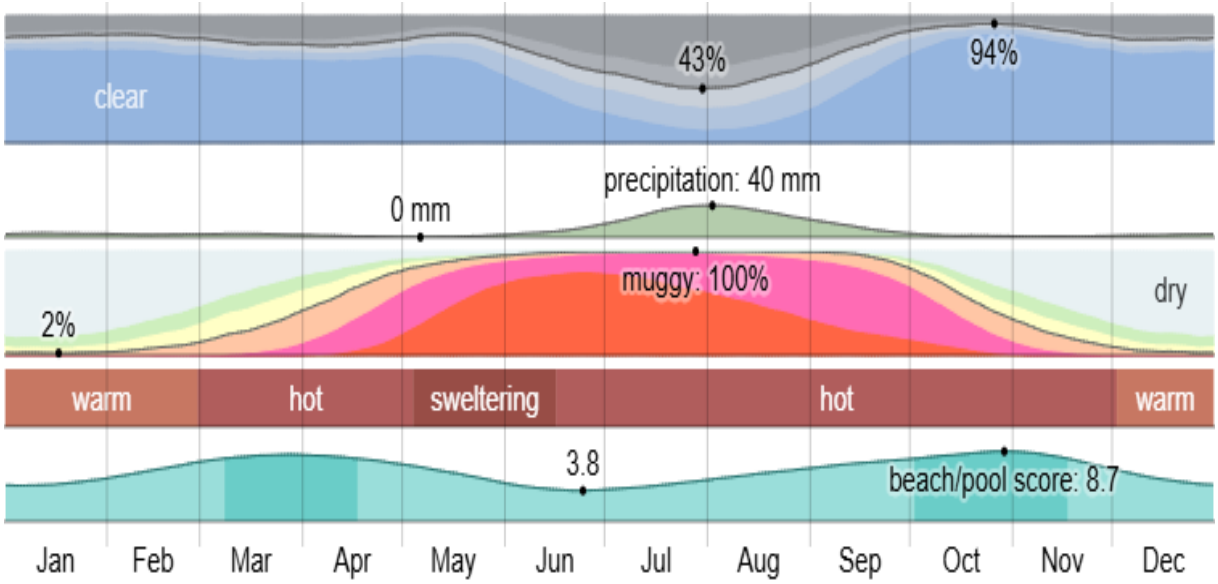


Figure 5.20 - Average Annual Climate (District Malir)

Temperature

The hot season lasts for 3.4 months, from March 31 to July 13, with an average daily high temperature above 33°C. The hottest month of the year at Malir, Karachi is June, with an average high of 35°C and low of 29°C. The cool season lasts for 1.8 months, from December 16 to February 11, with an average daily high temperature below 27°C. The coldest month of the year at Malir, Karachi is January, with an average low of 13°C and high of 26°C.

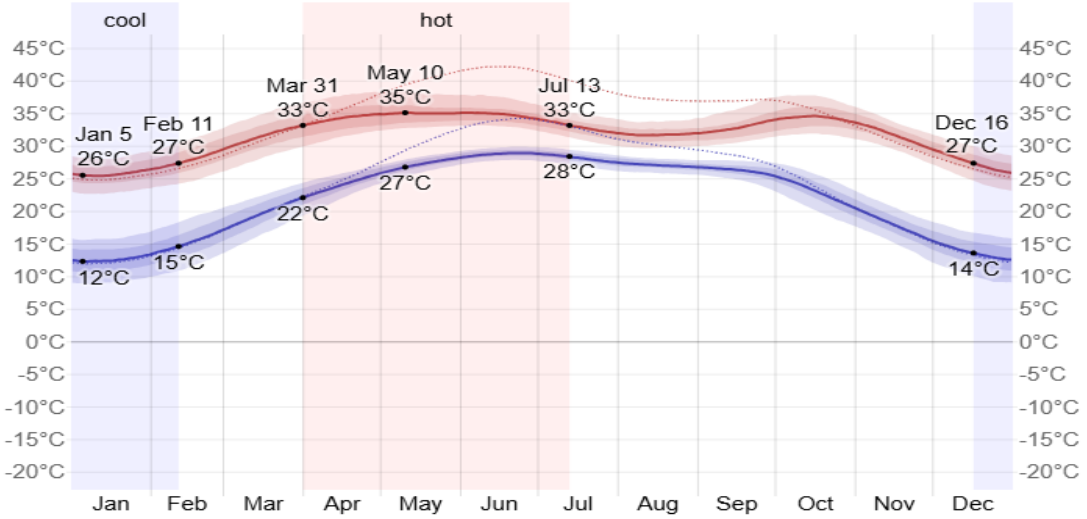


Figure 5.21 – Maximum & Minimum Temperatures (District Malir)

Precipitation

The rainy period of the year lasts for 2.7 months, from June 25 to September 15, with a sliding 31-day rainfall of at least 13 millimeters. The month with the most rain at Malir, Karachi is August, with an average rainfall of 34 millimeters.
The rainless period of the year lasts for 9.3 months, from September 15 to June 25. The month with the least rain at Malir, Karachi is May, with an average rainfall of 1 millimeter.

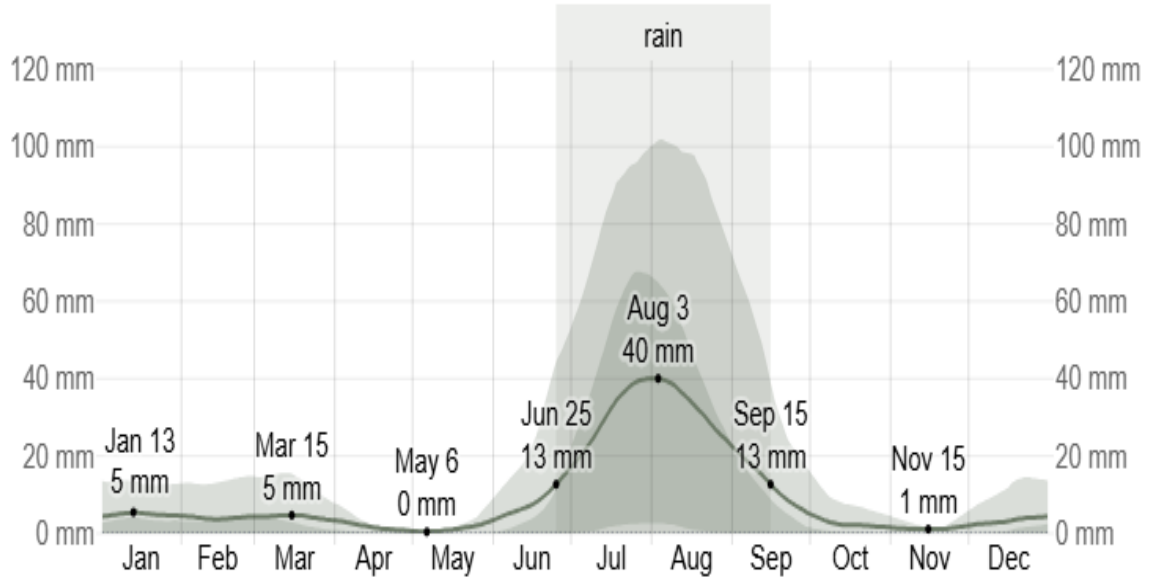


Figure 5.22 - Average Annual Precipitation (District Malir)

Humidity

Malir, Karachi experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 7.6 months, from March 18 to November 7, during which time the comfort level is muggy, oppressive, or miserable at least 27% of the time. The month with the muggiest days at Malir, Karachi is July, with 31.0 days that are muggy or worse.

The month with the fewest muggy days at Malir, Karachi is January, with 0.7 days that are muggy or worse.

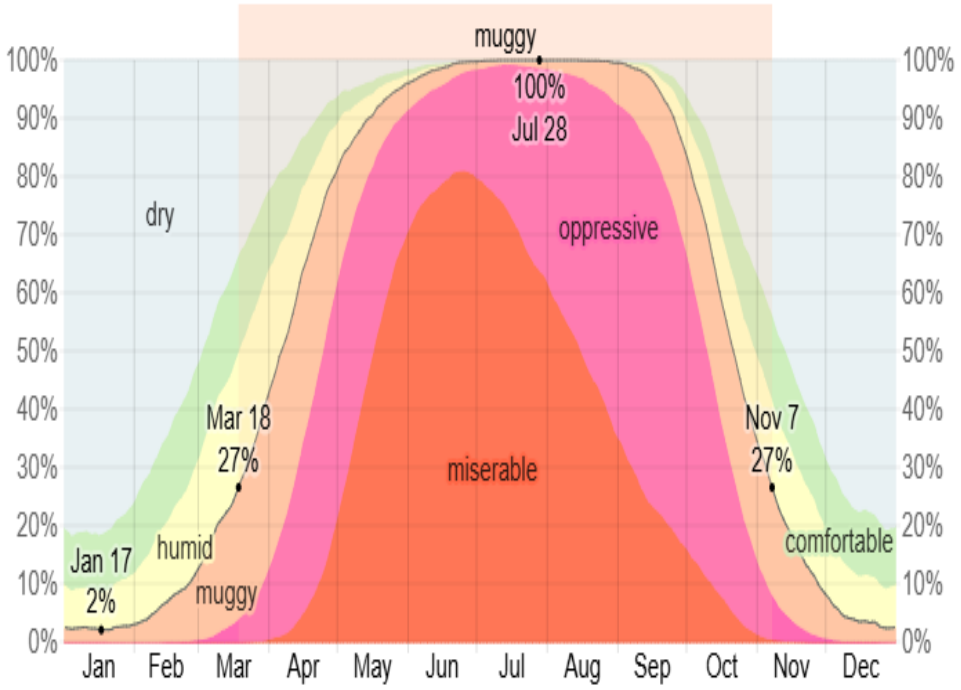


Figure 5.23 - Average Annual Humidity (District Malir)

Wind

The average hourly wind speed at Malir, Karachi experiences extreme seasonal variation over the course of the year. The windier part of the year lasts for 5.1 months, from April 15 to September 18, with average wind speeds of more than 4.9 meters per second. The windiest month of the year at Malir, Karachi is June, with an average hourly wind speed of 6.5 meters per second. The calmer time of year lasts for 6.9 months, from September 18 to April 15. The calmest month of the year at Malir, Karachi is November, with an average hourly wind speed of 3.1 meters per second.

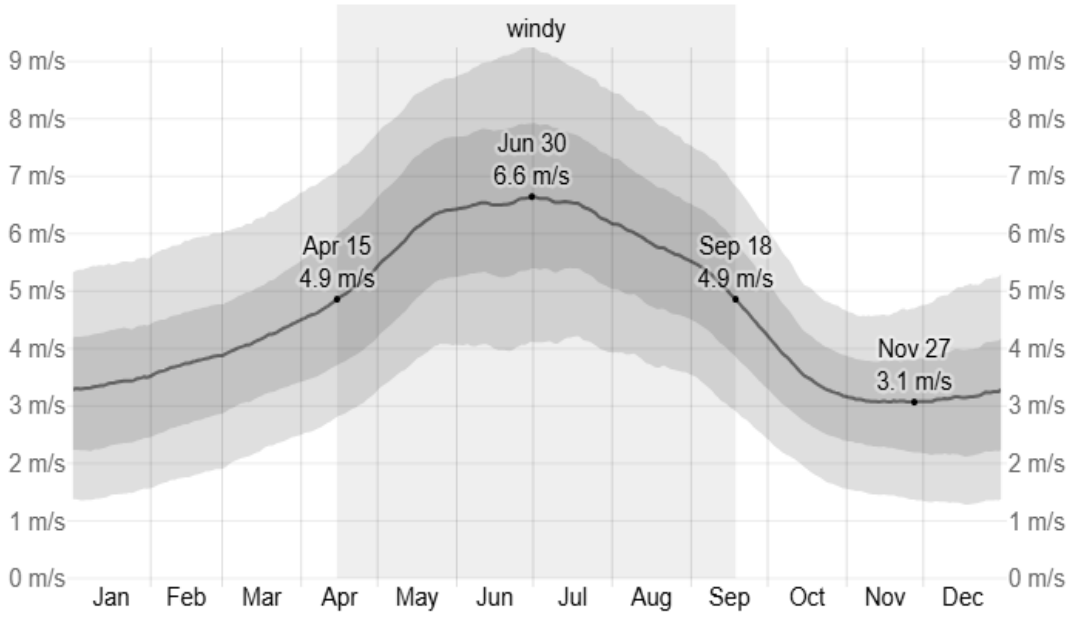


Figure 5.24 - Average Annual Wind Speeds (District Malir)

The predominant average hourly wind direction at Malir, Karachi varies throughout the year. The wind is most often from the west for 10 months, from January 18 to November 26, with a peak percentage of 93% on May 2. The wind is most often from the north for 1.7 months, from November 26 to January 18, with a peak percentage of 40% on January 1.

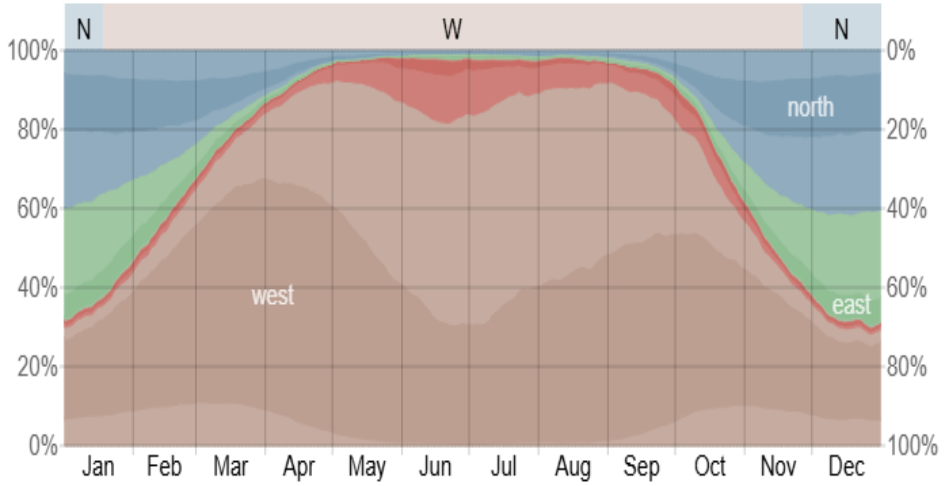


Figure 5.25 - Average Annual Wind Direction (District Malir)

Cloud Cover

At Malir, Karachi, the average percentage of the sky covered by clouds experiences extreme seasonal variation over the course of the year. The clearer part of the year at Karachi Airport begins around September 7 and lasts for 9.2 months, ending around June 12. The clearest month of the year at Malir, Karachi is October, during which on average the sky is clear, mostly clear, or partly cloudy 92% of the time. The cloudier part of the year begins around June 12 and lasts for 2.8 months, ending around September 7. The cloudiest month of the year at Malir, Karachi is July, during which on average the sky is overcast or mostly cloudy 52% of the time.

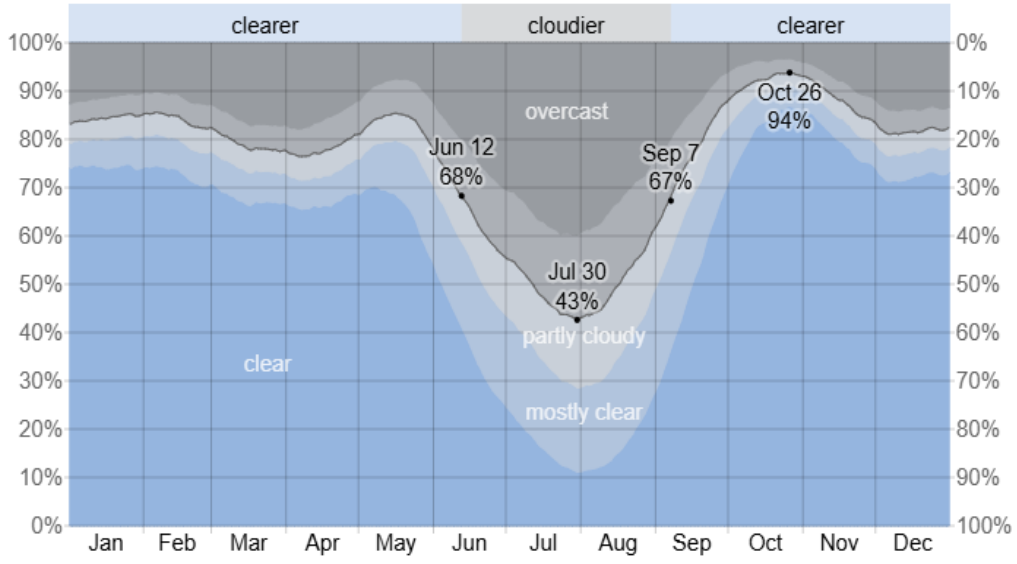


Figure 5.26 - Average Annual Cloud Cover (District Malir)

5.5 Environmental Monitoring

An environmental monitoring regime was carried out to observe and document the existing environmental conditions along the route of the transmission line.

5.5.1 Ambient Air Quality

Air quality monitoring was carried out within the project area to assess existing ambient air conditions. The selection of monitoring locations was based on the representativeness of surrounding activities such as industrial operations, vehicular movement, and local settlement influences. The monitoring results indicate that ambient air quality parameters were generally within the permissible limits of SEQS, reflecting minimal anthropogenic sources of air emissions within the vicinity. The project area itself is largely barren, with no significant industrial or construction activities contributing to air quality deterioration.

Table 5.1 - Ambient Air Quality Conditions

Parameter	Unit	SEQS	World Bank/IFC	AA-1 24.941775 67.565999	AA-2 24.920842 67.524425	AA-3 24.911575 67.482751	AA-4 24.939378 67.558762
Carbon Mono Oxide (CO)	mg/m3	5	NA	0.25	0.27	1.1	1.3
Oxides of Nitrogen as (NO2)	µg/m3	80	200	15.44	14.3	13.2	15.3
Oxides of Nitrogen as (NO)	µg/m3	40	NA	8.3	6.3	7.4	8.4
Ozone (O3)	µg/m3	130	100	9.3	8.7	10.7	13.3
Respirable Particulate Matter (PM-10)	µg/m3	150	50	20.8	17.5	19.3	22.4
Respirable Particulate Matter (PM-2.5)	µg/m3	75	25	7.9	9.3	10.3	11.3
Suspended Particulate Matter (SPM)	µg/m3	500	NA	44.3	41.5	57.3	49.9
Sulphur Dioxide (SO2)	µg/m3	120	20	2.4	2.2	2.4	8.3
Lead (Pb)	µg/m3	1.5	-	BDL	BDL	BDL	BDL

5.5.2 Noise Quality

Noise level monitoring revealed that the ambient noise levels across most parts of the project area are generally within SEQS standards applicable for industrial zones.

However, elevated levels exceeding 64 dBA were recorded near the N-5 highway, primarily attributed to passing vehicular traffic. The predominant noise sources in the macroenvironment include light and heavy traffic, accompanied by background noise from coastal winds due to the open terrain. Given the barren nature of the project site and absence of human activity, the overall noise environment can be characterized as low to moderate.

Table 5.2 - Noise Levels

S.NO.	LOCATION/SOURCE	SEQS Limits: *75dB(A) *Leq		WBG – Guideline: *70dB(A) *Leq	
		Noise Level Readings			
		Coordinates	Minimum	Maximum	Average
1	NOISE 01	**24.9416980174, 67.5664714075**	63.3	63.9	63.6
2	NOISE 02	**24.9212565248, 67.5256806909**	62.4	63.2	63.0
3	NOISE 03	**24.9138793839, 67.4773982144**	64.1	64.9	64.5
4	NOISE 04	**24.9206772948, 67.3928248525**	62.9	63.3	63.1

5.6 Description of Biological Environment

The project corridor traverses predominantly arid and semi-arid open land characterized by sparse scrub, scattered trees, disturbed ground and localized agricultural or grazing areas. No notified protected area, Ramsar site or Important Bird Area has been identified within the immediate project footprint. However, absence of a formal protected-area designation does not, in itself, indicate absence of ecological sensitivity.

The wider landscape provides foraging, perching and flight habitat for resident and migratory birds, including raptors and vultures. Accordingly, ecological sensitivity has been evaluated through both habitat observations and a dedicated year-long bird monitoring programme.

Vegetation clearance associated with individual tower pads is expected to be spatially limited. Nevertheless, tower locations, temporary working areas and access routes may affect scattered trees, shrubs, nesting habitat, drainage features and land used by birds and other fauna. These features will be verified during final micro-siting.

5.6.1 Flora

The project area is characterized by sparse vegetation, limited soil fertility, and exposure to strong coastal winds, which restrict the growth of dense flora. Vegetation is primarily composed of drought-resistant and salt-tolerant species adapted to arid conditions. No natural forests or protected green areas are located along or in proximity to the proposed alignment. The vegetation observed along the transmission line route is largely natural, composed of xerophytic and salt-tolerant plant species that have adapted to the harsh climatic conditions.

The native flora of the typical habitat as in project area is given in below list.

Table 5.3 - List of Flora

S. No	Botanical Name	Local and English Name
Trees and Shrubs		
1.	Prosopis juliflora	Mesquite
2.	Acacia nilotica	Kikar
3.	Tamarix aphylla	Tamarisk
4.	Salvadora persica	Pilu
5.	Azadirachta indica	Neem Tree
6.	Zizyphus mauritiana	Ber Tree
7.	Eucalyptus camaldulensis	Eucalyptus
8.	Parkinsonia aculeata	Jerusalem Thorn
Grasses and Herbs		
1.	Cenchrus ciliaris	Buffel Grass
2.	Panicum antidotale	Blue Panic Grass
3.	Cynodon dactylon	Bermuda Grass
4.	Eleusine indica	Goose Grass
5.	Tribulus terrestris	Puncture Vine
6.	Launaea nudicaulis	Desert Dandelion
7.	Fagonia indica	Dhamasa
8.	Boerhavia diffusa	Punarnava
Shrubs and Bushes		

1.	Calotropis procera	Aak
2.	Capparis decidua	Kareer
3.	Leptadenia pyrotechnica	Khip
4.	Suaeda fruticosa	Sea-blite (common near saline soils)
5.	Haloxylon recurvum	Lana bush
6.	Aerva javanica	Desert cotton
7.	Pergularia daemia	Cow vine
8.	Calligonum polygonoides	Phog

5.6.2 Fauna

The faunal population in the project influence area is relatively low due to harsh climatic conditions, scarcity of food, and lack of suitable habitat. Most animals inhabiting the area are well-adapted to arid environments and exhibit nocturnal or burrowing behavior to cope with high temperatures and limited water availability. The majority of species recorded or expected in the area belong to small mammals, reptiles, and a few amphibians. No endangered or protected species were identified within the project corridor.

The common fauna observed or expected in project area is given in below list.

Table 5.4 - List of Fauna

S. No	Scientific Name	Common Name
1.	Lepus nigricollis	Indian Hare / Desert Hare
2.	Herpestes edwardsii	Indian Grey Mongoose
3.	Funambulus pennantii	Five-striped Palm Squirrel
4.	Felis chaus (Jungle Cat	Jungle Cat – occasionally reported in rural fringes
5.	Canis aureus	Golden Jackal – rare and transient occurrence
6.	Calotes versicolor	Oriental Garden Lizard
7.	Varanus bengalensis	Bengal Monitor Lizard
8.	Hemidactylus frenatus	Common House Gecko
9.	Bufo stomaticus	Indian Toad – occasionally found after rainfall events

5.6.3 Avifauna

A dedicated bird monitoring programme was undertaken from April 2025 to March 2026 to characterize bird abundance, species composition, seasonal use and flight activity within the project landscape, where the survey comprised of 606 monitoring sessions, 1,818 observation hours, four vantage points, and coverage over all 12 months of the year.

Frequently recorded species include:

Table 5.5 - Avifauna in Project Area

S. No.	Common Name	Scientific Name	IUCN Red List Status
1	House Crow	*Corvus splendens*	Least Concern (LC)
2	House Sparrow	*Passer domesticus*	Least Concern (LC)
3	Common Myna	*Acridotheres tristis*	Least Concern (LC)
4	Black Kite (Common Black Kite)	*Milvus migrans*	Least Concern (LC)
5	Cattle Egret	*Bubulcus ibis*	Least Concern (LC)
6	Indian Pond Heron	*Ardeola grayii*	Least Concern (LC)
7	Little Egret	*Egretta garzetta*	Least Concern (LC)
8	Red-naped Ibis (formerly Black Ibis)	*Pseudibis papillosa*	Near Threatened (NT)
9	Red-wattled Lapwing	*Vanellus indicus*	Least Concern (LC)
10	Eurasian Collared Dove	*Streptopelia decaocto*	Least Concern (LC)
11	Eurasian Hoopoe (Common Hoopoe)	*Upupa epops*	Least Concern (LC)
12	White-throated Kingfisher	*Halcyon smyrnensis*	Least Concern (LC)
13	Red-vented Bulbul	*Pycnonotus cafer*	Least Concern (LC)
14	Tawny Pipit	*Anthus campestris*	Least Concern (LC)
15	Common Kestrel	*Falco tinnunculus*	Least Concern (LC)

Furthermore, the presence of large soaring birds, raptors, and vultures was also documented, where this is significant as it highlights groups that may be susceptible to collision with overhead conductors, particularly where lines cross frequently used flight paths or where visibility is reduced. The species identified as being of particular conservation interest are also identified below:

Table 5.6 - Avifauna of Conservation Interests

Common Name	Scientific Name	IUCN Red List Status
Steppe Eagle	*Aquila nipalensis*	Endangered (EN)
Eastern Imperial Eagle	*Aquila heliaca*	Vulnerable (VU)
Greater Spotted Eagle	*Clanga clanga*	Vulnerable (VU)
Tawny Eagle	*Aquila rapax*	Vulnerable (VU)
Cinereous Vulture	*Aegypius monachus*	Near Threatened (NT)
Eurasian Griffon Vulture	*Gyps fulvus*	Least Concern (LC)
Long-legged Buzzard	*Buteo rufinus*	Least Concern (LC)
Shikra	*Tachyspiza badia* (syn. *Accipiter badius*)	Least Concern (LC)
Brahminy Kite	*Haliastur indus*	Least Concern (LC)

The survey recorded flight height at 15-second intervals using three height bands. Based on the recorded observation time:

- Approximately 8.8% occurred in the lower height band;
- Approximately 11% occurred in the middle height band; and
- Approximately 80.3% occurred in the upper height band

The precise relationship between these survey height bands and the final conductor risk zone will be finalized once the tower heights, conductor elevations, and sag profiles have been finalized. The middle and lower flight bands should not be automatically interpreted as collision-risk height without this.

5.7 Description of Socio-Economic Environment

The social baseline chapter provides a comprehensive review of the socio-economic conditions of the project area. This socio-economic profile is based on a literature review and several primary data gathering activities including site visits, socio-economic surveys of stakeholders in the area and consultations with primary and secondary stakeholders. This social baseline provides an overview of the socio-economic conditions of the people who reside and work in the project vicinity. It also includes an assessment of public utilities and social services (education and health facilities) in the area.

The socio-economic baseline data in this chapter identifies the existing socio-economic trends in the area and the potential impacts of the project providing the basis for the development of a Social Management Plan. The social baseline is divided into the macro and microenvironments of the project area. The macro-environment encompasses the entire Malir District of Karachi under which project area is falling. The discussion on macro environment covers the administrative setup, demography,

education, health and utilities profile of the area. The project area is considered to be the micro-environment, encompassing key aspects such as education, healthcare, transportation, and utility infrastructure.

The project aligns with the United Nations Sustainable Development Goal primarily, SDG 7 (Affordable and clean energy) transmission will enhance the capacity and reliability of the regional power grid enabling the efficient transmission of electricity across long distances.

5.7.1 Macroenvironment

Administrative Context

Karachi, the capital of Sindh province, is the country's largest city and the main seaport. Located along the Arabian Sea, northwest of the Indus River delta, Karachi is an important economic and cultural center. Historically, it has been known by names like Caranjee, Currachee, and Kalachi-jo-Goth, meaning "the village of Kalachi. Over time, Karachi has grown into Pakistan's industrial, commercial, and financial hub, serving as a trade gateway to Afghanistan. The sprawling division of Karachi covers an area of 3,527 sq.km with the city's seven districts, namely, Karachi: Central, West, South, East, Keamari, Korangi and Malir. The Sindh Local Government Act (2013)[6] establishes a framework for organizing local governance by dividing Local Councils in rural and urban areas. The rural areas have District Councils with Union Councils (with a population between 10,000 to 25,000) as their constituting units. Whereas the urban areas are divided into the local councils based on their population.[7]

The word Thatta has been derived from the Persian word Tah Tah which literally means layer over layer. The term signifies the settlement of various civilizations in the area over time. The district is located between 23° 48" 44' to 25° 26" 35' North latitudes and 67° 20" 48' to 68° 44" 52' East longitudes. This district is bounded by Badin and Tando Muhammad Khan districts on the East, Jamshoro district on the North, Hyderabad district on the Northeast, Karachi district on the Northwest and the Arabian Sea and Runn of Kutchh on the South.[8]

The proposed project involves the installation of a 220 kV double-circuit transmission line in District Malir and Thatta. The line will pass through Bin Qasim Town in District Malir and Jung Shahi in Thatta Tehsil, District Thatta.

Demography

Karachi is ranked as the 12th most populous urban center in the world. The city witnessed rapid urbanization over the past few 17 decades, with the urban population growing from 5 million in 1998 to 20.35 million in 2023. The population is highly

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[6] Government of Sindh. (2013). *The Sindh Local Government Act, 2013* (Sindh Act No. XLII of 2013). Provincial Assembly of Sindh. https://www.pas.gov.pk/index.php/acts/details/en/31/218

[7] [2] Pakistan Institute of Legislative Development and Transparency. (2024). *Strengthening democracy and democratic institutions in Pakistan* (Publication No. 978-969-558-900-7). PILDAT. https://pildat.org/

[8] [3] https://pakistanalmanac.com/sindh-thatta-sajawal/

diverse, 18 comprising various ethnicities, languages, and religious communities, contributing to the city's rich cultural landscape.

The District of Thatta, located in Pakistan's Sindh province, has seen its population grow from 599,492 in 1998 to 1.08 million in 2023, though it remains predominantly rural, with just 17.88% of the population living in urban areas as of 2023. The region's demographics are characterized by a high degree of linguistic homogeneity, with Sindhi spoken as the first language by 95% of its residents.

Table 5.7 - Demography

Name of Administrative Unit	Area S.Q Kilometres	Population Density Per S.Q Kilometres	Total Population of the Area	2017- 2023 Average Annual Growth rate
Karachi Division	3,527	5779.10	20,382,881	4.10
District Malir	2,160	1,126.04	2,432,248	3.99
Sub-division Bin Qasim	447	722.40	322,915	4.50
District Thatta	8,570	126.39	1,083,191	1.65
Thatta Taluka	3,823	116.39	444,976	1.51
Source: Pakistan Bureau of Statistics (2023)				

According to the Pakistan Bureau of Statistics (2023), the project area spans across parts of Karachi Division and District Thatta, reflecting notable contrasts in demographic and spatial characteristics. District Malir covers 2,160 sq. km with a population of over 2.4 million and a density of 1,126.04, while Bin Qasim Sub-division—where part of the transmission line passes—has a smaller area of 447 sq. km and a population of 322,915, growing at a relatively higher rate of 4.50%. In contrast, District Thatta, covering 8,570 sq. km, has a much lower density of 126.39 and a population of around 1.08 million, with a growth rate of 1.65%. Thatta Taluka, specifically, has a population of 444,976 spread over 3,823 sq. km.

Table 5.8 - Religions of Persons

District	Total Population	Muslim	Christian	Hindu	Ahmedi	Castes	Sikh	Parsi	Other
Malir	2,432,248	2,333,721	44,015	38,028	617	2,162	439	5	749
Sub-division Bin Qasim	322,915	312,547	3,513	6,083	142	466	31	2	131
Thatta	1,083,191	1,047,467	2,892	26,978	43	4,671	10	1	1,129
Thatta Taluka	444,976	425,870	1,745	15,450	12	1,412	5	-	482
Source: Pakistan *Bureau of Statistic 2023*									

Based on data from the Pakistan Bureau of Statistics (2023), the religious composition across the project-affected districts of Malir and Thatta is predominantly Muslim. District Malir has a total population of 2,432,248, of which 2,333,721 are Muslims, followed by 44,015 Christians and 38,028 Hindus, with smaller populations of Ahmadis, Sikhs, Parsis, and others. Within Bin Qasim Sub-division, the majority of the 322,915 residents are also Muslim (312,547), alongside small Christian (3,513) and Hindu (6,083) communities. In District Thatta, out of a total population of 1,083,191, Muslims account for 1,047,467, with a significant Hindu minority of 26,978. Thatta

Taluka, which is part of the transmission line route, has 444,976 residents, including 425,870 Muslims and 15,450 Hindus. Minor religious groups such as Christians, Ahmadis, Sikhs, and others are present in very small numbers across both districts. These figures highlight the religious diversity of the area, with a dominant Muslim majority and varying minority distributions.

Cultural Heritage

There are no known archaeological or religious sites identified along the proposed transmission line route. The shrine found nearby the vicinity of the transmission line was not found to be an identified or notified antiquity, where the importance of the shrine was also discussed in stakeholder consultations with the people in the area, where no such cultural importance or value was ascertained.

Education

Education in Karachi reflects its status as Pakistan's largest urban and economic hub. The region is home to a wide range of educational institutions, catering to various levels of education from primary to higher education. For higher education, Karachi boasts prestigious universities such as the University of Karachi, Aga Khan University, and Dow University of Health Sciences, which attract students from across the country.

The education sector in the Thatta district stands in stark contrast to the large urban centers of Pakistan. The district has a very low overall literacy rate of 26.88%, with a notable gender gap (33.23% for males and 20.12% for females), reflecting significant educational challenges. Despite these issues, Thatta does offer opportunities for higher education, including a University of Sindh campus, Allama Iqbal open university and the Liaquat Institute of Medical and Health Sciences (LUMHS).

Table 5.9 - Educational Details

District Name	No. of Schools				Enrolment			Teacher		
	Boys	Girls	Mixed	Total	Boys	Girls	Total	Male	Female	Total
Malir	133	80	320	533	36,832	33,477	70,309	1,462	1,479	2,941
Thatta	400	150	426	976	55,219	33,930	89,149	2,286	1,058	3,344
Sub-Division/Taluka Wise Student Enrollment										
Bin Qasim					11,440					
Thatta					1,713					
Source: Sindh Education Management Information System (2023-2024)										

According to the Sindh Education Management Information System (2023–2024), District Malir has a total of 533 schools, with an enrolment of 70,309 students and 2,941 teachers. District Thatta has a higher number of schools (976) and a total enrolment of 89,149 students, supported by 3,344 teachers. Specifically, in the project-related sub-divisions, Bin Qasim has a student enrolment of 11,440, while Thatta Taluka reports 1,713 students, indicating limited educational access in some rural areas despite the overall presence of institutions.

Health

Karachi is home to a wide range of health facilities, offering both public and private healthcare services to meet the needs of its large population. Leading public hospitals such as the Civil Hospital Karachi and Jinnah Postgraduate Medical Centre provide comprehensive medical services. Private hospitals like Aga Khan University Hospital, Liaquat National Hospital, and Ziauddin Hospital are known for their advanced facilities and quality care.

Health facilities in District Thatta include both public and private sector options, though the system is challenged by weak infrastructure and significant access issues. Some major health services include hospitals, namely Aga khan University Hospital, Noori Surgical Service Hospital, Hope Hospital and Al Shifa Hospital.

Table 5.10 - Health Facilities

District	Teaching Hospitals		Civil, Major, Specialized, Taluka, Hospital		Dispensaries		Rural Health centers		T.B Clinics		Basic Health Unit		MCHC	
	No	Beds	No	Beds	No	Beds	No	Beds	No	Beds	No	Beds	No	Beds
Karachi	3	4,200	12	2,307	45	-	5	38	43	350	35	78	23	23
Thatta	-	-	2	310	14	-	6	59	10	-	22	46	-	-
Source: Sindh Bureau of Statistic 2024														

According to recent data, Karachi district is equipped with a robust healthcare infrastructure, including 3 teaching hospitals with 4,200 beds, 12 major hospitals offering 2,307 beds, and various dispensaries, rural health centers, TB clinics, basic health units, and maternal and child health centers (MCHCs). In contrast, Thatta district has a more limited healthcare setup, featuring 2 major hospitals with 310 beds, along with dispensaries, rural health centers, TB clinics, and basic health units, but lacks teaching hospitals and MCHCs. This disparity highlights the differences in healthcare availability between the two districts, with Thatta having fewer and smaller health facilities overall.

Utilities

In Karachi, the water supply is managed by the Karachi Water and Sewerage Corporation (KWSC). Additionally, the following entities 30 play roles in special aspects of water and sanitation: Sindh Local Government Department oversees municipal services, including water supply and sanitation in collaboration with KWSC and local 31 government bodies, while the Sindh Solid Waste Management Board (SSWMB) manages solid waste collection and disposal. According to the 2023 Census, 97% of households in Karachi have access to improved drinking water. The gas supply is managed by the Sui Southern Gas Company (SSGC) and the electricity

supply is provided by the K-Electric (KE). 89% of the households in Karachi use Sui Gas as fuel for 33 cooking, 6% use firewood, 4% use LPG/LNG cylinders and 1% use other sources.

In District Thatta, the provision of utilities is handled by different entities, with varied service reliability. Electricity is distributed by the Hyderabad Electric Supply Company (HESCO), though power plants like Thatta Power (Private) Limited also contribute power to the grid. The Sui Southern Gas Company (SSGC) manages the gas supply, having worked to expand its network to more areas. The Thatta Municipal Committee supplies surface water to the city of Thatta; however, the water is often contaminated, and many residents rely on poorly maintained reverse osmosis (RO) plants or other water sources.

Transport

Table 5.11 - Motor Vehicles on Road

Districts	Motor cars, Jeeps and station wagons	Motor cycles	Taxies	Rikshaws	Buses/Mini buses	Trucks	Tractors	Others	Total
Karachi	464,162	227,534	1,943	16,489	5,477	27,700	457	116,432	860,194
Thatta	1,598	-	-	6	22	50	78	1,111	2,865

Source: Sindh Bureau of Statistics 2024

According to the Sindh Bureau of Statistics (2024), Karachi district has a significantly larger and more diverse vehicle fleet, totaling 860,194 vehicles, including over 464,000 motor cars and jeeps, 227,000 motorcycles, taxis, buses, trucks, and other types. In contrast, Thatta district has a much smaller vehicle population of 2,865, with limited numbers of motor cars, rikshaws, buses, trucks, tractors, and other vehicles. This stark difference reflects the contrasting levels of urbanization and transportation infrastructure between the two districts.

5.7.2 Microenvironment

Administrative Context

The proposed project involves the installation of a 220 kV double-circuit transmission line, which will pass through the existing NPQ–Dhabeji Circuit (Bin Qasim Town, District Malir) to the SITE Neutral Hybrid Power Plant (Jung Shahi, District Thatta). The complete route will be 13.4 Km long, N-5 Link Road will provide access to the proposed project area.

Table 5.12 Administrative Details of Districts under Jurisdiction

S.NO	District	Year of Establishment	Status on YOE	Area	Governed By
1	Malir	2011	Restored	2,160	Karachi Metropolitan Corporation (KMC)
2	Thatta	1970	Created	8,570	Thatta District Council

Education and Health Facility

There are no education or health facilities located directly along the proposed transmission line route. The area is primarily rural, with limited access to basic social services. Nearby settlements rely on facilities located in more developed surrounding towns or villages.

Utilities and Living Condition

The nearby communities primarily rely on well water or water from local reservoirs for their daily needs. There is no access to electricity in these areas, and wood is the main source of fuel for cooking. Waste management practices are informal, with open dumping being commonly observed. These conditions reflect limited access to basic public services and infrastructure.

6 Anticipated Impacts & Mitigation Measures

6.1 Introduction

This chapter outlines the findings from the assessment of potential environmental and socio-economic impacts of the project and proposes appropriate mitigation measures. It includes the identification, analysis, prediction, significance, and characteristics of the impacts, as well as the proposed measures to prevent unacceptable adverse effects by incorporating necessary project modifications.

The chapter is a crucial component of the Environmental and Social Impact Assessment (ESIA), highlighting all significant impacts that may arise during the design, construction, and operation phases of the project. It also evaluates the environmental and social aspects identified through stakeholder consultations and the screening process, assessing their severity and recommending mitigation strategies based on these assessments. Additionally, residual impacts that may persist even after the implementation of mitigation measures are identified through professional judgment. The project proponent will adopt these measures to reduce, minimize, and compensate for negative impacts to the greatest extent possible.

6.2 Screening Methodology

This section identifies potential project impacts associated with the design, construction, and operational phases of the transmission line. Impact predictions are based on the consultants' previous experiences with similar projects, professional judgment, field data, discussions with local communities, relevant government authorities, and technical experts. The predicted impacts encompass all aspects of the proposed transmission line project. Mitigation measures primarily address community and occupational health and safety concerns, as well as the adoption of good construction practices.

The Environmental and Social Impact Assessment (ESIA) uses the following definitions to assess the significance of potential impacts:

- **No Impact:** An impact is considered negligible or non-existent if the project activity is either geographically or temporally distant from the environmental component, or if the impact is so minor that it cannot be measured. No mitigation is needed for such impacts.
- **Minor Impact (Positive or Negative):** If an impact occurs but does not meet the criteria for a significant impact, it is classified as minor. For minor adverse impacts, appropriate mitigation measures will be implemented.
- **Major Impact (Positive or Negative):** A major impact is considered significant if the project has the potential to affect the environmental component. The criteria for determining whether an impact is significant include: (i) spatial scale of the impact (local, regional, national/international); (ii) time scale of the impact (short, medium, or long term); (iii) the extent of the change in the environmental component (small, moderate, or severe); (iv) significance for local communities;

(v) compliance with relevant conservation laws, regulations, and standards (local, national, international). If serious adverse impacts are identified, mitigation measures will be developed to reduce them to acceptable levels.

- **Unknown Impact:** If the severity of an impact cannot be determined due to uncertainties about the nature or location of the project, the environmental components in the study area, the time frame, or the spatial scale of the impact, the potential impact is classified as "unknown." Where possible, mitigation measures will be defined for unknown impacts.

Impacts can be categorized as follows:

- **Direct Impacts:** These result from project activities that occur at the same time and in the same location, both during construction and operation. Direct impacts are expected to be limited in this project, as the reconstruction and construction of water supply and sewerage systems are primarily environmental protection measures.
- **Indirect Impacts:** These include secondary effects, such as project-induced growth or longer-term or more distant environmental consequences. Although indirect impacts may occur later or at a greater distance, they remain relatively predictable.
- **Short-term Impacts:** These typically involve temporary effects, such as noise and emissions from heavy machinery during construction, and generally do not result in long-term environmental damage.

Environmental screening identifies a range of potential environmental impacts associated with project activities. If these impacts are considered significant or severe, mitigation measures will be developed and incorporated into the project documentation.

The impacts of construction activities will depend on various factors, including the temporary use of land and its restoration after construction. Adopting best practices during construction, coordinating with local authorities for impact management, and ensuring compliance with environmental regulations outlined in project proposals and specifications, as well as the Environmental and Social Management Plan (ESMP), will be key to mitigating these impacts.

The following section details the environmental impacts expected from the project, along with the mitigation measures designed to minimize these impacts to technically feasible levels. The description is divided by project phase: design and construction. All construction-related mitigation measures will be included in the tender or contract documents, making them mandatory for construction and supervision contracts.

6.3 Design Phase: Impacts and Mitigation Measures

Impacts during the design phase mainly relate to:

- Land acquisition, resettlement, and necessary approvals;

- Sensitive receptors (e.g., settlements, schools, protected areas) and existing infrastructure (e.g., roads, railways);
- Physical cultural resources

The mitigation measures focus on the careful selection of the transmission line's right-of-way (ROW) to minimize or avoid impacts.

6.3.1 Land Acquisition

The precise permanent and temporary land requirements cannot be fully determined at this stage until tower micro-siting and access planning have been completed. Potential permanent impacts are expected to be limited primarily to tower foundations, and gantry footprints. Temporary impacts may arise from access tracks, working areas, conductor stringing, vehicle movement, material storage, and restriction of land use.

The preliminary impacts is assessed to be potentially minor to moderate, depending on the final locations of the towers, however, in the absence of complete land records, the impact cannot be fully classified.

Mitigation Measures

- Apply the approved pylon routing and micro-siting procedure which is attached to this report as an annex
- Obtain land records, and prepare detailed land use maps prior to final tower placement
- Avoid houses, cultivated land, trees, and livelihood assets to the extent possible
- Locate towers on plot boundaries or unproductive lands where feasible
- Identify all affected owners and users, including non-title holders
- Conduct consultations at site prior to finalization of design if any private land owners are identified
- Undertake inventories and valuation of crops, trees, structures, and other affected assets (if any)
- Schedule works to avoid peak agricultural periods where practicable
- Restore temporary working areas and access routes
- Maintain an accessible GRM

6.3.2 Siting & Routing

Poorly selected tower locations may result in avoidable impacts on land, vegetation, drainage, cultural receptors, community access and bird movement. Once tower foundations are constructed, relocation becomes difficult and costly. The design stage therefore presents the principal opportunity to avoid impacts.

Mitigation Measures

- Overlay proposed tower locations with land records, ecological, and bird activity data

- Flag towers and spans near sensitive receptors
- Conduct joint engineering, ecological, and social verification
- Evaluate tower shifts, increased spans, alternative tower types, and modified access routes
- Avoid areas of concentrated low, or middle height target species flights where feasible
- Document accepted and rejected alternatives

6.3.3 Cultural Resources

There are no protected cultural or heritage sites located near the proposed transmission line route.

6.3.4 Sensitive Receptors and Existing Infrastructure

The proposed transmission line route (13.4 km) passes through areas that may have scattered rural settlements and small residential clusters. Careful alignment planning will be required to maintain safe vertical and horizontal clearances from houses, in accordance with KE specifications and regulatory standards.

6.3.5 Temporary Construction Camps

There may be a requirement to establish small construction camps. If not undertaken carefully, activities involved in establishing and running campsite can result in deterioration of air & water quality, and social impacts including disease transmission.

Mitigation Measures

- Sanitation facilities in the camps should be provided and its wastewater should adequately be disposed offsite through septic tank and soak pit or connected to the local sewerage system;
- Contractor shall be made responsible through contract documents for proper disposal of the waste generated and not to dump these spoils/ earth near open plots, open spaces, open storm water drains, in front of settlements, on cultivated lands or left unattended along the construction site. It should be disposed in designated landfill site.
- Contractors shall also be made responsible through contract documents to follow Sindh Environmental Quality Standards (SEQS) and applicable standards during all the construction activities and ensure compliance of the same through periodic environmental monitoring reports.

6.4 Construction Phase: Impacts and Mitigation Measures

Construction phase impacts include erosion of soil; impacts on surface and groundwater; solid waste management; air quality issues - primarily related to dust generation; noise; vegetation removal; aesthetic impacts; and occupational and community health risks. Mitigation measures include good construction and

housekeeping practices, and compensatory plantation for any loss of trees in the ROW.

6.4.1 Solid Waste Management

Typical solid waste generated during construction include waste concrete, steel scrap, wooden scaffolding, empty cement bags, excavated soil, wood remains etc. Solid waste generated during land clearance and Earth-fill material could be in significant quantities. This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. It may block nearby natural drainage channels that can ultimately cause localized flooding during monsoon season. Random storage of this waste may be injurious to the workers at the site as well. Windblown debris is a nuisance to the nearby settlements. Poor waste management practices would result in short term and long-term negative impacts on the aesthetics of the surrounding.

Mitigation Measures

- A Comprehensive Waste Management Plan for Construction phase should be developed;
- Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site;
- Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmentally friendly manner;
- All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and
- Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation.
- Any and all hazardous waste generated at the site is to be disposed of through a SEPA certified contractor.

Waste Segregation

- All hazardous waste if found shall be segregated from nonhazardous wastes at the point of generation of waste. During construction phase, suitable containers with following color coding shall be kept to collect and segregate common wastes at all facilities:

Waste material	Color code
Concrete/ Campsite Debris	Blue
Metal	Green
Plastic	White
Oily Rags	Black
Used Oil	Red
Rubbish/Trash	Yellow

Recycling

Recycling and reuse minimize the quantity of waste requiring disposal. Some of the wastes can be reused within the construction site while others can only be recycled. There is a great recycling potential for few of these wastes in the recycling market. Waste shall be sold to the third-party contractors/ companies, who have proper recycling facilities.

CC will suggest/recommend recycling of the paper, glass, plastic wastes in their respective processing units. Iron/steel waste would be sent to re-rolling mills.

Table 6.1 - Waste Management Options (Different Categories)

S#	Waste Type	Category	Disposal Options
1.	Septic Tank Sludge	Non-hazardous	Disposed in Landfill site.
2.	Excavation Material	Non-hazardous	Reuse for backfill
3.	Construction debris including Scrap	Non-hazardous	Recycle, reuse or sell to third party contractor.
4.	Metals	Non-hazardous	Store cuttings in designated area for reuse. Remove surplus materials and use them at other sites, where feasible.
5.	Concrete	Non-hazardous	Store unused concrete blocks for later reuse. Recycle, reuse or sell to third party contractor.
6.	Bricks	Non-hazardous	Reuse for footings and broken bricks.
7.	Plastic and vinyl	Non-hazardous	Recycle, reuse or sell to third party contractor.
8.	Corrugated Cardboard	Non-hazardous	Recycle, reuse or sell to third party contractor.
9.	Woods	Non-hazardous	Recycle
10.	Empty Drums and Containers	Non-hazardous	Disposed them off through recycler.
11.	Oil waste (fuel oil, transformer oil, switchgear oil)	Hazardous	Handled and disposed through incineration via EPA certified waste contractor hired by CC.
12.	PV modules	Hazardous	Send back to the supplier/equipment manufacturer for recycling/disposal.
13.	Sanitary Wastewater	Non-hazardous	Treat wastewater in septic tanks before disposal.

Table 6.1 - Waste Management Options (Different Categories)			
S#	**Waste Type**	**Category**	**Disposal Options**
14.	Trash	Non-hazardous	1. Segregate glass, metal, plastic from trash. 2. Recycle all recyclable items. 3. Designed landfill.

6.4.2 Impact on Air Quality

6.4.2.1 Dust Emissions

Construction activities that may lead to dust generation include excavation; transportation and tipping of cut materials; handling and storage of aggregates in concrete plants; concrete batching; site leveling and clearing of vegetation; and associated activities. The quantity of dust that may generate on a particular day of construction phase will depend on the magnitude and nature of activity and the atmospheric conditions prevailing on that day.

Mitigation Measures

Different options are available to control dust and exhaust pollution. They are listed below:

- The exposure of construction workers to dust should be minimized by provision of dust masks and mandating the workers to wear them.

Dust Reduction Measures

- Water should be sprinkled daily to wet all the expose surfaces.
- Use of water suppression for control of loose materials on paved or unpaved internal road surfaces. Oil and oil by-products are not recommended method to control dust[9].
- Truck loads should be covered with tarpaulin.
- Construction site, including soil and material piles at the site, should be adequately barricaded to avoid material escape, generation of dust.
- Ready-mix can be used in the stages of the project wherever and whenever required and deemed appropriate.
- Careful handling and working under moist conditions and monsoon season will be avoided as much as possible.

6.4.2.2 Exhaust Emissions

Major sources of exhaust emissions are standby diesel generators, material transport vehicles and emissions from construction machinery/earth moving equipment. Major exhaust emissions of concern are CO, SOx, NOx and Particulates. These emissions

[9] WBG EHS Guidelines

are injurious to human health in high concentration and can also cause vegetation damage by clogging the photosynthesis process in plants.

Mitigation Measures

- Construction machinery, vehicles should be properly tuned and kept in good working condition, minimizing exhaust and vehicular emissions.
- Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance of SEQS;
- Excessive engine idling will be discouraged and machinery causing excessive pollution (i.e., visible smoke/soot) will be banned from sites;
- Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited.

6.4.3 Noise Pollution

During the construction phase noise will be generated from the operation of heavy machinery and haulage of construction materials to and around construction sites and construction activities including concrete mixing, excavation, backup power generators for supply of electricity; use of pressure horn etc. These construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to local residents and fauna.

Table 6.2 - Typical Noise Levels of Construction Equipment

Clearing		**Structure Construction**	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
		Concrete vibrator	76
Excavation and Earth Moving		Air compressor	74-87
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement and dump trucks	83-94
Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
Grading and Compaction		**Landscaping and clean-up**	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
Paving		Front and end loader	72-84
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77	Dump truck	83-94

Table 6.2 - Typical Noise Levels of Construction Equipment	
Clearing	**Structure Construction**
Source: U.S. Environmental Protection Agency, Noise from Construction Equipment and Operations. Building Equipment and Home Appliance. NJID. December 31, 1971	

Mitigation Measures

- Machinery operation and high noise activities should be carefully planned and scheduled;
- To the extent practical, batching plants and construction areas should not be located within 500 meters of a settlement;
- Where that is not possible, high noise activities should cease between 22:00 and 06:00 hrs (Night time hours given in SEQS for Noise) at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents.
- Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery;
- Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs;
- Occupational health, safety and environmental procedures and Environmental and Social Management Plan for proposed project would be followed.

6.4.4 Vibration Impacts

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used. The operation of construction equipment causes vibrations that spread through the ground and diminish in strength with travelled distance. During earthworks and excavations heavy machinery such as bulldozers, excavators, and loaders used for earthmoving can generate significant vibrations and it can have impact on nearby building structure. The predicted ground vibrations at various distances are shown in **Table 6.3** for typical equipment that may be used during proposed construction.

Table 6.3 - Typical Vibration Levels at Distance (Peak mm/s)				
Plant Item	Peak Vibration (mm/s), Distance from Source			
	10 m	20 m	50 m	100 m
Roller	7.0 to 8.0	3.8	1.5	0.8
Compactor	5.0 to 7.0	3.0	1.2	0.6
Dozer	2.5 to 4.0	1.6	0.7	0.3
Backhoe	1.0	0.5	0.2	0.1
Source: Environmental Noise Management Manual-Roads & Traffic Authority, NSW, Australia, 2001				

Based on the predicted peak vibration levels described in above table, it is expected that vibration would be barely perceptible at sensitive receiver locations within over 50m for most construction activities. According to British Standards of Noise and Vibration, humans are particularly sensitive to vibration with the threshold of

perception typically being in the range of 0.14 to 0.3 mm/sec Peak Particle Velocity (PPV) and levels above this may cause annoyance. However, significantly higher levels than this can be tolerated for single short-term events and do not cause annoyance or disturbance to humans.

Mitigation Measures

- Vibration measurement will be carried out during construction phase by the contractor near the settlements in the AOI.
- Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels in the AOI.
- The vibration from major construction activities such as excavation, compacting, drilling, etc. are considered intermittent and short-term, and likely to be tolerated if prior warning is given to potentially affected residents as and where they may be encountered along the route.
- The equipment operators to be made aware by the contractor of potential vibration issues problems and of techniques to minimize vibration effects during construction works.

6.4.5 Impacts on Ecology

6.4.5.1 Impacts on Flora

The overhead TL will require the least footprint on flora as only site clearance is required at tower bases. Onsite vegetation clearance will be required only within the boundaries of proposed transmission lines. Therefore, the impact on ecology of area from construction activities is minimal. There were also no trees identified during the survey of the RoW, hence, no tree removal is anticipated under the project.

Mitigation Measures

- Prior to clearing or excavation at any tower location, the contractor's environmental representative shall inspect and demarcate the approved footprint. Clearance shall be limited to the minimum area required for safe construction. Mature native trees, nesting vegetation, and ecologically useful shrubs shall be retained where practicable.
- No clearance shall occur outside of the approved tower pad, access route, or working area. Temporarily disturbed areas shall be reinstated with salvaged topsoil, and, where appropriate, native species.

6.4.5.2 Impacts on Avifauna

Construction activities may disturb birds through noise, movement of machinery, vegetation clearance, lighting and the temporary presence of workers. Disturbance may result in displacement from foraging or perching locations and may affect active nests if works are undertaken during breeding periods.

Mitigation Measures

To mitigate these impacts, several measures should be considered:

- Undertake a pre-construction ecological inspection at each tower and access location.
- Check trees, shrubs, tower structures and ground vegetation for active nests.
- Establish an appropriate species-specific exclusion buffer around active nests.
- Do not remove or disturb an active nest until nesting has concluded, unless authorized by the relevant wildlife authority.
- Avoid unnecessary night work and high-intensity lighting.
- Direct temporary lighting downward and away from open habitat.
- Restrict vehicle movement and personnel to approved footprints.
- Prohibit hunting, trapping, harassment and feeding of wildlife.
- Schedule particularly noisy activities outside periods of concentrated bird activity where practicable.
- Maintain records of nests, sensitive observations and work restrictions.
- Brief workers on wildlife protection requirements.
- Engage a qualified ecologist where sensitive or protected species are encountered.

6.4.6 Impact on Land Resources

6.4.6.1 Top-soil Removal

During site preparation, the removal of topsoil is necessary for leveling and grading the land. This is typically done to facilitate the construction of infrastructure such as buildings, roads, and utilities. The removal of topsoil removes the nutrient-rich layer essential for supporting vegetation, which could impact local biodiversity and lead to long-term degradation of soil quality if not managed properly. Once the topsoil is removed, the land is more vulnerable to erosion, especially if vegetation is not re-established in a timely manner.

6.4.6.2 Soil Compaction

The movement of construction machinery, transport vehicles, and heavy equipment across the project site leads to soil compaction. Areas that will be developed, such as internal access roads, temporary laydown areas, and building foundations, are especially vulnerable to compaction. Compaction decreases the pore space between soil particles, reducing air and water flow within the soil. This can impair plant growth and affect water retention. Compacted soils have reduced capacity to absorb water, leading to increased surface runoff, erosion, and potential flooding risks in the long term.

6.4.6.3 Waste Generation and Soil Contamination

Construction activities generate a variety of waste materials, both general and hazardous. Improper handling of waste materials, particularly hazardous ones, could

have significant consequences for the land. This includes materials such as concrete, wood, metals, and packaging waste. If not disposed of or recycled properly, these can contribute to land pollution and waste accumulation on-site. Waste such as used oils, hydraulic fluids, fuel, and chemicals can pose serious risks to land quality if they leak or are disposed of irresponsibly. These materials can contaminate soil and groundwater, leading to long-term environmental degradation.

Mitigation Measures

- One way to reduce the impact is to stockpile the removed topsoil for later reuse in landscaping or reclamation efforts. Additionally, erosion control measures, such as mulching or silt fences, can be employed.
- Use of less invasive machinery, proper scheduling of construction activities, and restoration techniques (e.g., subsoiling or deep tillage) can help alleviate compaction impacts. Additionally, controlling vehicle movement to designated paths can minimize the extent of compaction.
- Proper waste segregation, recycling programs, and designated storage areas for hazardous materials are essential to prevent contamination.
- All hazardous wastes should be disposed of according to local regulations, ideally by certified waste management contractors.
- Spill prevention measures (e.g., secondary containment for fuel storage) should be implemented.
- Develop and implement a soil management plan that includes strategies for stockpiling and reusing topsoil, reducing compaction, and restoring soil health post-construction
- Once construction activities are completed, the site should be revegetated with native plants to help restore soil structure, prevent erosion, and enhance biodiversity.
- Establish a comprehensive waste management system that includes recycling, proper hazardous waste disposal, and contamination prevention measures to protect land resources

6.4.6.4 Soil Erosion

Project activities may cause erosion of soil. Such activities may be identified as trenching, transportation of materials and equipment, preparation of tower base for overhead TL, landscaping and removal of bushes etc. Usually, the exposed soil after excavation is vulnerable to erosions and runoff by moderate to heavy rains. But, the impact of all these activities would be less significant and temporary lasting only for construction period. Inappropriate handling, storage and disposal of fuels, oils and chemicals at construction sites may also lead to contamination of soil.

Mitigation Measures

- Construction activities should be so scheduled to avoid runoff due to rain;
- The removed soil must be contained in an enclosure to reduce the chances of runoff during the seasons of precipitation;

- Stock piles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions;
- Site workers should wear dust masks especially during the dry and windy weather conditions;
- Debris should be collected during construction and disposed of in low lying areas near the site;
- Cut material should be used to level the site area where required or be disposed at designated spoil disposal sites;
- Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course;
- Refueling, oil changing and maintenance of machinery, equipment and vehicles should only be carried out at designated areas within the construction site;
- Oil contaminated materials should be disposed at designated waste disposal facilities.

6.4.6.5 Impacts on Surface and ground water sources

While the direct impacts of soil disturbance, compaction, and waste generation may be confined to the project site, there is always potential for broader, off-site effects. Erosion or runoff from compacted or disturbed soils could carry sediments and contaminants into nearby water bodies, affecting water quality.

Mitigation Measures

- Remove all excavated soil completely
- Regularly clear all the debris and vegetation clogging ditches, sewers, drains and pipe systems
- Prevent soil runoff from the site leading to off-site contamination (particularly during rainy season)
- Avoid the spillage of oil and grease from the vehicles

6.4.6.6 Temporary Access Roads

The proposed Project currently does not have any direct roads due to lying outside of the city of Karachi, and as such will require access roads to be built for work. Similar access roads will be required along the length of the project also for contractors working on the T/L.

The development of these roads will allow for the transport of workers, construction materials, and machinery for purposes related to the project. The construction of these roads however, may cause damage to crops, soil erosion, soil contamination, air and noise problems.

Mitigation Measures

- According to usual practices during the construction of large-scale infrastructure projects like these, the access road will be developed within the

RoW of the proposed project. This will limit and reduce the additional impact of the establishment of the access roads for the proposed Project.

- For the development of access roads/tracks, contractor will be bound to consider mitigations to further reduce the severity of this impact including the selection of access roads/tracks based on certain criteria to ensure high stability, no or minimum tree cutting and crop damage, minimum disturbance to nearby settlements and other social amenities.
- The approach roads should be selected to avoid any soil degradation and erosion impacts.
- Mitigations for the loss of tress and crops, soil erosion, soil contamination, air and noise pollution, waste generation, and loss of agricultural land provided in below sections will be adopted.

6.4.7 Fuel, Oil & Chemical handling, storage and disposal

Inappropriate handling, storage and disposal of fuels, oils and chemicals at construction sites may lead to contamination of soil.

Mitigation Measures

- Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course;
- Refueling, oil changing and maintenance of machinery, equipment and vehicles should only be carried out at designated areas within the construction site;
- Oil contaminated materials should be disposed at designated waste disposal facilities.

6.4.8 Water Consumption and Conservation

Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is likely to be met from external sources such as water tankers supplying water to the construction site.

Mitigation Measure

- Regular monitoring of water consumption, conservation and quality;
- Use of leak proof water storage tanks;

6.4.9 Seismicity

Potential Impact

The proposed project area, extending across Thatta and Karachi (Malir District), lies within a region classified as moderate seismic risk. According to national seismic zoning, Sindh Province, including the Thatta and eastern Karachi areas, falls within Seismic Zone 2, while the specific project alignment is located in Seismic Zone 2A, which represents the upper limit of moderate seismic hazard. In this zone, the expected Peak Ground Acceleration (PGA) is generally less than 0.05 g.

Review of historical seismic records for the region indicates that earthquakes recorded in and around the project corridor during the past several decades have generally been of low to moderate magnitude, typically ranging between approximately 4.0 and 4.7 on the Richter scale. These events have not resulted in significant structural damage but indicate that seismic activity, although infrequent, is a relevant consideration for infrastructure development in the area.

A low to moderate seismic event could potentially affect transmission line structures, including towers, foundations, and gantry arrangements, if seismic considerations are not adequately incorporated into design. Therefore, all transmission line towers, foundations, and associated structures will be designed in accordance with applicable seismic design standards and K-Electric engineering specifications, considering local ground conditions and Peak Ground Acceleration values. Incorporation of appropriate seismic design measures will minimize structural risks and ensure the safety, stability, and long-term reliability of the transmission line infrastructure.

Mitigation Measures

The proposed project and the associated structures should be designed and constructed as per Seismic Building Code of Pakistan 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures.

6.4.10 Impacts on Traffic

Traffic flow in the locality of project slightly increases during construction activities. The transportation of trucks for raw materials and mobilization and demobilization of the earth works equipment are required during construction phase of proposed project. This activity has potential to directly impact the traffic flow along the right of way of proposed transmission line. However, as the project area is not frequented by heavy and light traffic, adverse impact of general traffic conditions in area would be minimal.

Mitigation Measures

- Traffic management plan will be developed and implemented during the construction phase;
- Construction activities will be scheduled to reduce the chances of traffic congestion;
- Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission line;
- Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway;
- Vehicles will be maintained regularly to reduce the exhaust emissions; and
- Any complain launched by community member will be responded and appropriate action will be taken to avoid it in future.

6.4.11 Community Health & Safety

The construction of transmission line may pose a modest risk to local communities from emergency events such as entry of local people in dangerous working environment i.e., close to transmission line infrastructure.

Mitigation Measures

- Emergency response plan should be prepared and implemented during entire phase of construction;
- In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours;
- Erection of towers and poles for the overhead TLs should be barricaded and crane movement should be assessed prior to the operation near the community areas;
- Diversions, hazard points and works at construction sites will have appropriate warning signs; this is particularly important at night to avoid accidents.

6.4.12 Heat Stress to Construction Workers

In the districts of Karachi (Malir) and Thatta, which are characterized by arid to semi-arid climatic conditions. During the summer months, ambient temperatures in the project area frequently exceed 40°C, with high solar radiation and low wind protection due to the absence of significant tree cover along much of the transmission line corridor.

Construction activities such as tower erection, conductor stringing, material handling, and work at elevated heights will require prolonged outdoor exposure, increasing the risk of heat stress, dehydration, heat exhaustion, and heat stroke among construction workers. These risks are expected to be more pronounced during peak summer periods, particularly for workers engaged in physically demanding tasks under direct sunlight. Without appropriate preventive measures, heat stress could affect worker health, safety, and productivity during the construction phase of the project.

Mitigation Measures

- Move to a cool place e.g., cool shady area;
- Provide plenty of drinking water;
- Break the working in shifts

6.4.13 Occupational Health and Safety

The construction works involving earthworks, excavation, erecting structures, etc. poses an inherent risk of injury to labor from accidents. Poor housekeeping practices may lead to stagnant water as breeding grounds for insect vectors (causing malaria, dengue fever etc.). Hazards from handling equipment, ergonometric stress, lifting heavy materials etc. may cause injury to the labor. Electrical equipment and substation pose electrocution hazard.

Mitigation Measures

Site-specific labor health and safety hazards are also critical to identify based on job safety analysis or comprehensive hazard or risk assessment. Health and safety management planning should include the adoption of a systematic and structured approach for prevention and control of physical, electrical, chemical, and biological health and safety hazards. Use of PPE should be made mandatory. Only trained and experience crane, forklift, etc. operators should be hired. CC shall ensure that Job Hazard Analysis (JHA) is performed prior to commencing jobs. It shall also be ensured that the JHA is reviewed after the following:

- Whenever work is stopped
- Every time work conditions or the job scope changes
- Persons working the job shall review and acknowledge the JHA by their signature

6.4.13.1 Crane and Lifting Operations

For all Crane & Lifting Operations CC shall ensure full compliance with standard operating procedures. CC shall develop a site-specific pre-lift checklist which includes the following at minimum:

- Crane rigging capacity adequately for load
- Condition of slings
- Rigging condition adequate for load
- Area of swing or travel unobstructed
- Multiple crane use
- Power line approach distance maintained
- Stability and footing
- Taglines and spotters
- Illumination and weather
- Signal operator
- Job hazard analysis and other permits

All lifting and rigging activities shall be supervised and conducted by a competent person or team, CC shall maintain a lifting gear registry for all lifting gear on-site inclusive of a listing of all lifting gear, copies of equipment certificates (manufacturer, safe working load, serial number) and the inspection/recertification frequency.

6.4.13.2 Forklifts and Non-Road Vehicles

CC should ensure forklift and non-road vehicles are fit for purpose and operated according to manufacturer's requirements. Only competent operators are permitted to operate forklifts and non-road vehicles.

At minimum, all forklifts and non-road vehicles shall be equipped with following equipment:

- Seat belts

- Horn
- Emergency Brake
- Wheel chock
- Labeled Controls
- Fire Extinguishers
- First Aid Kit
- Back-up Alarm

6.4.13.3 Scaffolding

CC is responsible to establish periodic inspection, certification and recertification program for scaffold works. Only qualified worker is authorized to erect, inspect and certify scaffold. All scaffolds should have a guardrail system on each open side, up to the access point. It should be equipped with toe boards having suitable access ladder.

6.4.13.4 Over-exertion

Over-exertion, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, and manual handling, are among the most common causes of injuries at construction site.

Mitigation Measures

Recommendations for their prevention and control include:

- Workers will be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two-person lifts are necessary.
- Work site layout will be planned to minimize the need for manual transfer of heavy loads.
- Tools will be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations.
- Administrative controls, such as job rotations and rest or stretch breaks will be implemented into the work processes.

6.4.13.5 Slips and Falls

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground, are also among the most frequent cause of lost time accidents at construction site.

Mitigation Measures

Recommended methods for the prevention of slips and falls from, or on, the same elevation include:

- Good house-keeping practices, such as the sorting and placing loose construction materials in established areas, would be implemented.
- Excessive waste debris and liquid spills will be cleaned up regularly.
- Electrical cords and ropes will be located in common areas and marked corridors.
- Slip retardant footwear will be used.

6.4.13.6 Struck by Objects

Construction activities of the project may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities.

Mitigation Measures

Techniques for the prevention and control of these hazards include:

- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap.
- Temporary fall protection measures in scaffolds and out edges of elevated work surfaces would be used, such as hand rails and toe boards to prevent materials from being dislodged.
- Appropriate PPE such as safety glasses with side shields, face shields, hard hats, and safety shoes, would be worn.

6.4.13.7 Moving Machinery

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise.

Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving.

Mitigation Measures

Techniques for the prevention and control of these impacts include:

- The location of vehicle traffic, machine operation, walking areas, and controlling vehicle traffic will be planned and segregated through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic.
- The visibility of personnel will be ensured through the use of high visibility vests when working in or walking through heavy equipment operating areas as well as training of workers to verify eye contact with equipment operators before approaching the operating vehicle.

- Inspected and well-maintained lifting devices will be used that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

6.4.13.8 Electrocution Hazard

High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s). An electrical hazard can be defined as a serious workplace hazard that exposes workers to any of the following:

- Burns
- Electrocution
- Shock
- Arc flash or arc blast
- Fire
- Explosions

List of potential electrical hazard at site is as follows;

- Improper grounding
- Exposed electrical parts
- Inadequate wiring
- Damaged insulation
- Overload circuits
- Damaged tools and equipment

Mitigation Measures

- Use of ground-fault circuit interrupters
- Periodic inspection of extension cords and portable tools
- Use power tools and equipment as designed
- Proper lockout/tagout procedures will be followed
- Safety signs for electrical hazard will be placed
- Ensuring proper guarding of electrical equipment and facilities such as substation and switchgear

6.4.13.9 Other Site Hazards

- Construction of site may pose a risk of exposure to dust, hazardous or flammable materials, and wastes in a combination of liquid, solid, or gaseous forms.

Mitigation Measures

- Only authorized personal should be allowed at the construction site
- Identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers, including communicable diseases such as HIV/AIDs and vector borne diseases;

- Avoid stagnation of water and initiate drainage/cleanup of stagnant water;
- Provide for the provision of appropriately stocked first-aid equipment at work sites;
- Provide for appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate outerwear, boots and gloves; safety helmets;
- Provide training for workers for the use of PPE;
- WB Group's Environment, Health and Safety (EHS) Guidelines (attached at the end of this document) will be implemented;
- No bonded and child labor will be permitted at site;
- Major labor laws will be followed e.g., Minimum Wage, Harassment of women in the work place Hours of work, Overtime Payment.
- Also, laborers will be trained on appropriate interaction with local people especially women;
- Include procedures for documenting and reporting accidents, diseases, and incidents; and
- All safety precautions will be taken to address safety hazards for the nearby community. These precautions may include safety/warning signage, safety barrier around the construction site.
- Lighting provided for labor during night time work should be adequate.

Summary of Recommended Personal Protective Equipment According to Hazard		
Objective	**Workplace Hazards**	**Suggested PPE**
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation.	Safety Glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Plastic Helmets with top and side impact protection.
Hearing protection	Noise, ultra-sound.	Hearing protectors (ear plugs or ear muffs).
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids.	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.

Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors.	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.
Source: IFC Environmental, Health, and Safety General Guidelines		

6.4.14 GHG Emissions

Greenhouse gas (GHG) emissions contribute to climate change at both regional and global scales. For the proposed project, GHG emissions are expected to be limited and primarily associated with the construction phase. Emissions will mainly arise from the combustion of diesel fuel in construction vehicles, cranes, stringing equipment, material transportation trucks, and temporary power generation units used at construction sites and camps. Minor contributions to carbon dioxide (CO_2) emissions may result from site preparation activities, including excavation for tower foundations, limited vegetation clearance along the Right of Way (ROW), and transportation of construction materials. These activities may also cause short-term disturbance to soil and vegetation, resulting in a temporary reduction in local carbon sequestration capacity.

Mitigation Measures

- Employing energy-efficient and low-emission machinery, as well as transitioning to electric or hybrid vehicles for transport, can significantly reduce direct CO2 emissions.
- Minimizing land disturbance and adopting soil conservation practices can help preserve the carbon sequestration capacity of the area. Reforestation and replanting efforts post-construction can also help offset emissions.
- Streamlining the construction schedule and reducing idle time for machinery can minimize unnecessary fuel consumption and associated emissions.
- Implementing carbon offset initiatives, such as funding renewable energy projects or supporting local reforestation efforts, can help balance out the GHG emissions generated during construction.

- Regular maintenance of vehicles, plants, and machinery according to the manufacturer's specifications.
- Monthly visual inspections of vehicle and plant exhausts to detect excessive smoke emissions and take corrective action when needed.
- Installation of approved pollution control devices on equipment and machinery.
- Avoid overloading the transport vehicles to reduce emissions.
- Site vehicles and machinery will be switched off or throttled down when not in use.

6.4.15 Impact on Migratory & Soaring Birds

The project area is not known to lie within a formally designated Important Bird Area. Nevertheless, year-long monitoring confirms that resident and migratory raptors, vultures and other birds use the wider project landscape. Construction does not create the same collision hazard as an energized transmission line, but conductor stringing, cranes, temporary wires and increased disturbance may temporarily affect bird movement. The risk will be highest where activities occur across repeatedly used flight paths or during periods of reduced visibility.

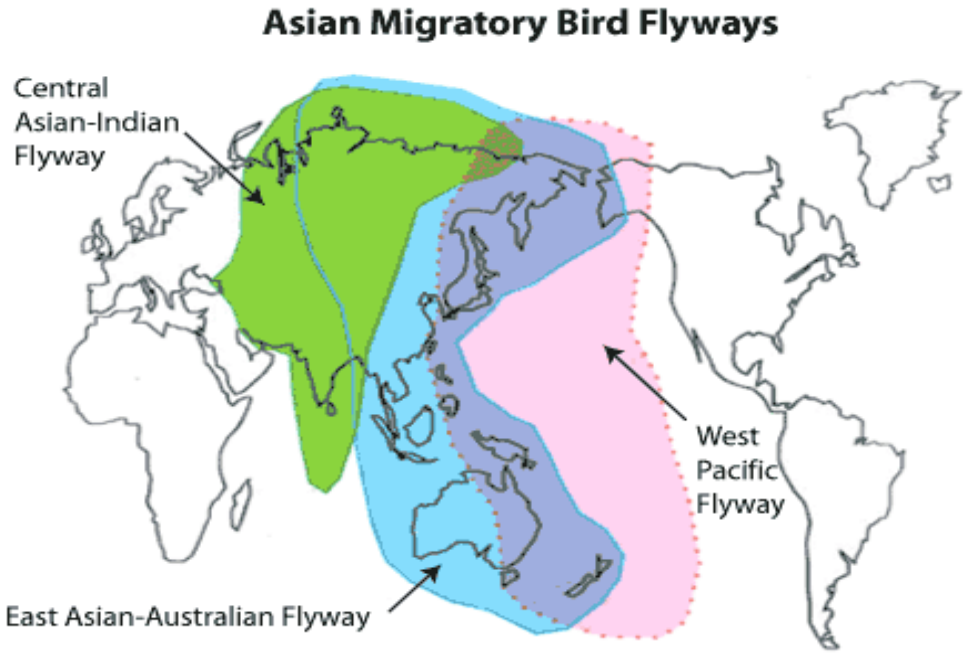


Figure 6.1 Various flyways of birds from Siberia to south

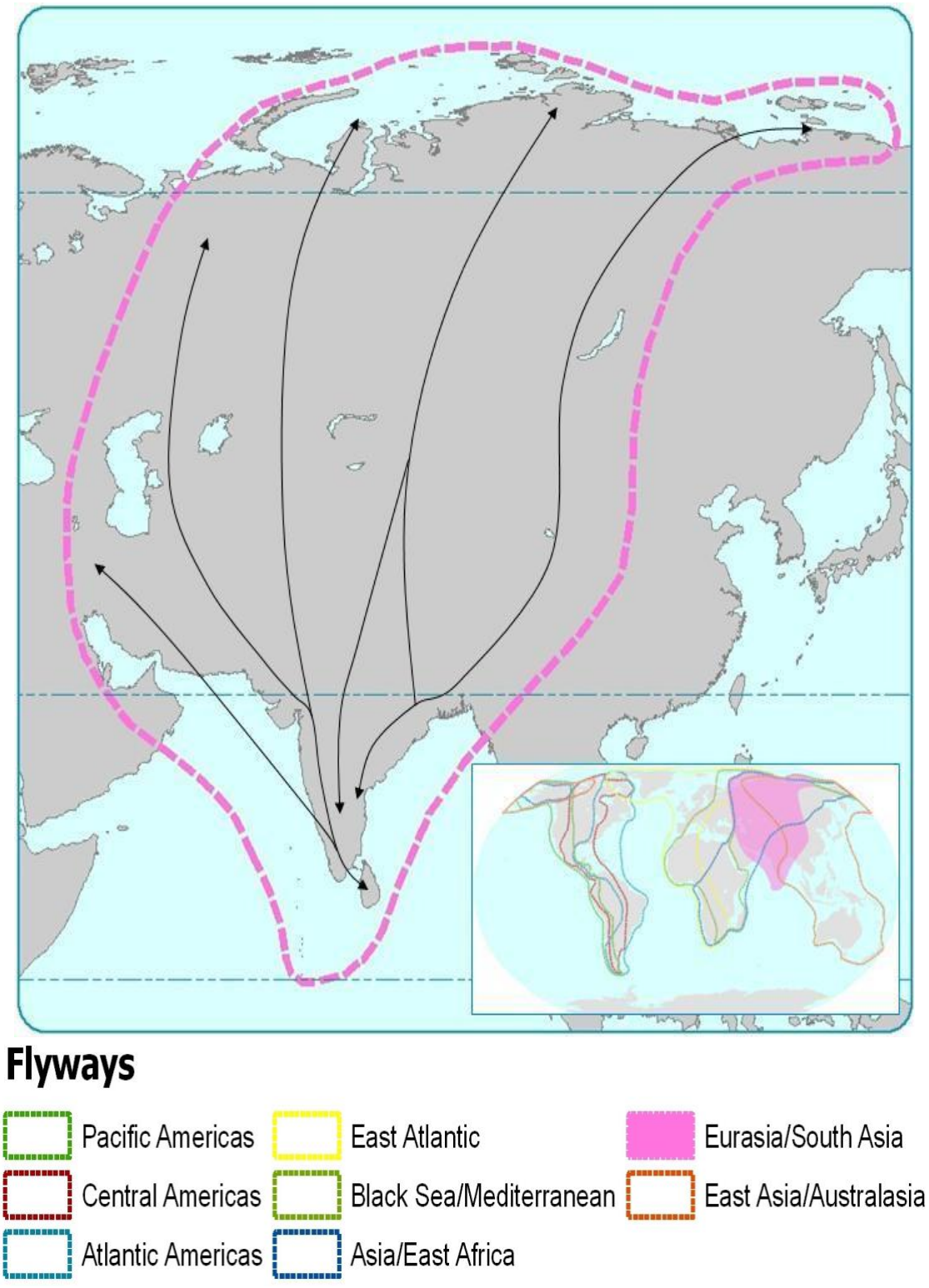


Figure 6.2 Eurasian/South Asia Migratory bird flyway (Source: Birdlife International)

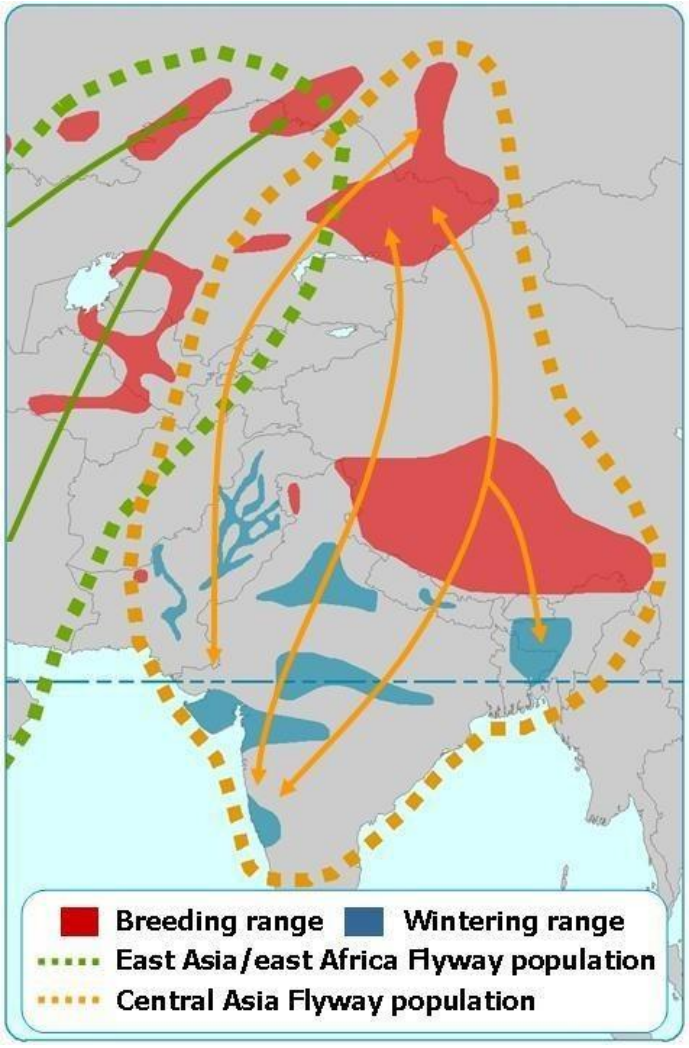


Figure 6.3 Migratory Route, Breeding Range, and Wintering Range of Ferruginous Duck in Pakistan

Mitigation Measures:

To minimize the negative impacts on these birds, several mitigation strategies can be implemented:

- Use the bird-monitoring data to identify spans with repeated target-species activity.
- Avoid leaving temporary wires, pulling ropes or conductors suspended unnecessarily.
- Fit temporary visibility markers where stringing equipment remains in place for extended periods.
- Suspend stringing during severe dust, fog, heavy rain or other poor-visibility conditions where bird movement is observed.
- Maintain ecological supervision during stringing at identified sensitive spans.
- Record bird incidents and near misses.
- Review the need for additional permanent diverters before energization.

6.5 Operation Phase: Impacts and Mitigation Measures

The impacts following the energization of the transmission line, during the operational phase, are highlighted below.

6.5.1 Flood Risk

In line with the topography and flood risk carrier out earlier, the flood risk identified for the project site is low. This is also in line with the data from 2010-2022, which shows that the project site has not been under the influence of flood risk since 2010 and thus is unlikely to be affected by flooding in the coming years too may be due to higher elevation in this area.

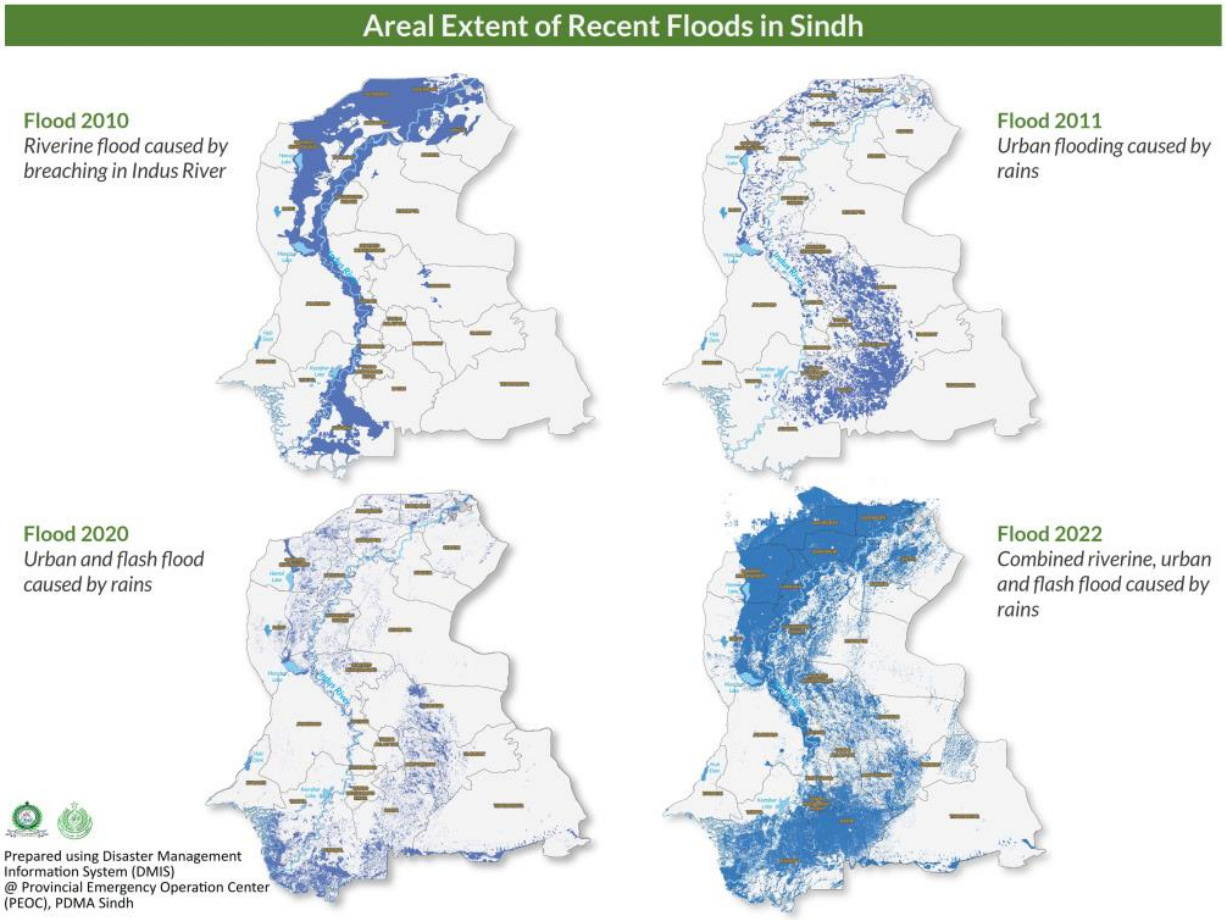


Figure 6.4 - Recent Flood Profile of Sindh

Mitigation Measures

- Transmission towers located in low to moderate flood risk zones will be designed with adequate foundation depth and elevation to withstand localized flooding and waterlogging conditions.

- Towers crossing seasonal drainage channels and ephemeral streams will be placed outside active flow paths where feasible, and foundation designs will account for potential scouring and erosion.
- Natural drainage patterns will be maintained, and construction activities will avoid obstruction or diversion of existing drainage channels.
- Temporary construction materials, equipment, and spoil will not be stored within natural drainage paths or low-lying areas susceptible to water accumulation.
- Proper surface drainage and slope protection measures will be implemented around tower foundations to prevent erosion and ponding during rainfall events.
- Construction activities in areas of moderate flood risk will be scheduled, as far as practicable, outside the monsoon season to reduce flood-related risks.
- Emergency preparedness measures will be included in the Environmental and Social Management Plan (ESMP) to address extreme weather or unexpected flooding events.

6.5.2 Bird Collisions

Overhead transmission lines may result in bird collision where conductors or earth wires intersect frequently used flight paths. Collision susceptibility varies according to species, body size, maneuverability, flight behavior, age, weather, visibility, surrounding habitat and line configuration.

The yearlong dataset demonstrates regular use of the area by raptors, vultures, and other birds. Although most target-species observation time was recorded in the upper survey band, approximately 19.8% occurred in the lower- and middle-class bands combined. Final collision risk interpretation requires comparison of recorded flight heights with final conductor elevations and sag profiles. Potentially sensitive groups identified include eagles, buzzards, vultures, kites, harriers, kestrels, hawks, sandgrouse, lapwings, egrets, herons, flocking pigeons, and doves.

Mitigation Measures

- Correlate flight height bands with actual conductor and earth wire elevations
- Map target flight paths in relation to final alignment
- Prioritize diverters on earth wires or the most difficult to see conductor
- Install diverters on spans showing repeated crossings, low or middle flight activity, proximity to feeding/ perching areas or restricted visibility
- Use high-contrast, durable devices suitable for local dust, heat, and wind conditions
- Implement the bird flight diverter and carcass monitoring procedure of KE, which includes:
    - Identification of locations and spacing at which diverters are to be installed
    - Inspect devices after installation and during routine line patrols
    - Implement the carcass monitoring procedure
    - Apply adaptive management where mortality exceeds the project trigger levels

6.5.3 Avian Electrocution

Electrocution risk depends on tower configuration, conductor separation, exposed energized components and opportunities for birds to perch or bridge energized and grounded elements. Large raptors and vultures may be more susceptible due to their wingspan.

At 220 kV, conductor separation is generally greater than on distribution infrastructure, which may reduce the likelihood of phase-to-phase electrocution. However, risk may remain at jumpers, gantries, terminations and other configurations where energized and grounded components are in close proximity.

Mitigation Measures

- Review tower and gantry design against bird safe engineering principles
- Maintain adequate separation between energized and grounded components
- Insulate or cover exposed jumper connections where a bridging risk is identified
- Avoid attractive perching arrangements immediately above hazardous components
- Install safe perch deterrents or alternative perch structures, where justified
- Investigate all bird mortality beneath towers and gantries
- Retrofit hazardous configurations where monitoring identifies repeated incidents

6.5.4 Displacement from Habitats

The presence of towers, conductors, maintenance personnel, and access activity may alter localized bird use. Some species may avoid the line, while others may use towers for perching or nesting.

Mitigation Measures

- Restrict routine maintenance to approved access routes
- Avoid disturbance of active nests during maintenance
- Do not remove nests unless required for safety
- Record repeated nesting or roosting locations
- Apply species specific management where towers become regularly used by sensitive species of bird
- Avoid pesticide use for vegetation management
- Maintain restored areas and prevent unnecessary widening of access tracks

6.5.5 Wind, Fire and Earthquake Hazards

Wind, fire and earthquakes pose risks to the project operation, and the likelihood of occurrence consider medium with significance of impact is major.

Mitigation Measures

- Transmission towers have been designed as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions.
- Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads.
- The fire hazards risk will be minimized through the use of tall towers and wide ROW.
- System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards.
- Regular maintenance of the protection system including conductors and circuit breakers should be undertaken.

6.5.6 Electromagnetic Interference

The corona of overhead Transmission Line conductors and high frequency currents of overhead Transmission Line can create radio noise which may interfere with broadcast signals or electronic equipment.

Mitigation Measures

- Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.

6.5.7 Electrocution Hazard

High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s).

Mitigation Measures

- Reduction in the Resistance to Ground of the grounding system
- Proper placement of ground conductors
- The addition of resistive surface layer
- Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season.
- Keep extra safety margin from live part during wet season.
- A grounding (earthing) system must be designed. The total ground potential rise, and the gradients in potential during a fault (called touch and step potentials) must be calculated to protect passers-by during short-circuit.
- Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground.

6.5.8 Visual Impacts

Transmission Line

Transmission line towers and conductors may be visible from surrounding areas, particularly along access roads, xerophytes, barren land, and open land. The presence of these structures may result in a change to the existing visual character of the area; however, the baseline visual environment is already influenced by existing infrastructure such as roads, utility corridors, pipelines, and nearby industrial developments. The transmission line alignment does not pass through any designated scenic viewpoints, tourist locations, or visually sensitive receptors. There are no dense residential settlements or recreational areas located within the immediate Right of Way (ROW). As a result, visual impacts are expected to be localized, linear, and of low to moderate significance, primarily affecting short-range views within the project corridor.

Mitigation Measures

- The transmission line alignment has been selected to follow existing utility corridors and disturbed areas as far as practicable, thereby reducing visual contrast with the surrounding landscape.
- Tower locations will be optimized during detailed design to avoid prominent ridgelines and visually sensitive locations, where feasible.
- Lattice towers will be finished in non-reflective, neutral colors that blend with the surrounding terrain to minimize visual prominence.
- Construction camps, material storage areas, and temporary access tracks will be located away from public view where practicable and will be removed upon completion of construction.
- Temporary construction areas will be restored to their original condition after completion of works, including leveling of disturbed ground and removal of construction debris.

6.6 Climate Risk & Vulnerability Assessment

Climate change may alter the frequency and severity of climatic hazards over the operational life of the proposed transmission line. Accordingly, climate resilience has been considered in relation to the physical location of the project, characteristics of the transmission infrastructure, construction activities, and long-term operation and maintenance requirements.

The vulnerability of the project depends on both its exposure to climatic hazards and the sensitivity of individual project components. Transmission towers and foundations are relatively robust infrastructure; however, their long operational life means that future climatic conditions should be considered during detailed engineering rather than relying solely on historical conditions.

Based on the project setting and infrastructure proposed, the principal climate risks and corresponding resilience measures are summarized in the table below.

Table 6.4 - Climate Resilience & Vulnerability Assessment

Climate Hazard	Potential Vulnerability / Impact	Risk Significance	Adaptation / Mitigation Measures
Extreme heat and heatwaves	Construction workers undertaking tower erection, conductor stringing and other outdoor activities may be exposed to heat stress. During operation, exceptionally high ambient temperatures may increase conductor temperature and sag and can affect transmission capacity and equipment performance.	**High – Construction**; **Moderate – Operation**	Implement heat-stress management including potable water, shaded rest areas, appropriate work/rest cycles and avoidance of strenuous work during peak afternoon temperatures. Detailed engineering shall verify conductor sag, clearances and equipment temperature ratings against appropriate maximum design temperatures, allowing for future warming.
Extreme rainfall, localized flooding and scour	Intense rainfall may generate rapid surface runoff through natural drainage channels and low-lying terrain, potentially causing temporary inundation, soil erosion, foundation scour or restricted access to towers.	**Moderate**, potentially **High at individual drainage crossings/low-lying locations**	Avoid locating towers within natural drainage channels and depressions during micro-siting. Maintain existing drainage pathways and provide adequate foundation depth, drainage, erosion and scour protection where required. Inspect vulnerable foundations following major rainfall/flood events.
High winds, severe storms and cyclonic conditions	The open and exposed terrain provides limited natural shielding from strong winds. Extreme gusts may impose additional loading on towers, conductors, insulators and gantries and may cause conductor movement, galloping or structural damage.	**High**	Design towers, foundations, conductors and gantries in accordance with applicable extreme wind-loading criteria and appropriate safety factors. Particular attention shall be given to angle towers, long spans and infrastructure crossings. Appropriate vibration/galloping controls shall be provided where required. Post-storm inspections and emergency repair procedures shall be maintained during operation.
Drought and prolonged dry conditions	Extended hot and dry periods may increase dust generation, soil erosion and construction water demand. Dry conditions may also increase deposition of dust and contaminants on insulators and other exposed equipment.	**Moderate**	Minimize unnecessary water consumption, use authorized water sources, suppress dust where necessary and stabilize/reinstate disturbed surfaces. Operational inspection shall identify excessive contamination of insulators and other components, with cleaning undertaken where required.
Vegetation/grass fire	Prolonged hot and dry conditions may increase the potential for localized grass or shrub fires. Although vegetation along much of the alignment is sparse, fires could potentially affect tower bases, cables or maintenance personnel.	**Low to Moderate**	Maintain appropriate vegetation clearance around towers and electrical infrastructure, prohibit uncontrolled burning during construction and incorporate fire response within emergency preparedness arrangements. Electrical protection systems shall enable rapid fault isolation.

Climate Hazard	Potential Vulnerability / Impact	Risk Significance	Adaptation / Mitigation Measures
Coastal salinity and corrosion	The wider Dhabeji–Thatta area is influenced by coastal environmental conditions. Saline air and deposition may accelerate corrosion of exposed steelwork, bolts, earthing systems and electrical fittings over the operational life of the project.	**Low to Moderate**	Provide suitable galvanization, corrosion-resistant fittings and protective coatings. Include corrosion checks within routine inspection and preventive maintenance programmes, particularly for tower legs, bolts, gantries and earthing components.
Sea-level rise/coastal inundation	The transmission alignment is inland and predominantly traverses higher, barren terrain. Direct permanent inundation associated with sea-level rise is therefore not considered a significant vulnerability for the current alignment.	**Low**	No specific major adaptation measure is presently required beyond appropriate drainage, corrosion protection and maintenance. The risk shall be reassessed if project components are subsequently relocated towards low-lying coastal areas.

Based on the project location, nature of the proposed infrastructure and existing environmental conditions, the most important climate vulnerabilities are considered to be extreme heat, high winds/severe storms, and localized flooding and foundation scour associated with extreme rainfall. The significance of these risks' ranges from Moderate to High prior to implementation of resilience measures.

The assessment, however, does not indicate that any identified climate hazard would render the proposed alignment unsuitable. Provided that climate considerations are incorporated into tower micro-siting, structural and foundation design, conductor clearances, construction health and safety arrangements, drainage/scour protection, preventive maintenance and post-extreme-event inspections, the project is considered capable of achieving an overall Low to Moderate residual climate vulnerability during its operational life.

7 Stakeholder Consultations

7.1 Overview

Public consultation and information disclosure is an essential component of the Environmental and Social Impact assessment process, recognized by development agencies and national governments alike. Similarly, to incorporate the views, concerns, and suggestions of project stakeholders and to provide them with sufficient opportunity to become part and parcel of the development process, the importance of stakeholder engagement throughout the project life cycle cannot be dismissed.

Stakeholder consultation presents an opportunity for mutual information-sharing and dialogue between the project proponent and stakeholders. An effective public consultation provides concrete suggestions that can help improve project design, resolve conflicts at an early stage, identify management solutions to mitigate potentially adverse consequences and enhance perceived positive impacts.

7.2 Consultation Objectives

Effective stakeholder engagement enhances project beneficiaries' role from "participants" to "enabling agents" that proactively provide insights to project planning and implementation. The stakeholder consultation process for this project has been designed to enhance the role of stakeholders and thereby contribute towards project success and sustainability. Specific tasks and purposes of consultations with stakeholders have been given in the table below.

Table 7.1 - Tasks & Purpose of Consultations

Task	Purpose of Consultation with Stakeholders
Need for consultation with the stakeholders	▪ To build trust to ensure sustained support for the proposed project and build resilience during the times of crisis. ▪ To learn about public concerns that need to be addressed and considered in designing of the project concept and preparing mitigation measures and programs. ▪ To learn about the strengths, skills, and organizational support that the stakeholders can bring to support project planning and implementation. ▪ To introduce the project and obtained their views and feedback on it, along with measures to incorporate to improve the project
Modes and benefits of consultation	▪ Listening and creating dialogue with stakeholders to keep the project tuned to public concerns early, to pre-empt breakdowns, and avoid mistrust in public confidence. ▪ Engaging the public as advocates for the project construction and to support the implementation of social, resettlement, and environment and health programs.

The specific objectives of the stakeholder engagement exercise carried out for the subject project include:

- Ensure all stakeholders are informed about the project's objectives, context, and scope, including the key design features, and potential environmental and social implications.
- Promote active engagement with project-affected parties, beneficiaries, and other stakeholders to foster acceptance, ownership, and sustainability of the project.
- Gather community feedback on potential impacts, such as environmental changes or livelihood disruptions, and develop practical solutions to address these concerns while enhancing project outcomes.

7.3 Stakeholder Identification & Analysis

The stakeholders for this project have been divided into two major categories which are outlined below:

- **Primary Stakeholders** – Persons, groups, and other entities within the project corridor of influence (COI) that are directly influenced (actually or potentially) by the project and/or have been identified as most susceptible to change associated with the project, and who need to be closely engaged with in identifying impacts and their significance, as well as in decision making
- **Secondary Stakeholders** – Individuals, groups, entities that may not experience direct impacts from the project, but who consider or perceive their interests as being affected by the project and/or who could affect the project and the process of its implementation in some way

Details regarding Primary stakeholders and their roles and responsibilities is represented in the table below:

Table 7.2 - Roles & Responsibilities of Primary Stakeholders

Project Stakeholder	Roles and Responsibilities
Sindh Environmental Protection Agency (SEPA)	• SEPA is the regulatory authority and mainly responsible for the development and implementation of environmental policies and strategies in ordr to integrate sustainable development and environmental conservation approaches into the legal and regulatory frameworks as per Sindh Environmental Protection Act, 2014 • EPA Sindh is responsible for the approval of the proposed project prior to implementation • EPA Sindh is responsible for the compliance of the ESMP and ultimately the preservation of environmental conditions in the area
Beneficiaries of the project	• Identification of issues, suggestions, and coordination for improvement of the project design • Support for implementation and aftercare of the project

	• Identification of project-related environmental and social issues and concerns • Identification of positive solutions for environmental and social sustainability of the project that are technically sound and cost-effective • Aftercare of the project

Similarly, the roles and responsibilities of secondary stakeholders for the project are also provided below:

Table 7.3 - Roles & Responsibilities of Secondary Stakeholders

Project Stakeholder	Roles and Responsibilities
Revenue Department	▪ Provide and verify land ownership data which includes but is not limited to the ownership record, land categorization, and price details of land around the project site
Provincial Government Departments	▪ Various government departments at both federal and provincial levels will provide regulatory oversight, ensure compliance with national and provincial policies, and support the implementation of necessary permits. ▪ They may also be involved in land issues, coordination for infrastructure development, and providing resources for the monitoring and management of the project's environmental and social impacts.
Civil Society Groups (CSG)	▪ Civil society groups will advocate for the protection of local communities' rights, including environmental and social justice, ensuring that the concerns of the affected populations are addressed. ▪ They will also monitor the project's compliance with human rights and environmental standards, highlighting any negative impacts on vulnerable communities, flora and fauna.
Academia and Subject Specialists	▪ Academics and subject matter specialists will provide expert advice on technical, environmental, and social aspects of the project, including environmental sustainability and socio-economic impacts.
Local Councilors	▪ Elected union committee constituents. Key link between constituents and city legislature and executive ▪ Help in project implementation through raising awareness and increasing project acceptability through dialogue

7.4 Consultation and Participation Process

The project utilizes various methods of engagement that were employed as part of its continuous interaction with project stakeholders. For the engagement process to be effective and meaningful, a range of various techniques were applied that were specifically tailored to the identified stakeholder groups. For ascertaining the perceptions of different stakeholders about the project consultations/ meetings were carried out at following two levels:

• Consultations with Primary Stakeholders
• Consultations with Secondary Stakeholders

7.4.1 Consultations with Primary Stakeholders

In order to align with international standards and good practices, local level engagement was provided to all stakeholders. The main purpose of the exercise was to disseminate information to relevant stakeholders and solicit their feedback received at an early stage regarding potential issues and concerns based on the current project design and features.

Consultation meetings were conducted with identified stakeholders, where they were briefed about the background and scope of the project. Concerns and suggestions from the stakeholders was noted down by the team and pictures of the sessions were taken with the consent of the stakeholders. If the interviewees had any questions about the project, the team responded to their queries during the session.

For ascertaining the perceptions of different stakeholders, key informant interviews were held with primary stakeholders. These meetings were held in an open atmosphere, in which participants expressed their concerns and views freely.

7.4.2 Consultations with Secondary Stakeholders

Secondary stakeholders, identified in the form of departmental stakeholders, such as non-governmental organizations, government departments, and utility departments were approached separately for consultation on the project.

7.5 Consultation Feedback & Analysis

7.5.1 Primary Stakeholders

The comments, concerns, and suggestions received from the primary stakeholders during the survey have been collated in this section. The comments solicited from the primary stakeholders were helpful in the screening of the potential environmental and social aspects of the project.

Details regarding Primary stakeholder's feedback and suggestions are represented in the table below:

Table 7.4 - Stakeholder Feedback from Primary Stakeholders

Stakeholder	Feedback & Suggestions
1. Deewan Cement	**Meeting Date: 2nd October 2025** **Respondent: Majid Bhatti, Mujahid Farooqui** Representatives from Dewan Cement Limited, including the DMG Electric and MG Admin departments, requested detailed information regarding the exact alignment of the proposed 220 kV transmission line and the associated wind

	power project. They indicated that a clear understanding of the project's location is necessary to evaluate any potential interference or impact on their ongoing operations . The stakeholders informed that approximately 12,000 acres of land are currently under their lease, where active mining activities are being carried out. They emphasized the need to obtain information on both the project contractor and the finalized installation coordinates of the transmission line. Upon receipt of these details, Dewan Cement's technical team plans to undertake a site visit to assess possible implications for their mining and operational areas.
2. Village Abdul Raheem/Dhore	**Meeting Date: 2nd October 2025** **Respondents: Fida Hussain, Muhammad Ayub, Rozaddin** This village comprises of 500 – 600 households. During the consultation with the residents of Village Abdul Raheem Dhore, community members expressed serious concerns regarding the lack of basic amenities in their area. The village currently has no access to electricity, gas supply, clean drinking water, healthcare services, or essential infrastructure development. The participants urged both the project proponent and the government authorities to take immediate measures to provide these fundamental services to their community. They also highlighted the need for local employment opportunities under the proposed project, emphasizing that inclusion of local labor would help improve livelihoods and contribute to the socioeconomic uplift of the area.
3. Goth Haji Suleman	**Meeting Date: 2nd October 2025** **Respondents: Khuda Baksh, Ghulam Qadir** The village comprises of 60 – 70 households. During the consultation with the residents of Goth Haji Suleman, community members expressed concern over the absence of basic facilities in their village. They reported that the local population is economically disadvantaged and faces significant challenges in meeting their daily needs. The residents requested that priority be given to local inhabitants for employment opportunities once project activities commence, to help improve their socioeconomic conditions. They also emphasized the importance of ensuring that the installation and operation of the transmission line do not cause any adverse environmental or social impacts on their village or the surrounding areas.

Below are some pictures of the team with Primary Stakeholders:

Primary Consultation	
	
	

7.5.2 Secondary Stakeholders

The comments, concerns, and suggestions received from the secondary stakeholders during the survey have been collated in this section. The comments solicited from the secondary stakeholders were helpful in the screening of the potential environmental and social aspects of the project.

Details regarding Secondary stakeholder's feedback and suggestions are represented in the table below:

Stakeholder	Feedback & Suggestions
1. **Sindh Environmental Protection Agency (SEPA)**	**Respondent: Mr. Mubarak Ali, Deputy Director (Technical), Mr. Abdul Rehman, Assistant Director** They responded that the Environmental Assessment Regulations of 2021 and the Sindh Environmental Protection Act, 2014, should be followed. While they were uncertain about the potential risks, they emphasized that any religious sensitivities must be respected. They also noted that the project could help reduce electricity shortages and that promoting green energy is always a positive step forward.
2. **WAPDA (K-IV Project Team)**	**Respondent: Lal Baksh Soomro** Mr. Soomro informed us that the client should provide a detailed map clearly indicating the intersection or proximity of K-Electric's transmission line and WAPDA's line. This map should be emailed to WAPDA's GM Office to enable proper scrutiny. He emphasized that this matter should be treated with the utmost priority, as WAPDA will issue a departmental NOC if no disruptions are anticipated.
3. **Sindh Forest Department**	**Respondent: Mr. Shahzad Sadiq, Divisional Forest Officer** Mr. Sadiq highlighted that there are no protected forests in the area where the project is being developed. Furthermore, he highlighted that a tree survey should be carried out for each tree that will be felled, and compensation for affected trees should be calculated based on ownership classification and environmental/economic value, ensuring fair and transparent payment to property owners and affected communities. Environmental offset measures, including tree replanting or afforestation activities in nearby areas, should be planned to offset any vegetation loss and maintain ecological balance in the region.
4. **Sindh Wildlife Department**	**Respondent: Mr. Mumtaz Soomro, Deputy Conservator Wildlife** Mr. Soomro highlighted firstly that there are no protected areas in the RoW of the alignment. Nevertheless, he highlighted that to understand and ensure incorporation of adequate measures, baseline surveys should be carried out to identify any sensitive, endangered, or ecologically important species following which mitigation strategies should be developed and implemented during construction and operation. The efforts and their effectiveness should then be monitored through third party monitoring.

Below are some pictures of the team with Secondary Stakeholders:



WAPDA



SEPA

	
Sindh Forest Department	**Sindh Wildlife Department**

7.6 Stakeholder Engagement Plan

Stakeholder engagement and consultation is a continuous process, adopted to obtain real time information on the project, its impacts and means/ methods to improve implementation. The ongoing consultation process may be scheduled on a need basis with all stakeholders including but not limited to the concerned government departments, local administration, community representatives, and affected persons from the proposed project areas.

Consultations will then continue through the construction and operation stages of the project, where consultations with communities will take place quarterly, or more, depending on the number of concerns raised under each consultation. The type of stakeholder engagement activities to continue through the project include (but are not necessarily limited to):

- Community liaison during the implementation of the ESIA of the proposed project
- Reporting on progress and implementation of the measures mentioned in the ESIA and their effectiveness
- Updating communities and other stakeholders about project activities and recording of comments
- Implementation, and effectiveness of the grievance redress mechanism

Efforts will be made to maximize consultations during project implementation, where these will be carried out with the objectives to develop and maintain communication linkages between the project proponent and the stakeholders, provide key project information to the stakeholders, and to solicit their views on the project and its potential perceived impacts, whilst ensuring that views and concerns of the stakeholders are incorporated during implementation with the objectives of reducing or offsetting negative impacts and enhancing the benefits. A preliminary framework for future consultations is also given below in line with best practices:

Table 7.5 - Proposed Consultations Framework

Description	Target Stakeholders	Timing	Responsibility
• Public awareness campaigns / information sharing sessions to share the ESIA with communities and other stakeholders • Location: various places in project area	Communities within the project area, general public, and line departments/ agencies	At the start of activities	Project Proponent/ EPC Contractor
• Establishment of GRM and Grievance Redress Committees (GRCs) • Location: various places in project area	Communities at/around the project area	Before commencement of project activities	Project Proponent/ EPC Contractor
• Consultations with the communities during ESIA implementation • Location: various places in project area	Communities at/ around the project area	During project implementation	Project Proponent/ EPC Contractor
• Grievance Redressal • Location: various places in project area	Proponent staff; consultants; relevant line departments and communities	During project implementation	Project Proponent/ EPC Contractor
• Informal consultations & discussions • Location: various places in project area	Communities at/ around the project area	During project implementation	Project Proponent/ EPC Contractor
• Consultations with communities during internal monitoring • Location: various places in project area	Communities at/ around the project area	Construction stage	Project Proponent/ EPC Contractor
• Consultations with communities during Independent Monitoring • Location: various places in project area	Communities at/ around the project area	Construction stage	Project Proponent/ EPC Contractor
• Consultation workshops to review ESIA implementation, any outstanding issues and grievances, views, and concerns of communities; and actions needed to address them • Location: site offices in project area	Communities at/ around the project area, relevant line departments, relevant NGOs	Quarterly during implementation	Project Proponent/ EPC Contractor

7.7 Information Disclosure Plan

The ESIA and the translation of its Executive Summary in the local languages will be disclosed on the KE website. Physical copies will also be available at the KE office, any site offices established, and any other relevant location as needed.

8 Environmental and Social Management Plan

8.1 Introduction

This section discusses the implementation and management of mitigation measures that are required for the proposed project which include progressive report and techniques to ensure that all necessary environmental protection measures are carried out in the future as planned and to reduce residual impact to acceptable levels and achieve the expected outcomes of the project. The Environmental and Social Management Plan (ESMP) is based on the type, extent and duration of the identified environmental impacts.

Environmental and Social management/monitoring are mandatory activities to be undertaken by the project administration over the entire project cycle showing its commitment towards meeting environmental regulations/standards as well as maintaining health and safety standards.

The ESMP is implemented from the very early stages of the planning and execution phases of the project. The authorization of the project is the point of initiation of the environmental and social management plan. The monitoring data, observations recorded and test results/ analyses are vital for the formulation of legal documents. All the data and legal documents are kept in safe custody and may be provided to the competent authority in accordance with the Sindh Environmental Protection Act 2014 when required.

ESMP stands for Environmental and Social Management Plan, which is a strategic framework used to identify, assess, and mitigate the environmental impacts of projects. It ensures compliance with environmental regulations and promotes sustainable practices.

The Proponent will be responsible for implementing the ESMP and ensuring that all personnel management are informed about the ESMP and the requirement to implement the procedures it contains. The ESMP is intended as a quick reference for Project personnel and regulators to monitor compliance.

8.2 Objectives of ESMP

The ESMP will serve as a principal execution module of the project that would not only mitigate adverse environmental impacts during the designing, construction and maintenance phase of the project but also ensures that environmental standards and good housekeeping is maintained. Continuous environmental monitoring is exercised to ensure that preventive measures are in place and are effective; to sustain environmental integrity. Some of the key objectives of the ESMP are to:

Outline mitigation measures recommended in the ESIA and define the responsibility and implementation of these measures;

- To outline functions and responsibilities of personnel;
- To state and implement environmental standards, guidelines and legislations relevant to the project;
- To facilitate the implementation of mitigation measures according to the project details and proposed mitigation measures;
- To develop a monitoring mechanism for the identification of whether the monitoring parameters are being implemented completely and effectively
- To identify training requirements at various levels and provide a plan for the implementation of training sessions. It is important that the recommendations and mitigation measures are carried out according to the spirit of the environmental assessment process and in line with the guidelines. The ESMP are presented in **Table 8.2 (a) 8.2 (b)**. Screening of potential environmental and social impacts has played a vital role in reconfirming typical mitigation measures and in identifying any different approaches based on the feasibility and detailed design assumptions and any alternatives available at this stage.

8.3 Coverage of the ESMP

All activities ordained under the three stages of the project (pre-construction and construction) will be controlled and monitored as per the guidelines of the ESMP.

8.4 Institutional Requirements

The institutional requirements for the different phases of the proposed project are elaborated upon in the following sections:

8.4.1 ESMP Implementation During Pre-Construction Stage

The project, and the works therein, will be executed by KE during the pre-construction stage. In the organizational hierarchy of the company, the GM CHSEQ has the overall responsibility for implementing the aspects associated with this study during the different phases of the project. The responsibilities of KE under this stage including the following:

- Engaging in collaborative efforts to monitor environmental and social compliance in the pre-construction phase
- Providing regular reports on the status of the environmental and social compliance
- Conducting assessments and implementing measures to address the long term environmental and social impacts of the project
- Maintaining a productive partnership amongst relevant line departments and agencies identified in the stakeholder's chapter to ensure ongoing collaboration

8.4.2 ESMP Implementation During Construction Stage

The key stakeholders during the implementation of the proposed project are SEPA, KE, the Contractor, and the Third-Party Monitoring Team. The roles and responsibilities of these different parties are defined below:

- KE
- SEPA
- Third Party Monitoring Team
- Contractor

KE will bound the contractors through clauses in their contracts to implement the ESIA including the ESMP, and other terms and conditions of the environmental approval issued by SEPA. The entire ESMP will be included as a clause in the contractor's documents.

Roles & Responsibilities

a) SEPA

In accordance with the Sindh Environmental Protection Act of 2014, the responsibility for environmental protection and pollution control lies with SEPA (Sindh Environmental Protection Agency). SEPA is tasked with approving the Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) for all development projects falling under their jurisdiction. Additionally, SEPA will conduct audits of the proposed sub-project activities as necessary, ensuring adherence to the protocols outlined in the Environmental and Social Management Plan (ESMP) and obtaining environmental approval.

b) K-Electric (KE)

The KE team will oversee the day-to-day activities and overall implementation of the ESMP. This team will also manage the environmental and social aspects of project related activities, including arranging for environmental and social monitoring and preparing compliance reports for submission to GM CHSEQ, CEO, and SEPA. The team will be responsible to ensure compliance of the ESMP during the different phases of the project, where this team will also hire an independent environmental and social consultancy firm as the Third-Party Monitoring Team.

Furthermore, they shall also be responsible for:

- Ensuring the provision of necessary environmental training to relevant personnel.
- Ensuring compliance with all contractual obligations pertaining to environmental standards.
- Conducting regular site visits to construction sites to assess the environmental performance of the Contractor(s).
- Regularly checking the proper implementation of the Environmental and Social Management Plan (ESMP) during the construction phase.
- Reviewing monitoring reports on the progress of environmental activities.
- Ensuring that the Contractor implements additional measures recommended by the Supervising Consultant (SC) in environmental monitoring reports.

- Documenting and disclosing monitoring results, identifying corrective and preventive actions in periodic reports, and monitoring the progress of these actions towards desired outcomes.
- Assisting the Contractor in ensuring timely payments of negotiated prices.
- Providing assistance to the Contractor in obtaining necessary approvals from relevant departments.
- Overseeing compliance with all monitoring programs outlined in the ESMP.
- Maintaining effective communication with other relevant departments and stakeholders.
- Reporting the status of ESMP implementation to the Sindh Environmental Protection Agency (SEPA).

c) Third Party Monitoring Team

The Third-Party Monitoring Process will involve the engagement of independent Environmental specialists, where they will be responsible for monitoring environmental factors including conducting field surveys at the construction sites to assess the level of compliance. Their role will entail conducting external and independent monitoring of the ESMP implementation. The external monitoring agency will perform biannual, annual, and final evaluations of the ESMP and provide recommendations for necessary changes to the proponent team. Roles and responsibilities of the Third-Party Monitoring Team will include:

- Conduct autonomous monitoring at crucial sites throughout the construction phase and oversee the implementation of the Environmental and Social Management Plan (ESMP) within the project area.
- Track the Grievance Redress Mechanism (GRM) and ensure the resolution of complaints.
- Observe and revise or prepare corrective action plans as necessary.
- Monitor the implementation of the plans in collaboration with the Project Implementation Consultant.

d) Construction Contractor

Contractors will be obligated to hire on-site Environmental Experts who possess appropriate education and experience for each construction site. It will be the responsibility of the contractors to execute measures that prevent or minimize any negative environmental and social effects during the construction phase. Prior to commencing work, contractors must develop a site-specific Environmental and Social Management Plan (SSESMP) that outlines their approach to meeting the ESMP requirements for each site. This plan must be submitted for approval to KE. The Environmental Experts employed by the contractors will be responsible for undertaking the following activities:

- Develop the Site-Specific Environmental and Social Management Plan (SSESMP) and secure approval from KE.
- Implement the mitigation measures outlined in the ESMP and SSESMP at each construction site.

- Contractors are contractually obligated to comply with all the specific and general provisions stated in the contract document.
- Provide appropriate Personal Protective Equipment (PPE) to workers and train them on its proper usage.
- Prepare and submit monthly, quarterly, biannual, annual, and final progress reports to KE
- Immediately report any accidents, incidents, including environmental and social incidents, to KE.
- Conduct environmental and health and safety training for workers and laborers.
- Coordinate with the proponent project team.

8.4.3 ESMP Implementation During Operations Stage

The proposed project will be managed by KE during the operational phase, where the GM CHSEQ will be responsible for the O&M of the project with respect to the E&S aspects, where the aspects under this include:

- Coordinating for monitoring environmental and social compliance during operations
- Advising on, and monitoring any plantations
- Reporting on the O&M progress of environmental and social compliance to SEPA
- Assessing as well as mitigating the long term environmental and social impacts of the proposed project
- Sustaining a working partnership among SEPA, and other related public and private sector organizations

8.5 Environmental Mitigation & Management Matrix

The Environmental mitigation and management matrix is one of the central elements of the ESMP, where it will be used as the management tool for implementation of the above-mentioned mitigation measures. The plan includes the following:

- Envisaged impacts as identified in the ESIA and their recommended mitigation measures
- The person/ organization directly responsible for adhering to or executing the required mitigation measures

Regardless of the different organizations being delegated responsibilities for execution and monitoring of the project, proponent will be the primary party responsible for ensuring the complete implementation of the ESMP. The following table provides information about all impacts anticipated from project activities during different phases. The contractor(s) will be responsible for the preparation of Site Specific Environmental and Social Management Plan (SSESMPs) on the same format as this ESMP along with site specific plans based on the guidelines provided in the annexures.

Table 8.1 - Environmental & Social Mitigation & Management Matrix

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
Pre-Construction Stage				
1.	Land Acquisition The precise permanent and temporary land requirements cannot be fully determined at this stage until tower micro-siting and access planning have been completed. Potential permanent impacts are expected to be limited primarily to tower foundations, and gantry footprints. Temporary impacts may arise from access tracks, working areas, conductor stringing, vehicle movement, material storage, and restriction of land use. The preliminary impacts is assessed to be potentially minor to moderate, depending on the final locations of the towers, however, in the absence of complete land records, the impact cannot be fully classified.	• Apply the approved pylon routing and micro-siting procedure which is attached to this report as an annex • Obtain land records, and prepare detailed land use maps prior to final tower placement • Avoid houses, cultivated land, trees, and livelihood assets to the extent possible • Locate towers on plot boundaries or unproductive lands where feasible • Identify all affected owners and users, including non-title holders • Conduct consultations at site prior to finalization of design if any private land owners are identified • Undertake inventories and valuation of crops, trees, structures, and other affected assets (if any) • Schedule works to avoid peak agricultural periods where practicable • Restore temporary working areas and access routes • Maintain an accessible GRM	Contractor	KE
2.	Siting & Routing Poorly selected tower locations may result in avoidable impacts on land, vegetation, drainage, cultural receptors, community access and bird movement. Once tower foundations are constructed, relocation becomes difficult and costly. The design	• Overlay proposed tower locations with land records, ecological, and bird activity data • Flag towers and spans near sensitive receptors • Conduct joint engineering, ecological, and social verification • Evaluate tower shifts, increased spans, alternative tower types, and modified access routes	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	stage therefore presents the principal opportunity to avoid impacts.	• Avoid areas of concentrated low, or middle height target species flights where feasible • Document accepted and rejected alternatives		
3.	Cultural Resources There are no protected cultural or heritage sites located near the proposed transmission line route.	-		
4.	Sensitive Receptors & Existing Infrastructure The proposed transmission line route (13.4 km) passes through areas that may have scattered rural settlements and small residential clusters. Careful alignment planning will be required to maintain safe vertical and horizontal clearances from houses, in accordance with KE specifications and regulatory standards.	-	Contractor	KE
5.	Temporary Construction Camps There may be a requirement to establish small construction camps. If not undertaken carefully, activities involved in establishing and running campsite can result in deterioration of air & water quality, and social impacts including disease transmission.	• Sanitation facilities in the camps should be provided and its wastewater should adequately be disposed offsite through septic tank and soak pit or connected to the local sewerage system; • Contractor shall be made responsible through contract documents for proper disposal of the waste generated and not to dump these spoils/ earth near open plots, open spaces, open storm water drains, in front of settlements, on cultivated lands or left unattended along the construction site. It should be disposed in designated landfill site. • Contractors shall also be made responsible through contract documents to follow Sindh Environmental Quality Standards (SEQS) and	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		applicable standards during all the construction activities and ensure compliance of the same through periodic environmental monitoring reports.		
Construction Stage				
6.	Solid Waste Management Typical solid waste generated during construction include waste concrete, steel scrap, wooden scaffolding, empty cement bags, excavated soil, wood remains etc. Solid waste generated during land clearance and Earth-fill material could be in significant quantities. This waste has the potential to cause negative impact on the surroundings if not properly managed and disposed of. It may block nearby natural drainage channels that can ultimately cause localized flooding during monsoon season. Random storage of this waste may be injurious to the workers at the site as well. Windblown debris is a nuisance to the nearby settlements. Poor waste management practices would result in short term and long-term negative impacts on the aesthetics of the surrounding.	• A Comprehensive Waste Management Plan for Construction phase should be developed; • Construction sites should be equipped with temporary refuse bins, and construction wastes should be collected on a daily basis and contained in a temporary designated waste storage area on each site; • Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmentally friendly manner; • All type of wastes should be routinely collected from the designated area and disposed at designated waste disposal site(s); and • Upon completion of activities at a construction site all solid wastes should be completely removed and the site should be re-contoured or prepared for natural re-vegetation. • All hazardous waste if found shall be segregated from nonhazardous wastes at the point of generation of waste. During construction phase, suitable containers with following color coding shall be kept to collect and segregate common wastes at all facilities: • Recycling and reuse minimize the quantity of waste requiring disposal. Some of the wastes can be reused within the construction site while others can only be recycled. There is a great recycling potential for few of these wastes in	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		the recycling market. Waste shall be sold to the third-party contractors/ companies, who have proper recycling facilities.		
7.	Air Quality – Dust Emissions Construction activities that may lead to dust generation include excavation; transportation and tipping of cut materials; handling and storage of aggregates in concrete plants; concrete batching; site leveling and clearing of vegetation; and associated activities. The quantity of dust that may generate on a particular day of construction phase will depend on the magnitude and nature of activity and the atmospheric conditions prevailing on that day.	• The exposure of construction workers to dust should be minimized by provision of dust masks and mandating the workers to wear them. • Water should be sprinkled daily to wet all the expose surfaces. • Use of water suppression for control of loose materials on paved or unpaved internal road surfaces. Oil and oil by-products are not recommended method to control dust[10]. • Truck loads should be covered with tarpaulin. • Construction site, including soil and material piles at the site, should be adequately barricaded to avoid material escape, generation of dust. • Ready-mix can be used in the stages of the project wherever and whenever required and deemed appropriate. • Careful handling and working under moist conditions and monsoon season will be avoided as much as possible.	Contractor	KE
8.	Air Quality – Exhaust Emissions Major sources of exhaust emissions are standby diesel generators, material transport vehicles and emissions from construction machinery/earth moving equipment. Major exhaust emissions of concern are CO, SOx, NOx and Particulates. These emissions are	• Construction machinery, vehicles should be properly tuned and kept in good working condition, minimizing exhaust and vehicular emissions. • Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance of SEQS;	Contractor	KE

[10] WBG EHS Guidelines

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	injurious to human health in high concentration and can also cause vegetation damage by clogging the photosynthesis process in plants.	• Excessive engine idling will be discouraged and machinery causing excessive pollution (i.e., visible smoke/soot) will be banned from sites; • Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited.		
9.	Noise Pollution During the construction phase noise will be generated from the operation of heavy machinery and haulage of construction materials to and around construction sites and construction activities including concrete mixing, excavation, backup power generators for supply of electricity; use of pressure horn etc. These construction activities are expected to produce noise levels in the range of 80 – 95 dB and may cause discomfort to local residents and fauna.	• Machinery operation and high noise activities should be carefully planned and scheduled; • To the extent practical, batching plants and construction areas should not be located within 500 meters of a settlement; • Where that is not possible, high noise activities should cease between 22:00 and 06:00 hrs (Night time hours given in SEQS for Noise) at any construction site within 500 meters of a settlement, or if noise complaints are received from settlement residents. • Vehicles and machinery will be equipped with silencers. Contractors will be required to fit noise shields on high noise construction machinery; • Site labor working in high noise area such as where noise level exceeds 80 dB (A), will wear earplugs; • Occupational health, safety and environmental procedures and Environmental and Social Management Plan for proposed project would be followed.	Contractor	KE
10.	Vibration Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used. The	• Vibration measurement will be carried out during construction phase by the contractor near the settlements in the AOI.	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	operation of construction equipment causes vibrations that spread through the ground and diminish in strength with travelled distance. During earthworks and excavations heavy machinery such as bulldozers, excavators, and loaders used for earthmoving can generate significant vibrations and it can have impact on nearby building structure. Based on the predicted peak vibration levels described in above table, it is expected that vibration would be barely perceptible at sensitive receiver locations within over 50m for most construction activities. According to British Standards of Noise and Vibration, humans are particularly sensitive to vibration with the threshold of perception typically being in the range of 0.14 to 0.3 mm/sec Peak Particle Velocity (PPV) and levels above this may cause annoyance. However, significantly higher levels than this can be tolerated for single short-term events and do not cause annoyance or disturbance to humans.	• Timing of the construction works to be conducted during the recommended operational hours, to reduce vibration levels in the AOI. • The vibration from major construction activities such as excavation, compacting, drilling, etc. are considered intermittent and short-term, and likely to be tolerated if prior warning is given to potentially affected residents as and where they may be encountered along the route. • The equipment operators to be made aware by the contractor of potential vibration issues problems and of techniques to minimize vibration effects during construction works.		
11.	Ecology – Flora The overhead TL will require the least footprint on flora as only site clearance is required at tower bases. Onsite vegetation clearance will be required only within the boundaries of proposed transmission lines. Therefore, the impact on ecology of area from construction activities is minimal. There were also no trees identified during the	• Prior to clearing or excavation at any tower location, the contractor's environmental representative shall inspect and demarcate the approved footprint. Clearance shall be limited to the minimum area required for safe construction. Mature native trees, nesting vegetation, and ecologically useful shrubs shall be retained where practicable. • No clearance shall occur outside of the approved tower pad, access route, or	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	survey of the RoW, hence, no tree removal is anticipated under the project.	working area. Temporarily disturbed areas shall be reinstated with salvaged topsoil, and, where appropriate, native species.		
12.	Ecology – Avifauna Construction activities may disturb birds through noise, movement of machinery, vegetation clearance, lighting and the temporary presence of workers. Disturbance may result in displacement from foraging or perching locations and may affect active nests if works are undertaken during breeding periods.	• Undertake a pre-construction ecological inspection at each tower and access location. • Check trees, shrubs, tower structures and ground vegetation for active nests. • Establish an appropriate species-specific exclusion buffer around active nests. • Do not remove or disturb an active nest until nesting has concluded, unless authorized by the relevant wildlife authority. • Avoid unnecessary night work and high-intensity lighting. • Direct temporary lighting downward and away from open habitat. • Restrict vehicle movement and personnel to approved footprints. • Prohibit hunting, trapping, harassment and feeding of wildlife. • Schedule particularly noisy activities outside periods of concentrated bird activity where practicable. • Maintain records of nests, sensitive observations and work restrictions. • Brief workers on wildlife protection requirements. • Engage a qualified ecologist where sensitive or protected species are encountered.	KE	KE
13.	Land Resources	• One way to reduce the impact is to stockpile the removed topsoil for later reuse	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	Top Soil Removal During site preparation, the removal of topsoil is necessary for leveling and grading the land. This is typically done to facilitate the construction of infrastructure such as buildings, roads, and utilities. The removal of topsoil removes the nutrient-rich layer essential for supporting vegetation, which could impact local biodiversity and lead to long-term degradation of soil quality if not managed properly. Once the topsoil is removed, the land is more vulnerable to erosion, especially if vegetation is not re-established in a timely manner. Soil Compaction The movement of construction machinery, transport vehicles, and heavy equipment across the project site leads to soil compaction. Areas that will be developed, such as internal access roads, temporary laydown areas, and building foundations, are especially vulnerable to compaction. Compaction decreases the pore space between soil particles, reducing air and water flow within the soil. This can impair plant growth and affect water retention. Compacted soils have reduced capacity to absorb water, leading to increased surface runoff, erosion, and potential flooding risks in the long term.	in landscaping or reclamation efforts. Additionally, erosion control measures, such as mulching or silt fences, can be employed. • Use of less invasive machinery, proper scheduling of construction activities, and restoration techniques (e.g., subsoiling or deep tillage) can help alleviate compaction impacts. Additionally, controlling vehicle movement to designated paths can minimize the extent of compaction. • Proper waste segregation, recycling programs, and designated storage areas for hazardous materials are essential to prevent contamination. • All hazardous wastes should be disposed of according to local regulations, ideally by certified waste management contractors. • Spill prevention measures (e.g., secondary containment for fuel storage) should be implemented. • Develop and implement a soil management plan that includes strategies for stockpiling and reusing topsoil, reducing compaction, and restoring soil health post-construction • Once construction activities are completed, the site should be revegetated with native plants to help restore soil structure, prevent erosion, and enhance biodiversity. • Establish a comprehensive waste management system that includes recycling, proper hazardous waste disposal, and contamination prevention measures to protect land resources		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	Waste Generation & Soil Contamination Construction activities generate a variety of waste materials, both general and hazardous. Improper handling of waste materials, particularly hazardous ones, could have significant consequences for the land. This includes materials such as concrete, wood, metals, and packaging waste. If not disposed of or recycled properly, these can contribute to land pollution and waste accumulation on-site. Waste such as used oils, hydraulic fluids, fuel, and chemicals can pose serious risks to land quality if they leak or are disposed of irresponsibly. These materials can contaminate soil and groundwater, leading to long-term environmental degradation. Soil Erosion Project activities may cause erosion of soil. Such activities may be identified as trenching, transportation of materials and equipment, preparation of tower base for overhead TL, landscaping and removal of bushes etc. Usually, the exposed soil after excavation is vulnerable to erosions and runoff by moderate to heavy rains. But, the impact of all these activities would be less significant and temporary lasting only for construction period. Inappropriate handling, storage and disposal of fuels, oils and	• Construction activities should be so scheduled to avoid runoff due to rain; • The removed soil must be contained in an enclosure to reduce the chances of runoff during the seasons of precipitation; • Stock piles of fine material should be wetted or covered with tarpaulin especially during windy weather conditions; • Site workers should wear dust masks especially during the dry and windy weather conditions; • Debris should be collected during construction and disposed of in low lying areas near the site; • Cut material should be used to level the site area where required or be disposed at designated spoil disposal sites; • Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course; • Refueling, oil changing and maintenance of machinery, equipment and vehicles should only be carried out at designated areas within the construction site; • Oil contaminated materials should be disposed at designated waste disposal facilities. • According to usual practices during the construction of large-scale infrastructure projects like these, the access road will be developed within the RoW of the proposed project. This will limit and reduce the		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	chemicals at construction sites may also lead to contamination of soil. Temporary Access Roads The proposed Project currently does not have any direct roads due to lying outside of the city of Karachi, and as such will require access roads to be built for work. Similar access roads will be required along the length of the project also for contractors working on the T/L. The development of these roads will allow for the transport of workers, construction materials, and machinery for purposes related to the project. The construction of these roads however, may cause damage to crops, soil erosion, soil contamination, air and noise problems.	additional impact of the establishment of the access roads for the proposed Project. • For the development of access roads/tracks, contractor will be bound to consider mitigations to further reduce the severity of this impact including the selection of access roads/tracks based on certain criteria to ensure high stability, no or minimum tree cutting and crop damage, minimum disturbance to nearby settlements and other social amenities. • The approach roads should be selected to avoid any soil degradation and erosion impacts. • Mitigations for the loss of tress and crops, soil erosion, soil contamination, air and noise pollution, waste generation, and loss of agricultural land provided in below sections will be adopted.		
14.	Fuel, Oil, & Chemical Handling Inappropriate handling, storage and disposal of fuels, oils and chemicals at construction sites may lead to contamination of soil.	• Chemicals and oils should be stored in secure designated areas with temporary impermeable bunds at distance of at least 100 m from any water course; • Refueling, oil changing and maintenance of machinery, equipment and vehicles should only be carried out at designated areas within the construction site; • Oil contaminated materials should be disposed at designated waste disposal facilities.	Contractor	KE
15.	Water Consumption & Conservation	• Regular monitoring of water consumption, conservation and quality; • Use of leak proof water storage tanks;	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	Water is used in numerous construction activities such as concreting, curing, plastering, domestic etc. Water required for such activities is likely to be met from external sources such as water tankers supplying water to the construction site.			
16.	Seismicity The proposed project area, extending across Thatta and Karachi (Malir District), lies within a region classified as moderate seismic risk. According to national seismic zoning, Sindh Province, including the Thatta and eastern Karachi areas, falls within Seismic Zone 2, while the specific project alignment is located in Seismic Zone 2A, which represents the upper limit of moderate seismic hazard. In this zone, the expected Peak Ground Acceleration (PGA) is generally less than 0.05 g. Review of historical seismic records for the region indicates that earthquakes recorded in and around the project corridor during the past several decades have generally been of low to moderate magnitude, typically ranging between approximately 4.0 and 4.7 on the Richter scale. These events have not resulted in significant structural damage but indicate that seismic activity, although infrequent, is a relevant consideration for infrastructure development in the area. A low to moderate seismic event could potentially affect transmission line structures, including towers, foundations, and gantry	The proposed project and the associated structures should be designed and constructed as per Seismic Building Code of Pakistan 2007 (SBC-07) to comply with minimum requirements for seismic safety of structures.	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	arrangements, if seismic considerations are not adequately incorporated into design. Therefore, all transmission line towers, foundations, and associated structures will be designed in accordance with applicable seismic design standards and K-Electric engineering specifications, considering local ground conditions and Peak Ground Acceleration values. Incorporation of appropriate seismic design measures will minimize structural risks and ensure the safety, stability, and long-term reliability of the transmission line infrastructure.			
17.	Traffic Traffic flow in the locality of project slightly increases during construction activities. The transportation of trucks for raw materials and mobilization and demobilization of the earth works equipment are required during construction phase of proposed project. This activity has potential to directly impact the traffic flow along the right of way of proposed transmission line. However, as the project area is not frequented by heavy and light traffic, adverse impact of general traffic conditions in area would be minimal.	• Traffic management plan will be developed and implemented during the construction phase; • Construction activities will be scheduled to reduce the chances of traffic congestion; • Adequate and appropriate road signs will be erected to warn road users along the ROW of transmission line; • Raw materials for construction work will be adequately covered within the trucks to prevent any escaping into the air and along the roadway; • Vehicles will be maintained regularly to reduce the exhaust emissions; and • Any complain launched by community member will be responded and appropriate action will be taken to avoid it in future.	Contractor	KE
18.	Community Health & Safety	• Emergency response plan should be prepared and implemented during entire phase of construction;	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	The construction of transmission line may pose a modest risk to local communities from emergency events such as entry of local people in dangerous working environment i.e., close to transmission line infrastructure.	• In order to minimize traffic congestion (if applicable), deliveries of materials and equipment should avoid peak traffic hours; • Erection of towers and poles for the overhead TLs should be barricaded and crane movement should be assessed prior to the operation near the community areas; • Diversions, hazard points and works at construction sites will have appropriate warning signs; this is particularly important at night to avoid accidents.		
19.	Occupational Health & Safety The construction works involving earthworks, excavation, erecting structures, etc. poses an inherent risk of injury to labor from accidents. Poor housekeeping practices may lead to stagnant water as breeding grounds for insect vectors (causing malaria, dengue fever etc.). Hazards from handling equipment, ergonometric stress, lifting heavy materials etc. may cause injury to the labor. Electrical equipment and substation pose electrocution hazard.	Site-specific labor health and safety hazards are also critical to identify based on job safety analysis or comprehensive hazard or risk assessment. Health and safety management planning should include the adoption of a systematic and structured approach for prevention and control of physical, electrical, chemical, and biological health and safety hazards. Use of PPE should be made mandatory. Only trained and experience crane, forklift, etc. operators should be hired. CC shall ensure that Job Hazard Analysis (JHA) is performed prior to commencing jobs. It shall also be ensured that the JHA is reviewed after the following: • Whenever work is stopped • Every time work conditions or the job scope changes • Persons working the job shall review and acknowledge the JHA by their signature Crane & Lifting Operations	Contractor	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		For all Crane & Lifting Operations CC shall ensure full compliance with standard operating procedures. CC shall develop a site-specific pre-lift checklist which includes the following at minimum: • Crane rigging capacity adequately for load • Condition of slings • Rigging condition adequate for load • Area of swing or travel unobstructed • Multiple crane use • Power line approach distance maintained • Stability and footing • Taglines and spotters • Illumination and weather • Signal operator • Job hazard analysis and other permits All lifting and rigging activities shall be supervised and conducted by a competent person or team, CC shall maintain a lifting gear registry for all lifting gear on-site inclusive of a listing of all lifting gear, copies of equipment certificates (manufacturer, safe working load, serial number) and the inspection/recertification frequency. Forklifts & Non-road Vehicles CC should ensure forklift and non-road vehicles are fit for purpose and operated according to manufacturer's requirements. Only competent operators are permitted to operate forklifts and non-road vehicles.		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		At minimum, all forklifts and non-road vehicles shall be equipped with following equipment: • Seat belts • Horn • Emergency Brake • Wheel chock • Labeled Controls • Fire Extinguishers • First Aid Kit • Back-up Alarm Scaffolding CC is responsible to establish periodic inspection, certification and recertification program for scaffold works. Only qualified worker is authorized to erect, inspect and certify scaffold. All scaffolds should have a guardrail system on each open side, up to the access point. It should be equipped with toe boards having suitable access ladder. Over-exertion • Workers will be trained with lifting and materials handling techniques before the construction of the project, including the placement of weight limits above which mechanical assists or two-person lifts are necessary. • Work site layout will be planned to minimize the need for manual transfer of heavy loads.		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• Tools will be selected and work stations would be designed to reduce force requirements and holding times, which promote improved postures, including, where applicable, user adjustable work stations. • Administrative controls, such as job rotations and rest or stretch breaks will be implemented into the work processes. Slips & Falls • Good house-keeping practices, such as the sorting and placing loose construction materials in established areas, would be implemented. • Excessive waste debris and liquid spills will be cleaned up regularly. • Electrical cords and ropes will be located in common areas and marked corridors. • Slip retardant footwear will be used. Struck by Objects • Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap. • Temporary fall protection measures in scaffolds and out edges of elevated work surfaces would be used, such as hand rails and toe boards to prevent materials from being dislodged.		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• Appropriate PPE such as safety glasses with side shields, face shields, hard hats, and safety shoes, would be worn. Moving Machinery • The location of vehicle traffic, machine operation, walking areas, and controlling vehicle traffic will be planned and segregated through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic. • The visibility of personnel will be ensured through the use of high visibility vests when working in or walking through heavy equipment operating areas as well as training of workers to verify eye contact with equipment operators before approaching the operating vehicle. • Inspected and well-maintained lifting devices will be used that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations. Electrocution • Use of ground-fault circuit interrupters • Periodic inspection of extension cords and portable tools • Use power tools and equipment as designed		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• Proper lockout/tagout procedures will be followed • Safety signs for electrical hazard will be placed • Ensuring proper guarding of electrical equipment and facilities such as substation and switchgear Other Site Hazards • Only authorized personal should be allowed at the construction site • Identify and minimize, so far as reasonably practicable, the causes of potential hazards to workers, including communicable diseases such as HIV/AIDs and vector borne diseases; • Avoid stagnation of water and initiate drainage/cleanup of stagnant water; • Provide for the provision of appropriately stocked first-aid equipment at work sites; • Provide for appropriate personal protective equipment (PPE) to minimize risks, such as but not limited to appropriate outerwear, boots and gloves; safety helmets; • Provide training for workers for the use of PPE; • WB Group's Environment, Health and Safety (EHS) Guidelines (attached at the end of this document) will be implemented; • No bonded and child labor will be permitted at site;		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• Major labor laws will be followed e.g., Minimum Wage, Harassment of women in the work place Hours of work, Overtime Payment. • Also, laborers will be trained on appropriate interaction with local people especially women; • Include procedures for documenting and reporting accidents, diseases, and incidents; and • All safety precautions will be taken to address safety hazards for the nearby community. These precautions may include safety/warning signage, safety barrier around the construction site. • Lighting provided for labor during night time work should be adequate.		
20.	GHG Emissions Greenhouse gas (GHG) emissions contribute to climate change at both regional and global scales. For the proposed project, GHG emissions are expected to be limited and primarily associated with the construction phase. Emissions will mainly arise from the combustion of diesel fuel in construction vehicles, cranes, stringing equipment, material transportation trucks, and temporary power generation units used at construction sites and camps. Minor contributions to carbon dioxide (CO_2) emissions may result from site preparation activities, including excavation for tower foundations, limited vegetation clearance along the Right of Way	• Employing energy-efficient and low-emission machinery, as well as transitioning to electric or hybrid vehicles for transport, can significantly reduce direct CO2 emissions. • Minimizing land disturbance and adopting soil conservation practices can help preserve the carbon sequestration capacity of the area. Reforestation and replanting efforts post-construction can also help offset emissions. • Streamlining the construction schedule and reducing idle time for machinery can minimize unnecessary fuel consumption and associated emissions. • Implementing carbon offset initiatives, such as funding renewable energy projects or		

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	(ROW), and transportation of construction materials. These activities may also cause short-term disturbance to soil and vegetation, resulting in a temporary reduction in local carbon sequestration capacity.	supporting local reforestation efforts, can help balance out the GHG emissions generated during construction. • Regular maintenance of vehicles, plants, and machinery according to the manufacturer's specifications. • Monthly visual inspections of vehicle and plant exhausts to detect excessive smoke emissions and take corrective action when needed. • Installation of approved pollution control devices on equipment and machinery. • Avoid overloading the transport vehicles to reduce emissions. • Site vehicles and machinery will be switched off or throttled down when not in use.		
21.	Impacts on Migratory & Soaring Birds The project area is not known to lie within a formally designated Important Bird Area. Nevertheless, year-long monitoring confirms that resident and migratory raptors, vultures and other birds use the wider project landscape. Construction does not create the same collision hazard as an energized transmission line, but conductor stringing, cranes, temporary wires and increased disturbance may temporarily affect bird movement. The risk will be highest where activities occur across repeatedly used flight paths or during periods of reduced visibility.	• Use the bird-monitoring data to identify spans with repeated target-species activity. • Avoid leaving temporary wires, pulling ropes or conductors suspended unnecessarily. • Fit temporary visibility markers where stringing equipment remains in place for extended periods. • Suspend stringing during severe dust, fog, heavy rain or other poor-visibility conditions where bird movement is observed. • Maintain ecological supervision during stringing at identified sensitive spans. • Record bird incidents and near misses. • Review the need for additional permanent diverters before energization.	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
Operational Stage				
22.	Flood Risk In line with the topography and flood risk carrier out earlier, the flood risk identified for the project site is low. This is also in line with the data from 2010-2022, which shows that the project site has not been under the influence of flood risk since 2010 and thus is unlikely to be affected by flooding in the coming years too may be due to higher elevation in this area.	• Transmission towers located in low to moderate flood risk zones will be designed with adequate foundation depth and elevation to withstand localized flooding and waterlogging conditions. • Towers crossing seasonal drainage channels and ephemeral streams will be placed outside active flow paths where feasible, and foundation designs will account for potential scouring and erosion. • Natural drainage patterns will be maintained, and construction activities will avoid obstruction or diversion of existing drainage channels. • Temporary construction materials, equipment, and spoil will not be stored within natural drainage paths or low-lying areas susceptible to water accumulation. • Proper surface drainage and slope protection measures will be implemented around tower foundations to prevent erosion and ponding during rainfall events. • Construction activities in areas of moderate flood risk will be scheduled, as far as practicable, outside the monsoon season to reduce flood-related risks. • Emergency preparedness measures will be included in the Environmental and Social Management Plan (ESMP) to address extreme weather or unexpected flooding events.	KE	KE
23.	Bird Collisions	• Correlate flight height bands with actual conductor and earth wire elevations	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	Overhead transmission lines may result in bird collision where conductors or earth wires intersect frequently used flight paths. Collision susceptibility varies according to species, body size, maneuverability, flight behavior, age, weather, visibility, surrounding habitat and line configuration. The yearlong dataset demonstrates regular use of the area by raptors, vultures, and other birds. Although most target-species observation time was recorded in the upper survey band, approximately 19.8% occurred in the lower- and middle-class bands combined. Final collision risk interpretation requires comparison of recorded flight heights with final conductor elevations and sag profiles. Potentially sensitive groups identified include eagles, buzzards, vultures, kites, harriers, kestrels, hawks, sandgrouse, lapwings, egrets, herons, flocking pigeons, and doves.	• Map target flight paths in relation to final alignment • Prioritize diverters on earth wires or the most difficult to see conductor • Install diverters on spans showing repeated crossings, low or middle flight activity, proximity to feeding/ perching areas or restricted visibility • Use high-contrast, durable devices suitable for local dust, heat, and wind conditions • Implement the bird flight diverter and carcass monitoring procedure of KE, which includes: ○ Identification of locations and spacing at which diverters are to be installed ○ Inspect devices after installation and during routine line patrols ○ Implement the carcass monitoring procedure ○ Apply adaptive management where mortality exceeds the project trigger levels		
24.	Avian Electrocution Electrocution risk depends on tower configuration, conductor separation, exposed energized components and opportunities for birds to perch or bridge energized and grounded elements. Large raptors and vultures may be more susceptible due to their wingspan.	• Review tower and gantry design against bird safe engineering principles • Maintain adequate separation between energized and grounded components • Insulate or cover exposed jumper connections where a bridging risk is identified • Avoid attractive perching arrangements immediately above hazardous components	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	At 220 kV, conductor separation is generally greater than on distribution infrastructure, which may reduce the likelihood of phase-to-phase electrocution. However, risk may remain at jumpers, gantries, terminations and other configurations where energized and grounded components are in close proximity.	• Install safe perch deterrents or alternative perch structures, where justified • Investigate all bird mortality beneath towers and gantries • Retrofit hazardous configurations where monitoring identifies repeated incidents		
25.	Displacement from Habitats The presence of towers, conductors, maintenance personnel, and access activity may alter localized bird use. Some species may avoid the line, while others may use towers for perching or nesting.	• Restrict routine maintenance to approved access routes • Avoid disturbance of active nests during maintenance • Do not remove nests unless required for safety • Record repeated nesting or roosting locations • Apply species specific management where towers become regularly used by sensitive species of bird • Avoid pesticide use for vegetation management • Maintain restored areas and prevent unnecessary widening of access tracks	KE	KE
26.	Wind, Fire, & Earthquake Hazards Wind, fire and earthquakes pose risks to the project operation, and the likelihood of occurrence consider medium with significance of impact is major.	• Transmission towers have been designed as per relevant national building codes which include earthquake resistance and loading requirements related to wind conditions. • Transmission support structures such as tower foundations have also been designed to withstand different combinations of loading conditions including extreme winds that generally exceed earthquake loads.	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• The fire hazards risk will be minimized through the use of tall towers and wide ROW. • System protection features designed to safeguard the public and line protection systems will consist of Transmission Line relays and circuit breakers that are designed to rapidly detect faults and cut-off power to avoid shocks and fire hazards. • Regular maintenance of the protection system including conductors and circuit breakers should be undertaken.		
27.	Electromagnetic Interference The corona of overhead Transmission Line conductors and high frequency currents of overhead Transmission Line can create radio noise which may interfere with broadcast signals or electronic equipment.	• Standard design guidelines have been adopted to limit the conductor surface gradients so as to minimize electronic interference.	KE	KE
28.	Electrocution Hazard High voltage transmission lines may pose electrocution hazard for unauthorized person(s) attempting to climb the tower(s).	• Reduction in the Resistance to Ground of the grounding system • Proper placement of ground conductors • The addition of resistive surface layer • Use of insulating protective equipment inside safety boots or standard class safety shoes to provide protection against electrocution, during wet season. • Keep extra safety margin from live part during wet season. • A grounding (earthing) system must be designed. The total ground potential rise, and the gradients in potential during a fault (called touch and step potentials) must be	KE	KE

S. No.	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		calculated to protect passers-by during short-circuit. • Each tower shall be fitted with an anti-climbing device to prevent unauthorized persons from climbing the tower. The anti-climbing device shall be the ACD spiked type barbed wire or other approved type, and shall be fixed at a height not less than 3 meters above ground.		
29.	Visual Impacts Transmission line towers and conductors may be visible from surrounding areas, particularly along access roads, xerophytes, barren land, and open land. The presence of these structures may result in a change to the existing visual character of the area; however, the baseline visual environment is already influenced by existing infrastructure such as roads, utility corridors, pipelines, and nearby industrial developments. The transmission line alignment does not pass through any designated scenic viewpoints, tourist locations, or visually sensitive receptors. There are no dense residential settlements or recreational areas located within the immediate Right of Way (ROW). As a result, visual impacts are expected to be localized, linear, and of low to moderate significance, primarily affecting short-range views within the project corridor.	• The transmission line alignment has been selected to follow existing utility corridors and disturbed areas as far as practicable, thereby reducing visual contrast with the surrounding landscape. • Tower locations will be optimized during detailed design to avoid prominent ridgelines and visually sensitive locations, where feasible. • Lattice towers will be finished in non-reflective, neutral colors that blend with the surrounding terrain to minimize visual prominence. • Construction camps, material storage areas, and temporary access tracks will be located away from public view where practicable and will be removed upon completion of construction. • Temporary construction areas will be restored to their original condition after completion of works, including leveling of disturbed ground and removal of construction debris.	KE	KE

8.6 Environmental & Social Monitoring Plan

Environmental monitoring plays a crucial role in providing timely and valuable information to project management and implementation agencies. In essence, monitoring involves regularly checking and balancing the progress of project activities and the achievement of developmental targets during construction and operation. It aids in promptly identifying, analyzing, and addressing any obstacles that may arise. Specific environmental parameters, encompassing physical, ecological, and aspects, are carefully selected, and subjected to quantitative analysis. The results of this analysis are then compared against established guidelines, standards, and pre-project conditions to assess the effectiveness of the Environmental and Social Management Plan (ESMP) and its implementation in mitigating impacts. The objectives of the environmental monitoring plan throughout the construction and operation phases are as follows:

- Monitor the actual impacts of the project on physical, ecological, and socio-economic receptors.
- Provide recommendations for mitigation measures in case of unforeseen impacts or when the impact level exceeds the anticipated level stated in the Environmental and Social Impact Assessment (ESIA).
- Ensure compliance with legal and community obligations, including safety measures during the construction and operation phases.
- Ensure the proper disposal of excess construction materials, solid waste, water, wastewater, and gaseous emissions.
- Evaluate the adequacy of the ESIA in relation to the project's predicted long-term impacts on the physical, ecological, and socio-economic environment of the area.
- Assess the effectiveness of the mitigation measures proposed in the Environmental and Social Management Plan (ESMP) and recommend improvements if necessary.
- Compile data on periodic incidents and accidents to support analyses aimed at minimizing future risks.

The project team will hold responsibility for all monitoring activities to be conducted (compliance and effects monitoring). All findings and results will form part of the monitoring report to be shared with SEPA.

8.6.1 Compliance Monitoring

Compliance monitoring of the proposed project activities will serve as a tool to ensure that the environmental control measures identified are strictly adhered to during project execution. This will be conducted by the staff of the SC. The goals of the compliance monitoring will be to:

- Observe the activities carried out by the contractor(s) or other individuals involved in the proposed project in a systematic manner.
- Ensure that the activities are in accordance with the Environmental and Social Management Plan (ESMP).

- Document and communicate the observations to the project team for prompt corrective actions, if necessary.
- Maintain a record of all environmentally and socially significant incidents, along with the corresponding actions and corrective measures taken.
- Establish communication with the local communities, gather their opinions and concerns, and discuss them during monthly meetings.
- Prepare regular reports on the environmental performance of the proposed project.

8.6.2 Effects Monitoring

The Environmental and Social Impact Assessment (ESIA) considers the projected impacts of the proposed project using available information and the interconnectedness of various environmental and social factors. Mitigation measures are incorporated based on this assessment to ensure that the expected residual effects remain within acceptable thresholds. However, it is important to recognize that despite full implementation of mitigation measures, there is a possibility that the project's negative impacts may exceed predicted levels or acceptable limits. To address these concerns, an effect monitoring program will be implemented during the project activities, aiming to effectively manage environmental and social risks and uncertainties. The objectives of the effects monitoring program can be outlined as follows:

- To ensure that the impacts of the proposed project remain within acceptable thresholds, thereby establishing trust and confidence among the public.
- To promptly alert the project team about any unforeseen adverse impacts or sudden changes in impact trends, enabling swift corrective actions such as modifications to project activities or the implementation of additional mitigation measures.
- To provide information that assists in planning and controlling the timing, location, and intensity of specific project activities, with the aim of minimizing their effects.
- To support research and development efforts by documenting the effects of the proposed project, which can be used to validate impact prediction methods and enhance the accuracy of future project assessments.

The contractor(s) holds the primary responsibility for conducting effect monitoring under the KE team, covering the entire project. The effect monitoring program has been meticulously developed, considering the identified impacts outlined in Chapter-5. Some adjustments may be made to this program, including potential changes in frequency, based on insights gained from the project's one-year operation, documented in the Change Record Register.

Table 8.2 - Environmental & Social Monitoring Plan

Environmental Aspect	Monitoring Parameters	Monitoring Location	Monitoring Frequency	Responsibility
Construction Phase				
Air Quality	Priority parameters (as per SEQS)	Near Construction sites/camps	Monthly	CC
Excavation, storage of soil and waste, generation of waste	Check any obstruction in existing drains due to construction, check lifting of waste material, check waste management plan	At construction site	Monthly	CC
Fuel, Oil & Chemical handling, storage and disposal	Check contamination on the ground, check waste disposal	Vehicles/ machinery in working areas	Monthly	CC
Construction Waste Disposal	Domestic waste, Hazardous waste – Chemical waste, electro waste, Paper and Polythene material waste and Wood	Collection, handling, storage areas and disposal	Monthly	CC
Exhaust Emissions	Parameters as per SEQS	Construction vehicles	Monthly	CC
Noise and Vibration	Noise Intensity (dB)	Near Construction site	Monthly	CC
Drinking water	Priority parameters	Water coolers	Monthly	CC
ROW Clearance	Check tree cutting, compensatory plantation, inventory of cleared trees / plants	At construction alignment	Monthly	CC
Safety Precautions for the Workers	Accidents, PPE, Annoyance, Fire Hazards, Safety Protocols, Spill on Land and Spill on Water	All construction areas	Monthly	CC

Birds monitoring	Birds Population dynamics, displacement and death of birds	Around Keenjhar Lake and project site	Monthly	CC
Traffic Movement near construction site	Traffic flow, timing of activities, near misses and injuries records and reporting	At crossroads and along transmission line Right of Way	Monthly	CC
Social Impacts	Review of complaint register Local Consultations	Near Construction site	Monthly	CC
	Surface topography, Proper backfilling and carpeting	All excavated areas	Continuous monitoring	CC
Operational and Maintenance phase				
Human Exposure to Electromagnetic Fields (EMF)	EMF value	Transmission line Corridor	Annually & record is maintained	K.E

8.7 Communication & Documentation

Communication and documentation are essential features of the ESMP, where the key features are:

8.7.1 Data Recording & Maintenance

Standardized formats will be used for documenting information during environmental monitoring, ensuring consistency and compatibility with the designed database. To streamline data entry, check boxes, will be incorporated wherever applicable. Additionally, a tracking system will be established for each form to facilitate efficient management and organization of collected data.

8.7.2 Database

The database includes the following information:

- Training Programs
- Staff Deployment
- Non-compliances
- Corrective Actions
- List of Environmental & Social Data on soil and land pollution
  - Disposal of waste
  - Water resources
  - Fuel oil and chemical spills
  - Vegetation record
  - Wastewater treatment records
  - Noise pollution
  - Air and dust pollution
  - Socio-economic data
  - Ecological sensitivities

8.7.3 Meetings & Reporting

During the construction phase, the SC will convene monthly site meetings to address regular activities, non-compliance issues, and their corresponding corrective actions. Periodic reports, as outlined in the table below will be generated specifying the responsible individuals for report preparation and review. Furthermore, meeting minutes will be included in routine environmental reports to ensure comprehensive documentation:

Table 8.3 - Periodic Reporting Mechanism

S. No	Report Category	Prepared by	Submitted To	Reviewed by
1.	Monthly	Contractors' environmental staff	KE	KE
2.	Quarterly	Contractors' environmental	KE	KE

3.	Quarterly Environmental Monitoring Report	Contractors' environmental	KE	KE
4.	Semi-Annual External Environmental Monitoring Report	Third Party Monitoring and Evaluation Consultant	KE	KE
5.	Annual Report	Contractors' environmental staff	KE	KE
6.	Completion Report	Contractors' environmental staff	KE	KE

8.7.4 Photographic Records

Contractors will be required to maintain photographic documentation throughout the implementation of the project. This photographic record should encompass essential elements such as site photographs, road infrastructure, camp sites, monitoring activities, and more.

8.7.5 Non-Compliance of the ESMP

The successful implementation of the proposed ESMP relies on the collaboration of various stakeholders. The Contractor holds primary responsibility for ensuring the execution of the mitigation measures outlined in the ESMP, which will be included in the contractual agreements. The environmental mitigation costs will be factored into the overall project budget, and the Contractor will receive payment based on monthly compliance reports. However, failure to comply with the ESMP implementation and timely submission of compliance reports may result in deductions from the Contractor's payments allocated for environmental components. The compliance status of the ESMP will also be periodically submitted to SEPA for review, as mandated by their environmental approval requirements. Non-compliance may lead to the withdrawal of the environmental approval.

8.7.6 Review of Recorded Data

KE will periodically review and examine all data and communications documented and maintained by the Contractor. Based on their assessment, appropriate actions and recommendations will be provided to the Contractor to enhance the quality of recording and documenting practices.

8.8 Contractor's Obligation & Management

The contractor will bear primary responsibility for ensuring the effective implementation of the proposed mitigation measures outlined in the ESMP. The necessary details of the ESMP will be included in the bidding document and subsequently incorporated into the contract documents of the contractor. The costs

associated with the environmental and social mitigation will be included in the overall project budget, and payments to the contractor will be based on monthly compliance reports, actual work completed on site, and resource allocation. Additionally, the contractor will be accountable for developing and executing a site specific ESMP in accordance with the guidelines of the ESMP. Prior approval from the client will be required for the Contractor's ESMP and all associated sub-plans. Furthermore, the Contractor will ensure the presence of E&S staff on site from the project's commencement. A cost has also been calculated for the implementation of the mitigation measures outlined in the report above, where this cost is highlighted below.

Table 8.4 Environmental & Social Implementation Cost		
Activity	**Cost (Rupees PKR)**	**Remarks**
Training Program	500, 000	refer section 7.9.8
Environmental Monitoring		
Ambient Air (Construction)	(40,000*1*4) = 160,000	Cost for monitoring at 01 location @Rs.40, 000/per location.
Ambient Air (Operation)	(40,000 * 1*12) = 480,000	Cost for 1-year monitoring at 1 location @Rs.40,000/per location
Wastewater (Operation)	(50,000 * 12) = 600,000	Cost for 1-year monitoring at 1 location @Rs.50,000/location
Noise Levels (Construction)	(1,000 * 4 * 4) = 16,000	Cost for 1-year monitoring at 04 locations @Rs.1,000/location
Noise Levels (Operation)	(1,000 * 4 * 4) = 16,000	Cost for 1-year monitoring at 04 location @Rs.1,000/location
Gaseous Emissions (Construction)	(4,000 * 1 * 4) = 16,000	Cost for 1-year monitoring at 1 location for quarterly @Rs.4,000/ location
Gaseous Emissions (Operation)	(4,000 * 2 * 12) = 88,000	Cost for 1-year monitoring at 2 locations for monthly @Rs.4,000/location
Mitigation Measures (Construction)	500,000	Initial estimates
Mitigation Measures (Operation)	500,000	Initial estimates
Reporting	1,000,000	Initial estimates
Sub-total	3,876,0000	-
Contingencies (5% of ESMP cost)	209,000	-
Grand Total	**4,085,000**	-

9 Conclusion

This Environmental and Social Impact Assessment (ESIA) has evaluated the potential environmental and social impacts associated with the proposed 220 kV double-circuit transmission line throughout its planning, design, construction, operation, maintenance and eventual decommissioning phases. The assessment considered the existing physical, biological and socio-economic environment, relevant national legislation and international good practice, stakeholder concerns, and project-specific engineering requirements to identify potential impacts and develop appropriate mitigation measures.

The assessment concludes that the proposed transmission line is environmentally and socially feasible, provided that the mitigation measures and management commitments contained within this ESIA and the accompanying Environmental and Social Management Plan (ESMP) are fully implemented. The routing process has sought to avoid environmentally and socially sensitive receptors through the application of engineering, environmental and land-use constraints during route selection and pylon micro-siting. Although localized impacts associated with vegetation clearance, earthworks, construction traffic, noise, dust generation, waste management and temporary disturbance to nearby communities are expected during construction, these impacts are generally short-term, localized and reversible.

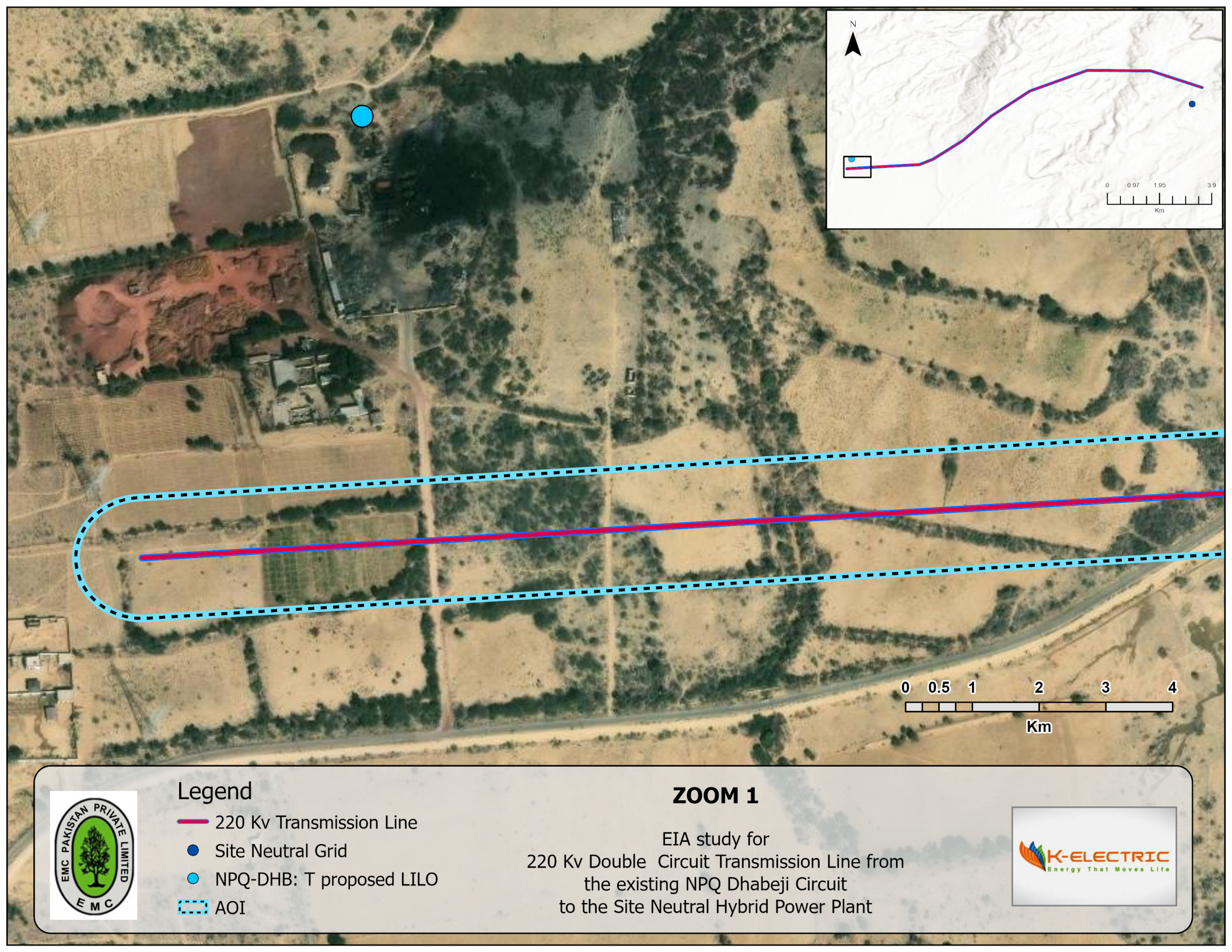
During the operational phase, the most significant residual environmental consideration relates to the potential interaction between birds and the transmission infrastructure. The year-long avifaunal surveys indicate that the project area is regularly used by both resident and migratory bird species, including several species of conservation interest. While the transmission line is not located within a designated Important Bird Area (IBA) or internationally recognized migratory bottleneck, localized bird collision risk remains a credible impact requiring targeted mitigation and long-term monitoring. The incorporation of bird flight diverters at identified high-risk spans, together with a structured bird carcass monitoring programme and adaptive management approach, will substantially reduce this risk.

No significant irreversible impacts are anticipated on geology, hydrology, land use, air quality, groundwater resources, cultural heritage or community health and safety, provided that construction activities are undertaken in accordance with approved method statements, environmental management plans and industry best practices.

Overall, the project is expected to provide substantial socio-economic benefits through strengthening the regional electricity transmission network, improving system reliability, reducing transmission constraints, facilitating future energy development and supporting sustainable economic growth. These long-term benefits significantly outweigh the residual environmental and social impacts, which are expected to remain low following implementation of the proposed mitigation measures.

Annexures

Annex I - Detailed Land Use Maps



Legend

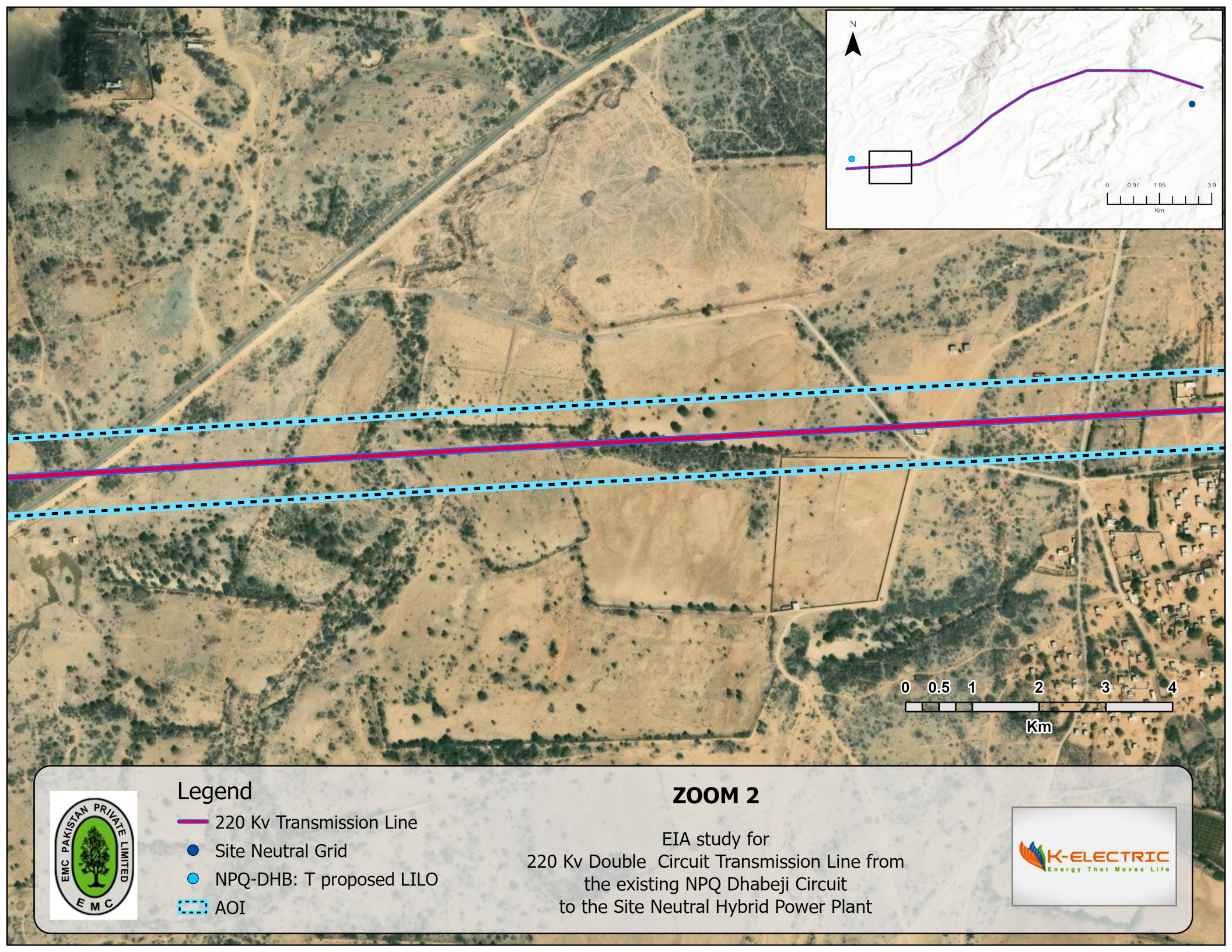
- 220 Kv Transmission Line
- Site Neutral Grid
- NPQ-DHB: T proposed LILO
- AOI

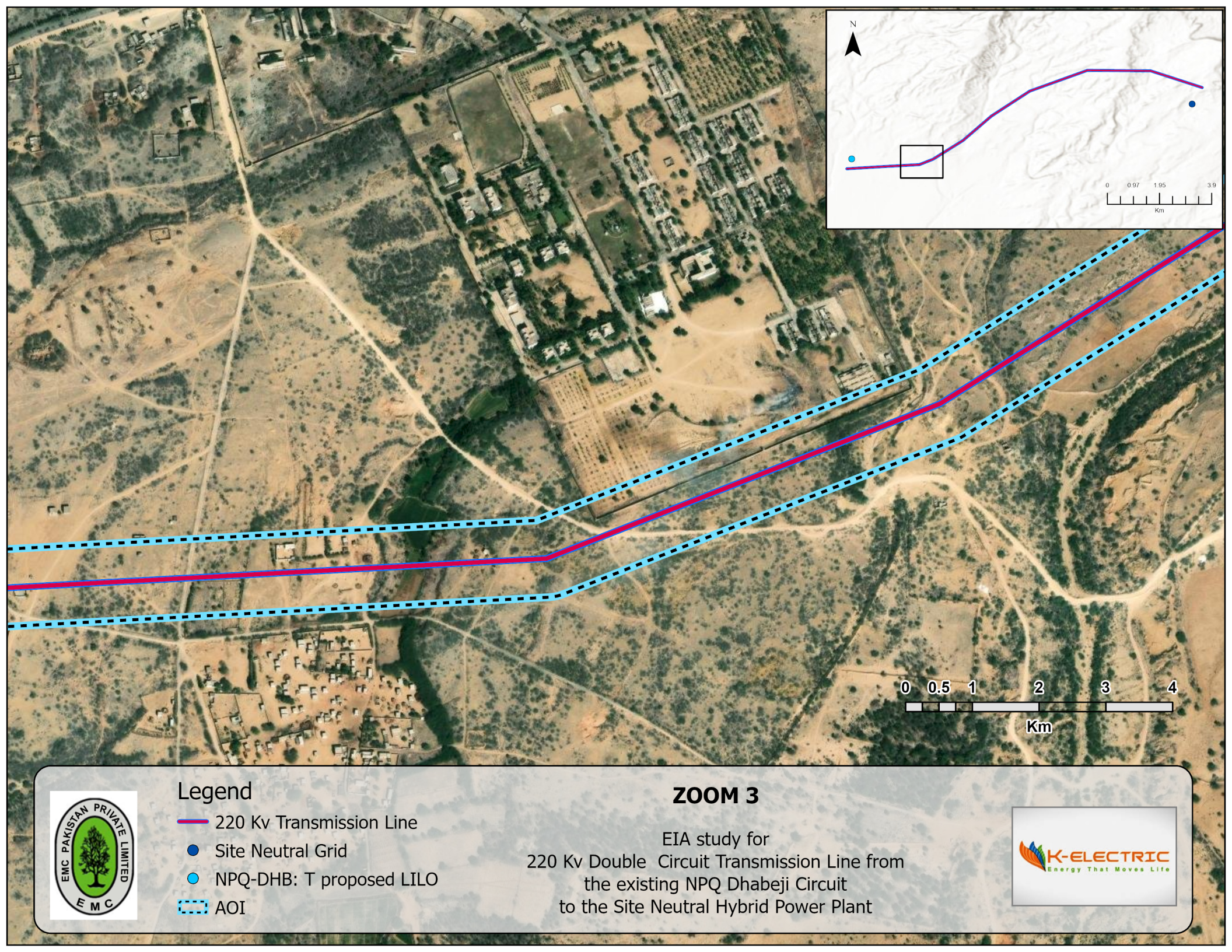
ZOOM 1

EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant

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E M C

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220 Kv Transmission Line
Site Neutral Grid
NPQ-DHB: T proposed LILO
AOI
ZOOM 2
EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant
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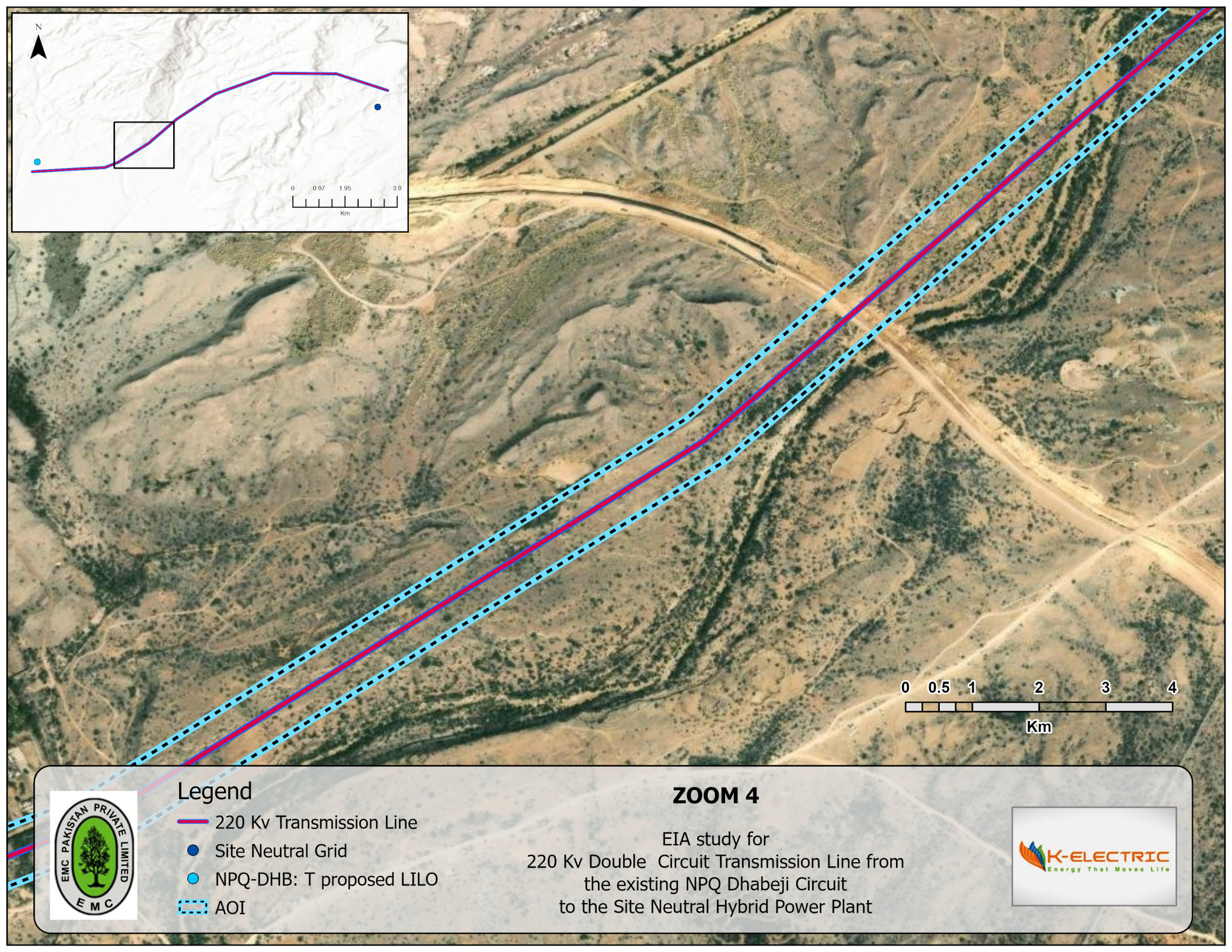
- 220 Kv Transmission Line
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- AOI

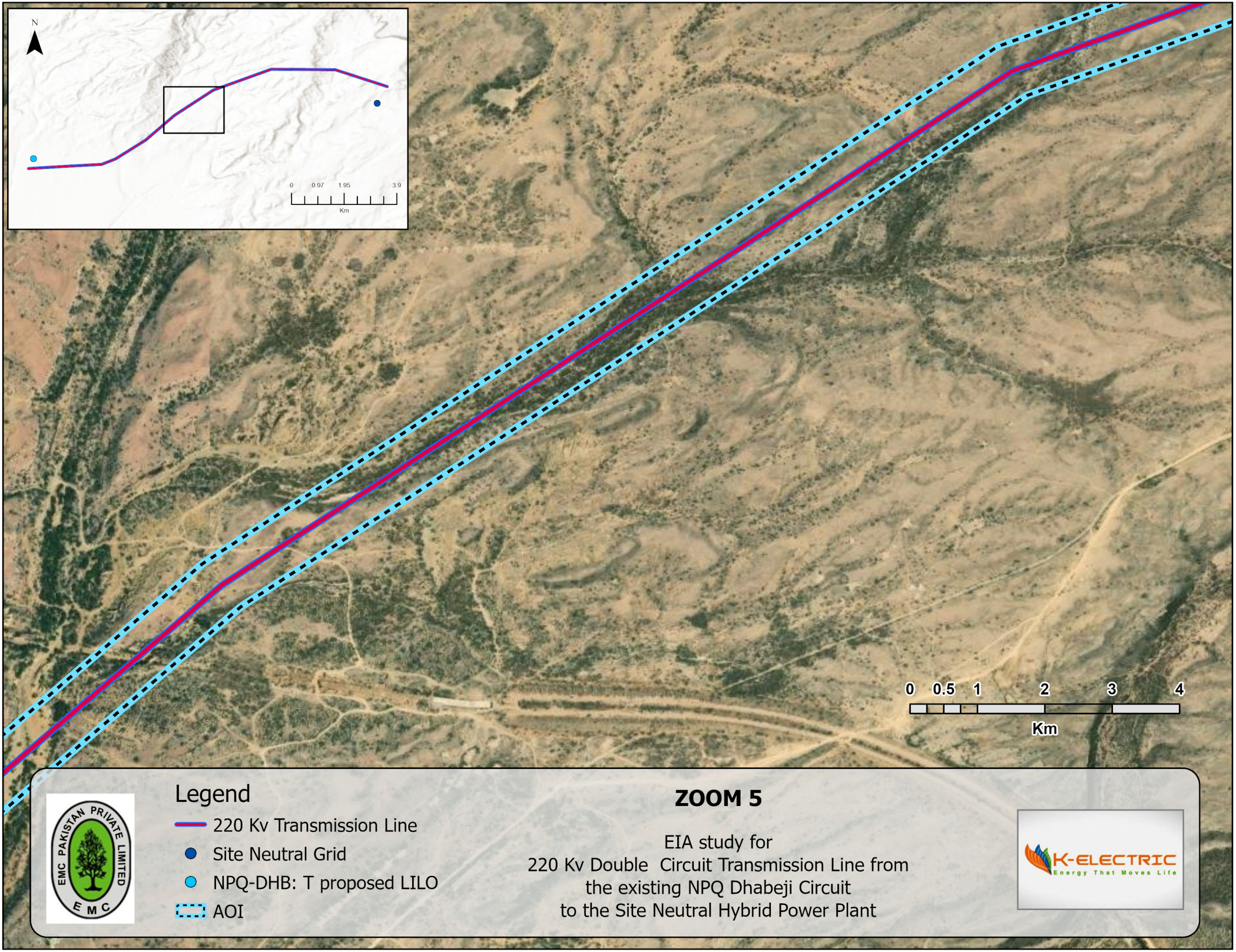
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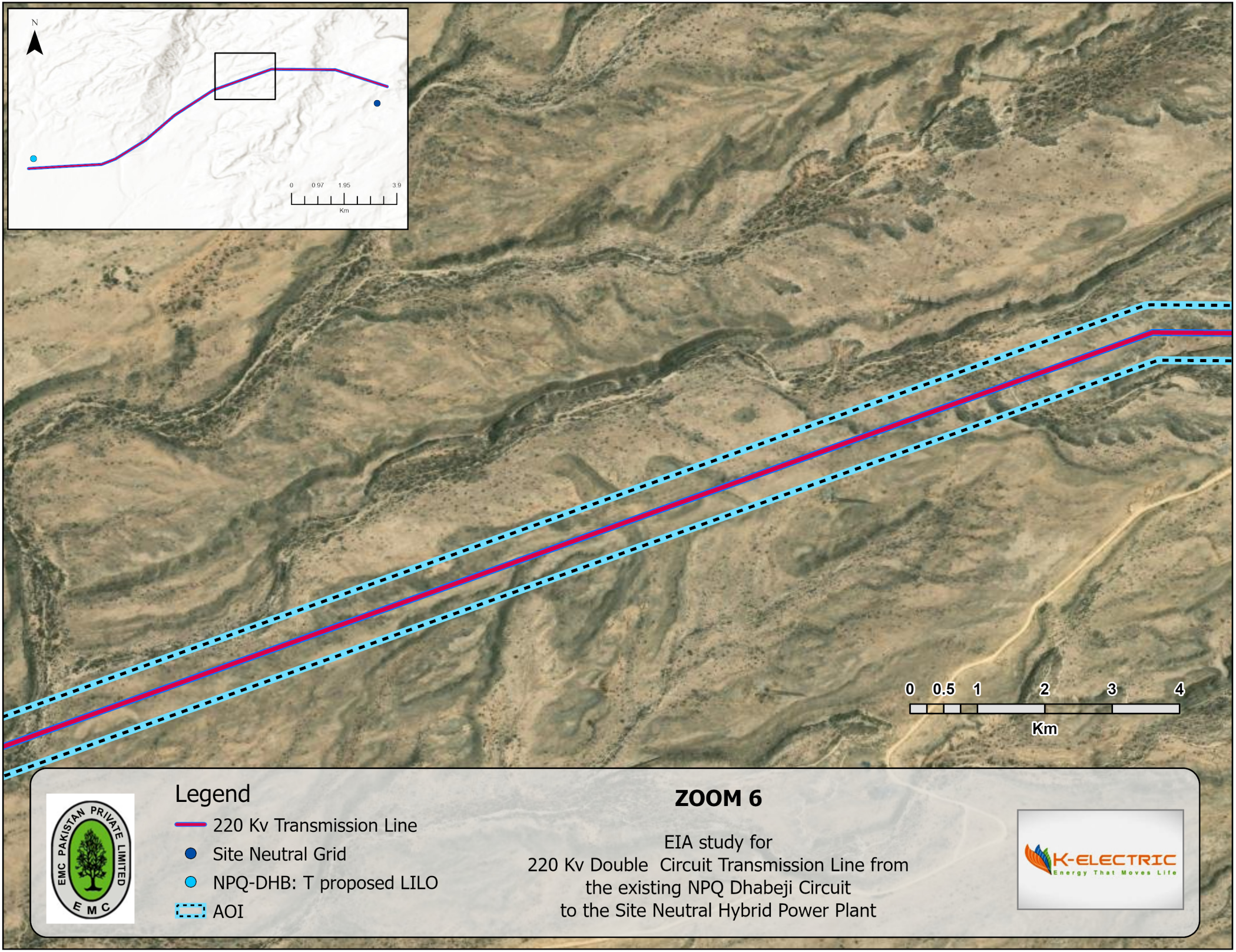
ZOOM 3

EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant

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220 Kv Transmission Line
Site Neutral Grid
NPQ-DHB: T proposed LILO
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ZOOM 4
EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant
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220 Kv Transmission Line
Site Neutral Grid
NPQ-DHB: T proposed LILO
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ZOOM 5
EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant
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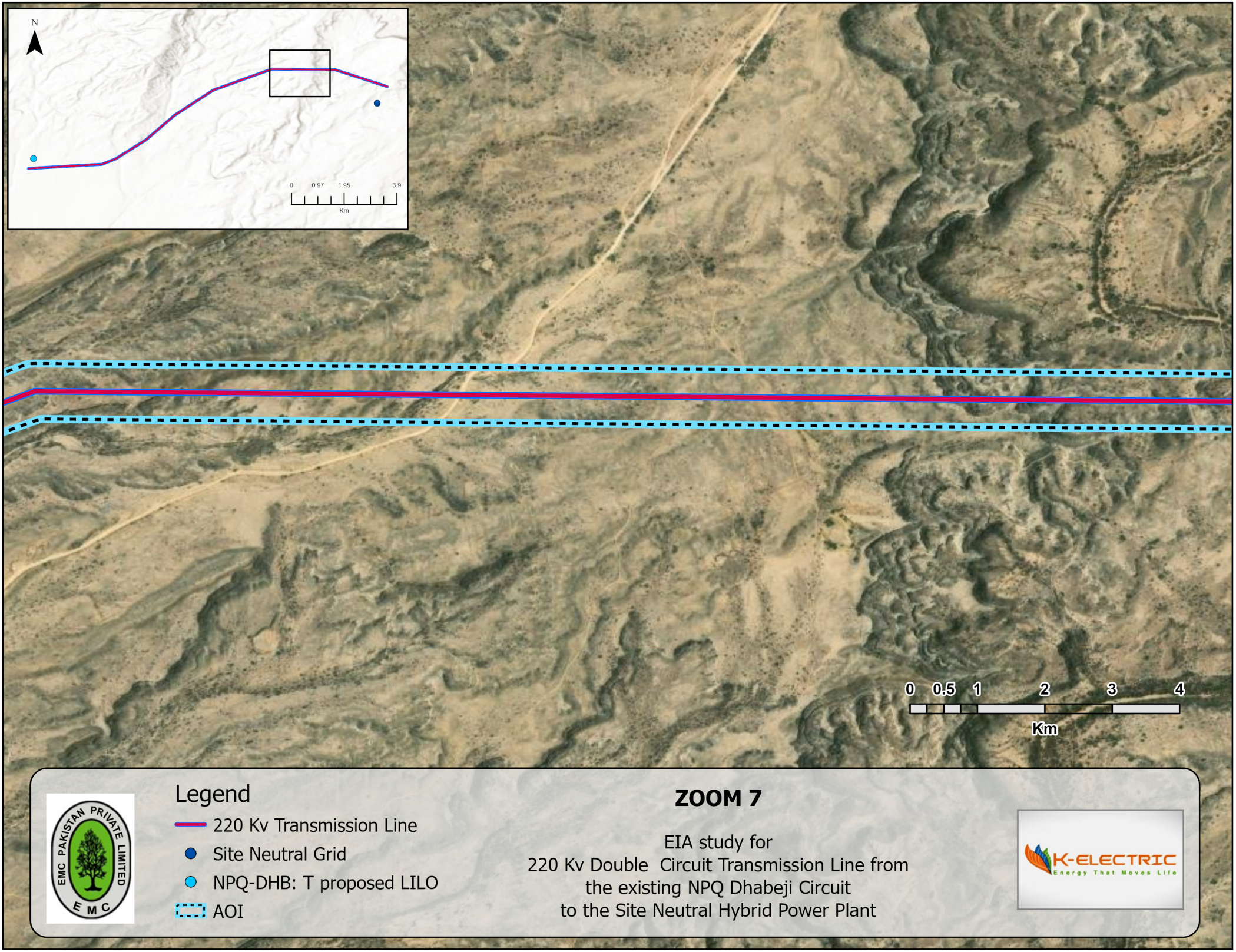
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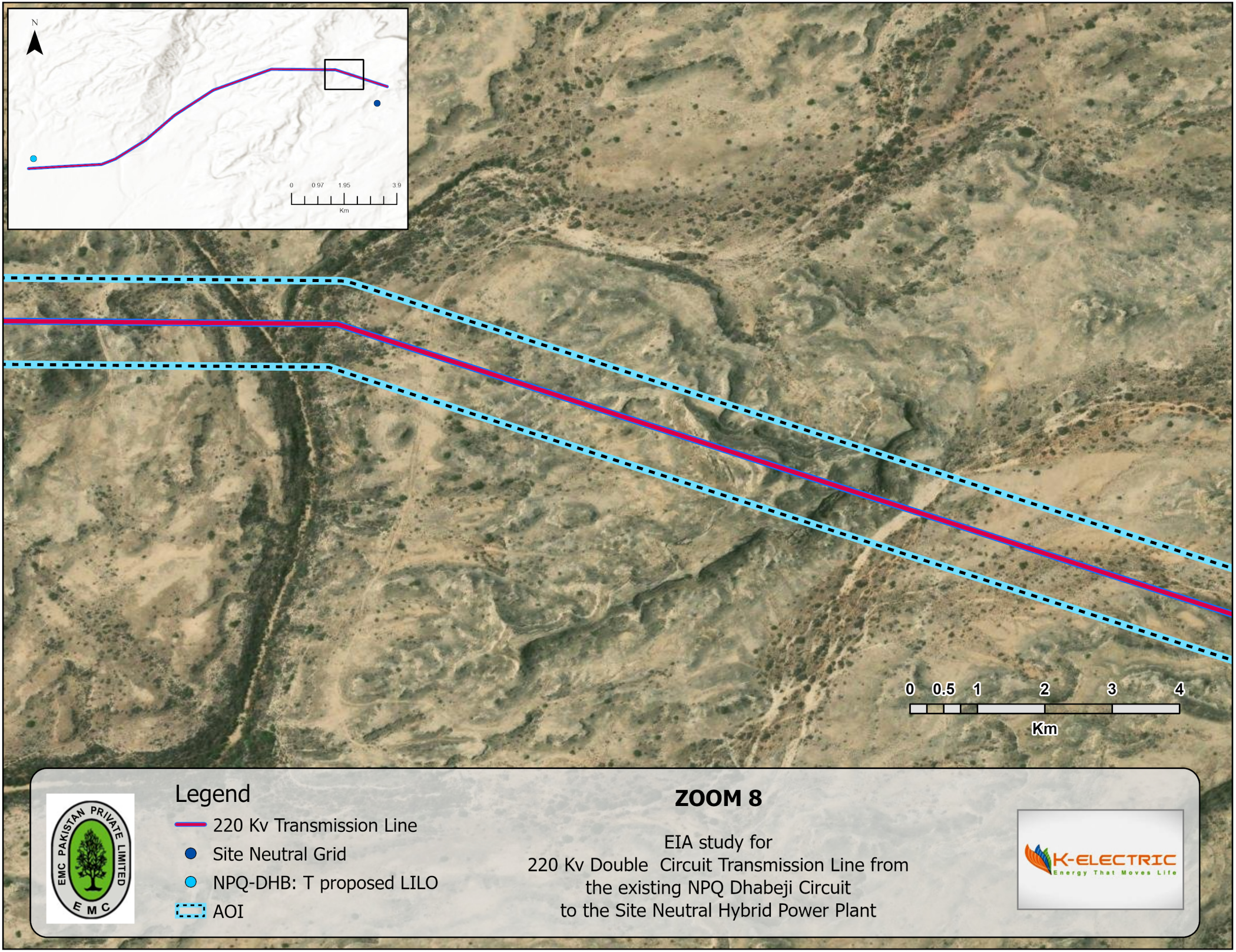
- 220 Kv Transmission Line
- Site Neutral Grid
- NPQ-DHB: T proposed LILO
- AOI

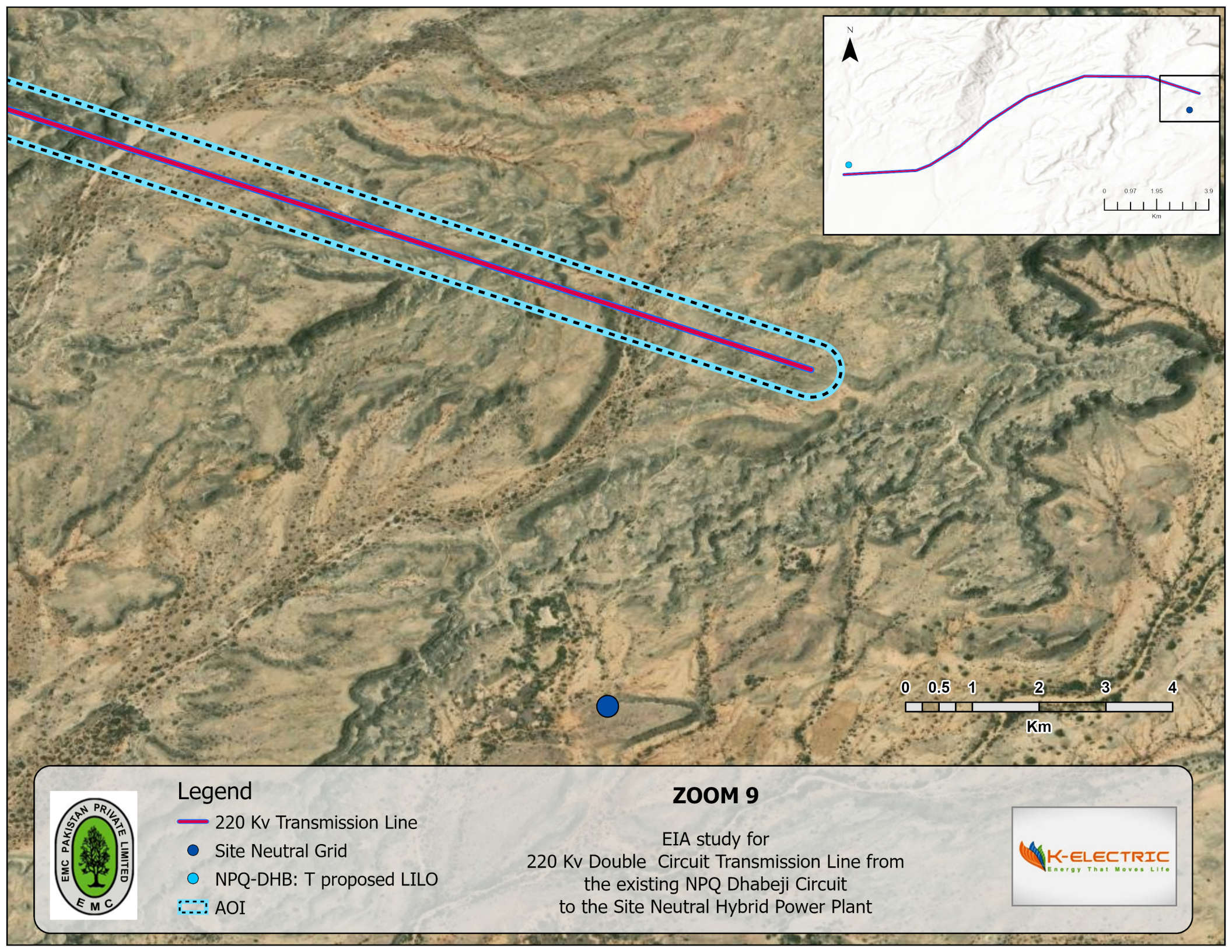
ZOOM 6

EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant

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Legend
220 Kv Transmission Line
Site Neutral Grid
NPQ-DHB: T proposed LILO
AOI
EMC PAKISTAN PRIVATE LIMITED
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ZOOM 7
EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant
K-ELECTRIC
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Legend
220 Kv Transmission Line
Site Neutral Grid
NPQ-DHB: T proposed LILO
AOI
EMC PAKISTAN PRIVATE LIMITED
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ZOOM 8
EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant
K-ELECTRIC
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Legend

- 220 Kv Transmission Line
- Site Neutral Grid
- NPQ-DHB: T proposed LILO
- AOI

ZOOM 9

EIA study for
220 Kv Double Circuit Transmission Line from
the existing NPQ Dhabeji Circuit
to the Site Neutral Hybrid Power Plant

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Annex II - Scoping Report

Environmental & Social Impact Assessment
Loop In /Loop Out of 220kV NPQ-Dhabeji2 Transmission Line (Ckt-2) at SITE Neutral Hybrid Power Plant (Dhabeji, Sindh)
Scoping Report

This report outlines the findings of the scoping exercise carried out for the subject project, including literature review, site visit, consultations, and a workshop held at the KE Head Office on 20th October 2025, where the following members were present for the meeting and subsequent discussion:

S. No.	Name	Designation	Department
1.	Dr. Nida Gul	Lead Env Manager	CHSEQ
2.	M. Adnan	Manager	HSE Ground
3.	Arshad Mahmood	GM PID	PID
4.	Owais Hassan Khan	Head of P&E	PID
5.	Syed Omar Arif	Director	EMC Pakistan (Pvt) Limited
6.	Farooq Ahmed	Manager	CHSEQ
7.	Moinuddin	Manager	Real Estate
8.	Beena Riaz	Advisor	CHSEQ
9.	Aliya Idris	Head of ESG	ESG
10.	Mahrukh Murtaza	DGM ESG	ESG

Some pictures of the meeting are provided below, along with the findings of the discussion:





1. Introduction and Scoping Methodology

Scoping was carried out for the *220 kV Double Circuit Transmission Line* to identify the key environmental and social (E&S risks and impacts likely to arise from the construction and operation of the proposed project in order to determine the project's E&S risk category, and to define the terms of reference for the subsequent Environmental and Social Impact Assessment (ESIA). The scoping process was completed through the following methodology:

- A literature review of similar projects was carried out, along with different projects carried out in the area to understand and appreciate the conditions where the project is to be implemented
- A review of the Project description was carried out by the project and consultant team.
- A review of the combined requirements from national legislation and the International Finance Corporation's (IFC) Performance Standards (PS) on Environmental and Social Sustainability which are applicable to the project.
- Identification of the applicable standards that apply to the Project, which is the stricter standard between national legislation and the World Bank Group Environmental, Health, and Safety (EHS) General Guidelines including sector-specific guidelines that also apply.
- A review of the Google Earth imagery to identify potential E&S sensitive receptors along the RoW of the transmission line along with a screening of the potential impacts that the project may have on these people.
- Using the outcome of the above to identify potential the Area of Influence (AOI) and potential E&S risks and impacts associated with each stage of the Project including potential cumulative and transboundary risks and impacts.
- Identifying E&S baseline data gaps that need to be addressed during the future ESIA.
- Identifying the future stakeholder engagement activities that are required during the ESIA.

With this agenda, a scoping workshop was carried out by the different departments of KE along with the consultant commissioned for carrying out the ESIA of the project. This scoping process was conducted by EMC Pakistan (Pvt.) Ltd. on behalf of K-Electric and forms the first formal step in the environmental and social due diligence process in accordance with the Sindh Environmental Protection Act, 2014 and the SEPA (Review of IEE and EIA) Regulations, 2021.

2. Project Description and Options/Alternatives

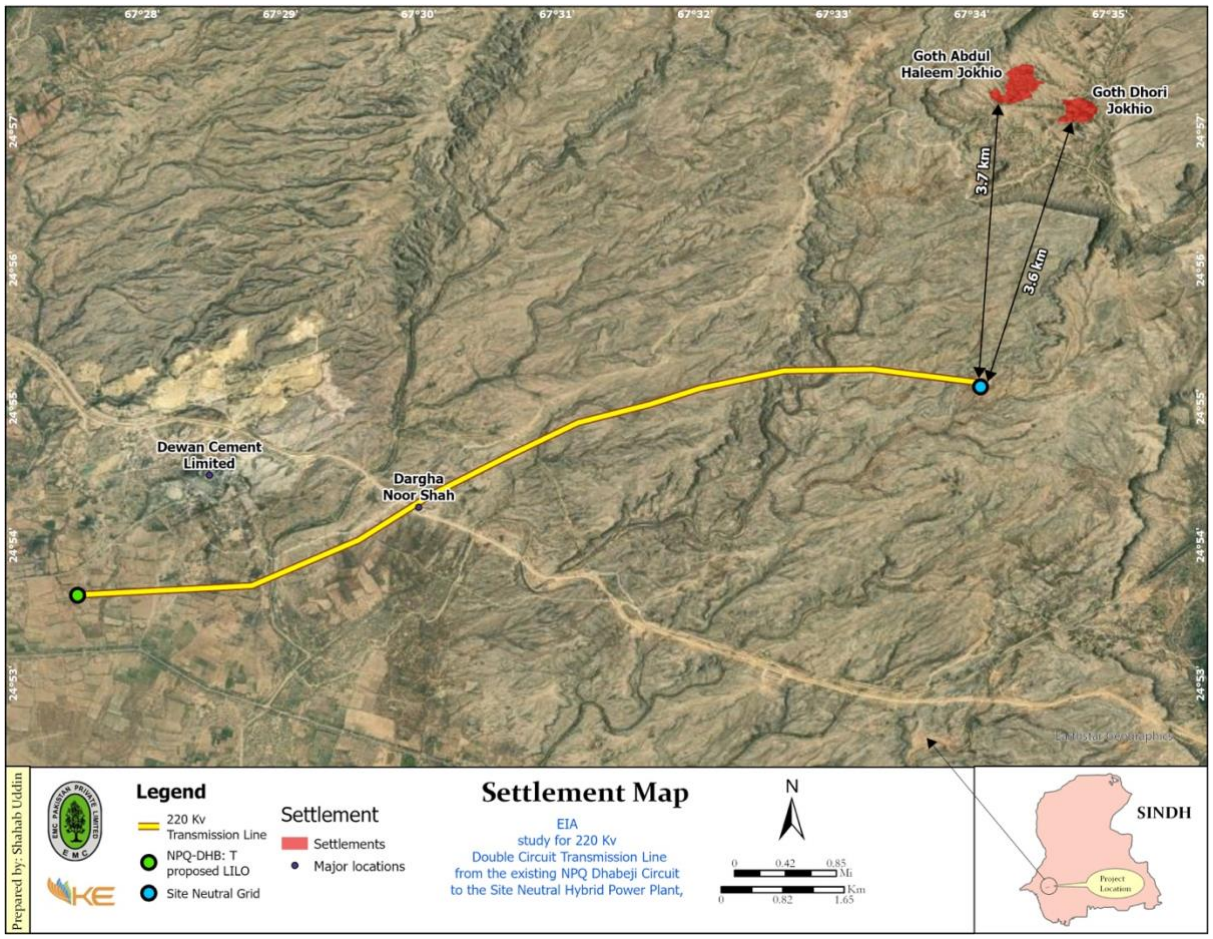
The proposed project, commissioned by K-Electric (KE), involves the establishment of a 3.142 km transmission line connecting the existing NPQ–Dhabeji circuit-2 to the SITE Neutral Hybrid Power Plant (SNHPP) in Dhabeji, Sindh (Dhabeji GS to 2PLDP = 0.413 km 2PLDP to Interconnection point = 2.729 km). The primary objective of the project is to enhance K-Electric's power transmission and loading capacity, enabling efficient evacuation of renewable energy generated from wind and solar sources and strengthening grid reliability for the Dhabeji and adjoining industrial zones.

The proposed transmission line will traverse a 30-meter-wide corridor including the horizonal clearances from both sides and Right-of-Way (ROW) to be acquired on structure pylon basis i-e area covered by tower / pole, mainly through barren, semi-arid land with minimal human settlements or ecological sensitivity. The line will be

supported by lattice steel towers, with 01 No. terminal gantry at the SITE Neutral Power Plant and 02 Nos. crossing gantries to cross the existing 500kV NTDC transmission line. The project does not include new access road development; construction materials and tower components will be transported using existing road routes. Approximately 50–60 workers will be engaged during peak construction periods, residing in rented accommodations near the main city of Dhabeji rather than on-site camps.

The construction period is estimated at 16 months, after which operational responsibility will be assumed by K-Electric's Transmission Department. The project will be implemented in compliance with IFC Performance Standards (2012), Sindh Environmental Quality Standards (SEQS, 2016), and K-Electric's Corporate HSEQ policies.

Provided below is a GIS map of the project, where the districts it passes through, along with the nearby receptors are identified.



As can be seen from the map above, the proposed transmission line will pass through mostly barren lands, ultimately tying into KE's existing network near the existing

Dewan cement. The only major road in the area, is the one leading to the Dewan cement factory, after which the only access to the project is through dirt roads.

Whilst the project is primarily being built to offtake energy from a solar-wind hybrid project that will be built in the Dhabeji area, the hybrid energy project is not expected to qualify as an Associated Facility under IFC's PS 1. The screening for this, in line with the World Bank's ESF 2017 criteria outlined is provided below:

S. No.	Criteria from WB	Applicability to the Project
1	The project is directly and significantly linked to the project being funded by the Bank	Applicable, as the transmission line is being built to offtake energy from the hybrid energy project
2	Carried out or planned to be carried out contemporaneously	This is not confirmed as KE has initiated it's project, however, the other project has not initiated.
3	Necessary for the project to be viable and would not have been constructed, expanded, or conducted if the project did not exist	Applicable, as the transmission line would not be developed if the hybrid energy project is not developed.

From the above screening, it can be ascertained that whilst the transmission line project is required for the hybrid energy project and vice versa, the qualification of the project as an Associated Facility to the transmission line project cannot be definitively concluded as the timelines of the project may not coincide, thereby, not qualifying under criteria point number 2 identified above.

Land Ownership

KE has highlighted that the land ownership of the right of way will be identified by the contractor once they are brought onboard. Should any parcel of land be identified where there is private ownership, then priority will be given to avoiding that parcel of land. Following this, the right of way for the project will be finalized. Given that this is a transmission line project, the overall right of way for the project will not be procured by KE, but, only the areas where the pylons for the project are to be placed (from the government or private entities as and where required).

Solid Waste Management

The different sorts of waste that are expected to be generated during the construction works of the project are highlighted below:

Non-Hazardous Waste

- Construction & Excavation Waste
- Packaging & Material Waste

- Scrap & Recyclable Waste
- Domestic/ Municipal Waste from contractor camps
- Vegetation Waste from site clearances

Hazardous Waste

- Oils, Fuels, Lubricants
- Chemical & Maintenance Waste (containers, solvents, adhesives, and sealants)
- Electrical & Mechanical Wastes
- Hazardous Containers & Absorbents (Oil drums & kits, used spill kits, contaminated PPEs)

Where further breakdown into the quantities and types of wastes will be explored in the ESIA.

Project Alternatives

1. No Project Alternative – This project by nature is meant to be an accessory to the main project, i.e., the hybrid renewable energy project being established in Dhabeji from where energy will be off taken by the proposed transmission line. Coupling this with the overall rising prices of diesel being imported along with the dwindling natural gas reserves of the country, renewable energy projects are foreseen as the only sustainable solution to the energy shortfall being faced in the country. Hence, as such, the No Project Alternative is not foreseen as a viable option.
2. Route Alternatives – Whilst KE has carried out surveys and highlighted a tentative route for the transmission line, the ultimate responsibility for route finalization rests with the contractor. A set of guidelines in this regard, in line with the World Banks' mitigation hierarchy, have been prepared for adherence to by the contractor. These guidelines include ensuring that no land acquisition or involuntary resettlement are carried out, along with ensuring to avoid critical habitats and cultural heritage sites and graveyards.
3. Technical Alternatives – Deliberating on the use of and between overhead transmission lines and underground transmission lines, tower design & configuration alternatives (including tower type, height, span) to finalize the technically most feasible and acceptable option with minimal or easily manageable environmental & social impacts.

3. Applicable Requirements KE's internal standards, National Legislation, and the IFC PS

KE's internal standards

KE has its own set of internal procedures, established to maintain quality, and ensure adequate risk assessments are carried out prior to projects to understand the level and extent of impacts along with the measures required to mitigate these impacts to acceptable levels. The procedures applicable to this project along with the requirements stemming from them are highlighted below:

Add the details here. We have KE's CHSEQ Policy, the ESIA procedure, and engineering standards such as minimum separation distances/design requirements to make sure that the OHTL wires are a certain minimum distance below ground/not too close to a structure (for example).

National & Provincial Legislations

Alongside KE's internal policies & procedures, the National and Provincial Legislations applicable to the project, along with the requirements that stem from these legislations are highlighted below:

Table Error! No text of specified style in document.**.1 - National Legislations**

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
1.	**The Electricity Act, 1910**	The Electricity Act, 1910 is a federal legislation in Pakistan that governs the generation, transmission, and distribution of electricity. It establishes the legal framework for the electricity sector, including licensing requirements, safety standards, and operational regulations. The Act also provides provisions for the regulation of electric supply companies and the rights and duties of consumers. The electricity Act, 1910 is amended through the electricity (Amendment) Ordinance, 1979. Penalty of three years imprisonment or five thousand fines or with both is prescribed for dishonest abstraction or consumption of energy.	The Electricity Act, 1910 is relevant to the project as it sets the regulatory framework for obtaining necessary licenses and permits for electricity generation and distribution.	Ensure that the project acquires the relevant approvals from the relevant departments for electricity transmission under the project
2.	***Electricity Rules, 1937***	These rules regulate the generation, transmission, supply and use of energy in Pakistan. The Act prescribes the conditions and procedures of issuance of licenses. General precautions for the safety of the public are mentioned. Construction, insulation and earthing of apparatus are prescribed to be done to prevent danger. Additional rules for electric tractions are also given	Relevant to the project as it prescribes conditions for obtaining license and practices to prevent electrical danger.	Ensure that the project acquires the relevant approvals from the relevant departments for electricity transmission under the project
3.	**National Climate Change Policy, 2021**	Pakistan developed its first National Climate Change Policy (NCCP) in 2012, which was updated in 2021. The focus of the NCCP-2021 is on adaptation and mitigation, with a major emphasis on nature-based solutions.	Relevant as it defines the different ways projects must inbuild sustainability into their design and development	Ensure that the project includes precursors for sustainability and sustainable development
4.	**National Climate Change Policy, 2021**	The policy highlights the vulnerabilities of various sectors to climate change and outlines appropriate adaptation measures. These measures cover sectors such as water, agriculture, forestry, coastal areas, biodiversity, and other vulnerable ecosystems. Despite Pakistan's small contribution to global greenhouse gas (GHG) emissions, its role as a responsible member of the global community in combating climate change is emphasized, particularly through mitigation efforts in energy, transport, forestry, and agriculture. Additionally, the policy incorporates disaster preparedness, capacity building, institutional strengthening, technology transfer, and international cooperation as important components.	Focuses on reducing GHG emissions, particularly in the energy and transport sectors, contributing to Pakistan's climate change commitments.	Ensure that the project is developed, prioritizing minimal GHG emissions and employing methods to reduce these to the extent possible

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
5.	**National Gender Policy Framework, 2022**	Ministry of planning, development and special initiatives, Government of Pakistan has launched National Gender Policy Framework on 8th March 2022 with an objective for year 2022-25 to accelerate progress towards equality between women and men by bringing gender equality goals and women's perspectives to the center of policy related decision making in all sectors. The Government of Pakistan aims to achieve a gender-responsive society where women and men equally contribute to, and benefit from development, and this shall be done through promotion of gender perspective in all policies and programs, understanding the prospective impact on women and men respectively, before rolling out the programs.	The policy is applicable to the project to ensure and encourage inclusion of all genders in all stages of the project and eliminate, discrimination, violence against women and girls in all its manifestations and removal of socio-cultural impediments that hinder travelling to desired places.	Ensure no discrimination is carried out in the employment of persons for the project and incentivize inclusion of women to the extent possible
6.	**Pakistan Climate Change Act, 2016**	The Prime Minister of Pakistan established Pakistan Climate Change Council which coordinates and supervises the enforcement of the provisions of the Act, monitor implementation of the international agreements relating to climate change, approve and monitor implementation of comprehensive adaptation and mitigation policies, strategies, plans, programs, projects and other measures formulated by the authority to meet Pakistan's international obligations, monitor the implementation of National Adaptation Plan and its constituent provincial and local adaptation action plans, approves guidelines for the protection and conservation of renewable and non-renewable resources, species, habitats and biodiversity adversely affected or threatened by climate change.	The Act is applicable to proposed project as the proposed project involves the solid waste management activities that may contribute to generation of greenhouse gases.	Requires compliance with local EPA and its requirements
7.	**Antiquities Act, 1975**	The Antiquities Act, 1975 (amended in 1990) states the following: "Ancient" is any object that is at least 75 years old. All accidental discoveries of artefacts must be reported to the Federal Department of Archaeology. The Government is the owner of all buried antiquities discovered on any site, whether protected or otherwise. All new construction within a distance of 200 feet from protected antiquities is forbidden. No changes or repairs can be made to a protected monument, even if it is owned privately, without approval of the responsible authorities; and	Although no antiquity site has been identified within the proposed AoI. However, the law will be applicable to the Project mainly due to its two provisions: According to the law, any construction activity within 61 m or 200 ft. of protected antiquities, are prohibited. The provisions of this Act would also be applicable, if any accidental archaeological discoveries may occur during the excavation works for the	Should there be an identified antiquity lying within 200 feet of one of the project sites, then approval must be obtained from the culture and heritage department. Further during project execution, on account of discovery of any archaeological remains, antiquities department to be intimated promptly.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		The cultural heritage laws of Pakistan are uniformly applicable to all categories of sites regardless of their state of preservation and classification as monuments of national or world heritage.	construction of proposed Project.	
8.	**Pakistan Penal Code, 1860**	The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions, and disposal of effluents.	The provisions of the Penal Code, 1860 are applicable to the Project in terms of penalties for effecting human lives and public property. It also addresses the control of noise, air emissions and effluent disposal.	Requires adherence to the law of the land, where it defines the need to comply with aspects affecting the environment and other humans.
9.	**Protection against Harassment of women at the workplace Act, 2010**	The Protection Against Harassment of Women at the Workplace Act (2010) refers to sexual harassment at the workplace.	This Act will be applicable to the Project if women are employed for the construction of the proposed Project.	Ensure that women are not harassed at workplaces.
10.	**Labor Laws as part of Constitution of Pakistan, 1973**	The Constitution of Pakistan contains a range of provisions with regards to labor rights, in particular: Article 11 of the Constitution prohibits all forms of slavery, forced labor and child labor. Article 17 provides a fundamental right to exercise the freedom of association and the right to form unions. Article 18 proscribes the right of its citizens to enter upon any lawful profession or occupation and to conduct any lawful trade or business. Article 25 lays down the right to equality before the law and prohibition of discrimination on the grounds of sex alone; and Article 37(e) makes provision for securing just and human conditions of work, ensuring that children and women are not employed in vocations unsuited to their age or sex, and for maternity benefits for women in employment. Labor law is controlled at both provincial and national levels with compulsory employment agreements containing the terms set out by the labor laws. The labor laws are a comprehensive set of laws in Pakistan dealing with the	The labor laws are relevant as it would deal with employment of labor for the construction of proposed Project. Following are the major labor laws which are applicable to the Project: Sindh Workers Compensation Act 2015 Sindh Minimum Wage Act 2015 Sindh Terms of Employment (Standing Orders) Act 2015 Sindh Bonded Labor System (Abolition) Act 2015 Sindh Payment of Wages Act 2015 Sindh Occupational Safety & Health Act 2017 Sindh Factories Act 2021	Requires that the labor regulations defined therein are complied with during project implementation.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		following aspects: Contract of Employment. Termination of Contract. Working Time and Rest Time. Working hours. Paid Leave. Maternity Leave and Maternity Protection. Other Leave Entitlements. Minimum Age and Protection of Young Workers. Equality Pay Issues. Workers' Representation in the Enterprise. Trade Union and Employers Association Regulation; and Other Laws.		
11.	**Land Acquisition Act, 1894**	The primary law for acquisition of land for public purposes in Pakistan is the "Land Acquisition Act (LAA), 1894" (hereinafter referred as the Act). The land acquired under the Act vests in the province, and it is only thereafter that the province may transfer it to someone else. The Sindh Amendment 2009 of LAA 1894 specifically related to Section 16, Section 23, Section 24, and Section 28-A.	Neither land acquisition nor physical displacement is envisaged under this project (as it currently stands)	Ensure that no land acquisition takes place under the project, unless absolutely required, in which case it will then abide by the guidelines laid out in this Act.
12.	**National Disaster Management Act, 2010**	National Disaster Management Act, 2010 was passed by Parliament of Pakistan in 2010. The Act applies to whole Pakistan. The Act was passed in backdrop of 2010 Floods in Pakistan and strengthens Disaster Management system.	This Act is applicable as proper mitigation measure will be adopted by design team during design stage to offset any chances of flooding during torrential rains.	Requires that the project design take into account the previous intake and data on any national disasters.
13.	**Building Code of Pakistan, 2007**	The provision of Building Code of Pakistan shall apply for engineering design of building like structure and related components. The construction in violation of the building code shall be deemed as violation of professional engineering work. Moreover, a certificate for the proposed action will be obtained from Provincial Building Control Authority.	These codes shall be used in structural design of building area components constructed under this proposed Project.	Requires that the codes defined therein are used in the construction of any buildings constructed for the project.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
14.	**The Criminal Law (Third Amendment Act, 2011)**	The Criminal Law (Third Amendment) Act 2011 was passed by the Parliament in 2011 and assented by the President on 16th December 2011. The Act amended relevant sections in the Pakistan Penal Code and Code of Criminal Procedures. The Amendment criminalized a number of customary practices such as giving women or girls in marriage for settling a dispute), forced marriage, marriage with the Holy Quran and depriving women of inheriting property. All these offences are made non-compoundable and non-bailable under this Act.	This Act is applicable as the proposed project may involve the numbers of staff/worker having different religion, political affiliation, sect, colour, caste, creed, ethnic background.	Requires that workers of all different backgrounds, religions, cultures are treated the same without any discrimination.
15.	**Gender Equality as part of the Constitution of Pakistan, 1973**	The Constitution of Pakistan contains a range of provisions regarding gender equality, in particular, provides the principle of equal rights and equal treatment to all citizens/ persons, without any distinction including on the basis of sex: Article 3 calls upon the State to eliminate all forms of exploitation. Article 4 provides for the right of individual to enjoy the protection of law and to be treated in accordance with the law. This applies to the citizens as well as "to every other person for the time being within Pakistan" without distinction. This article also clearly states that certain rights cannot be suspended. Article 25 ensures equality before the law and equal protection of the law and states that there shall be no discrimination on the basis of sex alone. Articles 25(3) and 26(2) allow the state to make special provisions for the protection of women and children. Articles 26 & 27 provide for equal access to public places and equality of employment in the public and private sector. Articles 11 & 37 (g) prohibit trafficking in human beings as well as prostitution. Article 32 makes special provisions for the representation of women in local Government. Article 34 directs the state to take appropriate measures to enable women to participate in all spheres of life and social activities. Article 35 asks the state to protect the marriage, the family, the mother, and the child. Article 37 (e) directs the state to make provisions for	The articles of laws Constitution of Pakistan are relevant as it would deal with employment of male and female labor having different religion, political affiliation, sect, colour, caste, creed, ethnic background for the construction of proposed Project.	Requires that women are not discriminated against for jobs during project implementation.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		securing just and humane conditions of work ensuring that children and women are not employed in vocations unsuited to their age or sex, and for ensuring maternity benefits for women in employment. Articles 51 & 106 provide for the reservation of seats for women in the legislatures.		

Table 2 - Provincial Legislations & Regulations

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
1.	**Sindh Strategy for Sustainable Development, 2007**	The Sindh Strategy for Sustainable Development (SSSD) proposes a ten- year sustainable development agenda for Sindh. Its purpose is to highlight the ecological, economic and social issues of the province and to provide recommendations and strategic actions to address them. The strategy promotes the sustainable use of natural resources to achieve the objectives of poverty alleviation and social development through the participation of the people of Sindh. It is a live document, which should evolve with the changing scenario. The strategy would be reviewed and revised every three years, incorporating lessons learned during implementation.	The project supports sustainable development by enabling energy generated from renewable resources to be off taken and incorporated into the energy mix available in the local grid.	Ensure that development carried out includes incorporation of sustainability to the extent possible
2.	**Sindh Drinking Water Policy, 2017**	This policy is to provide safely managed drinking water whose supply is adequate, well maintained and sustainable; and to enhance public awareness about health, nutrition and hygiene related to safe drinking water. The basic objective of this policy is to introduce legislative measures and regulations to create an enabling framework for safely managed drinking water supply, regulation of water usage, extraction, treatment transportation and distribution.	There will be numerous workers working under the project, both during the construction and the operation stage, along with living at the site, where it will need to be ensured that people have potable water available to them.	Requires that people employed under the project are provided with clean drinking water for safe consumption
3.	**Sindh Water Policy 2023**	The Sindh Water Policy outlines a comprehensive strategy aimed at addressing the pressing challenges surrounding water resources and their sustainable use. With increasing	Ensures the project's water usage is efficient and aligned with policy goals.	Ensures the project's water usage is efficient and aligned with policy goals.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		concerns over water scarcity, pollution, and climate change, this policy document seeks to establish a forward-looking framework that promotes efficient water management, conservation, and equitable distribution. The overarching goal of this policy is to ensure a secure water supply for present and future generations while preserving aquatic ecosystems and fostering socio-economic development.		
4.	**1st Sindh Labour Policy, 2018**	1St Sindh Labour Policy was introduced in 2018. The Major focus of the 1st Sindh labour policy, 2018 is to ensure the health and safety of workers at workplace with guaranteeing living wages for all. As labour laws are mostly male centric, but this policy will address women labour issues, which include equal opportunities and equal remuneration in line with the International Labour Organization (ILO) conventions.	The policy is applicable to the project since labor will be employed for the project at various stages.	Ensure that labor dealing and handling is in line with the requirements of the policy.
5.	**Sindh Environmental Protection Act, 2014**	Sindh Environmental Protection Agency as a part of Sindh Act No. VIII of 2014 prepared Sindh Environmental Protection Act (SEPA), 2014 which was passed by the provincial assembly of Sindh on 24th February 2014 and asserted by the Governor of Sindh on 19th March 2014 and notified on 20th March 2014. It is a fairly comprehensive legislation and provides legislative framework for protection, conservation, rehabilitation, and improvement of the environment. It contains concrete action plans and programs for the prevention of pollution and promotes sustainable development. Act has 11 parts with 37 Sections followed by sub-sections and clauses. Part VI is related to the environmental examinations and assessments while part X is related to the public participation.	The proposed Project is located in Sindh so it falls under the jurisdiction of the SEPA that will be the responsible authority for governing the environmental compliance of the project with local guidelines.	Prior to project construction, an Environmental Impact Assessment must be conducted against which an approval has to be obtained from the department.
6.	**Sindh Environmental Assessment Regulations, 2021**	These regulations set out: • Key policy and procedural requirements for filing an EIA. • The purpose of environmental assessment. • The goals of sustainable development. • The requirement that environmental assessment be integrated with feasibility studies. • The jurisdiction of the Provincial EPA and Planning & Development (P&D) Departments.	Defines the categories for different projects, where the type of study/ assessment required (Checklist, IEE, EIA) against each category of project is defined to fulfil local environmental compliance.	As per the categories defined, the following project falls into the category of an EIA based on: **Schedule III – Projects Requiring an EIA** Category (A) – Energy *Sub-Category (4) – Transmission Lines above 132 kVA and distribution projects*

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		• The responsibilities of proponents. • Duties of responsible authorities. • Provides schedules of proposals that the Project requires either EC, IEE, or an EIA. • The environmental screening process of the projects under schedule I, II and III; and The procedure for the environmental approval for filing the case with the Sindh EPA for the granting of the NOC.		
7.	**Sindh Environmental Quality Standards, 2016**	SEPA has formulated the Sindh Environmental Quality Standards (SEQS) as per Clause (g) of sub-section (1) of Section 6 of SEPA Act 2014. The SEQS were promulgated in 2016 which includes standards for liquid effluent, industrial gaseous emissions, ambient air, drinking water quality, noise levels and standards for motor vehicle exhaust, diesel vehicle, and petrol vehicles.	Defines acceptable standards for emissions and effluents that may be gnerated during the construction and operation of different projects in Sindh with respect to ambient air quality, vehicular and exhaust emissions, drinking water quality, and effluent quality.	All projects to be implemented in Sindh must conform to SEQS during all the phases i.e., construction and operation.
8.	**Sindh Solid Waste Management Act, 2021**	The Sindh Solid Waste Management Act, 2021 enacted to establish a board for collection and disposal of all solid waste, to arrange effective delivery of sanitation services, to provide pollution free environment and to deal with other relevant matters. The Board established under the Act headed by the Chief Minister or his nominee and constitutes of thirteen other ex-officio members of other relevant departments.	This Act is applicable as the main Act of the implementing agency of the project. It will define the boundaries in which the project must take place, and continue operations in.	No requirements, only defines the ambit of SSWMB's operations.
9.	**Sindh Cultural Heritage (Preservation) Act, 1994**	This provincial Act empowers the Government of Sindh to preserve and protect any premises or objects of archaeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected. Karachi alone has over 200 buildings declared as "Protected Heritage" by the Government of Sindh.	If a site is declared as a protected heritage, then no work may take place within 200 feet of that area.	None of the sites protected under this law has been identified within the RoW/ZoI of the proposed Project. KE will get NOC from Department of Culture, Tourism and Antiquities if any protected heritage site is identified along the project.
10.	**The Sindh Prohibition of Employment of Child Act, 2017**	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 Prohibition of Child Employment Act (PCEA) 2017 disallow child labor in Sindh. The PCEA defines a child as a person who has not completed his/her fourteenth years of age, and an adolescent means a person who has completed fourteenth year of age but has not completed eighteenth years of his age. No child shall be employed or permitted to work in any	Ensure that children are not employed for works to be carried out under the project.	Does not permit child labour during project construction or operation.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		establishment including construction, but an adolescent can be employed or permitted to work under strict guidelines provided in the PCEA and rules. An adolescent shall not be employed in any hazardous work included in the schedule to the PCEA.		
11.	**Sindh Factories Act, 2021**	The Act deals with regulations related to Project Area workers and workplace EHS requirements. The Factories Act also provides regulations with provision for general health and safety of the work force in their work area. Conditions are specified for clean workplace, toilets, waste handling, provision of drinking water quality, worker health and hygiene etc. Under the Act, no occupier of a factory shall be allowed to start manufacturing process unless he has obtained factory registration certificate from the Directorate of Labor. The Act does not allow a child below the age of 14 years to work in a factory in any case. The new Law restricts the employment of contractual labor in manufacturing process. The amendment 2021 is specifically related to the provision of safe transportation facility to women workers, working hours and working periods of seasonal and whole year factories.	This Act is applicable to persons who will work under the project, along with persons belonging to communities residing nearby the project area during the construction works of the project.	Requires that the occupational health and safety measures, along with labor regulations defined therein are complied with during project implementation.
12.	**Sindh EPA Hazardous Substances Rules, 2014**	The rule describes the procedure of handling, transportation and disposal of hazardous substances and hazardous waste. General safety precautions for handling hazardous substances as well as safety precautions for workers, and notification requirements in the event of an accident are also described in these rules.	This rule is applicable to the proposed Project due to involvement of hazardous waste handling, use and disposal during different construction activities of the project.	A separate approval must be obtained from the Sindh EPA during the operational phase of the project if there is any permanent use of any of the hazardous substances that are listed in the Rules.
13.	**Sindh Minimum Wages Act, 2015**	To provide the regulation of minimum rates of wages and various allowances for different categories of workers employed in certain industrial and commercial undertakings and establishments.	This Act will be applicable to the Project to ensure that the minimum wages and allowances should be given to the Project labor (skill and unskilled employed for the construction of the proposed Project.	Requires that the project ensure that workers are not paid below the defined minimum wage.
14.	**Sindh Occupational Health & Safety Act, 2017**	The Act makes provisions for occupational safety and health conditions at all workplaces in the province for the protection of workers during work. Under the Act, an Occupational Safety and Health Council will be established in Sindh with secretary of Sindh government's	The Act applies in any Project situation where worker's rights and protections are enforced. This law is applicable to construction and Project workers and will be complied during construction	Requires that the occupational health & safety regulations defined therein are complied with during project implementation.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		Labor and Human Resources Department as its chairperson. The proposed council lays down penalties in case of death and injury due to violation. In case of death sub-section 01 of section 38 will accord 2 years' imprisonment or a fine of PKR 100,000 or both. Similarly, in case of injury the imprisonment may extend to six months or a fine up to PKR 20,000 or both.	and operation phases.	
15.	**Sindh Bonded Labour System (Abolition) Act, 2015**	The Act is gender sensitive; an anti-discrimination clause is added to each new proposed Law in accordance with ILO requirement viz: "No discrimination shall be made on the basis of sex, religion, political affiliation, sect, colour, caste, creed, ethnic background in considering and disposing of issues relating to the enforcement of this Act". In all proposed Laws the cognizance has been changed from that of the Judicial Magistrate to the Presiding Officer Labor Courts who is a Session Judge.	This Act is applicable as the proposed project may involve the numbers of staff/worker having different religion, political affiliation, sect, colour, caste, creed, ethnic background.	Bonded labour will not be allowed or utilized for the project
16.	**Sindh Differently Abled Persons (Employment, Rehabilitation and Welfare) (Amendment) Act, 2017**	The Act provides for the employment, rehabilitation, and welfare of differently able persons. The definition of "differently able" is any persons who on account of injury, disease, or congenital deformity, is challenged for undertaking any gainful profession or employment in order to earn his livelihood and includes a person who is blind, deaf, physically challenged or mentally challenged. In the Sindh Differently Able Persons (Employment, Rehabilitation and Welfare) Act, 2014 was amended and job quota was increased from two percent to five percent. The Act also waived admission fees at public educational institutions for people with disabilities as well as 75% of tuition fee, along with establishing reserved seats. Pakistan is a signatory of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD).	This Act is applicable as the proposed project will involve serious occupation health and safety issues during construction phase and may cause serious injury to worker/staff causing permanent disability and differently able.	Requires differently abled persons are not discriminated against during project implementation for jobs and are accordingly accomodated during project implementation works.
17.	**Sindh Commission on the Status of Women Act, 2015**	The Act has enabled the government to constitute a Commission to be known as the Sindh Commission on the Status of Women, to exercise the powers to examine the policy, programs and other measures taken or to be taken by Government for gender equality, women's empowerment, political participation, representation, assess, implementation and make suitable recommendations to the concerned authorities. In addition, the Commission will be responsible to review all	This Act is applicable as the proposed project may involve female staff/worker as well as local resident women along the project corridor which are directly or indirectly linked with project activities.	Requires that women are not discriminated against for jobs during project implementation.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		provincial laws, rules, and regulations prejudicial to the legitimate interest and rights of women and suggest accordingly.		
18.	**Sindh Resettlement & Rehabilitation Policy, 2023 (R&R Policy)**	The Sindh R&R Policy aims to provide a structured framework for addressing involuntary resettlement resulting from development projects in Sindh. It's primary objective is to ensure fair and timely compensation, proper relocation, and the restoration of livelihoods for project-affected persons (PAPs). The main requirements under the policy are: 1. **Resettlement Planning:** ○ **Resettlement Action Plan (RAP):** Develop a comprehensive RAP detailing the extent of displacement, compensation strategies, relocation sites, and support for livelihood restoration. 2. **Eligibility Criteria:** ○ **Affected Persons:** Recognize all individuals experiencing loss of land, assets, or access due to project activities, regardless of legal land ownership status. 3. **Compensation Framework:** ○ **Replacement Cost:** Compensate lost assets at full replacement cost without depreciation. ○ **Timely Disbursement:** Ensure compensation is provided before displacement occurs. 4. **Relocation Assistance:** ○ **Housing and Infrastructure:** Provide suitable housing options and access to essential services at relocation sites. ○ **Transitional Support:** Offer interim assistance to cover the period between displacement and the restoration of livelihoods. 5. **Livelihood Restoration:** ○ **Skill Development:** Facilitate training programs to enhance employment opportunities for PAPs. ○ **Financial Assistance:** Provide support to re-establish businesses or agricultural activities. 6. **Consultation and Participation:**	The project does not require any land acquisition, and neither were there any huts or settlements identified within the COI of the project or at any of the areas where the project has been proposed for development.	A separate survey to be carried out by KE prior to development of project works to identify whether there are persons who rely on the lands where work will take place and to quantify this impact in the form of livelihood loss that may be faced by these persons. If so, there will also be the need to develop a resettlement plan/ livelihood restoration plan that carries out the steps identified on the land to develop a plan, and then to implement it through providing compensations to any potential project affected persons.

Sr. No	Policy/Plan	Description	Relevance to Project	Regulatory Requirement from Project
		○ **Stakeholder Engagement:** Conduct meaningful consultations with PAPs, ensuring their input influences resettlement decisions. ○ **Information Disclosure:** Provide clear and accessible information about resettlement plans and entitlements. 7. **Grievance Redress Mechanism (GRM):** ○ **Accessible Channels:** Establish multiple avenues for PAPs to voice concerns or complaints. ○ **Timely Resolution:** Ensure grievances are addressed promptly and transparently. 8. **Monitoring and Evaluation:** ○ **Internal Monitoring:** Regularly assess the implementation of resettlement activities to ensure compliance with the RAP. ○ **External Audits:** Engage independent parties to evaluate the effectiveness of resettlement measures. The policy underscores the importance of minimizing displacement and, when unavoidable, ensuring that affected individuals receive adequate support to rebuild their lives with dignity. It aligns with international best practices and legal frameworks to uphold the rights and well-being of displaced populations.		

IFC Performance Standards on Environmental and Social Sustainability and E&S Guidelines

Alongside local legislations, the project will also aim to abide by the IFC's Environmental & Social Policy Framework, where these include:

- The IFC's Performance Standards on Environmental & Social Sustainability
- The IFC's General Environmental, Health, & Safety Guidelines
- The IFC's Industry Specific Environmental, Health, & Safety Guidelines for Electric Power Transmission & Distribution

A further breakdown into these guidelines, along with their applicability, and requirements from the project is provided below:

IFC's Performance Standards

The Performance Standards provide a framework to project developers for the management of environmental and social risks and impacts so that development opportunities are enhanced. The Performance Standards and their applicability to the project is highlighted below:

IFC PS	Applicability (Yes/No) and justification
IFC PS 1 Assessment and Management of Environmental and Social Risks and Impacts	PS1 applies to all projects that have environmental and social risks which require management and mitigation in line with the guidelines provided therein. Given that the project is expected to have various environmental and social impacts during its different phases, PS1 will be applicable.
IFC PS2 Labor and Working Conditions	PS2 lays down the requirements associated with ensuring a safe workplace, conducive to the fair treatment, non-discrimination, and equal opportunity of different types of workers involved. Given the project will involve, both directly and indirectly, a various number of laborers, the guidelines of PS2 will be applicable.
IFC PS3 Resource Efficiency & Pollution Prevention	PS3 aims to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project

IFC PS	Applicability (Yes/No) and justification
	activities and by promoting the more sustainable use of natural resources. PS3 will be applicable given that the project will involve the use of non-renewable resources, e.g. water, and that there will be areas where pollution prevention measures can be implemented.
IFC PS4 Community Health, Safety, & Security	PS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. PS4 will be applicable as despite there being no immediate community within the AOI of the project that stands to affected from project activities (given the current route). Movement of project related infrastructure along roads may have community health & safety impacts.
IFC PS5 Land Acquisition & Involuntary Resettlement	PS5 lays out guidelines for addressing impacts that may arise associated with project related land acquisition and/or involuntary resettlement of persons and their assets (including physical displacement and economic displacement). PS5 may not be applicable (as per the information available at this stage) as the land for the transmission line is not privately owned, and neither does it have any persons that reside on the land along the RoW or use it for any economic purposes e.g. agriculture.
IFC PS6 Biodiversity Conservation & Sustainable Management of Living Natural Resources	PS6 underscores the importance of protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources to ensure sustainable development. PS6 may not be applicable to the project as there was no direct impact on biodiversity observed, e.g. no migratory bird pathway identified, no tree removal deemed necessary, and no critical or important habitats identified in the AOI of the project area.

IFC PS	Applicability (Yes/No) and justification
IFC PS7 Indigenous Peoples	PS7 recognizes that Indigenous peoples are distinct from mainstream groups and are often the most marginalized and vulnerable, requiring specifically targeted interventions for mitigating project impacts and inclusion in projects. PS7 is not applicable as no Indigenous Persons exist in the project area, nor were identified during the visits carried out to the site.
IFC PS8 Cultural Heritage	PS8 recognizes the importance of cultural heritage for current and future generations, where the standard aims to ensure that cultural heritage is protected during any project implementation operations. PS8 is not applicable as there are no identified cultural heritage receptors within the project AOI.

IFC EHS General Guidelines

The IFC's EHS General Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. These General EHS Guidelines are designed to be used together with relevant Industry Sector EHS Guidelines which provide guidance on EHS issues in specific industry sectors. The sectors covered in these guidelines include:

1. Environmental
    a. Air Emissions & Ambient Air Quality
    b. Energy Conservation
    c. Wastewater & Ambient Air Water Quality
    d. Water Conservation
    e. Hazardous Materials Management
    f. Waste Management
    g. Noise
    h. Contaminated Land
2. Occupational Health & Safety
    a. General Facility Design & Operation
    b. Communication & Training
    c. Physical Hazards
    d. Chemical Hazards

   e. Biological Hazards
   f. Radiological Hazards
   g. Personal Protective Equipment (PPE)
   h. Special Hazard Environments
   i. Monitoring
3. Community Health & Safety
   a. Water Quality & Availability
   b. Structural Safety of Project Infrastructure
   c. Life & Fire Safety
   d. Traffic Safety
   e. Transportation of Hazardous Materials
   f. Disease Prevention
   g. Emergency Preparedness & Response
4. Construction & Decommissioning
   a. Environment
   b. Occupational Health & Safety
   c. Community Health & Safety

<u>IFC EHS Guidelines for Electric Power Transmission & Distribution</u>

The EHS Guidelines for Electric Power Transmission & Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. Specific requirements are presented below:

1. Routing & Siting
   a. Avoid critical habitats and prioritize existing corridors and access routes
   b. Minimize Right of Way (RoW) width and vegetation clearing
2. Biodiversity & Vegetation
   a. Apply Integrated Vegetation Management (IVM) and encourage low growing native species
   b. Restrict clearing during breeding/ migration seasons where relevant
   c. Prevent and control invasive species and rehabilitate any disturbed areas after work is completed
3. Birds & Wildlife
   a. Avoid bird migration routes, nesting, and foraging areas where feasible
   b. Install bird diverters/ line markers and insulate exposed components to reduce collision and electrocution
   c. Consider undergrounding in highly sensitive areas
4. Water Bodies & Wetlands
   a. Avoid placing towers and access roads in streams, wetland, and riparian zones
   b. Maintain natural drainage and fish passage at crossings

    c. Implement erosion and sediment control measures
5. Electric & Magnetic Fields (EMF)
    a. Assess EMF exposure and maintain setbacks from communities
    b. Ensure compliance with ICNIRP public exposure limits through routing and design
6. Hazardous Materials
    a. Provide secondary containment for transformer oils and fuels
    b. Minimize SF_6 use and leakage in switchgear
    c. Identify and safely manage or replace PCB containing equipment
7. Community Health & Safety
    a. Prevent public access to hazardous areas using signage, fencing, grounding, and locks
    b. Address visual, noise, and land use concerns through consultation and design
    c. Coordinate with aviation authorities where towers may affect flight patterns
8. Occupational Health & Safety
    a. Apply minimum safe working distances for live-line works by voltage class
    b. Train workers on EMF risks, working at heights, and electrical safety
    c. Target zero fatalities and monitor OHS performance indicators
9. Fire Risk Management
    a. Manage RoW vegetation to reduce wildfire risk, especially in forested areas
    b. Control slash disposal and avoid high risk construction periods
10. Monitoring & Reporting
    a. Monitor environmental impacts, EMF levels, and OHS performance
    b. Maintain records, audits, and corrective tracking in line with IFC expecations

4. Environmental and Social Baseline

For the development of the environmental and social baseline, literature reviews were carried out, alongside a detailed review of the RoW using satellite imagery, and a visit to the site undertaken in September 2025. This aided in understanding the conditions within which the project has been proposed for implementation. Brief details on the baseline conditions of the project site are provided below:

4.1 Physical Environment

The project area lies within the southern coastal plain of Sindh, which is characterized by flat, saline, loamy-sandy soils. In terms of water resources, there

are no significant surface water bodies along the route, while slightly saline groundwater is accessed through boreholes.

The project area experiences high temperatures, dust storms, and occasional monsoon winds, and the ESIA will further assess the implications of wind loading, heat exposure, and moderate seismicity (Zone 2A) on project design and overall safety.

4.2 Land Ownership and Land Use

Add details of land ownership here and then go onto land use below – land appears to be under the ownership of the government and leased to Deewan Cement – is that right?.

The land use pattern along the RoW of the transmission line is pre-dominantly vacant, i.e., there are no persons or activities found taking place within the RoW (no occupation/ residence, no commercial activities formally or informally). At the time of the visit, the area was found to be pre-dominantly green due to rain fed vegetation that had sprouted in the area following the monsoon areas that had occurred earlier.

There is also no direct road or route that traverses the entire length of the RoW, requiring the team to take detours and diversions to travel effectively between the two end points of the transmission line, ensuring that most of the RoW is covered. Major crossings along the RoW for the project include:

- One point where the transmission line crosses the corridor of the K-IV project (where underground pressurized water pipelines have been laid for the project), where the transmission line would pass over this project.
- One point where the KE transmission line would cross a transmission line in place by the National Transmission & Dispatch Company (NTDC), where a gantry will be set up to allow for the step down and step up of the KE transmission line to effectively cross the NTDC transmission line.

Alongside this, the transmission line RoW will also pass nearby from a shrine and the Dewan cement plant. Further details on the shrine are attached below in the cultural heritage section.

The nearest community from the transmission line is 3 km away.

4.3 Biological Environment

The transmission line corridor primarily traverses barren scrubland with no forested, wetland, or agricultural areas, and therefore only minimal vegetation

clearance is anticipated during construction. The area supports no endangered or protected species, with the presence limited to common desert fauna such as lizards, rodents, and hares. In terms of avifauna, the proposed alignment does not intersect any Important Bird Areas (IBAs) or known migratory flyways. However, the potential for bird collisions with conductors will be assessed further, and bird diverters may be incorporated into the design as a preventive mitigation measure to minimize avian impacts.

4.4 Social Environment

The transmission line route primarily traverses unused and barren land, with no residential or commercial structures located within the Right-of-Way (ROW). There are also no agricultural or livestock-based livelihoods in the project corridor, and therefore no economic displacement is anticipated. The key stakeholder communities, including Village Abdul Raheem (Dhore) and Goth Haji Suleman, which are approximately 3 km away from the nearest point of the transmission line, expressed support for the project while requesting local employment opportunities and community development initiatives under K-Electric's CSR program.

4.5 Cultural Heritage

There are no known archaeological or religious sites identified along the proposed transmission line route. The shrine found nearby the vicinity of the transmission line was not found to be an identified or notified antiquity, where the importance of the shrine was also discussed in stakeholder consultations with the people in the area, where no such cultural importance or value was ascertained.

5. Potential Environmental and Social Impacts Identified

The scoping stage identified several Valued Environmental and Social Components (VECs) that will form the focus of the ESIA. These components represent the physical, biological, and socio-economic features most likely to be affected by project activities or of concern to stakeholders during project implementation. These are described in further detail below:

5.1 Physical Environment

<u>Construction Phase</u>

- The generation of hazardous and non-hazardous waste leading to the contamination of soil and groundwater and potential attraction of vectors for disease.

- The combination of movement of heavy machinery and site clearance may lead to potential soil erosion in different areas along the Right of Way.
- The risk of leaks and spills from machinery waste leading to the contamination of soil and groundwater.
- The use of water in a water-scarce region leading to increased pressure on other water users.
- The generation of noise and dust emissions (including PM2.5) leading to health impacts to the workforce and any nearby community receptors.
- The clearance of vegetation where OHTL pylons are to be located and along the route of the underground cable leading to a change in natural drainage patterns.
- The movement of machinery along unpaved roads and pathways, along with potential excavation and transportation of materials may lead to extended dust emissions, deteriorating overall air quality of the area temporarily.
- The use of heavy machinery and generators will also contribute emissions from exhausts, leading to temporary air quality deterioration.
- Works associated with the project, including use of heavy machinery, tower erection, material movement, etc. will contribute towards an increase in overall noise and vibration levels in the area.

Operation

- No risks and impacts to the physical environment are expected to occur during operations apart from the permanent change in visual setting which is not considered a source of significant risk.

5.2 Biological Environment

Construction

- The clearance of vegetation where OHTL pylons are to be located and along the route of the underground cable, leading to a loss of habitat.
- The potential introduction of invasive species of flora in areas where work is being carried out along the RoW from seeds/ roots that may be introduced through plantation activities or the movement of machinery.

Operation

- The risk of collisions between birds/bats and the OHGTL wires leading to fatalities.
- The RoW of the transmission line does not fall under any of the migratory bird pathways, hence, no impacts on migratory bird movement anticipated from the project.

5.3 Social Environment

Construction

- The generation of road safety risks from use of trucks and other vehicles on the public road network leading to injuries and fatalities, including impacts to vulnerable road users such as children, along with potential restriction on mobility of locals during machinery/ vehicular movement.
- The generation of community health and safety risks to local people from the presence of excavations at OHTL pylons, trenches, and where machinery is in use.
- The generation of occupational health and safety risks to the workforce from the installation works leading to injuries/fatalities, including those linked to the use of mechanical machinery, heat stress, and from the generation of air and noise emissions.
- The risk of security personnel used to guard machinery and materials using inappropriate force towards local people, leading to injuries/fatalities.

Operation

- The generation of long-term land use restrictions below the wires along the RoW where certain activities will become prohibited, such as the installation of a structure, and the growing of tall trees and vegetation.
- Potential community health and safety impacts that may arise from fire, or earthquake hazards
- No impacts associated with cultural heritage have been identified to arise from the project.

5.4 Cumulative and transboundary risks and impacts

There may be potential cumulative impacts from the development of the transmission line under this project, and the solar and wind developments proposed under the hybrid energy project, including impacts on bird and bat populations. These will ultimately be assessed under the hybrid energy project.

6. Area of Influence (AoI) and Associated Facilities

The primary AoI includes the 13.4 km transmission corridor and all temporary use areas (e.g., equipment yards and storage sites). The secondary AoI extends to 1–2 km on either side of the ROW for assessing air, noise, and community safety impacts. No associated facilities (such as new substations, access roads, or fuel pipelines) are included within the project scope. The only operational interface is with the existing

NPQ–Dhabeji circuit and the under-construction SITE Neutral Hybrid Power Plant Grid Station, which will serve as the connection points.

The AoI mapping exercise confirmed that the alignment avoids settlements, sensitive receptors, and ecologically significant habitats.

7. Stakeholder Engagement Outcomes

Stakeholders were approached which includes communities, local businesses, and relevant government departments, including SEPA, NTDC and Dewan Cement. Details on stakeholder engagement and the feedback obtained is provided below:

Stakeholder	Feedback & Suggestions
1. Deewan Cement	**Meeting Date: 2nd October 2025** **Respondent: Majid Bhatti, Mujahid Farooqui** Representatives from Dewan Cement Limited, including the DMG Electric and MG Admin departments, requested detailed information regarding the exact alignment of the proposed 220 kV transmission line and the associated wind power project. They indicated that a clear understanding of the project's location is necessary to evaluate any potential interference or impact on their ongoing operations . The stakeholders informed that approximately 12,000 acres of land is currently under their lease, where active mining activities are being carried out. They emphasized the need to obtain information on both the project contractor and the finalized installation coordinates of the transmission line. Upon receipt of these details, Dewan Cement's technical team plans to undertake a site visit to assess possible implications for their mining and operational areas.
2. Village Abdul Raheem/Dhore	**Meeting Date: 2nd October 2025** **Respondents: Fida Hussain, Muhammad Ayub, Rozaddin** This village comprises of 500 – 600 households. During the consultation with the residents of Village Abdul Raheem Dhore, community members expressed serious concerns regarding the lack of basic amenities in their area. The village currently has no access to electricity, gas supply, clean drinking water, healthcare services, or essential infrastructure development. The participants urged both the project proponent and the government authorities to take immediate measures to provide these fundamental services to their community. They also highlighted the need for local employment opportunities under the proposed project, emphasizing that inclusion of local labor would help improve livelihoods and contribute to the socioeconomic uplift of the area.

3. Goth Haji Suleman	**Meeting Date: 2nd October 2025** **Respondents: Khuda Baksh, Ghulam Qadir** The village comprises of 60 – 70 households. During the consultation with the residents of Goth Haji Suleman, community members expressed concern over the absence of basic facilities in their village. They reported that the local population is economically disadvantaged and faces significant challenges in meeting their daily needs. The residents requested that priority be given to local inhabitants for employment opportunities once project activities commence, to help improve their socioeconomic conditions. They also emphasized the importance of ensuring that the installation and operation of the transmission line do not cause any adverse environmental or social impacts on their village or the surrounding areas.
4. Sindh Environmental Protection Agency (SEPA)	**Respondent: Mr. Mubarak Ali, Deputy Director (Technical), Mr. Abdul Rehman, Assistant Director** They responded that the Environmental Assessment Regulations of 2021 and the Sindh Environmental Protection Act, 2014, should be followed. While they were uncertain about the potential risks, they emphasized that any religious sensitivities must be respected. They also noted that the project could help reduce electricity shortages and that promoting green energy is always a positive step forward.
5. WAPDA KIV	**Respondent: Lal Baksh Soomro** Mr. Soomro informed us that the client should provide a detailed map clearly indicating the intersection or proximity of K-Electric's transmission line and WAPDA's line. This map should be emailed to WAPDA's GM Office to enable proper scrutiny. He emphasized that this matter should be treated with the utmost priority, as WAPDA will issue a departmental NOC if no disruptions are anticipated.

Overall, the stakeholders were briefed on the proposed project, its associated activities, and the ESIA being carried out including the potential impacts that may arise from its implementation. To this, the various stakeholders voiced their concerns and highlighted any measures they believe should be incorporated into the ESIA and ultimately the project.

8. IFC Project Categorization

Based on the findings of the scoping process and in accordance with SEPA's Schedule II (Energy Projects) and IFC Environmental and Social Risk Classification, the project has been categorized as "Category B – Moderate Risk." This categorization reflects that the project involves a linear transmission corridor with predictable, site-specific impacts that can be readily mitigated through established engineering design and management practices. There are no protected areas, critical habitats, or indigenous populations located within or near the project's area of influence (AoI). The potential

risks are primarily temporary and construction-related, including dust generation, noise, traffic safety concerns, and occupational hazards, rather than any form of irreversible or large-scale environmental degradation.

Thus, while the project does require a comprehensive Environmental and Social Impact Assessment (EIA), it is not expected to result in significant adverse, cumulative, or transboundary impacts.

9. Key Lessons and Recommendations from Scoping

The scoping exercise revealed several important lessons and best practices that will guide the effective implementation of the ESIA. Firstly, community cooperation is strong, as local residents have shown support for the project and view it as an opportunity for social and economic upliftment. Integrating early CSR initiatives—particularly those addressing basic services and employment—can further enhance community goodwill.

Secondly, environmental sensitivity within the project area is low, as the alignment predominantly traverses barren land with minimal ecological value, thereby simplifying the environmental mitigation framework. Thirdly, the consultations with Dewan Cement highlighted the need for clear and transparent communication, especially regarding route mapping and engagement with land-dependent stakeholders and ensuring that the land being used for the project is free from any and all potential claimants.

Moreover, Occupational Health and Safety (OHS) and climate-related risks, such as heat stress, wind exposure, and dust generation, require robust management measures integrated into construction planning. Lastly, institutional coordination remains essential—sustained engagement with SEPA, NTDC, and relevant provincial departments will be critical to ensure timely permitting, effective right-of-way (ROW) management, and consistent compliance reporting throughout the project lifecycle.

10. Focus Areas for the Environmental and Social Impact Assessment

The Environmental and Social Impact Assessment (ESIA) will prioritize several key focus areas to ensure comprehensive evaluation and effective management of the project's environmental and social dimensions. It will begin with comprehensive baseline surveys covering parameters such as land ownership, land use, risks to biodiversity, Community health & safety, stakeholder engagement to establish accurate reference data. The ESIA will include a detailed impact assessment and quantification for critical Valued Environmental and Social Components (VECs), with particular emphasis on community health, worker safety, and the land environment.

An integrated Environmental and Social Management Plan (ESMP) will be developed to identify mitigation measures for all construction and operational impacts. The ESIA will also outline a robust Occupational Health and Safety (OHS) Plan, addressing heat stress, working at heights, and electrical hazards, along with a Community Health and Safety Plan that incorporates traffic management and emergency communication protocols.

To protect biodiversity, Biodiversity Management Measures—including the installation of bird diverters, restricted vegetation clearance, and habitat restoration activities—may need to be incorporated. Furthermore, a comprehensive Monitoring and Reporting Framework will be aligned with IFC Performance Standards and SEPA approval conditions to ensure ongoing compliance and performance tracking. Lastly, a Stakeholder Engagement Plan will be maintained to facilitate continuous consultation and feedback with local communities, government agencies, and institutional stakeholders throughout both the construction and operational phases of the project.

11. Conclusion

The scoping process for the *K-Electric 220 kV Transmission Line Project* confirmed that the project poses moderate, site-specific environmental and social risks that are readily manageable through established mitigation measures. The project's alignment avoids sensitive ecological and community areas, and stakeholders have expressed strong support for its implementation.

The forthcoming ESIA will build upon these findings by undertaking detailed field studies, impact modeling, and management planning to ensure that the project is developed in a socially responsible, environmentally sustainable, and regulatory-compliant manner.

Annex III - Environmental Monitoring Reports

Project Name:	**220 kV Double Circuit Transmission Line via LILO Arrangement from existing NPQ Dhabeji Circuit to Site Neutral Hybrid Power Plant**	**Test Report No:**	**QTS/KE/25/4401-A**
		Sample Location	**AA-1**
Sample Description:	**Ambient Air Quality Test (AA-1)**	**Coordinates:**	**24.9417759951, 67.5659995548**
Monitoring Date:	**25/09/2025**		

ANALYTICAL TEST REPORT

S.NO.	PARAMETERS TO BE ANALYZED		STANDARD SEQS	STANDARD WORLD BANK/IFC	UNITS	RESULTS (Avg)	TEST METHOD
1	Carbon Mono Oxide	CO	5	NA	mg/m^3	0.25	Haz Scanner -EPAS
2	Oxides of Nitrogen as	NO_2	80	200	$\mu g/m^3$	15.44	
3	Oxides of Nitrogen as	NO	40	NA	$\mu g/m^3$	8.3	
4	Ozone	O_3	130	100	$\mu g/m^3$	9.3	
5	Respirable Particulate Matter	PM-10	150	50	$\mu g/m^3$	20.8	
6	Respirable Particulate Matter	PM-2.5	75	25	$\mu g/m^3$	7.9	
7	Suspended Particulate Matter	SPM	500	NA	$\mu g/m^3$	44.3	
8	Sulphur Dioxide	SO_2	120	20	$\mu g/m^3$	2.4	
9	Lead	Pb	1.5	-	$\mu g/m^3$	BDL	

SEQS= Sindh Environmental Quality Standard for Ambient Air
NA=Not Available

Term & Condition:

- This report is not valid for any negotiations
- Report is valid for current batch(sample)
- This report is intended only for your guidance & not for legal purpose or for advertisement.

Comments:
Tested parameter results are within the permissible limits of SEQS and World Bank Guidelines, established for Ambient Air Quality.

Sample Analyzed by: Ather Adil	**Signature of Laboratory Manager:** **Name: Haseeb Arshad**

Project Name:	**220 kV Double Circuit Transmission Line via LILO Arrangement from existing NPQ Dhabeji Circuit to Site Neutral Hybrid Power Plant**	**Test Report No:**	**QTS/KE/25/4401-B**
		Sample Location	**AA-2**
Sample Description:	**Ambient Air Quality Test (AA-2)**	**Coordinates:**	**24.9208423063, 67.524425559**
Monitoring Date:	**25/09/2025**		

ANALYTICAL TEST REPORT

S.NO.	PARAMETERS TO BE ANALYZED		STANDARD SEQS	STANDARD WORLD BANK/IFC	UNITS	RESULTS (Avg)	TEST METHOD
1	Carbon Mono Oxide	CO	5	NA	mg/m^3	0.27	Haz Scanner -EPAS
2	Oxides of Nitrogen as	NO_2	80	200	$\mu g/m^3$	14.3	
3	Oxides of Nitrogen as	NO	40	NA	$\mu g/m^3$	6.3	
4	Ozone	O_3	130	100	$\mu g/m^3$	8.7	
5	Respirable Particulate Matter	PM-10	150	50	$\mu g/m^3$	17.5	
6	Respirable Particulate Matter	PM-2.5	75	25	$\mu g/m^3$	9.3	
7	Suspended Particulate Matter	SPM	500	NA	$\mu g/m^3$	41.5	
8	Sulphur Dioxide	SO_2	120	20	$\mu g/m^3$	2.2	
9	Lead	Pb	1.5	-	$\mu g/m^3$	BDL	

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Comments:
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Sample Analyzed by: Ather Adil	**Signature of Laboratory Manager:** **Name: Haseeb Arshad**

Quality Testing Services Karachi Q.T.S

Project Name:	**220 kV Double Circuit Transmission Line via LILO Arrangement from existing NPQ Dhabeji Circuit to Site Neutral Hybrid Power Plant**	**Test Report No:**	**QTS/KE/25/4401-C**
		Sample Location	**AA-3**
Sample Description:	**Ambient Air Quality Test (AA-3)**	**Coordinates:**	**24.9115756679, 67.4827511269**
Monitoring Date:	**25/09/2025**		

ANALYTICAL TEST REPORT

S.NO.	PARAMETERS TO BE ANALYZED		STANDARD SEQS	STANDARD WORLD BANK/IFC	UNITS	RESULTS (Avg)	TEST METHOD
1	Carbon Mono Oxide	CO	5	NA	mg/m^3	1.1	Haz Scanner -EPAS
2	Oxides of Nitrogen as	NO_2	80	200	$\mu g/m^3$	13.2	
3	Oxides of Nitrogen as	NO	40	NA	$\mu g/m^3$	7.4	
4	Ozone	O_3	130	100	$\mu g/m^3$	10.7	
5	Respirable Particulate Matter	PM-10	150	50	$\mu g/m^3$	19.3	
6	Respirable Particulate Matter	PM-2.5	75	25	$\mu g/m^3$	10.3	
7	Suspended Particulate Matter	SPM	500	NA	$\mu g/m^3$	57.3	
8	Sulphur Dioxide	SO_2	120	20	$\mu g/m^3$	2.4	
9	Lead	Pb	1.5	-	$\mu g/m^3$	BDL	

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Term & Condition:

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Comments:
Tested parameter results are within the permissible limits of SEQS and World Bank Guidelines, established for Ambient Air Quality.

Sample Analyzed by: Ather Adil	**Signature of Laboratory Manager:** **Name: Haseeb Arshad**

Quality Testing Services Karachi Q.T.S

Project Name:	**220 kV Double Circuit Transmission Line via LILO Arrangement from existing NPQ Dhabeji Circuit to Site Neutral Hybrid Power Plant**	**Test Report No:**	**QTS/KE/25/4401-D**
		Sample Location	**AA-4**
Sample Description:	**Ambient Air Quality Test (AA-4)**	**Coordinates:**	**24.9393781605, 67.5587622585**
Monitoring Date:	**25/09/2025**		

ANALYTICAL TEST REPORT

S.NO.	PARAMETERS TO BE ANALYZED		STANDARD SEQS	STANDARD WORLD BANK/IFC	UNITS	RESULTS (Avg)	TEST METHOD
1	Carbon Mono Oxide	CO	5	NA	mg/m^3	1.3	Haz Scanner -EPAS
2	Oxides of Nitrogen as	NO_2	80	200	$\mu g/m^3$	15.3	
3	Oxides of Nitrogen as	NO	40	NA	$\mu g/m^3$	8.4	
4	Ozone	O_3	130	100	$\mu g/m^3$	13.3	
5	Respirable Particulate Matter	PM-10	150	50	$\mu g/m^3$	22.4	
6	Respirable Particulate Matter	PM-2.5	75	25	$\mu g/m^3$	11.3	
7	Suspended Particulate Matter	SPM	500	NA	$\mu g/m^3$	49.9	
8	Sulphur Dioxide	SO_2	120	20	$\mu g/m^3$	8.3	
9	Lead	Pb	1.5	-	$\mu g/m^3$	BDL	

SEQS= Sindh Environmental Quality Standard for Ambient Air
NA=Not Available

Term & Condition:

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- Report is valid for current batch(sample)
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Comments:
Tested parameter results are within the permissible limits of SEQS and World Bank Guidelines, established for Ambient Air Quality.

Sample Analyzed by: Ather Adil	**Signature of Laboratory Manager:** **Name: Haseeb Arshad**

Lab Report Ref. No.: QTS/KE/25/4402 Reporting Date: 27/09/2025

Project Name:**220 kV Double Circuit Transmission Line via LILO Arrangement from existing NPQ Dhabeji Circuit to Site Neutral Hybrid Power Plant**

SAMPLE DESCRIPTION

Sample ID: Noise Level Test
Sample Description: Ambient Noise
No. of samples: 04
Sample Collected/Submitted by: QTS representative
Sampling Date:25/09/2025
Sample Receipt at QTS - Date:25/09/2025

NOISE LEVEL TEST REPORT

S.NO	LOCATION	Noise Level Readings					
		Coordinates	Minimum	Maximum	Average	Limits	
1	NOISE 01	24.9416980174, 67.5664714075	63.3	63.9	63.6	SEQS-Limits: 75 dB(A)	WBG - Guideline 70 dB(A) Leq
2	NOISE 02	24.9212565248, 67.5256806909	62.4	63.2	63.0		
3	NOISE 03	24.9138793839, 67.4773982144	64.1	64.9	64.5		
4	NOISE 04	24.9206772948, 67.3928248525	62.9	63.3	63.1		

SEQS *= Sindh Environmental Quality Standards.*
dB (A) Leq=Time weighted average of the level of sound in decibel on scale which is relatable to human hearing.

Term & Condition:

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- Report is valid for current batch(sample)
- This report is intended only for your guidance & not for legal purpose or for advertisement.

Comments:
All areas of noise level measurement within Standard of SEQS & WBG Limits, for day time.

Sample Analyzed by: Ather Adil	**Signature of Laboratory Manager:** **Name: Haseeb Arshad**

Quality Testing Services Karachi Q.T.S

Annex IV - Waste Management Plan

CONSTRUCTION WASTE MANAGEMENT PLAN

Construction waste material consists mainly of concrete, masonry, limestone, sandstone, metal, and wood, depending on the construction type. In building waste, a larger percentage of paper, plastic, etc. is expected due to packaging materials and the wood retired from formwork and scaffolding. This is in addition to significant amounts of concrete, masonry and metal materials.

1.0 Origins and Causes of Construction Waste

Origins of waste	Causes of waste
Contractual	▪ Errors in contract documents ▪ Contract documents incomplete at commencement of construction
Design	▪ Design changes ▪ Design and detailing complexity ▪ Design and construction detail errors ▪ Unclear/unsuitable specification ▪ Poor coordination and communication (late information, last minute client requirements, slow drawing revision and distribution)
Procurement	▪ Ordering errors (i.e., ordering items not in compliance with specification) ▪ Over allowances (i.e., difficulties to order small quantities) ▪ Supplier errors
Transportation	▪ Damage during transportation ▪ Difficulties for delivery vehicles accessing construction sites ▪ Insufficient protection during unloading ▪ Inefficient methods of unloading
On-site Management and Planning	▪ Lack of on-site waste management plans ▪ Improper planning for required quantities ▪ Delays in passing information on types and sizes of materials and components to be used ▪ Lack of on-site material control ▪ Lack of supervision
Material storage	▪ Inappropriate site storage space leading to damage or deterioration ▪ Improper storing methods ▪ Materials stored far away from point of application
Material handling	▪ Materials supplied in loose form ▪ On-site transportation methods from storage to the point of application ▪ Inadequate material handling
Site operation	▪ Accidents due to negligence ▪ Unused materials and products ▪ Equipment malfunction ▪ Poor craftsmanship

Origins of waste	Causes of waste
	▪ Use of wrong materials resulting in their disposal ▪ Time pressure ▪ Poor work ethics
Residual	▪ Waste from application processes (i.e., over preparation of mortar) ▪ Off-cuts from cutting materials to length ▪ Waste from cutting uneconomical shapes ▪ Packaging
Other	▪ Weather ▪ Vandalism ▪ Theft

2.0 Construction Waste Management Plan

1) Waste Management Goals

To establish that this project shall generate at least 50% less waste into landfills and the processes shall be employed to ensure that this goal is met. These shall include prevention of damage to materials to be incorporated into the work due to mishandling, improper storage, contamination, inadequate protection or other factors as well as minimizing poor quantity estimation, as well as through building design.

2) Responsibility

- The Project Director shall be responsible for the implementation of the administrative portions of this program, including the notification of subcontractor management, the training of the site supervisor and the onsite posting of this plan.
- The site supervisor will be responsible for the implementation of the onsite portions of this program including the training of subcontractor personnel.

3) Waste Prevention Planning

- In addition to other requirements specified herein it is a requirement for the work of this project that the contractor comply with the applicable city waste disposal requirements.
- Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling where practical and possible.
- Project Construction Documents: The General Contractor will contractually require all subcontractors to comply with these recycling guidelines. A copy of this “Construction Waste Management Plan” will accompany all subcontractor agreements and require subcontractor participation.
- The “Construction Waste Management Plan” shall be implemented and executed as follows and as on the chart:
  - Salvageable materials will be diverted from disposal where feasible.
  - There will be a designated area on the construction site reserved for materials that can be recycled.
  - Areas shall be marked to designate what recycle materials are to be stored there.
  - Hazardous waste will be managed by a licensed hazardous waste vendor.

4) Communication & Education Plan

- This Construction Waste Management Plan will be posted onsite.

- Each subcontractor will be made aware of the intent of this project with respect to reduction of waste and recycling.
- Onsite recycling containers and/or areas will be plainly marked.
- The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan.
- All recycling containers/areas will be clearly marked.
- Lists of acceptable/unacceptable materials will be posted at the site.
- All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.

5) Motivation Plan

The General Contractor will conduct a pre-award meeting for subcontractors. Subcontractors under consideration will be required to attend the meeting to review project goals and requirements with the project team. Attendance will be a prerequisite for award of subcontracts. This document will be an attachment to every subcontract. Copies of the attachment will be posted prominently at the job site.

6) Expected Project Waste, Disposal, and Handling

The following chart identifies waste materials expected on this project, their expected disposal methods and handling procedures. New items may be added as needed.

Material	Quantity	Disposal Method	Handling Procedure
Land clearing debris		Keep separate for reuse and or wood sale. Separate topsoil and rock for future landscaping use.	Keep separated in designated areas onsite.
Clean dimensional wood and palette wood		Keep separate for reuse by on-site construction or by site employees for either heating stoves or reuse in home projects. May be offered to public.	Keep separated in designated areas onsite.
Plywood, OSB, particle board		Reuse onsite when possible, landfill or recycle off site.	Keep separated in designated areas onsite. Place in “Trash” container.
Painted or treated wood		Reuse, off site recycle, landfill.	Keep separated in designated areas onsite. Place in “Trash” container.
Concrete		Recycle when possible.	
Concrete Masonry Units		Keep separate for re-use by on-site construction or by site employees.	Keep separated in designated areas onsite.

Material	Quantity	Disposal Method	Handling Procedure
Metals		Recycle off site when possible. Separate copper wire when possible.	Keep separated in designated areas onsite. Place in "Metals" container.
Paint		Reuse onsite.	Keep separated in designated areas onsite
Insulation		Reuse, landfill.	
Flooring		Reuse, landfill.	
Carpet and pad		Reuse or recycle with carpet manufacturer	
Glass		Glass Bottles: recycle locally.	Keep separated in designated areas onsite.
Plastics		Plastic Bottles: recycle locally; be aware of plastics that are acceptable to recycle facility.	Keep separated in designated areas onsite.
Beverage		Recycle locally	Keep separated in designated areas onsite.
Cardboard		Recycle locally	Keep separated in designated areas onsite.
Paper and newsprint		Recycle locally	Keep separated in designated areas onsite.

7) Waste Disposal Company

To be determined

a) Contact:

8) Recycle Hauler

To be determined

b) Contact:

c) Some or all recycle may be hauled by the builder.

9) Possible Recycle Locations and Acceptable Materials

i) Coordinate with companies which are registered with local Municipality that accept materials for recycle; and

ii) Using the above as a resource, a list will be kept indicating local opportunities for recycle of expected materials. New locations should be added as needed.

Annex V - OHS Plan

GUIDELINE OCCUPATIONAL HEALTH AND SAFETY PLAN

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

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

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

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

1.1 SCREENING AND REGULAR UNANNOUNCED CHECKING OF WORKERS

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

In addition to this, the Project Management will also undertake sudden, unannounced checks on workers to look for diseases such as COVID-19, HIV, STDs, and hepatitis and take necessary steps as mandated by the Contractual agreement between the Contractor and the Worker(s).

1.2 MINIMIZING HAZARDS AND RISKS AT THE WORKPLACE

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

i. Installation of signboards and symbols in risky and hazardous areas, to inform workers to be careful.
ii. Construction of barricades around construction sites and deep excavated pits, to cordon off and deter entry of unauthorized personnel and workers into these areas.
iii. Providing a safe storage site/area for large equipment such as power tools and chains, to prevent misuse and loss.
iv. Proper Housekeeping: Ensuring that materials are all stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapse. Brick stacks will not be more than 7 feet in height and for concrete blocks they will not be more than 6 feet high.
v. Removing all scrap timber, waste material and rubbish from the immediate work area as the work progresses.
vi. Where scaffolds are required, ensuring that each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it. The platform/scaffold plank shall be at least 15 inches wide and 1.5 inches thick. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope. Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer and shall be

constructed and loaded in accordance with that design. Where scaffolds are not provided, safety belts/safety nets shall be provided;

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

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

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

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

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

1.3 PROVISION OF PERSONAL PROTECTIVE EQUIPMENT

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

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

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

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

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

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

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

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

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

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

Table 1: PPE Requirement List

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

Type of Work	PPE
	gloves and dust respirator.

1.4 PROCEDURES TO DEAL WITH EMERGENCIES SUCH AS ACCIDENTS, SUDDEN ILLNESS AND DEATH OF WORKERS

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

i. Provision of dispensaries by the individual EPC contractor.
ii. A vehicle shall be on standby from the Project Office so that emergency transportation can be arranged to take severely injured/sick workers to the nearest hospital for immediate medical attention.
iii. A designated Health Officer/worker for the Project will be identified as a focal person to attend to all health and safety related issues. This employee's contact number will be posted at all work sites for speedy delivery of emergency services. The focal person shall be well versed with the medical system and facilities available at the hospital.
iv. Communication arrangements, such a provision of radios or mobile communication for all work sites, for efficient handling of emergencies, will be made.

1.5 RECORD MAINTENANCE AND REMEDIAL ACTION

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

1.6 COMPENSATION FOR INJURIES AND DEATH

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

1.7 AWARENESS PROGRAMS

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

i. Dissemination sessions will clarify the rights and responsibilities of the workers regarding interactions with local people (including communicable disease risks, such as HIV/AIDS, COVID-19), work site health and safety, waste management (waste separation, recycling, and composting), and the illegality of poaching.
ii. Make workers aware of procedures to be followed in case of emergencies such as informing the focal health person who in turn will arrange the necessary emergency transportation or treatment.

1.8 NOMINATION OF A HEALTH AND SAFETY FOCAL PERSON

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

i. Function as the focal person/representative for all health and safety matters at the workplace;
ii. Responsible for maintaining records of all accidents and all health and safety issues at each site, the number of accidents and its cause, actions taken and remedial measures undertaken in case of safety issues;
iii. Be the link between the contractor and all workers and submit grievances of the workers to the contractor and instructions/directives on proper health care and safety from the contractors back to the workers;
iv. Ensure that all workers are adequately informed on the requirement to use Personal Protective Equipment and its correct use;
v. Also responsible for the first aid kit and making sure that the basic immediate medicines are readily available.

1.9 SUGGESTED CONTENTS OF OCCUPATIONAL HEALTH AND SAFETY PLAN

The suggested contents of Occupational Health and Safety Plan to be developed by the Contractor(s) are described below:

a Purpose
b Scope of Application
c Complying Basis
d Occupational Health and Safety Objectives
e Organization and Responsibility
  - Contractor's Project Manager
  - HSE Management Department of the Contractor(s)
  - Medical Treatment Room of the Contractor(s)
  - Subcontractor's Project Manager
  - Subcontractor's HSE Managers
  - Occupational Health and Safety
  - Community Health and Safety
f Health Plan
  - Labour Protection
  - Sanitary Epidemic Prevention
g Safety Plan
  - Summary
  - Qualification Review
  - Safety Training
  - Construction Plans and Documents
  - Control Measures
  - Monitoring Measures
  - Management of the Key Safety Accidents
h Public Security Plan
i Local Community Health and Safety

Annex VI - Emergency Preparedness & Response Plan

GUIDELINE EMERGENCY PREPAREDNESS AND RESPONSE PLAN

1.1 PURPOSE

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

i. Ensure all personnel and visitors to the office/job sites are given the maximum protection from unforeseen events.
ii. Ensure all personnel are aware of the importance of this procedure to protection of life and property.

1.2 EMERGENCY PREPARATION AND RESPONSE MEASURE SCOPE

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

i. Construction Accident
ii. Road & Traffic Accident
iii. Hazardous material spills
iv. Structure collapse or failure
v. Trauma or serious illness
vi. Sabotage
vii. Fire
viii. Environmental Pollution
ix. Loss of person
x. Community Accident

1.3 RESPONSIBILITIES

The detailed roles and responsibilities of certain key members of the Emergency Response team available to assist in emergency are provided in **Table 1** below.

Table 1: Emergency Response Team

Action Group	Responsibility
Emergency Coordinator	▪ Overall control of personnel and resources. ▪ The Emergency Coordinator will support and advise the Site Safety Supervision as necessary. ▪ Serves as public relations spokes persons, or delegates to some staff member the responsibility for working with news media regarding any disaster or emergency. Also assure proper coordination of news release with appropriate corporate staff or other designated people.
Site Safety Supervision (Emergency Commander)	▪ Overall responsibility for activating emergency plan and for terminating emergency actions. ▪ Be alternative of emergency response chairpersons. ▪ Disseminates warnings and information as required to ensure all people in the immediate area have been warned and evacuated either by alarms or by word of mouth. ▪ Supervise the actions of the Emergency Response Team to ensure all persons are safe from the danger. ▪ Notify outside authorities if assistance is required. ▪ Carries the responsibility for coordinating actions including other organizations in accordance with the needs of the situation.

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

Action Group	Responsibility
Other Staff and Employees	▪ All other staff and employees will remain at their workstations or assembly point unless directed otherwise from Emergency Response Team. ▪ Each supervisor will ensure that all members of his work group are accounted for and keep in touch with each of their Department Head.

1.4 PROCEDURE

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

Figure 3.1 Emergency Procedures for Fire

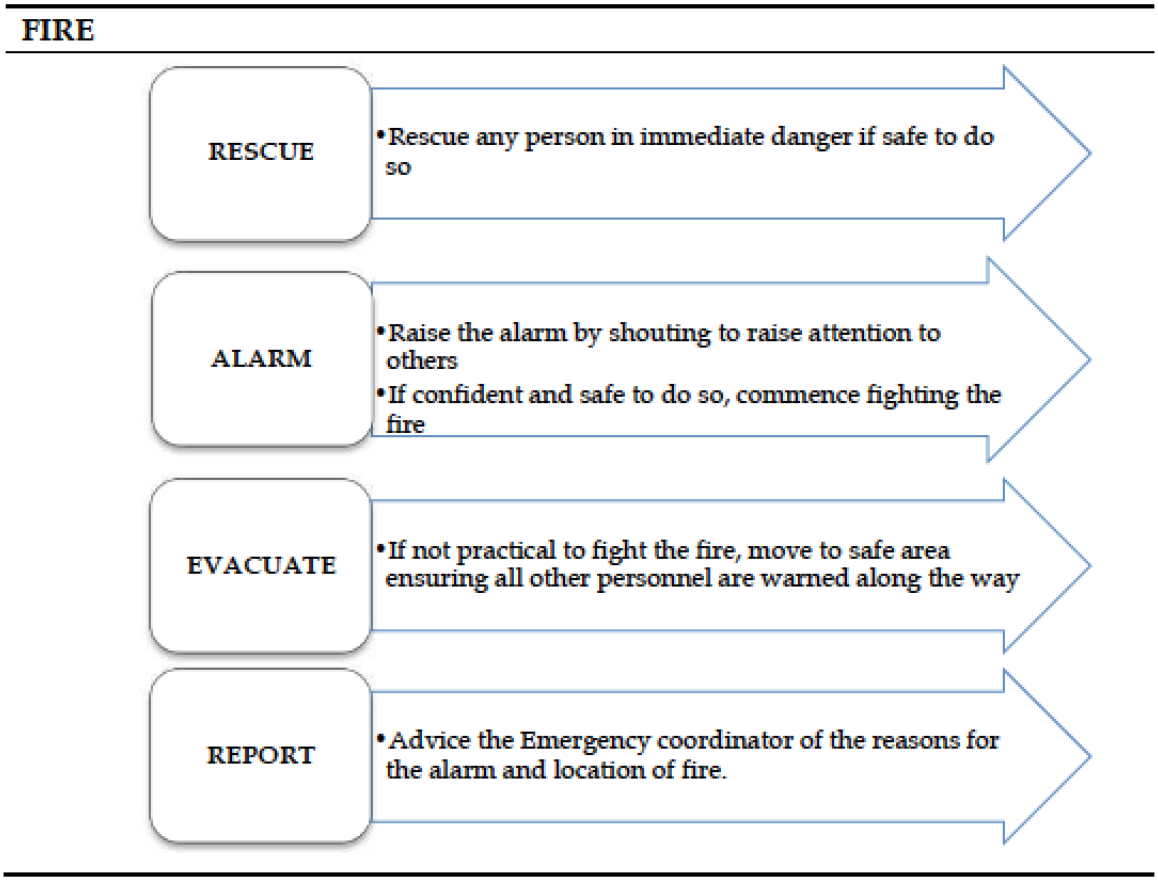
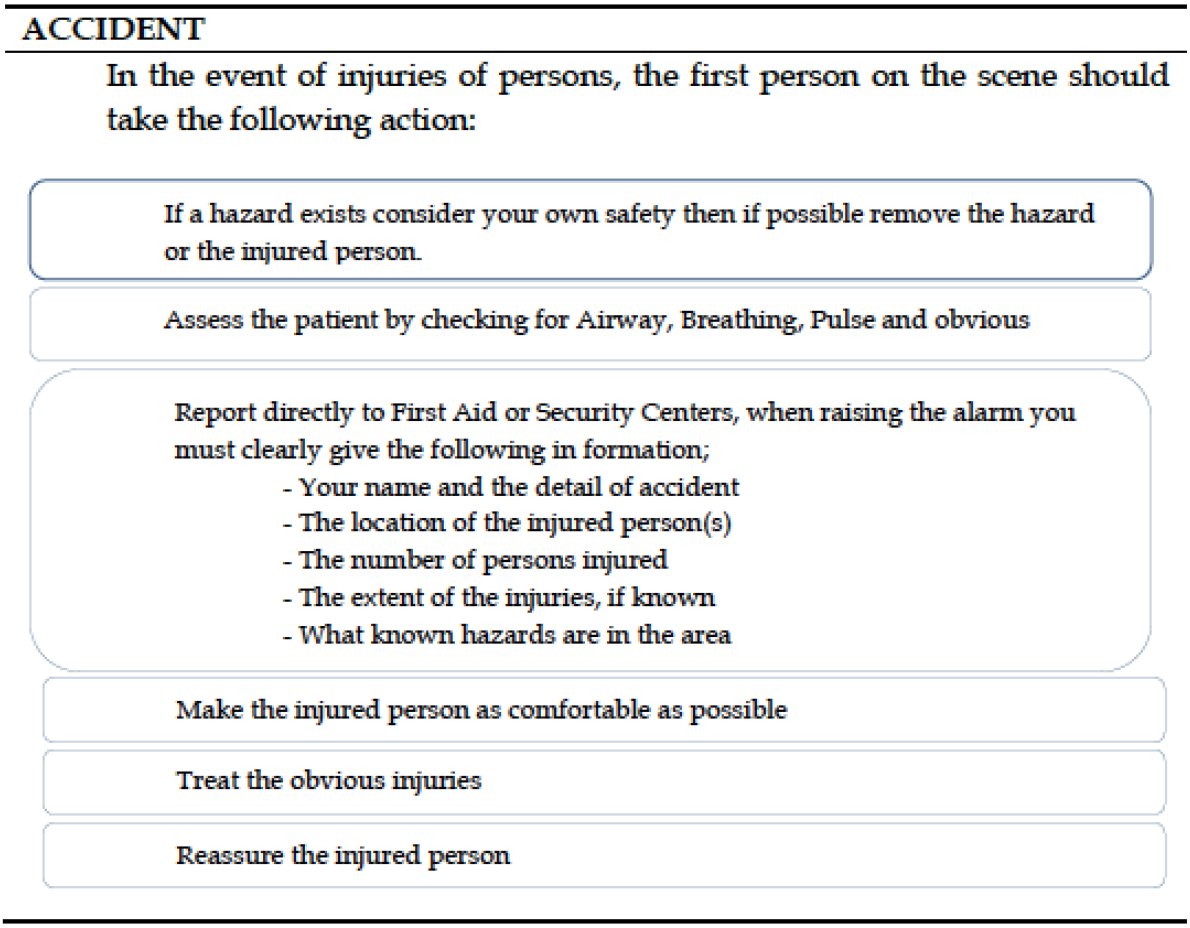


Figure 3.2 Emergency Procedures for Serious Accident



3.5 COMMUNICATION WITH AUTHORITIES / PRESS AT SITE

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

1.5 FIRST AID PERSONS

Upon advice of medical emergency, make immediate assessment to response required and if necessary, advise security to summon ambulance or medical assistance, the qualified first aid attendant should also,

- Provide treatment to the victim(s) to the best of his/her ability.
- Ensure the safety of victims by ceasing any work activity in the area.
- Protect the injured from further danger and weather.
- Assist medical services personnel when they arrive.

1.6 GENERAL ADMINISTRATION TEAM

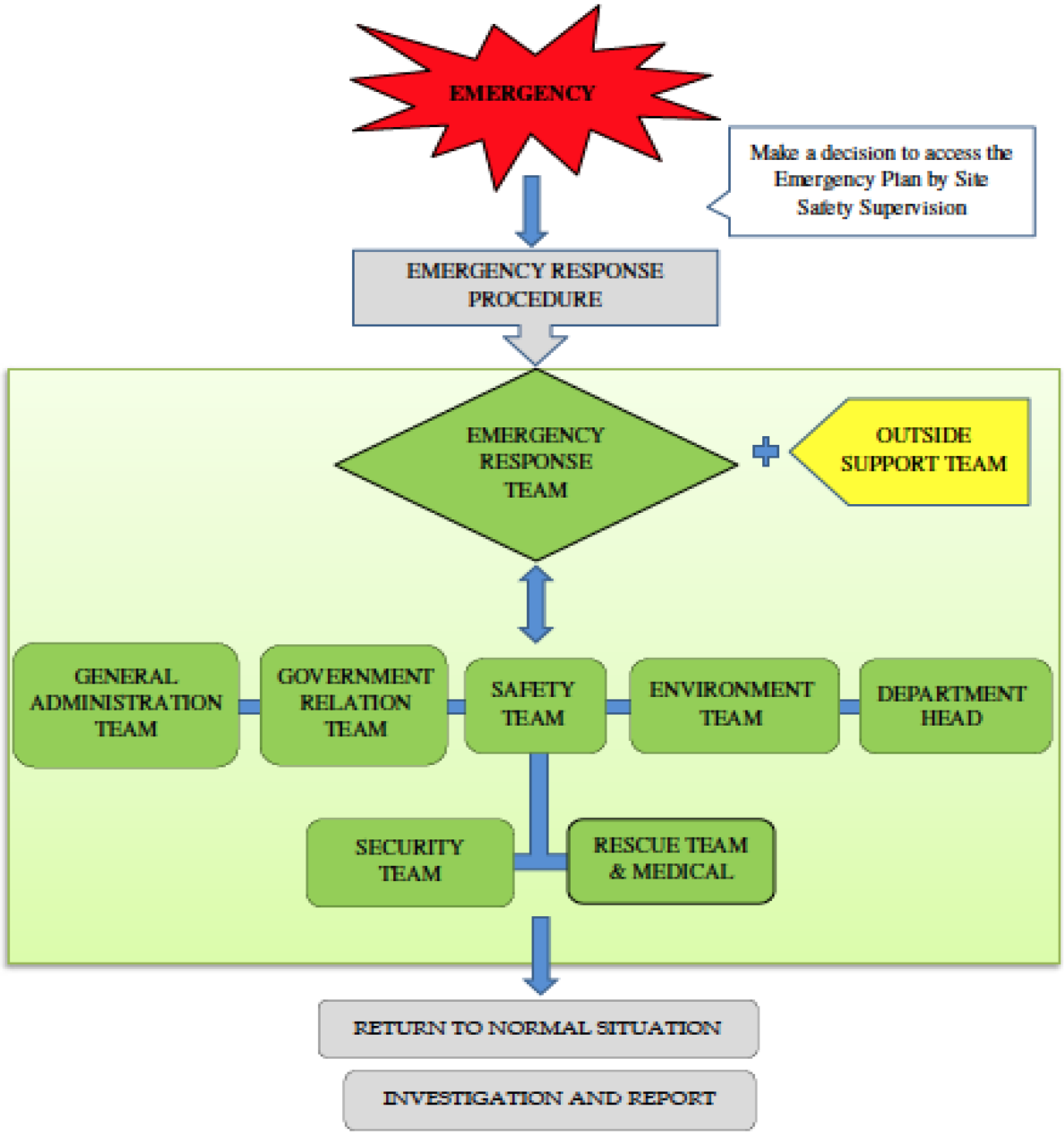
Upon advice of medical emergency, maintain contact with first aid personnel and summon ambulance if required.

1.7 SECURITY TEAM

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

1.8 EMERGENCY COORDINATOR

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



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

1.9 INCIDENT AND ACCIDENT REPORT

Section A: Identification Data

Report No:	Date of Reported:	Reporter:	Sign:
Job Title:		Company Name:	

Section B: Violence Rate

Accident Violence: ☐ 01-Death ☐ 02-Serious Injury ☐ 03-Lost Time Injury ☐ 04-First Aid ☐ 05- Not Injury ☐ 06-Near Miss

Property Damage Cost: ☐ 1-2,000 USD ☐ 2,001-10,000 USD ☐ 10,001-50,000 ☐ > 50,001

Section C: Environmental Impact

Affected area	☐ Construction area	☐ Public area	
Receptor	☐ None	☐ Workers	☐ Community
Type of pollution	☐ Physical	☐ Chemical	☐ Biological
Toxicity	☐ Non-toxic	☐ Low - toxic	☐ High - toxic
Return to Normal	☐ 1 day	☐ 1 day to 1 week	☐ ≥ 1 week
Cumulative impact	☐ Non-cumulative	☐ Cumulative	

Section D: Injured/Illness Employee

1.Name:	Sex:	Date of Birth: Month	Day	Year	Age:	Regular Job Title:	Experience: In this job title Years	Weeks	In this Project Years	Weeks
	☐ Male ☐ Female									

Site:	Company:	Reference:	Phone No:	Social Security Numbe

Part of Body Injured or Affected:

☐ Head	☐ Hands	☐ Face	☐ Nose
☐ Eyes	☐ Legs	☐ Teeth	☐ Neck
☐ Trunk	☐ Toes	☐ Elbow	☐ Shoulder
☐ Back	☐ Ankle	☐ Wrist	☐ Foot
☐ Arms	☐ Thump	☐ Fingers	☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration	☐ Amputation	☐ Puncture	☐ Fracture
☐ Strain & Sprain	☐ Burns	☐ Contusion	☐ Dry Heat Friction
☐ Hernia	☐ Foreign Body	☐ Chemical	☐ Contamination
☐ Skin (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

2.Name:	Sex:	Date of Birth: Month	Day	Year	Age:	Regular Job Title:	Experience: In this job title Years	Weeks	In this Project Years	Weeks
	☐ Male ☐ Female									

Site:	Company:	Reference:	Phone No:	Social Security Numbe

Part of Body Injured or Affected:

☐ Head	☐ Hands	☐ Face	☐ Nose
☐ Eyes	☐ Legs	☐ Teeth	☐ Neck
☐ Trunk	☐ Toes	☐ Elbow	☐ Shoulder
☐ Back	☐ Ankle	☐ Wrist	☐ Foot
☐ Arms	☐ Thump	☐ Fingers	☐ Internal

Remark: .....

Nature of Injury or Illness:

☐ Laceration	☐ Amputation	☐ Puncture	☐ Fracture
☐ Strain & Sprain	☐ Burns	☐ Contusion	☐ Dry Heat Friction
☐ Hernia	☐ Foreign Body	☐ Contamination	☐ Chemical
☐ Skin (Occupationnel)	☐ Rash	☐ Irritation	

Remark: .....

Section E: Accidents/incident Details

Date Accident/Incident Occurred:	Time Accident/Incident Occurred:	Exact Location of the Accident / Incident:

Details of the actual Job Being done at the time:

Details of Accident / Incident / What actually happened?

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

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

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

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

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

Detail below any immediate remedial actions that have been taken:

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

Section H: Witness Statement	
Witness Name	**Interviewer Name**

Section I: Reviewed & Recommend by			
Recommendation:			
Reviewed By:	Position:	Signature:	Date:

Remarks : If Accident or Incident happened with lost time injury and affected to the publicity must further report to Safety Department;
: First Aid Cases will not applicable to this form;
: The accident report shall submit to Safety Department within 3 days
: Attached the photograph or sketch the location of accident / incident;

1.10 SUGGESTED CONTENTS OF EPRP

The Contractor should prepare the EPRP based on the guidelines provided in the above sections. The suggested structure of the EPRP is listed below:

1. Purpose
2. Applicable Scope
3. Preparation Basis
4. Emergency Response System
   - 4.1 Generals
   - 4.2 Emergency Response System
   - 4.3 Responsibilities
5. Major Safety Risks
6. Precautionary Measures
   - 6.1 Training and Exercise
   - 6.2 Hazard Source Monitor
   - 6.3 Alert Action
   - 6.4 Management Measures
7. Control Measures
   - 7.1 Response
   - 7.2 Response Procedures
   - 7.3 Emergency Response
   - 7.4 Emergency Completion and Restoration
8. Emergency Response Report and Settlement
9. Supporting Measures
   - 9.1 Communication
   - 9.2 Emergency Team
   - 9.3 Funding for Emergency
   - 9.4 Provisions and Resources
10. Records

Annex VII - Traffic Management Plan

GUIDELINE TRAFFIC MANAGEMENT PLAN

1. Need for Plan

During the construction period of the project, considerable vehicular movement carrying large amounts of material and machinery is expected. This will definitely interrupt the local traffic and is therefore important to manage the traffic to avoid the nuisance to local residents in terms of noise, dust, congestion and inconvenience.

2. The plan

The objective of Traffic Management Plan (TMP) is to define the requirements that should be implemented to mitigate any potential negative risks to the environment, workers or the community resulting from construction traffic.

The TMP will advise and inform site Contractors and external suppliers of equipment and materials of access and entry points along with other key information such tipping areas and wash-out areas. It is intended to compliment and work alongside relevant EMP. The TMP will be classed as “live” and therefore be subjected to updates as required.

The Contractor, at the time of the execution of the project, will prepare a comprehensive TMP in coordination with local authorities, QICT, emergency services and local administrative department. QICT and SC will review and approve the Contractor’s TMP. The Contractor’s TMP shall include following mitigation measures during its preparation:

- Undertake a road conditions assessment prior to and following the peak construction period, to assess any damage to road infrastructure that can be attributed to Project development.
- Repair damage as appropriate or enter into a voluntary agreement with the relevant roads authority to reimburse the cost of any repairs required to the public road network as a result of the Project.
- Spoil dumpsites located close to project site to minimize journey distance and limit movements to site access roads.
- Construction of worker accommodation on site to reduce light vehicle movements relating to travel to/ from the site.
- Provision of bus/minibus services for personnel living in nearby settlements.
- Movements of construction workers will be planned to avoid the busiest roads and times of day when traffic is at its greatest.
- Schedule deliveries and road movements to avoid peak periods.
- Driver training for HGV drivers and refresher course every six months for project drivers.
- Run a safety campaign to improve the people’s knowledge of the traffic hazard on their roads, public information and other activities to address the issues.
- Run a pedestrian awareness programme.
- Temporary signage

The traffic management plan for the project corridor is provided below.

3. Other Recommendations

It is important to manage public access routes during construction because it can cause delay to local traffic and create a safety hazard both on and offsite. People working and living near the tower sites would be annoyed by the emissions, noise and visual intrusion of queuing vehicles. Some important factors involved in access routes and site traffic are as follows:

3.1. Public Access Routes

The use of public road for site access may be restricted in terms of:

- Vehicle size, width and type of load
- Time limits
- Parking
- Pedestrian conflicts

Contractor should have consultation with the local police or local authority to address these issues and to effectively manage them before the beginning of the construction.

3.2. Site Workers Traffic

Site personnel should not be permitted to park vehicles right on the road; this will lead to disruption in material deliveries. Designated parking areas with appropriate parking space will be needed for this purpose; any plain area near construction site can be used for this purpose.

3.3. Site Rules

- Access to and from the site must be only via the specified entrance.
- On leaving the site, vehicles must be directed to follow the directions given.
- Drivers must adhere to the site speed limits.
- All material deliveries to site must keep allocated time limits.
- No material or rubbish should be left in the loading-unloading area.
- Develop a map for alternate routes showing material delivery services.
- Assign designated personnel on site to receive deliveries and to direct the vehicles.
- Monitor vehicle movement to reduce the likelihood of queuing or causing congestion in and around the area.
- Project vehicles should have a unanimous badge or logo on windscreen displaying that they belong to the project.

4. Contractor’s Obligation

The traffic management plan of the Contractor should be safe enough and widening of any access roads and construction of the detours (as applicable and practical) must be completed prior to start of project construction activities so that heavy vehicular transportation for construction activities do not hinder the normal course of traffic lanes. Contractor must ensure

that road closures are carried out by a competent person. The Contractor obligation must include the display of traffic signs according to the need to divert the traffic volume and to guide the road users in advance. The traffic sign, traffic light should be placed from any diverting route or road marking.

The Contractor should consider the environmental and social impacts of the traffic during construction. It will be sole responsibility of the Contractor to implement a plan which produces minimum nuisance to the local people and to the environment. Safety of the people should be given due importance. It will be under Contractor obligation to notify the traffic management plan and its later changes to SC, QICT, emergency services and Traffic Police, and also publish weekly programme in the local newspaper.

Annex VIII - Resource Conservation & Pollution Prevention Plan

Guideline Resource Conservation & Pollution Prevention Plan

1. Introduction:

Sustainable development calls for the need to conserve resources, especially the non-renewable resources.

2. Objective of the plan:

The Resource Conservation Plan is intended to make an effort towards achieving sustainable development. The objective of the resource conservation plan is to:

- Minimize the use of natural resources; and
- Mitigate/ prevent pollution contaminating the natural resources.

3. Planning:

Careful estimations of quantities of material, fuel, water and energy required directly or indirectly shall be done to avoid excessive or unnecessary wastage of these materials. In addition to this, pollution prevention strategies shall also be devised to prevent contamination of resources.

- The estimations include the following:
    1. Estimation of construction material required for the project
    2. Estimation of fuel consumption for construction machinery, construction vehicles and generators etc.
    3. Estimations of the energy requirements during all the stages of the project
    4. Estimations of water consumption for construction activities and construction camp sites.
- Strategies shall be planned to reduce loads on the identified resources to be consumed;
- Best management practices shall be devised to control or reduce pollution resulting from the activities during different stages of the project; and
- An inspector shall be assigned responsibility to oversee the ongoing activities to check the compliance of the planned strategies.

4. Execution of the plan:

The planned strategies shall be implemented to conserve the natural resources including but not limited to the following:

Material

- Material supplied shall be in conformance with the estimated quantities and excess material shall be returned to the supplier;
- Material wastage shall be avoided by using best management practices;
- Waste produced during the project execution shall be disposed off safely to the designated disposal sites through approved contractors; and
- Reuse of the materials shall be appreciated.

Fuel/Energy

- Reduce trips and optimize routes to and from the construction site for all kinds of activities;
- Regular maintenance of equipment and vehicles to avoid leaks and sustain efficient fuel consumption;
- Switch off/plug off idle equipment and vehicles to avoid wastage of fuel;
- Minimize warm up time, unnecessary acceleration and deceleration of the construction equipment and vehicles;
- Avoid unnecessary burning of fuel for cooking in construction camps;
- Avoid unnecessary heating/cooling systems during extreme weathers;
- Construction shall start in early hours of the day to avoid heat in summers and utilization of day light; and
- Alternate energy sources shall be considered for electricity generations during construction and operation to conserve fossil fuel as it is non-renewable resource.

Water

- Avoid using potable water for sprinkling, curing and washing of equipment/vehicles. Surface water or treated effluent can be used instead;
- Wastage of water should be controlled through providing proper valves and through controlling pressure of the water;
- Unnecessary equipment washings should be avoided;
- Awareness amongst workers shall be raised to conserve water and immediately report for any leaks detected; and
- Ensure protection of canal water from contamination resulting from construction activities.

Pollution:

- Emissions shall be reduced/controlled as far as possible and direct discharges to air shall be avoided by strictly adhering to the mitigation measures outlined in ESIA report;
- Waste water shall not be discharged directly into the canal and must be managed as per the recommendations presented in ESIA; and
- Construction & demolition waste and municipal solid waste shall not be dumped/ burnt openly and shall be handled according to the preventative measure given in ESIA study.

5. Checking and Corrective Actions

The proponent shall bind the construction contractor through contract agreement to comply with the strategies outlined in the Resource Conservation Plan. The proponent shall also appoint an Inspector who shall monitor the daily onsite activities and shall report any issues/ concerns raised in relation to Resource Conservation Plan. The inspector shall recommend adequate corrective actions to mitigate the issues raised.

Annex IX - Chance Find Procedures

ARCHAEOLOGICAL 'CHANCE FIND' PROCEDURE

1. BACKGROUND

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

The Antiquities Act, 1975, protects archaeological sites, whether on Provincial Government owned or private land. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling It is recommended that due to the moderate to high archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

2. POTENTIAL IMPACTS TO ARCHAEOLOGICAL SITES

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

3. RELEVANT LEGISLATION

It ensures the protection, preservation, development and maintenance of antiquities in the provinces of Pakistan. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these 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 relevant provincial governments to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, any archaeological discovery made during the course of the project.

4. REMEDIES AND PENALTIES

The Antiquities Act, 1975 provides for heritage inspection or investigation orders, temporary protection orders, civil remedies and penalties to limit contraventions. These powers provide:

''A contravention of any provision of this Act or the rules shall, where no punishment has been specifically provided be punishable with rigorous imprisonment for a term which may extend to two years, or with fine up to rupees ten hundred thousand, or with both. ''

5. ARCHAEOLOGICAL 'CHANCE FIND' PROCEDURE

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

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

i. Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.
ii. Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.

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

iv. Work will not re-commence in this location until agreement has been reached between DoA and client as to any required mitigation measures, which may include excavation and recovery of the item.

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

6. DETAILED PROCEDURAL STEPS

- If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.
- Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.
- If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.
- Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.
- If any person, who discovers or finds any movable antiquity contravenes the provisions of the Act, he shall be punishable with imprisonment for a term which may extend to five (05) years, or with fine not less than fifteen hundred thousand rupees or with both and the Court convicting such person shall direct that the antiquity in respect of which such contravention has taken place shall stand forfeited to Government.
- The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.
- The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.
- No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.
- Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.
- If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part under the Land Acquisition Act, 1894 (I of 1894), as for a public purpose.

Annex X - Pylon Routing Procedure

Pylon Routing Procedure

1. Purpose and scope

This procedure defines the approach for finalising pylon locations for the overhead transmission line (OHTL) during the detailed design stage. It applies the mitigation hierarchy (avoid, minimise, restore, offset) and integrates direct engagement with affected landowners and land users to ensure that environmental and social (E&S) risks and impacts are systematically identified, avoided where possible, and managed in line with IFC PS1 and Good International Industry Practice (GIIP).

2. Principles

The routing and micro-siting process shall:

- Prioritise avoidance of sensitive E&S receptors (private land, crops, trees, structures, cultural heritage receptors, etc.).
- Restore temporarily affected areas to pre-project condition or better.
- Where residual impacts remain, implement proportionate offset or compensation measures consistent with IFC PS1 and PS5.
- Be evidence-based, transparent, and documented, with clear justification for decisions.
- Integrate early, meaningful, and ongoing engagement with landowners and land users, including vulnerable groups, so that their inputs and preferences are incorporated into the selection of pylon locations.

3. Constraints mapping

- Consolidate ESIA data, satellite imagery, cadastral records, and field survey data into a GIS-based constraints map.
- Identify E&S sensitive receptors and select a preferred corridor that demonstrably avoids high-risk receptors to the extent practicable.

4. Document the alternatives assessment and rationale.

- Within the preferred corridor, refine the alignment to reduce proximity to receptors, minimise land fragmentation, and avoid known E&S receptors.
- Consider engineering options (tower height, span length, angle towers) to reduce the number of towers and footprint in sensitive areas.
- Generate a preliminary list of tower coordinates and associated access routes.
- Flag towers within or near sensitive receptors for further review.

5. Field verification and micro-siting (avoid/minimise) and stakeholder engagement

- Conduct a field survey (engineering **and also the E&S Team**) to verify constraints, ground-truth sensitive receptors, and assess constructability.
- Record site-specific issues identified and adjust tower locations on-site if required.
- Using cadastral data and field verification, identify all affected landowners and land users (including tenants, sharecroppers, informal users, and seasonal users).
- Disclose clear, accessible information on proposed tower locations, right-of-way requirements, access needs, construction schedule, and potential impacts, and conduct site-level meetings with each affected landowner/user to discuss specific tower locations and access routes on their land.

- Where concerns are raised, explore feasible micro-adjustments (e.g. shifting tower within design tolerance, modifying access alignment, adjusting span configuration) to avoid or minimise impacts without compromising safety and technical requirements.
- Record agreed adjustments and outstanding issues.
- Generate consultation records (dates, participants, issues raised, commitments made).
- Update the tower schedule and maps to reflect agreed micro-siting outcomes and obtain an NOC from KE to the EPC for the Design Freeze to be implemented.

6. Land acquisition, compensation and livelihood restoration (mitigation/offset)

- Apply KE's SOP: Land Acquisition Procedure if required.
- Define entitlements for permanent land take (tower pads), temporary impacts (access, stringing), crop losses, trees, and other assets.
- Undertake asset inventories and valuations with participation of affected parties.
- Conclude written agreements with landowners/users covering compensation, access arrangements, and reinstatement commitments.
- Establish a transparent grievance mechanism accessible throughout the process.
- Where impacts on livelihoods are expected, implement targeted restoration measures (e.g. alternative access, support for replanting, scheduling to avoid peak seasons).

7. Construction-phase controls (minimise/restore)

- Demarcate tower locations and access routes on the ground to prevent footprint creep.
- Implement method statements to minimise disturbance (e.g. controlled vegetation clearance, topsoil management, timing restrictions for sensitive receptors).
- Reinstate temporary areas promptly and monitor restoration success.
- Implement a Management of Change Procedure if selected locations are altered during the construction stage.

8. Monitoring, reporting and adaptive management

- Report progress to lenders in E&S monitoring reports.
- Where unforeseen impacts arise, apply adaptive management, including further micro-siting where feasible and additional mitigation.

9. Record Keeping

- Maintain a complete audit trail including constraints mapping, alternatives assessment, field survey records, consultation logs, agreements, and final design documentation.
- Ensure traceability from initial corridor selection through to final tower placement and stakeholder agreements.

Annex XI - Criteria for Installation of Bird Flight Diverters & Bird Carcass Monitoring Procedure

APPROVALS

	Name	Designation	Signature
Prepared by			
Reviewed by			
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Approved By	.	.	

DOCUMENT CHANGE RECORD

REV. NO	DESCRIPTION OF CHANGE	EFFECTIVE DATE
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1.0 PURPOSE

This procedure provides an integrated approach for identifying areas along KE's network (especially it's transmission and distribution portion) where Bird Flight Diverters may be installed to minimize and mitigate the risk of bird collisions. Alonside this criteria, the document also outlines the procedure for bird carcass monitoring to allow for effectively monitoring the efficacy of the diverters installed. The overall goal is to minimize the risk of avian collisions with power lines and implement adaptive measures through monitoring to conserve biodiversity.

2.0 SCOPE OF APPLICATION

This procedure is applicable to all KE operational areas where transmission and distribution lines are installed or planned, including existing infrastructure and future projects where this infrastructure may intersect with avian flight paths or habitats as identified in high-risk zones.

3.0 REQUIREMENT

This procedure aligns with statutory environmental requirements, international good practices, and KE's internal Environmental and Social Management System (ESMS). It supports compliance with biodiversity conservation policies.

The requirements associated with the implementation of this procedure are highlighted below:

1. Identify areas in KE's network that intersect with avian flight paths or habitats as identified in high-risk zones, especially transmission and distribution lines. A digital/ GIS database of these areas is to be developed to prioritize
2. Choose the type of BFD to install for this procedure and carry out procurement of these diverters
3. Train workers on the installation and maintenance requirements of these diverters
4. Contract a qualified ecologist to train monitoring/ patrolling teams on the identification, health risk handling, and data recording of bird carcasses resulting from collisions with KE infrastructure/ electrocution

4.0 ABBREVIATIONS & DEFINITIONS

KE	K-Electric
ESMS	Environmental & Social Management System
ROW	Right of Way
Qualified Ecologist	An expert with a degree relating to ecology and over 20 years of experience working locally in similar areas
GIS	Geographic Information Systems
PPE	Personal Protective Equipment
BFD	Bird Flight Diverters
IBA	Important Bird Area
Ramsar Site	Wetland of international importance under the Ramsar Convention
GIIP	Good International Industry Practice

5.0 RESPONSIBILITIES

CHSEQ Department	Oversee, monitor, train, develop, and maintain reports pertaining to the installation of bird flight diverters and the associated efficacies interpreted through the associated findings from the bird carcass monitoring procedures
Transmission & Distribution Teams	Carry out installation and maintenance of bird flight diverters and maintain records
Transmission & Distribution Patrolling Teams	Carry out bird carcass monitoring procedure during routine patrol and monitoring, and maintain records

6.0 MINIMUM COMPETENCY REQUIREMENTS

For the implementation of the procedure, the personnel involved must meet at least the following minimum criteria requirements:

Personnel	Minimum Competency Requirements
CHSEQ Department	– Formal training in **Environmental Management, Ecology, or Occupational Safety** – Proficient in **data analysis and interpretation** of bird carcass monitoring results – Capable of preparing and maintaining detailed **environmental performance reports** – Certified in conducting **internal audits** and procedural training – Experience in **adaptive management planning** based on ecological trends
Transmission & Distribution Teams	– Technical training in **hot-stick or drone-based BFD installation** methods – Familiarity with **BFD model specifications** (weight, spacing, LED components, aerodynamic structure) – Knowledge of **safe working at height** and **live-line safety protocols** – Recordkeeping skills using **GPS or log sheets** for tracking installation locations – Capable of conducting **minor maintenance** or replacements on installed BFDs
Transmission & Distribution Patrolling Teams	– Basic training in **avian ecology** and visual identification of bird carcasses – Trained in use of the **Bird Carcass Monitoring Form**, including GPS tagging, habitat classification, and photo documentation – Understanding of **biohazard precautions**, PPE usage, and carcass handling procedures – Familiarity with **incident reporting channels** and logging protocols during routine patrols

7.0 SCOPE OF PROCEDURES

This procedure will be divided into two main categories:

1. The criteria moving forward that will determine where BFDs are to be installed on KE's infrastructure, along with the procedures on how these must be installed, maintained, and data from which recorded
2. The bird carcass monitoring procedure that will serve to understand the effectiveness of the BFDs installed, along with identifying areas where interventions are required by KE to minimize avian impact

Where the procedures and the practices highlighted herein have their basis in GIIP and International Best Practices.

The procedure should be reviewed and updated at intervals that align with international best practices, where the following frequency is proposed:

Review Type	Recommended Frequency	Trigger Criteria	Responsibility
Scheduled Review	**Annually**	Every 12 months, preferably before peak migratory season or during planning of the annual O&M cycle	CHSEQ Department in coordination with Ecology Advisor / Consultant
Interim / Ad-Hoc Review	**As needed**	- Spike in mortality (e.g., >4 carcasses/km/month)	

The procedure may also be updated should any of the following take place:

1. Identification of a new IBA or Ramsar site nearby a project area within an area of 100-150m[1]
2. Change in local environmental/ wildlife regulations that materially affect the requirements pertaining to BFD and bird carcass monitoring.
3. Introduction of new, more effective BFD technology or methodology
4. Within 30 days of a major incident, e.g., mortality of a protected/ endangered species following investigation
5. Within 60 days following major electrocution or mass bird fatality following investigation
6. Completion of a high-risk intervention, e.g., installation near IBAs with lessons learned

8.0 PROCEDURE

Installation of Bird Flight Diverters

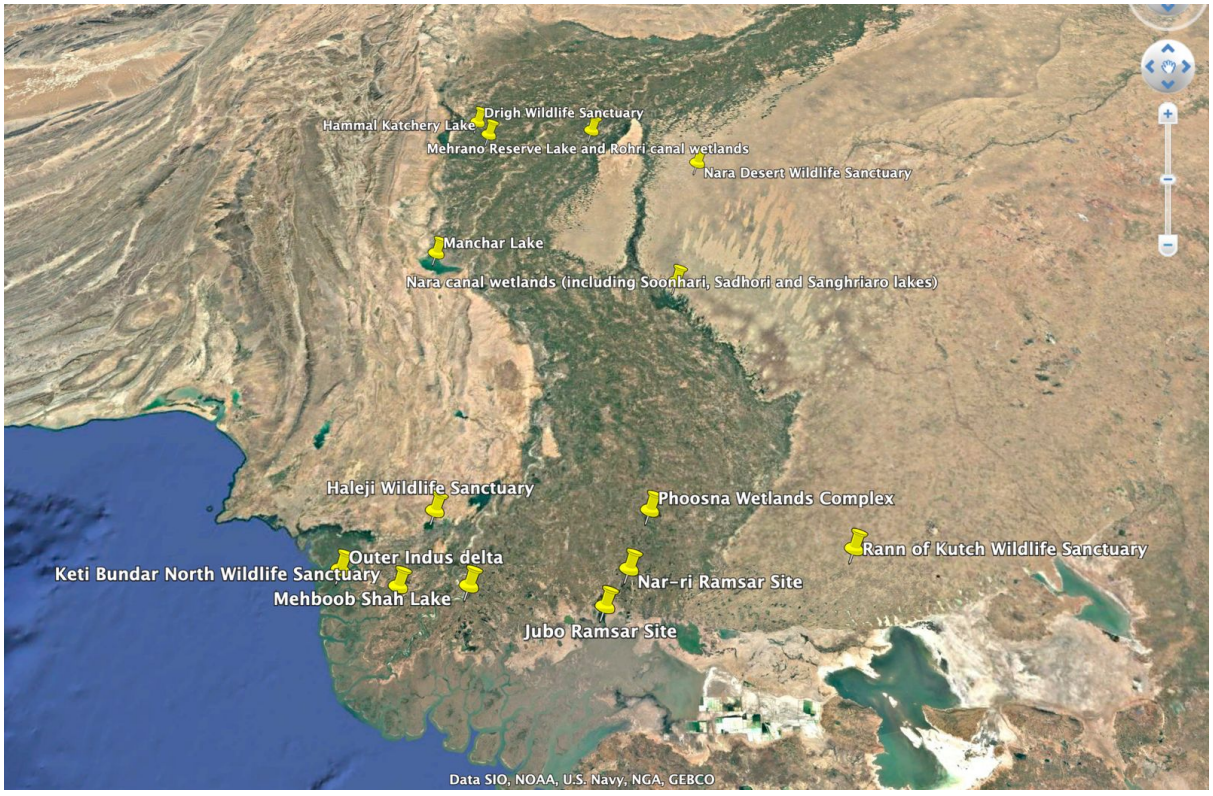
a. Identification of High-Risk Areas for BFD Installation

A power line will be considered as high risk and prioritized for BFD installation if it meets any of the following criteria:

[1] *Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the Afircan-Eurasian Region. UNEP-AEWA. (n.d.). https://www.unep-aewa.org/en/publication/aewa-conservation-guidelines-no-14-guidelines-how-avoid-or-mitigate-impact-electricity*

S. No.	Criterion	Description
1.	Within 10 km of an IBA	Important Bird Areas as identified by Bird Life International
2.	Within 10 km of a Ramsar Site	Internationally designated wetlands under Ramsar Convention
3.	Important Bird Sites	Identified through primary field surveys and desktop ecological studies
4.	Wetlands on Central Asian Flyway	Wetland areas supporting large scale migratory bird movement
5.	Operational Hotspots	Locations identified by KE due to repeated incidents of bird nesting, droppings, or carcasses

Areas that currently house ecological sensitivities are identified in the IBAT screening carried out and attached to this plan as Annex V. Furthermore, the locations of any and all Ramsar sites, and protected areas within Pakistan can be accessed at the following link: https://www.protectedplanet.net/country/PAK. A picture of these areas is also provided below:



b. Schedule for Installation

The implementation schedule for installation of these BFDs is also provided below:

- Immediate Priority: High-risk spans already associated with bird mortality (confirmed via carcass surveys)
- Short-Term (1 Year): All infrastructure located in the vicinity (within 05 km) of the IBAs, Ramsar sites, and migratory flyways

- Mid-Term (2-3 Years): Other risk prone segments identified through routine ecological screening

Overall, the installation timelines of BFDs should correlate with maintenance shutdowns or upgrades.

c. Competency & Training Requirements

It must be ensured that only trained and certified line crews, that have worked on maintenance and upgradation works of transmission and distribution lines may install BFDs. Furthermore, the persons working must meet the minimum competency requirements highlighted in Section 6.0 of this plan.

d. Future Project Requirements

BFDs may be planned for inclusion in projects being proposed for development, and subsequently in a project's budget if a project meets the following criteria:

- Project lines intersect areas flagged under the high-risk criteria defined above in Section 8.0 (a) – *Identification of High-Risk Areas for BFD Installation*
- Preliminary environmental assessments carried out identify potential bird collision risks

e. Reassessment of High-Risk Areas

The areas falling under the high-risk category for BFD installation are to be reviewed annually (in line with International Standards). An early re-assessment may also be triggered if:

- There is a spike in bird carcasses (more than 2/km/year)
- Changes are observed in bird migratory patterns or habitat use through increased bird risk collisions and carcasses observed by the monitoring team in areas where these were not observed prior despite presence of BFDs
- New infrastructure developments are carried out near sensitive ecological zones

f. Approved Installation Methods

Described below is the approved method for installation of BFDs:

- The following BFDs are proposed for installation:
  - Dynamic (flapper) or static spiral models, or
  - Solar powered LED diverters for foggy/ areas with low light
- Proper Spacing is to be maintained during installation
  - Every 5 meters on distribution wires (alternating across phases)
  - Every 5-10 meters on transmission shield/ earth wires
- The appropriate hardware proposed is to be used for installation, including:
  - UV resistant clamps
  - Corrosion proof metal parts
  - BFDs weighing less than 800g
  - BFDs with a minimum glow duration of at least 12 hours

As stipulated in IUCN Wildlife and power lines[2], line markers to place every 5 m. On distribution lines, this 5 m spacing is sometimes applied to the group of wires, so for example, if there are three conductors (A, B, C) and a ground wire (G), line markers are installed in the following pattern: conductors A, skip 5 m, conductor B, skip 5 m, conductor C, skip 5 m, ground wire G, skip 5 m and back to conductor.

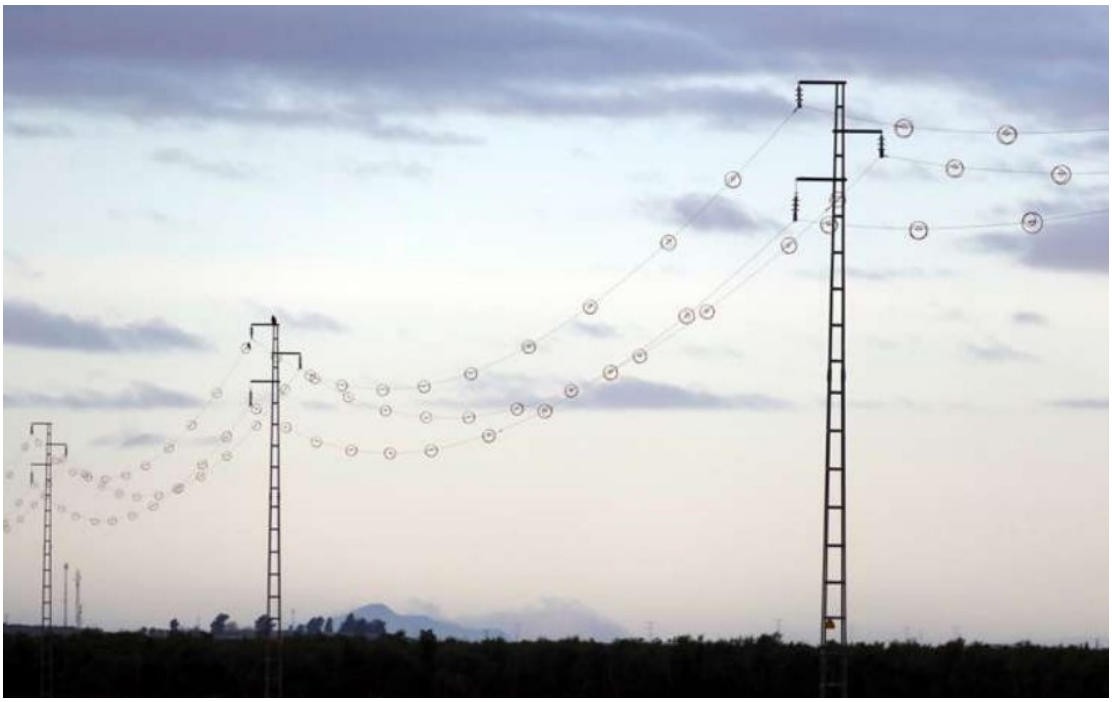


Figure 1: Line markers installed in an alternating pattern on the three conductors of a distribution line[3]

On transmission lines, typically only the overhead ground wire(s) are marked. This results in a line marker fitted every 5 m if only one overhead ground wire is present or staggered every 10 m on each wire if two overhead ground wires are present.

9.0 MANAGEMENT & MONITORING

Installation of Bird Flight Diverters

- Mortality data from bird carcass monitoring to be fed directly into BFD planning through documentation and recording done in a register with specific case numbers assigned against each carcass found (documenting location, date, type of carcass, the measures carried out thereafter, and their effectiveness)
- A GIS based BFD tracking system to log installations, inspections, and performance
- Conduct pilot installations prior to scaling up in a newly identified high risk zone as per Section 8.0 (a) – *Identification of High-Risk Areas for BFD Installation*

Monitoring indicators for this during different stages of the process will include:

[2] IUCN (2002), *Wildlife and Power lines*
[3] IUCN (2002), *Wildlife and Power lines*

Indicator	Description	Target / Frequency
# of high-risk spans identified	Number of transmission/distribution spans falling within high-risk criteria (IBA, Ramsar, Flyway etc.)	Updated annually
# of BFDs installed (cumulative and by location)	Count of diverters installed, disaggregated by line and geography	Quarterly update
% of identified high-risk spans with BFDs installed	Coverage ratio: Installed BFDs vs total high-risk spans identified	≥ 80% by year-end
# of bird carcasses recorded per km per year	Bird mortality rate along monitored spans	< 2/km/year (trigger for review)
# of protected species affected	Number of threatened/vulnerable species found in mortality records	0 tolerance
Time from hotspot identification to BFD installation	Lag between confirmed high-risk event (e.g., bird death) and BFD response	≤ 3 months
# of staff trained on BFD and carcass monitoring	Total KE/contractor field personnel trained on procedure	100% of relevant field crew
# of installations conducted using approved methods	Installation events complying with technical specs and tools	100% compliance
% of BFDs inspected annually	Routine physical inspections to check condition, placement, functionality	100% once per year
# of corrective actions taken post-inspection	Maintenance actions, replacements or repositioning of BFDs	All non-functional units rectified within 30 days
# of reassessments conducted annually	Review of priority areas for BFD need	1 per year
Database completeness index	% of carcass and BFD data entries linked with GPS/photos and properly uploaded	≥ 90% completeness

Bird Carcass Monitoring Procedure

The bird carcass monitoring procedure will follow the steps highlighted below:

1. Bird Carcass found
2. Field Survey conducted and completed
3. Coordinates and species logged
4. If the defined threshold value is met for bird carcasses, then the area shall be marked as high risk
5. Bird Flight diverters to then either be installed, or if already installed, different type of diverters to be installed
6. Effectiveness of the diverters to then be ascertained in the next monitoring cycle
7. If mortality is seen as decreasing over time, then maintain the same practice. If not, then reassess diverter type and location

Where further details on this procedure can be found in Annex III.

10.0 ANNEXURES

Annexure – I: BFD Procurement Criteria
Annexure – II: BFD Design Parameters
Annexure-III: Bird Carcass Identification Method
Annexure-IV: Bird Carcass Monitoring Form

ANNEX I – BFD Procurement Criteria

Since, there are no established criteria /procedure in Pakistan for the selection of BFD, hence General Technical Requirement set forth by Government of India Ministry of Power has been reproduced. Therefore, below are guiding principal which KE must adhere while procuring BFD:

a) BFD must be dynamic type and shall consist of warning disc (2-D or 3-D in design) and associated clamps and connectors.
b) The dynamic solar powered LED type BFD shall be preferred in areas where foggy / dusty weather persists, or the intensity of light is low, or the selection of the lines lying in the route of migratory birds. The KE may install a mixture of LED and Non-LED BFD on their powerlines, where at least one in five (20% of total) BFD on a line shall be LED type.
c) BFD shall be suitable for efficient working and shall retain good physical characteristics under all weather conditions.
d) BFD must have a design life of at least 15 years.
e) BFD to be suitable for installation on live line.
f) The iron, steel or other metal parts used in the diverters must be corrosion proof and shall withstand all weather conditions.

ANNEX II – BFD Design Parameters

1. Design Parameters

a. Warning Disc

For visibility of Bird Flight Diverter, a warning disc shall be provided. The warning disc shall:

a) Have glow in the dark feature. Glow in the dark shall remain activated for at least 12 hours after exposure to sunlight. If glow in the dark sticker is used, the same shall be of high quality with strong adhesive property, laminated, and suitable for all weather conditions.
b) The warning disk in the BFD shall have strong luminescence properties that emit immense light to provide enhanced visibility to the birds at night.
c) Have contrasting colored (combination of any two colors from White, Black, Red, Yellow, Orange,) retro-reflective surface with Sun and Moonlight reflectors on both faces. Since the warning disc is to be designed to rotate, the color change, while revolving, shall provide significant forewarning.
d) Swing, sway and rotate easily.
e) Must not flip on the powerline in high wind velocity.
f) Be resistant to all weather conditions
g) Be aerodynamically stable so that diverter faces a minimum amount of drag force which provides a swing and rotation effect under medium/strong wind speed.
h) Be made of UV stabilized plastic. The bearing shall be made of stainless steel and shall allow free spinning at a minimum wind speed of 1 km/hour.
i) Be made of a sealed bearing to avoid deposition of sand and/or soil particles and helps in smooth rotation.
j) Have a diameter of not less than 150 mm for a circular disc.
k) If the warning disc is quadrilateral or trapezoid or of any other shape, then the shortest a length shall not be less than 90 mm. The total surface area of the warning disc shall not be less than 15,000 mm^2 (including air vents).
l) The thickness of not less than 3 mm.
m) The reflective area on each face of the warning disc shall not be less than 3500 mm^2. And the glow in the dark area shall not be less than 3500 mm^2 for the LED type BFD, and not less than 7500 mm^2 for the non-LED type BFD.

b. Weight of BFD

The total weight of the Bird Flight Diverter shall not be more than 800 gm. LED type bird flight diverter shall not weigh more than 1000 gm.

c. Length of BFD

From connection point to end, the length of the bird diverter should not be more than 430 mm.

d. Clamp & Hardware

The warning disc shall be suitable for hanging on conductor/ earth wire or Optical Ground Wire (OPGW), by means of clamp & hardware. Design details are as follows:
The clamp for holding conductor/ (OPGW) /earth wire shall be spring type and shall be made of UV stabilized engineered composite plastic (polymer) or metal or carbon fiber and shall be suitable for live line installation by hot stick or drone.

a) All metal hardware used in Bird Flight Divert er, including bearing, must be corrosion-free material.
b) All plastic (polymer) parts must be UV stabilized.
c) The holding clamp must be suitable for gripping the conductor/OPGW / earth wire strongly; otherwise, due to aeolian vibrations/high wind speed, diverters may shift and move from their original position and get collected at mid-span (lowest sagging point).

Rubber/polyurethane lining shall be used in the gripping area of the clamp as per the requirement of the conductor type.

d) More than 50% of the clamp gripping area shall be in contact with earth wire/OPGW /Conductor.
e) Clamp shall be free from sharp ends or edges, abrasions, projections, grit or materials; and shall not cause chafing or damage to the conductor/earth wire/OPGW during fitting or during continued operation.
f) Parts of the clamp touching conductor must be able to withstand temperature ranges from -15°C to +85°C for conventional conductors. In case of installation on HTLS conductor, the utility shall specify maximum operating temperature under emergency loading conditions.
g) The clamp must be able to bear a pulling load of at least 50 kg, and it is to be tested on Universal Testing Machine by a NABL accredited laboratory.
h) Grip retaining strength: The clamp shall have a smooth and pennant grip to keep the Bird Flight Diverter in its original position on the conductor/earth wire/OPGW without damaging the strands or causing premature fatigue failure of the conductor/earth wire/OPGW due to clamping pressure. The clamp shall not slip beyond the permissible limit (10 mm) when pulled by a force of 25 Kg in the direction parallel to conductor/ earth wire/OPGW.
i) In the case of metallic bird diverters, the parts of the clamp touching conductor/earth wire/OPGW must be made of a material which is a bad conductor of electricity.

e. Additional requirements for LED type BFD

- For solar-powered LED type diverter, the following additional requirement shall be fulfilled:
- LED shall be of Orange or White color or a combination of both (one white followed by one orange arrangement system) with adequate light intensity so that it is clearly visible from a distance (>300 m) even during foggy /dusty weather/under the low intensity of light.
- The battery shall guarantee a service life of 5 years and be suitable for at least 100 hrs. of flashing operation by a single charge.
- An automatic power cut-off electronics circuit shall be provided to improve battery life so that during daytime (due to the high intensity of light from the sun), the circuit gets cut off & stops flashing, and the circuit switches on automatically under low-intensity light conditions.
- The position of the solar cells shall be such that it gets sunlight irrespective of the direction of the diverter face, and the dust & snow does not decrease its efficiency.

ANNEX III – Bird Carcass Identification Method

The objective of this procedure is to identify and document the cause of death of birds found deceased in proximity to power lines or other electrical infrastructure. By examining the bird's body for signs of collision, this procedure can determine the type of injury sustained. A crucial aspect of this procedure is accurately distinguishing between bird fatalities attributable to power lines and those resulting from natural causes. The detailed methodology for bird carcass identification is outlined in the preceding section.

Signs of Collision on the Bodies of Injured Birds

Collisions with power line cables can result in varying degrees of traumatic injury to birds, sometimes leading to instantaneous death. However, there are instances where birds survive the initial impact, falling to the ground while still alive. In cases where a bird has sustained only a wing fracture, it can manage to move away from the power line on foot, covering distances of over 2 km from the collision point. It's important to note that scavengers and opportunistic predators often prey on carcasses and seriously injured birds, a factor to consider when estimating mortality rates. The prevalent injuries manifest as distinctive indicators on the bird's body (Refer to Table-1).

Table 1: Types of Injury and Signs of Collision on a Bird's Body[4]

Type of Injury	Signs
Broken bones	Broken bones in extremities (wings and legs) and the back; fractured vertebrae and skull; amputation of limbs.
Damaged plumage	Mechanical damage (torn or split feathers); rarely burns.
Skin Injuries	Tears, pieces of torn skin; exposed muscles, tendons or bones; without immediate treatment, they rapidly develop infections and necrosis.
Secondary injuries to extremities	Oedemas and localized necrosis around wounds, exposed bones, tendons and muscles; signs of bacterial infection
Bruises in the impact area	Large bruises on wing and pectoral muscles.
State of surviving birds	Initially in a state of shock. Unable to fly or even move, depending on the wounds and secondary injuries

Signs of Electrocution on the Bodies of Injured Animals

Examining the injuries and marks on an animal's body is essential to determine how it died. Electrocution usually kills an animal instantly. However, sometimes the electrical shock itself doesn't kill the animal, and it dies from falling from a pole or tower. The carcass is then found at the bottom. Just like in collision cases, scavengers quickly eat the carcass. The passage of electric current through the animal's body leaves behind specific signs that help determine the cause of death or the nature of the incident. The table below summarizes the different types of injuries and electrocution marks found on an animal's body.

Table 2: Types of injury and signs of electrocution on an animal's body[5]

Type of Injury	Signs
Broken bones	Fractured vertebrae with paraplegia. Fractured skull. Fractured pelvis. Amputated legs or wings.

[4] IUCN (2002), *Wildlife and Power lines*
[5] IUCN (2002), *Wildlife and Power lines*

Burns on the plumage or skin	The burns are visible on the edges and tips of the burnt feathers which are blackened with irregular edges In the event of an electric arc, as the current passes externally through the animal's body, large burns may occur on the plumage but without internal injuries to the body..
Burns on the bones	Burns comprising small wounds or areas of dry tissue at the current entry and exit points (especially on the wings, legs, bill or breast). Burns in the bird's cloaca too if the electrocution was caused by defecation. Electroporation; generalized cell disorganization with a loss of consistency and muscular structure caused by the sudden high temperature as the electricity passed through the tissues. In these cases, there are white spots of viscous appearance on the skin of the legs. If the animal survives and does not receive treatment, necrotic areas develop on the skin of its extremities.
Perimortem bruises	The animal may show bruises on the parts of the body where it is hit when falling, even if it is already dead, as the blood continues to circulate for a short period of time
Internal injuries	Signs of fibrosis in the heart; congestion in internal organs (liver, spleen, kidneys); in birds, congestion lines in the subcutaneous tissue in the feet. In the case of electrocution due to defecation, necropsies reveal a wrinkled, blackish digestive tract

Diagnosis of the Cause of Death

While the majority of carcasses discovered near pylons or in proximity to power line spans are typically a result of electrocutions or collisions, it's important to acknowledge that other factors can sometimes contribute to these fatalities. A sick, injured, poisoned, or shot animal might perch on a pylon and pass away in that position, resembling an electrocution-related death. However, it's usually possible to differentiate this as the cause of death since the body would lack the characteristic indications outlined in table-3.

In addition to the previously mentioned signs of collisions and electrocutions, there are additional factors that aid in determining whether the cause of death was linked to a power line incident, poisoning, or shooting. These factors can essentially be categorized into two types.

Position

When a bird dies from electrocution or a collision, its body falls to the ground in a "droplet" shape. This is because the bird's weight is concentrated in its upper body, and gravity pulls it down in this way. When the bird hits the ground, it lands on its back, and its body looks relaxed with its head facing up.

Birds that die from poisoning usually die on the ground. As they die, their bodies tip forward because their center of gravity moves forward. This makes their heads point down. Poisoning also causes birds to have contractions, convulsions, and spasms, which can be seen in the way their bodies are positioned. Their wings may be spread out or partially open, their tails may be raised and sticking up, and their feet may be stiff.
If an animal dies on the ground from something other than poisoning, like a gunshot wound, its body will also be head-down. But the way its body is positioned will be different, and it will not show signs of contractions or convulsions.

External Signs

When a bird is poisoned, signs like vomit, a swollen crop, or loose and bloody droppings around it can be found. These indicators leave noticeable stains. Stiff feet are common in cases of electrocution, stiffness is important to notice, it alone doesn't tell everything but adds to the signs considered.

In cases of electrocution, a bird's claws can grip so tightly that prey might stay caught even after the bird dies. This is why sometimes one can see bird carcasses hanging on power line poles. When a bird is shot, there are clear signs.

Carcass Disappearance Rate

When studying bird carcasses near power lines, it's important to consider how scavengers behave and the effectiveness of search efforts. Carcasses are a major food source for scavengers, especially in areas with a high number of bird deaths. Interestingly, scavengers seem to learn and recognize places where birds often collide with power lines, and they visit these areas more often. Once scavengers find animal remains, they tend to quickly remove them, especially for smaller bird species, which disappear faster.

The speed at which carcasses vanish, or how long they stay, can vary and depends on factors like the type of vegetation, the season, and the weather such as heavy rain can make carcasses decompose faster.

ANNEX IV – Bird Carcass Monitoring Form

1. GENERAL DATA

1.1 Date _____ **1.2 Time** _____ **1.3 ID of Power line** _____

1.4 Name of Location _____ **1.5 Enumerator Name** _____

1.6 Enumerator Contact detail _____ **1.7 GPS** _____

1.8 Habitat Type (Tick one that is appropriate):

A. Forest **B**. Grassland **C**. Pond **D**. Stream **E**. Wetland **F**. Urban environment **E.** Any other

2. Identification and Characterization of Power Line

2.1 Location _____

2.2 Rated Voltage (i). Distribution (ii). Transmission

(i) Distribution A. 11KV B.440 V C. 220 V

(ii) Transmission A.500 KV B.220 KV C.132KV D.66 KV

2.3 Description of Support or Line

(a) Presence & Number of Ground Wires _____

(b) Presence of any strain Insulator or Jumper _____

(c) Number and Arrangement of Phases _____

3. Detected Fatalities

3.1 Detailed Information on Fatality if Detected during Survey _____

3.2 Specie _____

3.3 Number of Individuals: _____

3.4 Condition of Individual (Injured or Dead) _____

3.5 Condition of Carcass (Fresh / Decomposing / Skeleton) _____

3.6 Apparent Injury

(a) Broken bones (b) Skin Injury (c) Burns on the bones

(d) Burns on the skin (e) Internal Injury (f) State of Surviving Bird

3.7 Pictures (Digital photographs will be taken of each carcass found

Annex XII - Change Management Plan

Change Management Plan

Change in Operations

Any change in the project design or project operation if required, will be made in relevance to the EMP and all the impacts associated with changed process will be either similar to the existing impacts and if different, will be assessed and included in the mitigation management plan. This has, on the basis of nature of process change, been distributed into three categories.

a) First-Order Change

Change leading to a significant removal of any operation from the project described in the chapter on description of project of this report and consequently requires a reassessment of the environmental impacts associated with the changes. In such an instance, updated environmental impacts of the proposed change will be sent to EPA for approval.

b) Second-Order Change

Change that entails project activities not significantly different from those described in the EIA report, and which may result in project impacts whose overall magnitude would be similar to the assessment made in this report. In case of such changes, the environmental impacts of the activity will be reassessed. Additional mitigation measures, if required, will be identified and documented for being reported to EPA for their record.

c) Third-Order Change

Change that is of little consequence to the EIA findings. This type of change does not result in impact levels exceeding those already assessed in the EIA report; rather these may be made onsite to minimize the impact of an activity. The only action required in this regard will be to record the details of process change in the record register.

Change in Record Register

A record register will be maintained at project site at the start of project activities. All the changes to be made will be recorded in this register. This will assist in the step-by-step environmental monitoring and decision-making. Record register will be the responsibility of EHS department, and will be used internally.

Change in EMP

Changes in project design necessitate changes in the EMP. In this case, following actions will be taken:

- A meeting will be held between project manager and contractor, to discuss and agree upon the proposed change to the EMP.
- Based on the discussion during the meeting, a report will be produced, which will include the additional EMP clauses and the reasons for their addition.
- Additional EMP clauses will be added to the original EMP as a second volume which will be distributed to the relevant project personnel and contractor.