Initial Environmental Examination

December 2014

PAK: Pakistan Power Transmission Enhancement Program Tranche-IV (220 kV Nowshera Grid Station and Allied Transmission Line)

Prepared by Environment and Social Impact Cell (ESIC), NTDC for the Asian Development Bank.

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LIST OF ACRONYMS

ADB	Asian Development Bank
DXL	Distribution Transmission Line
DGS	Distribution Grid Substation
EARF	Environment Assessment Review Framework
EIA	Environment Impact Assessment
GDP	Gross Domestic Product
GOP	Government of Pakistan
GIS	Gas Insulated Switchgear
G/S	Grid Station
IA	Implementing Agency
ILO	International Labour Organization
IRR	Internal Rate of Return
KP	Khyber Pakhtunkhwa
LARP	Land Acquisition and Resettlement Plan
Nowshera SP	Nowshera 220KV Grid Substation and Associated T/Line Subproject
Leq	Equivalent Sound Pressure Level
NEQS	National Environmental Quality Standards
NGO	Non-Governmental Organization
PC	Public Consultation
PEPA	Punjab Environmental Protection Agency
PEPA	Pakistan Environment Protection Act 1997 (as regulated and amended)
PESCO	Peshawar Electric Supply Company
RoW	Right of Way
SP	Subproject
SR	Sensitive Receptor
TOR	Terms of Reference

EXECUTIVE SUMMARY

This document presents the Initial Environmental Examination (IEE) report of 220 kV Nowshera Grid Station and its allied Transmission Line to be constructed with financial assistance of Asian Development Bank (ADB) under its Multi Tranche Facility (MTF) by National Transmission and Despatch Company Limited (NTDCL) as part of its Tranche-IV programme. This IEE has been conducted in response to ADB Environmental Safeguard Policy Statement 2009 and according to ADB Environmental Assessment Guidelines 2003. The Pakistan Environmental Protection Act 1997, as adopted by KP Province in 2010, and other allied laws were also kept in view.

The proposed project is located 10 km on west side of G.T Road on Cherat Cement Factory Road, between the town of Nowshera and Pubbi in KP Province of Pakistan. The project will augment the efforts of Pakistan Water & Power Development Authority (WAPDA) to overcome the shortage of electricity by ensuring an efficient and loss free transmission of electricity available from Ghazi Barotha Hydel Power Project (GBHP). The site of the proposed Grid Station consists of 40 acre (450m x 350m) of community grazing land of village Spin Khak. The GPS coordinates of the site are 33° 56" 31.28" N and 71° 51" 55.71E.

This project will be completed by the end fall of 2016 at a preliminary total estimated cost of Pak. Rs. 1875 million. The design and construction of the project have been assigned to NTDC and its operation and maintenance shall be done by NTDC under an overall control of WAPDA. The cost of environmental mitigation measures and monitoring is estimated to be Rs. **2,293,250** Pak .

As part of this IEE study primary as well as secondary data were collected through field surveys, public consultation particularly local communities, and literature research. Consultation were also held with other stakeholders like WAPDA, NTDC, PESCO, ADB and related departments of Government of Pakistan as well as KP screening and scoping of the study was carried out before preparing the IEE. The proposed Grid Station as well as its associated Transmission Line is located in Peshawar valley which is partly flat and partly piedmont with rolling topography. Whereas the Grid Station is situated on semi-barren community range land, the transmission line shall pass through semi-arid grazing area as well as barani (rain fed) agricultural lands. Rainfall is scanty (300-500 mm/annum) and is mainly received during the late monsoon season or early spring. The Kabul River flows parallel to G.T Road on its east. The river can get in spate if there are heavy rains in its upper watershed. Extremely cold winds blow during winter. Ambient air is generally clean. Main flora in and around the project area consists of Kikar (*Acacia militia*), Walla (*Zizyphus numularia*), *Capparis Aphylla* and Mesquete *(Propis Glandulosa)* along with typical semi-arid zone bushes, herbs and grasses. If water is available from rain or tubewell, the valley is very suitable for fruit garden or plums and apricot. Main Fauna includes mammals like Jackals, foxes, porcupines, jungle cats, hares and field rats; birds like common crows, sparrows, shikra, nuyena, pigeon, doves, parrots, common kites and partridges. Common reptiles are snakes and lizards. Major amphibian is common toad. Scorpion and spiders are other poisonous creatures of the area. There are no reported endangered species nor there is any protected area. Along G.T Road, there is a Botanical Garden which is maintained by KP Forest Department.

Barani agriculture is restricted to comparatively flat area, and its practice is rather limited. Domestic arrivals include camels, horse, mules, donkeys, buffaloes, sheep and goats. Economy is mostly pastoral and therefore the people of the area are mainly meat eaters.

Although union councils and civil courts of various levels are fully functional, Jirga system is still considered to be the most dependable system for delivering justice by the local communities. The area is predominately inhabited

by Khattak tribe and is popularly known as Khattak Nama. Almost 100% population is Muslim. Women are from a less favoured section of society. Child labour is not considered as an objectionable practice.

Analysis of alternative has shown that project site as proposed and design as being prepared is the best option. It has a cost benefit ratio (CBR) of 2.25 at 12% and 1.97 at 14% with an economic rate of return (EIRR) as 27.34 %. Logistically the best option is to locate all facilities of the contractor within the walled and gated campus of proposed Grid Station. Best option of labour is an admixture of 100% unskilled with at least 50% semi-skilled and at least 20% skilled labour from the local population. Although the local labour will be given the priority, in case of unavailability, semi-skilled and skilled labour shall have to be bought from outside by the contractor.

This IEE has shown that the project construction with either cause no adverse impacts or will cause such impacts which will be linked with contractors work practice matter that inherent potential and shall be easily mitigable and manageable. Because of being of a localized nature, the project is unlikely to trigger any adverse impacts except during fixing of towers for transmission lines which are manageable in the light of experience of WAPDA gained from similar projects.

To ensure the implementation of mitigation measures of all potential adverse impacts, an environmental monitoring plan (EMP) has been prescribed. EMP shall be made integral parts of tender bid and contract agreement documents. The cost of implementation of mitigation as well as monitoring plan shall be reflected in project Bill of Quantities (B.O.Q). A system of contractor's non-compliance has been prescribed and its linkage with contractor's bill clearance has been provided.

This IEE study shows that the project does not have any negative environmental impacts inherently from design. Any non-compliance, during work practice, can be committed by contactor but those can be forestalled or mitigated through effective monitoring. The proposed project therefore is environmental friendly, socially acceptable, financially viable, economically sustainable, neutral to gender and pro-poverty alleviation.

CHAPTER - 1: INTRODUCTION

1. This document presents Initial Environmental Examination (IEE) of Nowshera 220 KV Grid Station, under Tranche-IV of a multi-tranche programme of Water and Power Development Authority (WAPDA) to be financed by Asian Development Bank (ADB) and to be implemented by National Transmission Despatch Company (NTDC).

1.1 Project Overview

2. Pakistan is suffering from serious shortage of energy. This shortage can be overcome by production of energy through optimizing the existing sources and discovering new sources. Of this effort hydropower can constitute a major part. A major limitation on an effective use of the hydropower available out of existing resources and to be available from potential resources is availability of an efficient transmission system. Absence of a good transmission system results in unequal distribution of available hydropower and heavy line losses along the way. For proper distribution of the hydropower produce from Ghazi Barotha Hydropower Project, a new transmission line is required of which Nowshera Grid station is essentially required. The scope of work includes addition of 6.3 MVA, 132/11 KM Power Transformers and allied equipment. The transmission line will require installation of towers which will be installed on the route of In/Out 2 Km Ghazi Brotha-Shahi Bagh transmission line. The Grid Station shall be located about 10 Km from Nowshera Town on a 450m x 350m (about 315 Kanals) of acquired barren land located along Cherat Cement Factory road about 10 Km off G.T. Road. When developed, the proposed Grid Station shall augment the transmission capacity of Peshawar Electric Supply Company (PESCO) and shall enable it to meet the increased domestic and industrial demand of electricity in and around Nowshera District. It will reinforce the transmission capacity of PESCO already existing in the area. For exact location of the proposed project see Figs. 1.1, 1.2, 1.3 and 1.4.

1.2 Scope of the Study and Personnel

3. As a part of IEE study, primary and secondary data have been collected through field survey, public consultations, literature research, ADB internet research and public libraries at Nowshera and Peshawar. WAPDA officials at Lahore, Peshawar and Islamabad were consulted. The information provided by PESCO staff, in particular the Executive Engineer, the sub-Divisional Officer and PESCO Land acquisition Officer was of great help. The information gathered from Soil Survey of Pakistan office, Meteorological Department Office, Departments of Forests, Wildlife and Fisheries, Land Revenue Department, and Agriculture Department all located at Peshawar was of great significance. The Geology, Botany and Zoology Departments of University of Peshawar, the Agronomy Department of University of Agriculture, Peshawar and Watershed Management and Range Watershed Management and Range Research Departments of Pakistan Forest Institute provided data wherever required. ADB Questionnaire has been used for assessment of general features of environment of the Project. Major data available out of these sources were land use, soil and physiography, climatic data, flora, fauna, surface and ground water quality and biodiversity in general. In addition, the social data collected through surveys was verified from Pakistan Statistical Year Book, Economic Survey of Pakistan and District Record in DCO office Nowshera.

4. As stated above a structured survey was conducted for social data of nearby communities. For issues pertaining to Land Acquisition and Resettlement Plan (LARP), a separate stand-alone study has been conducted. Its findings are contained in a separate report (LARP). Key findings of the LARP have, however, been incorporated under social impact assessment under baseline study of the area.

5. For various maps, the courtesy of Survey of Pakistan at Peshawar was used. The information available was also supplemented through a Google earth study on internet. Whereas necessary GPS coordinates and photographs of the Project area and its surroundings were taken for record and reference. GPS coordinates were used to derive site plans out of large maps.

6. A well trained local team of three experts, Mr. Afzal Chaudhry, Ms. Seher Waseem Ch. And Ms. Iman Meer carried out field surveys. They undertook two phased consultation programme, as detailed below.

7. Phase 1 composed of meetings and discussions with local and regional officials. Meeting with officials facilitated achieving multiple and diverse objectives such as:

- Provision of forum for initial definition of critical environmental issues
- Establishment of their implementation as official stakeholders, the key sector development issues and linkage to the social, the key sector development issues and lineage to the environmental and social development
- Confirmation of the suitability of initial list of communities selected for consultation

8. Phase 2 involved the understanding of a programme or a semi-structured discussion in communities in project area of influence. The programme induced both community discussion in general and discussion with women through their family elders.

9. The area around the selected project area generally known as Khattak Nama is highly conservative where direct access to women for social surveys was not possible. Even when contacted through family elders in selected localities, the women would not like to allow the recording of their names. However, through all available means, women consultation was carried out according to the Gender Issue Study, commissioned by EPA and ADB and is considered to be an essential part of IEE preparation. The ADB studies overlap those required out of this study, which also include the “Gender Impact Assessment”. Accordingly three meetings were held with women, through their family elders, in different small villages located part of Khattak Nama in Nowshera District.

1.3 The Study Objectives

10. The ultimate objective of this study is to assess realistically whether or not the project is environmentally manageable. This would make the project environmentally responsible and socially acceptable. Specific objectives of this study can be identified as follows:

- To collect the baseline data on physical, biological and social conditions of the project area and its surrounding area of influence.
- To carry out environmental (including physical, biological and social) assessment of supporting administrative and legal framework of the proposed Grid Station.
- To identify mitigation measures for any potential environmental impacts
- To propose institutional responsibilities and methods of monitoring the mitigation measures and monitoring procedures
- To prepare Management Plan for those environmental impacts which may be considered as adverse.

1.4 The Report Structure

11. The IEE document is structured, as per ADB outline, as follows:

Chapter 1: Introduction containing general information about the project, the IEE and the process of carrying out the study.

Chapter 2: Legal and Policy Framework describes the policy, laws, regulations any protocols governing the IEE.

Chapter 3: The Project Description describes overall details of the works to be undertaken. This in fact provides the physical framework in which various environmental impacts are likely to be generated.

Chapter 4: The Baseline Study gives data and explanatory information on Physical, Biological and Social conditions collected through surveys of the Project and project area of influence.

Chapter 5: Environmental Impact Assessment identifies various environmental impacts and classifies them according to their degree of effect on the environment. This classification makes the basis of the Mitigation Measures in IEE.

Chapter 6: Environmental Management Plan contains comprehensive prescription regarding mitigation measures for various adverse impacts of the project. This also includes institutional arrangement and short environmental monitoring plan for implementation of the Mitigation measures. Despite its being only a part of an IEE, the Mitigation Plan is included in the Tender as well as the contract Agreement Document.

Chapter 7: Public Consultations and Disclosures explain the process of public consultation and disclosure of the IEE report at important public offices/ places/ libraries. This step makes an IEE a public legal document.

Chapter 8: Conclusion is based on the entire IEE report saying that the Environmental Impacts are either both negligible and insignificant or can be easily and effectively mitigated.

Figure 1.1: Location Map of Nowshera Grid Station Project in Pakistan

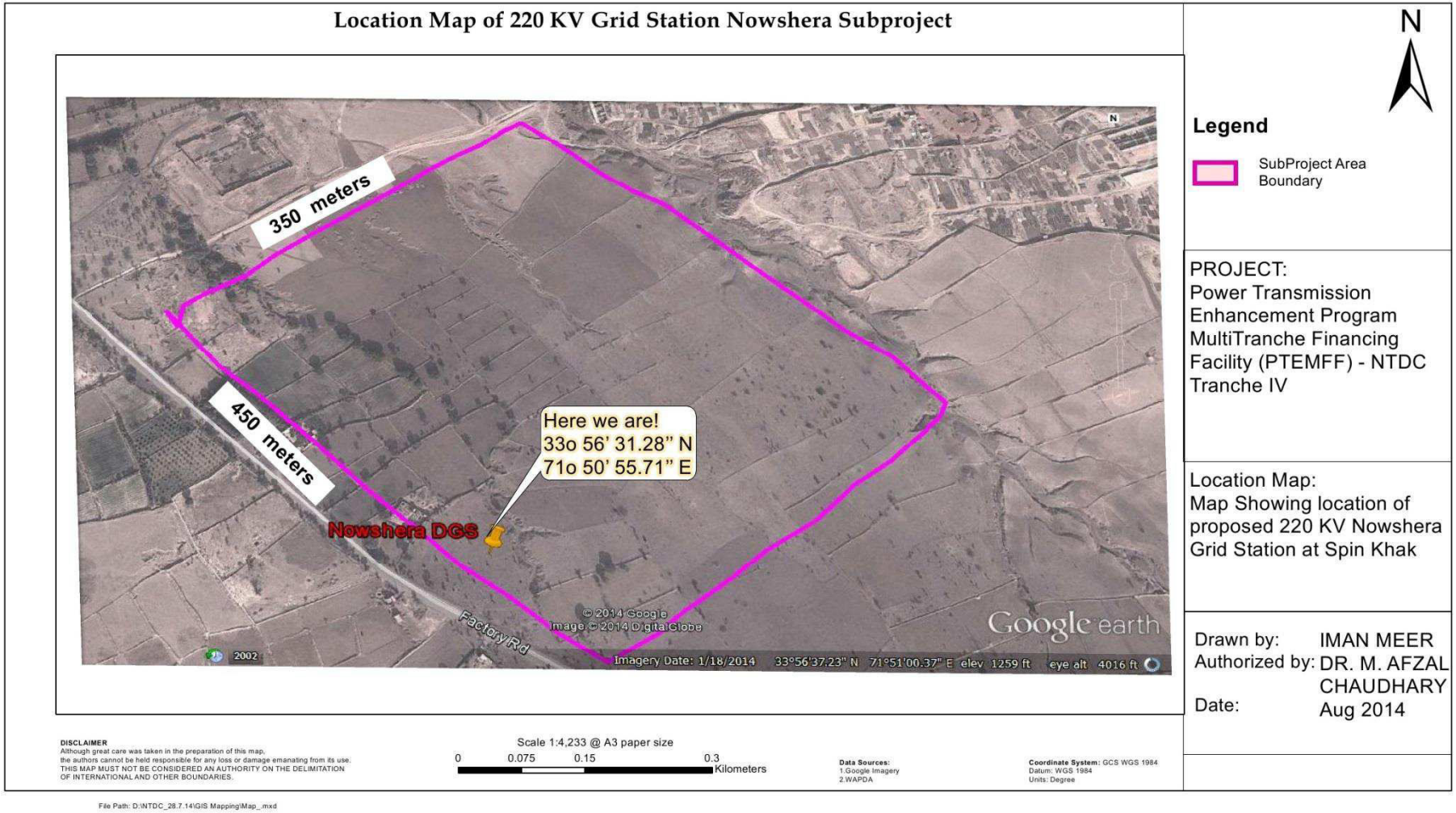


Figure 1.2: Map showing the location of Proposed Nowshera Grid Station

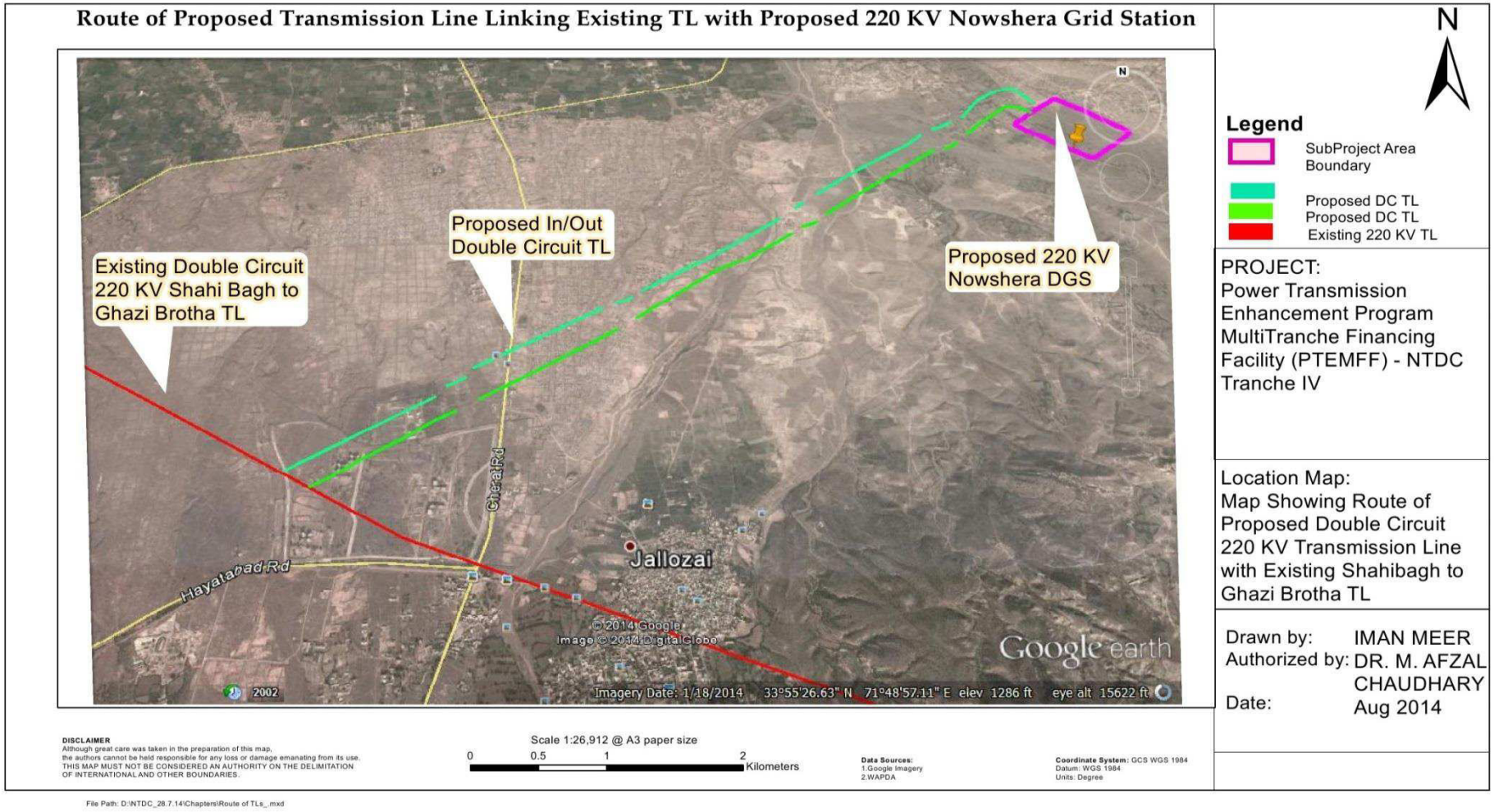


Figure 1.3: Map showing Existing and Proposed TL for Nowshera 220 KV Grid Station

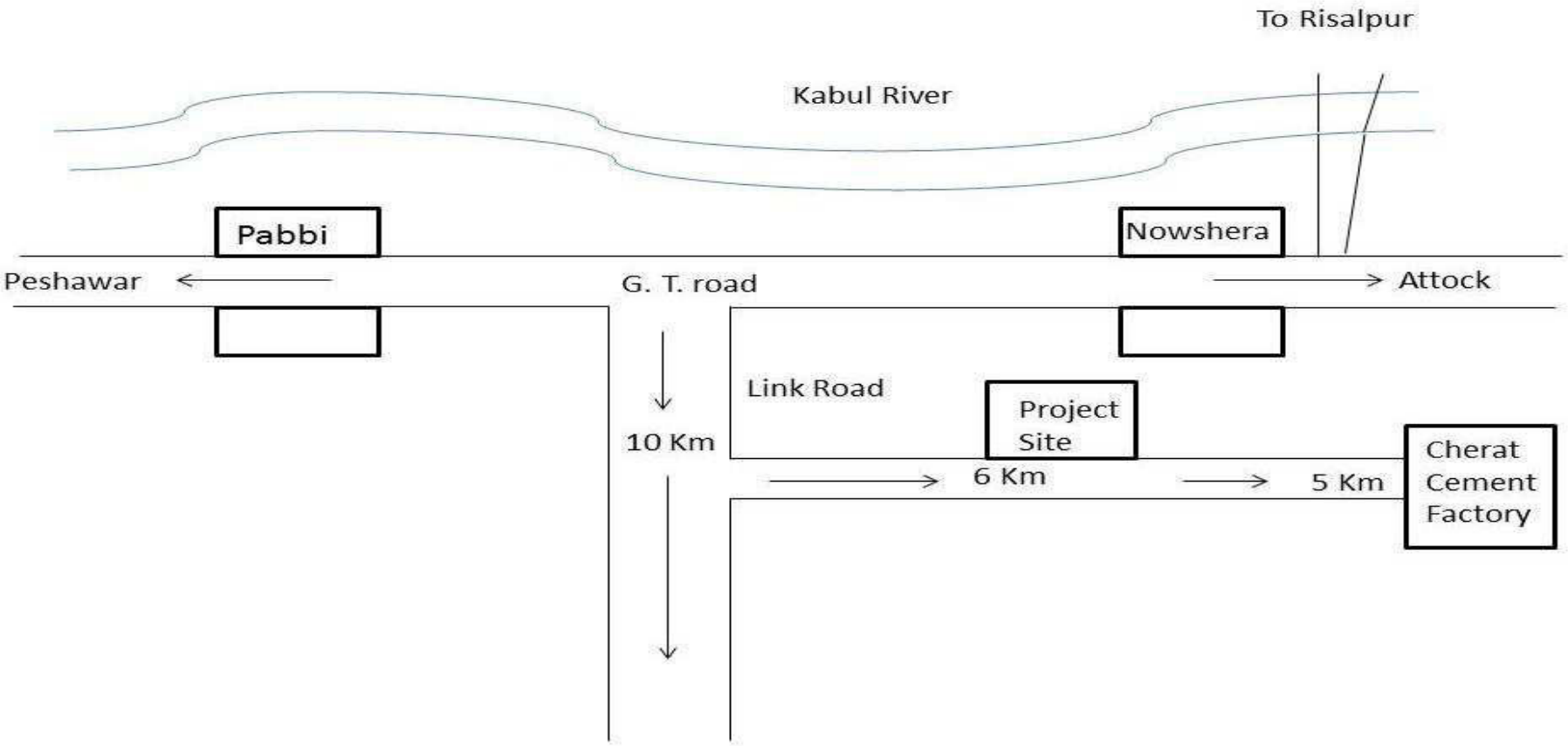


Figure 1.4: Sketch of the Project Area

CHAPTER - 2: POLICY, LAW AND PROTOCOLS

12. A detailed preview of all the legislations encompassing the subproject is cited below. Direct legislation on environmental protection is contained in several statutes, namely the Pakistan Environmental Protection Act (1997), the Forest Act (1927). In addition the Land Acquisition Act (1894) also provides powers in respect of land acquisition for public purposes. There are also several other items of legislation and regulations which have a bearing on the subproject or general environmental measures.

2.1 The ADB Environmental Assessment Guidelines

13. ADB's guidelines for Environmental Impact Assessment (EIA) for the developing countries in Asia 1997 is a useful tool for the environmental assessment for project loans. It is a useful guide for identifying impacts, and designing mitigation measures and monitoring requirements for the specific projects in the industrial, energy, social infrastructure, agriculture and natural resources, and transport sectors.

14. ADB's Environmental Assessment Guidelines, 2003, describe ADB's policies and procedures for preparation of IEE or EIA report for any project under consideration. It also provides strategic tools such as country environmental analysis (CEA) and strategic environmental assessment (SEA). The guide is developed to harmonize the procedures of multilateral banks development. These guidelines also specify the content and format to be followed for preparation of IEE.

2.2 Statutory Framework

15. The Constitution of Pakistan distributes legislative powers between the federal and the provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal List covers the subjects over which the federal government has exclusive legislative power, while the Concurrent List contains subjects regarding which both the federal and provincial governments can enact laws. "Environmental pollution and ecology" is included in the concurrent list; hence both the federal and the provincial governments can enact laws on this subject. However, to date, only the federal government has enacted laws on environment, and the provincial environmental institutions derive their power from the federal law. The key environmental laws affecting this subproject are discussed below.

2.2.1 Pakistan Environmental Protection Act, 1997

16. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a wide range of issues and extends to air, water, soil, marine, and noise pollution, as well as to the handling of hazardous wastes. The key features of the law that have a direct bearing on the proposed subproject relate to the requirement for an initial environmental examination (IEE) and environmental impact assessment (EIA) for development subprojects. Section 12(1) requires that: "No proponent of a subproject shall commence construction or operation unless he has filed with the Federal Agency an initial environmental examination [IEE] or, where the subproject is likely to cause an adverse environmental effect, an environmental impact assessment [EIA], and has obtained from the Federal Agency approval in respect thereof." The Pakistan Environmental Protection Agency has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies, in this case the Khyber Pakhtunkhwa EPA.

2.2.2 National Conservation Strategy (NCS) – Pakistan

17. The National Conservation Strategy (NCS) – Pakistan, as approved by the Federal Cabinet in March 1992 is the guiding document on the environmental issues in the country (Ref. EUAD / IUCN, 1992). The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources.

18. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the envisaged project are pollution prevention and abatement, restoration of supporting forestry and plantations, and preservation of cultural heritage.

2.2.3 Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000

19. The Pakistan Environmental Protection Act, 1997 (PEP Act) provides for two types of environmental assessments: initial environmental examinations (IEE) and environment impact assessments (EIA). EIAs are carried out for subprojects that have a potentially 'significant' environmental impact, whereas IEEs are conducted for relatively smaller subprojects with a relatively less significant impact. The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2001 (the 'Regulations'), prepared by the Pak-EPA under the powers conferred upon it by the PEP Act, categorizes subprojects for IEE and EIA. Schedules I and II, attached to the Regulations, list the subprojects that require IEE and EIA, respectively.

20. The Regulations also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process:

(i) A subproject is categorized as requiring an IEE or EIA using the two schedules attached to the Regulations.

(ii) An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.

(iii) The EIA or IEE is submitted to the concerned provincial EPA if it is located in the provinces or the Pak-EPA if it is located in Islamabad and federally administrated areas. The Fee (depending on the cost of the subproject and the type of the report) is submitted along with the document.

(iv) The IEE/EIA is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.

(v) The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.

(vi) The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, of the issue of confirmation of completeness.

(vii) Then the EPA accords their approval subject to certain conditions:

(viii) Before commencing construction of the subproject, the proponent is required to submit an undertaking accepting the conditions.

(ix) Before commencing operation of the subproject, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.

(x) An EMP is to be submitted with a request for obtaining confirmation of compliance.

(xi) The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.

(xii) The IEE/EIA approval is valid for three years from the date of accord.

(xiii) A monitoring report is to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operation.

21. Distribution lines and grid substations of 11 kV and above are included under energy subprojects in Schedule II, under which rules EIA is required by GoP. Initial environment examination (IEE) is required for distribution lines less than 11 kV and large distribution subprojects (Schedule I). A review of the need for EIA/ IEE submission is therefore required by the relevant EPA, in this case the Khyber Pakhtunkhwan Environment Protection Agency (EPA) as the proposed subproject will be located in KP.

2.2.4 NTDC Safety Considerations

22. NTDC Design Directorate has issued safety considerations which must be borne in mind during selection of route for a Transmission Line. The main points of the guidelines are:

- Operation in environmentally sensitive areas with special respect for fragile ecosystems and their inherent biodiversity are to be avoided to the extent possible;
- Similarly, ROW for a Transmission Line through natural features like mountains, hilly terrain susceptible to landslides, large lakes, reservoirs, marshes, human habitations and reserved forests or national parks are to be avoided to the extent possible;
- ROW is selected after due consideration for location of telecommunication lines and railway circuits to avoid electrical interference due to mutual induction;
- Residential structures are kept a minimum of 12m out from the plumb line of the outer conductor in the ROW. However, in the absence of an alternative alignment, an exception can be made for farm buildings and single floor factory buildings, provided neither is used for purposes of residence;
- Innovative technologies and latest equipment must be adopted or used to abate pollution in construction activities and operations;
- Routes of Transmission Lines are avoided to the maximum extent through areas of cultural or historical importance and religious places;
- Tubewells and open wells using a surface pump are not permitted under high voltage conductors as piping and cranes used to recondition such wells could make contact with high voltage conductors;
- Existing orchards can remain within the ROW although Towers are kept out of orchards wherever possible. Orchards are to be over-sailed by a clearance of 6m above the height of a mature orchard whereas all other trees are to be removed;
- Brick kilns should be kept at 30m outside the centerline of ROW;
- Alternative route alignments should be used if any school, rural dispensary, mosque or local shrine (ziarat) falls within 200m of the centerline of a planned route;

- Existing open wells and hand pumps can remain under high voltage conductors, provided open wells are capped;
- Selection of sites for Tower foundation and Tower erection is made consciously on stable surfaces and by rejecting sites susceptible to erosion, slips and landslides;
- Alignment of the Transmission Line is made by NTDC after discussions with key persons of the area and by avoiding properties and infrastructure to the extent feasible;
- Spacing between Towers/poles may not be uniform and ranges could vary for physical and other considerations, such as crossing of main roads, residential areas, streams and canals and trees and for avoiding graveyards and big ditches in between Towers/poles;
- The route alignment of the Transmission Line, location of the Towers/poles and the corridors are identified by NTDC;
- The main consideration relating to public safety is a safe horizontal and vertical distance of conductor from ground level to prevent electrocution of people or animals under the Transmission Line. A corridor having a minimum width of 30m, clear of all obstructions, is provided for extra high voltage (500KV and 220KV) Transmission Lines (half on either side from the centerline). However, general farming within this corridor is allowed and tree plantations that do not exceed a height of 1.5m are also allowed to remain under the lines. Similarly, open wells, including Persian wheels, can remain under Transmission Lines. Tubewells and pumps are not permitted under high voltage conductors, because piping and cranes used to refurbish such wells may come into contact with the lines; and
- No residential or other public buildings such as factory, school, hospital and mosque, except for graves/graveyards, are permitted within the corridor. However, farm buildings which are used for residential purposes may remain under extra high voltage lines, provided vertical clearance of at least 8m is maintained. The height of Towers can be increased to accommodate such buildings.

2.2.5 National Environmental Quality Standards - 2010

23. The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in 1995 and 2000. They have been revised and the latest NEQS were issued in 2010. The following standards that are specified in the NEQS are relevant to the proposed Subproject (See detailed Tables in Appendix III).

24. NEQS for Ambient Air – November, 2010 state the Maximum allowable concentration of pollutants (9 parameters) in gaseous emissions from vehicle exhaust.

25. NEQS for Drinking Water Quality 2010 describe the drinking water properties by outlining the defined physical and chemical parameters.

26. NEQS for Noise – November 2010 states the maximum allowable limit of noise arising from vehicles in decibels (dB) separately for day and night times.

27. NEQS for Waste Effluents 2000 states the Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea.

2.2.6 The Constitution of Pakistan 1973

28. It contains concurrent legislative power to federation and provinces to legislate in respect of environment and ecology (Article 142(b), Clause 24). Any gaps in the environmental law can be referred to National as well as the provincial assembly for passage of an appropriate law.

2.2.7 Pakistan Penal Code 1860

29. It treats pollution and destruction of ecology as a mischief and makes it a public offence. The Pakistan Penal Code further prohibits corrupting and fouling water, any public spring, reservoir or river or rendering it less fit for the purpose for which it is ordinarily used.

2.2.8 The Drainage Act 1973

30. The Act binds the public water users to restore the environment of the water bodies, should there be any damage by the community in any way.

2.2.9 Local Government Ordinance 1979

31. The ordinance empowers Zila Councils to control environmental pollution by preparing and implementing appropriate schemes to protect air, water and land in their respective jurisdictions.

2.2.10 The Telegraphy Act 1910

32. This act was promulgated for installation of telegraph polls and stringing. This act makes a provision of installing poles/towers without acquiring any land. However provision is there for temporary acquisition of land during the construction period. As such compensation is made for the loss of crop for a specific period.

2.2.11 The Khyber Pakhtunkhwa (KP) Wildlife (Protection, Preservation, Conservation and Management) Act 1974

33. The Act provides full protection to the listed birds and animals and their habitat including the migratory ones.

2.2.12 Guidelines for Sensitive and Critical Areas

34. Specifying the sensitive and critical areas in Pakistan, these guidelines apply to both the natural environment and cultural aspects of Pakistan.

2.2.13 The Forest Act 1927

35. The Act provides full protection to the reserved forests as well as to wildlife habitats. The Act also prohibits certain acts in protected forests.

2.2.14 The Antiquities Act 1976

36. The Act provides full protection and safety to archives, monuments, physical cultural heritage or chance finds and binds communities to cooperate, collabourate and report to the archeological department.

2.2.15 Factories Act 1934

37. Permission to establish an industry along the road can only be permitted by Government of Khyber Pakhtunkhwa.

2.2.16 The Public Health (Emergency Provision Act 1954 read with West Pakistan Epidemic Control Act 1958) Act

38. These two laws cover the preservation of human health by prohibition of any disease, safeguarding the public health and providing and maintaining adequate medical services and other services essential to the health of communities in the project area. Protection against HIV/AIDS and infectious diseases like Cholera and Hepatitis B in labour camps would come under the same preview.

2.2.17 Explosive Act 1884

39. Under the Explosive Act 1884, the Project Contractors are bound by regulation on properly and securely handling, transporting and using explosives during quarrying, blasting and any other purpose. A prior notice has to be given to local public and road users in collabouration with Resident Engineer.

2.2.18 Conventions, Protocols, Agreements and Understandings at International Level

40. On international level Pakistan is a signatory to a number of conventions, agreements, protocols and understandings. Not all of these may be directly applicable to this project but most important of these are listed below for any possible reference.

- Convention on Biological Diversity popularly called the Earth Charter (1992)
- Convention on wetlands of international importance especially wetland habitats (Ramsar 1971)
- Convention on conservation of Mitigatory migratory species of Wild Animals (Bonn 1979) a follow up of Ramsar 1971
- ILO convention No. 62 regarding ergonomic limitation of labour

2.2.19 Employment of Child Act, 1991

41. Article 11(3) of the Constitution prohibits employment of children below the age of fourteen years in factories, mines or any other hazardous employment. The Employment of Child Act, 1991, was accordingly enacted to comply with the Constitutional provision as also abide by international conventions and treaties in order to prohibit child labour.

2.2.20 Labour Laws

42. Construction and operational activities during project implementation can affect occupational health of workers. Employers are required to abide by labour laws in respect of their own employees and also to ensure that contractors also follow the relevant labour laws and rules relating to safety of the workforce and creating a healthy working environment. The proponents shall ensure that workers engaged at project site are not exposed to any danger by monitoring the contractor's work frequently.

2.2.21 Electricity Act IX of 1910 with Electric Rules 1937

43. Electricity Act 1910 and rules of 1937 are related to the supply and use of electrical energy in Pakistan. This Act will apply together with supplementary rules issued from time to time. It states the laws of electricity distribution system and the terms and conditions relevant to electric supply. It also states rules for abiding to the license provision. In a nutshell it outlines safe and practical distribution of electric Transmission lines, imposing penalties for those not abiding by the Act.

CHAPTER - 3: DESCRIPTION OF THE PROJECT

3.1 Type of the Project

44. The subproject has two components the grid station and transmission line. The 220 kV grid station and transmission line (total 2 km) will be located in KPK Province. The grid station will have equipment including 220 kV substation with 3*250 MVA Transformers.

3.2 Categorization of the Project

45. As studied locally, and as learnt from the experience of similar projects financed by ADB for WAPDA, the project does not cause high environmental sensitivity as per ADB classification of development projects. Either the project shall have negligible or conveniently mitigable environmental impacts. Hence it qualifies to fall in Category B project as per ADB guidelines. Accordingly its Environmental Assessment has been done at a manageable environmental sensitivity level and an Initial Environmental Examination (IEE) has been produced to provide an Environmental Assessment cover to the Project. In the chapters to follow, therefore, the study shall meet the requirements of an IEE as per latest guidelines provided by ADB.

3.3 Need for the Project

46. The conditions of the power distribution system in Pakistan are inadequate to meet rapidly growing demand for electrical power. This situation limits national development and economic growth. Electricity demand is expected to grow by 7.80% per annum during next 10 years over the period 2009-19. The existing power distribution infrastructure has to be improved and upgraded to ensure a reliable power supply to increasing number of industrial, agricultural, commercial, and domestic consumers. The overall contribution of power infrastructure also requires institutional arrangements and capacity that support strategic management of the sector, and planning and management of investments. Overall the proposed MFF facility has been designed to address both investment and institutional aspects in the electrical power sector.

47. As the result of this, enhancement in capacity of NTDC transmission system is required for power evacuation. The proposed project has therefore been prepared to meet the requirement which will also result in overall power efficiency and stability to deliver adequate & quality power to the consumers.

48. Main objective of project is to enhance the transmission capacity of NTDC system by addition of new 220 kV Nowshera Substation to meet the growing power demand of DISCOs, particularly PESCO.

- This improvement in system will help to bridge the demand supply gap to eliminate the sever load shedding of the country.
- Improvement and enhancement in overall power system efficiency, reliability and power supply position in PESCO area, particularly in the vicinity of Malakand, Charsadda and Mardan.
- Improvement in voltage profile of 132 kV Grid stations in PESCO area.

3.4 Location and Scale of the Project

49. WAPDA Tranch IV Nowshera subproject consists of a new 220 KV Grid Station along with its allied transmission line. The proposed site is located adjacent to Cherat Road some 10 Km on West side of G. T. Road between towns of Nowshera and Pubbi. The link road connecting to the proposed site with G. T. road is a single

lane metalled road. The GPS coordinates of the proposed site are 33° 56' 31.28' N and 50° 55' 71" E (See Figure 1.2 and 1.3).

50. The proposed site is a 450m x 350m piece of community grazing land situated lengthwise about 5 km short of Cherat Cement Factory. The area is semi-barren and supports grass and semi-arid zone shrubs and small trees only. The NTDC has already initiated the land acquisition process in collaboration with KP Revenue Department.

3.5 Design Criteria

3.5.1 Design Criteria for Grid Station

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

3.5.2 Design Criteria for Transmission Lines

52. The design of Transmission Lines is based on following parameters.

Table 3.1: Permissible Conductor Clearance at 65°C

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

3.6 Work and Material

3.6.1 Estimated Work/Major Work Items

53. Estimated quantum of work involved in the project is given below in Tables 3.2 and 3.3.

Table 3.2 Estimated Works in Grid Station

S. No.	Works	Unit
1	Civil Works in the Substation and Colony	Lot
2	Erection of Structures and Equipment	Lot
3	Conductor Stinging	Lot
4	Testing and Commissioning	Lot

Table 3.3 Estimated Works on Transmission Line

S. No.	Works	Unit
1	Civil Works (Structure Foundations and Erection of towers)	Lot
2	Conductor Stinging	Lot
3	Testing and Commissioning	Lot

3.6.2 Material Requirements

54. An estimated quantity of different materials required for construction of project Grid Station and associated Transmission Line are given in Table 3.4.

Table 3.4 Materials Required for the Project

S. No.	Material Item	Unit	Quantity
1	Rebar	Cubic feet	Lot
2	Wood	Cubic feet	Lot
3	Iron bars	Cubic feet	Lot
4	Cables	Cubic feet	Lot

3.6.3 Raw Materials Availability

55. Sources of different raw materials required for construction of Grid Station and associated Transmission Line are given below in Table 3.5.

Table 3.5 Sources of Raw Material Availability

S. No.	Raw Material	Availability
Civil Works		
1	Sand	Local
2	Cement	Local
3	Labour	Local
4	Stone Aggregate	Local

3.6.4 Machinery to be Used

56. As estimate of machinery of different types like grades, cranes, batching plants etc. are given below in Table 3.6.

Table 3.6 Machinery Requirement

S. No.	Machinery	Quantity /No.
1	Excavators	2
2	Mixer Machines	3
3	Tractors	5
4	Cranes	3
5	Tensioner Pulleys	1

3.6.5 Equipment and Installation

57. The equipment and installations required for propose Grid Station and associated Transmission Line are given below in Table 3.7.

Table 3.7 Equipment and Installation

S. No.	Equipment/ Installations	Quantity
1	Circuit Breaker 3-Pole 245 kV with Steel Structures Etc.	11
2	Bus Isolator 3-Pole 245 kV with Steel Support Structures Etc.	25
3	Line Isolator 3-Pole 245 kV with Steel Support Structures Etc.	4
4	C.T, 245 kV, Single Pole, 50 kA, 6 Core With Steel Structures Etc.	33
5	P.T (CVT) 245 kV, single pole, 50 kA, 2 core With Steel Support Structures Etc.	17
6	Auto T/F, 250MVA With Local Control Cubicals & Accessories Etc.	3
7	Lightning arrestor (198kV S.A) with Steel Support Structures Etc.	21
8	Bus Bar Material including Tubular Conductor/Overhead Flexible Conductor & Hardware Accessories Etc.	Lot
9	Overhead Shield Wire & Hardware Accessories Etc.	Lot
10	Insulator Assemblies	Lot
11	Steel Structure	Lot
12	Protection System	Lot
13	Telecommunication System	Lot
14	Metering Equipment	Lot
15	Fire Extinguisher	As per appropriate for site
16	Electricity generator	1
17	Water Pumping Equipment	1 set
18	Telephone Exchange	1
19	Lights, Vehicles etc.	3
20	Equipment/ Installations	As per appropriate for site

3.6.6 Construction Schedule

58. If all the processing goes on as per the schedule, the construction of Nowshera Grid Station and associated Transmission lines will be commenced by March, 2015 and completed by December, 2016. In case any unavoidable delays at the outset or during construction phase do take place, the envisaged completion date of the project will slide forward accordingly.

3.7 Construction Logistics

3.7.1 Work Base

59. Since Construction of the Grid Station is a localized work and the associated Transmission line will by and large start from the Switch yard from within the Grid Station Campus, an ideal arrangement would be to set up the work base within the fenced land acquired for construction of Grid Station. This will also help in keeping

the labour within an enclosed campus and forestall any social problem which can be caused due to interaction between any outside labour and local population especially women. The local labour can also come to the work base at the start of the shift and return to their homes after the work is finished. This will ease accommodation on labour camp on the campus.

3.7.2 Labour Supply

60. The contractor shall be contractually bound to employ maximum local people except on the job for which local expertise is not available. Keeping in view the experience of WAPDA on construction of similar Grid Stations and allied transmission lines, the local labour sharing can be illustrated as given in Table 3.8 given below.

Table 3.8 Illustration Distribution of Labour

Type of Labour	Local	Non-Local	Total
Skilled	20%	80%	100%
Semi-skilled	60%	40%	100%
Unskilled	100%	0	100%

By and large the daily wage rate fixed by the local communities will be used.

3.7.3 Labour Camp

61. Best Labour Camp shall be inside the fenced Grid Station campus. Although majority of labour will come from local sources, some semi-skilled and skilled labour shall have to be bought from outside by the contractor. All those who are bought from outside shall live in the camp on the campus. Pick and drop facility may have to be provided to the labour which is employed locally. Being facilitated to live in the camp or getting pick and drop, all the labour shall have an easy access to work base, which will also be placed within the Grid Station Walled Campus.

3.7.4 Machinery Maintenance and Equipment Yard

62. Near the work base a machinery and equipment yard will be provided. The yard will have enough storage and haulage space with ample moving and working space. The yard will be within the walled campus of proposed Grid Station yet its security shall have to be reinforced by appointing special guards.

3.7.5 Material Depot

63. Near the work base within the walled campus, a material depot shall be required for safe storage of construction material. It will have temporary sheds for storage of expandable material like cement and open space for storing stones, shingles and bricks. Sensitive electrical materials shall have to be kept in suitable stores under lock and key. Material depots shall have to be provided with extra security. A trained store keeper shall be appointed for keeping an account of incoming and outgoing materials.

3.7.6 Machinery Repair Workshop

64. With a large number of vehicles and other similar machinery a repair workshop is essential. The contractor may establish his own workshop.

3.7.7 Approach to Work Base

65. Since the work base will be established within the walled Grid Station campus, so the workers shall have an easy access to that. Within the campus internal small roads and paths shall have to be provided within the campus to facilitate movement of vehicles and workers.

3.7.8 Petrol Pump and CNG Pump

66. Petrol and CNG gas pumps are available at nearby towns such as Nowshera and Pubbi. For his own convenience, however, the contractor may like to have his own small facility of petrol and CNG pump on the campus.

3.7.9 Camp Offices

67. Adjacent to work base and material depot, the contractor will be allowed to set up a camp office to run his day to day field affairs.

3.7.10 Security Arrangements

68. Given the prevailing law and order and security position in the area around the proposed project area, necessary armed security staff is necessary. Reinforced security will be required at work base, labour camp, material depot, equipment yard and the locations where work is in progress.

3.7.11 Healthcare

69. With a good number of labour and employees working in the project, small accidents are expected to take place on various construction sites. A first aid box shall be maintained on every work site. A well-equipped dispensary will be set up by the contractor near his camp office. The dispensary will have services of a full time qualified doctor and a dispenser. An ambulance service shall support the dispensary. For major cases, the patients will be shifted to District Headquarter Hospital Nowshera under a pre-coordinated arrangement for full contract period.

3.7.12 Labour Reporting Officer

70. At a central point within the campus of proposed Grid Station, preferably close the work base, a special area will be marked where the labour can gather at the time of pick and drop or gather at the time of emergency or briefing. Such a place, also called Assembly Point will be indicated with a sign board. The place shall be kept open, clean and equipped with a public address system.

3.7.13 Labour Transport

71. Almost entire lot of unskilled labour will be employed from local sources. Contractor will provide transport (preferably a bus) to pick and drop local labour every day. That will help keep the labour camp less pressurized and more manageable.

3.7.14 Work Uniform and Health and Safety Equipment

72. Grid Station and allied transmission line construction is a special job and the labour working on such works requires special protective uniform and personal protection equipment to cope up with safety and health requirements. It will be ensured that the labour engaged in handling rough construction materials, mixing of concrete and handling transmission lines etc. shall have long boots, overall dresses, goggles, gloves and safety hats. They will invariably have their company Identity Cards worn around their necks with the help of a ribbon. As

an overall Safety, Health and Environment measure, any one going into the construction area will also wear safety helmet and safety shoes. Special arrangements must be made for Fire Protection by way of providing appropriate type of Fire extinguishers with firefighting training to concerned personnel.

3.7.15 Signology

73. On all construction sites and other important points like material store, machinery yard, equipment store, labour camp, main gate etc. suitable signboards and traffic signs will be displayed. Important instructions e.g. “no smoking”, “speed limit” and “stop for identity” can also be made known on well-presented sign boards. A good signology helps in forestalling any possible accidents.

3.7.16 Lighting and illumination

74. Suitable lighting arrangements will be made by the contractor on overall work site basis particularly at contractors office dispensary, labour camp, machinery yard, material depot, main gate and all other points where security at night has to be ensured. Good lighting at work places can help the contractor for extended working hours as well as security. If WAPDA electric supply is not available or is available with load shedding breaks, electricity generators will have to be arranged on all necessary points where lighting is required.

3.7.17 Estimated Cost of the Project

75. Final design and drawings of the Project have yet to be finalized. The total estimated preliminary cost of the Project as per the PC-1 document will be Pak Rs. 1875.6 million with 90% cost contributed through ADB financial assistance and 10% cost through the Government of Pakistan contribution. According to economic analysis of the Project, the Benefit: Cost Ratio will be 2.25 at 12% and 1.97 at 14% with an IRR of 27.34 %.

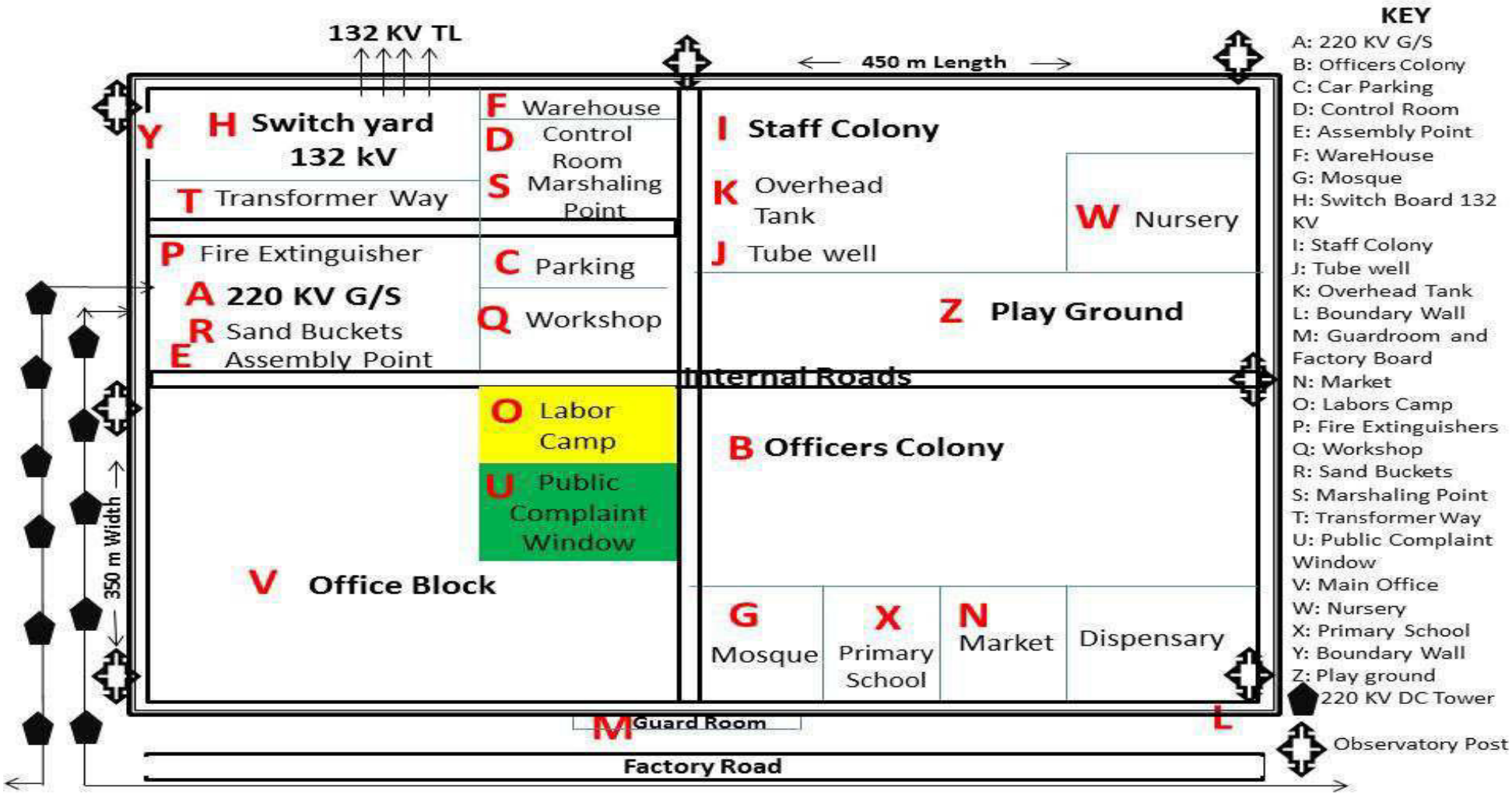


Figure 3.1: Layout of the Proposed 220 KV Nowshera G/S Subproject

3.8 ANALYSIS OF ALTERNATIVES

76. The various alternatives which have been considered during the conduct of the study are as under:

- No project option
- Alternative Location
- Alternative Construction Logistics

3.8.1 No Project Option

• Strengths and Opportunities

a. Land, funds inconvenience and staff time will be saved and can be diverted elsewhere on other projects

b. No land acquisition and rehabilitation shall be needed and no LARP will be required

c. No recurring cost shall be required for maintenance or repairs of Grid Station and also the operational cost will be saved.

d. No disturbance shall be caused to any physical, biological or social part of the environment.

• Weaknesses and Threats

a. Transmission of electricity to an acutely energy deficient area shall remain unchanged and allied developmental process shall be withheld.

b. Industrial development process shall be highly restricted and economy of the area, dependent upon, electricity shall not grow.

c. Greater job opportunities likely to become available at construction and operational steps of the project shall not be available.

d. One of the objectives of Ghazi Barotha hydroelectric Project shall be frustrated in that full utilization of Ghazi Barotha-Shahi Bagh transmission line shall not take place.

e. Standard of living of the local communities shall remain low as it is now and poverty would not be alleviated.

Conclusion

77. As per SWOT analysis for no project option, the weaknesses and threats outweigh the strengths and opportunities. “No Project Option” possessing the potentials of the worst scenarios is not recommended.

3.8.2 Alternatives of Location

Scenario A: Present Location

• Strengths and Opportunities

a. All costs on carrying out on any fresh survey or making new design shall be saved and expenses and efforts already incurred shall fully fructify

b. No fresh area shall be impacted at construction or operational stage and no fresh site shall have to be acquired and no problems connected with new site shall be triggered.

c. Existing proposal is in complete response of the engineering requirements of the transmission system and is located appropriately at a place where distribution of electricity received from Ghazi Barotha is aptly suitable for the area.

d. All along, during construction and operational phases, the project shall provide employment to local population.

e. The proposed site is a barren land with very open density scrub flora. There shall be no loss of any production agricultural land.

f. Availability of good supply of electricity shall help in giving better opportunities in education, health and social welfare.

g. The financial analysis of the project shows that the project is financially viable. Along with that it is socially acceptable, environmentally manageable, gender wise neutral and pro-poverty alleviation.

- **Weaknesses and Strengths**

a. Land shall have to be acquired but that would be inevitable on any site when no state land is available near Nowshera for this purpose.

b. The site is located in Khattak Nama area where tribal prides and prejudices are common and the Grid Station shall have to be secured properly by appointing armed security guards and building check posts and watch towers along the outer wall of the campus.

Conclusion

78. The strengths and opportunities of this option far outweigh the weaknesses and threats of this option. Further, the weaknesses and threats are conveniently mitigable. Therefore the option of existing design and proposed location is strongly recommended.

Scenario B: Grid Station Site at Shahi Bagh

- **Strengths and Opportunities**

a. The site is closer to Nowshera Town and is more easily approachable.

b. The site is located relatively closer to Ghazi Barotha-Shahi Bagh

c. The site is adjacent to an existing 132 KV Grid Station and some of the facilities at existing Grid Station can be of assistance to the new setup.

d. Due to reduced length of transmission line, there may be some reduction in cost.

- **Weaknesses and Strengths**

a. The entire available area has been occupied by internally displaced persons (IDPs) and some Afghan Refugees (AR) who have built their mud houses there. No part of the area is available physically for new Grid Station Installation.

b. Eviction of IDPs and ARs shall trigger heavy and complicated resettlement issues the solution of which may not be within the capacity of Government of KP or Pakistan. Experience from other AR campus shows that it is almost next to impossible to displace and resettle the ARs and move so IDPs. This is by far the greatest hurdle in the way of choosing this site for the Grid Station.

c. The ADB team surveyed the area and they opined that they would not be able to hear the high cost of resettlement. Moving to a nearly new site and paying the cost of land acquisition would be a lot more affordable than paying resettlement expenses for a large number of IDPs and ARs in KP area which is already destabilized because of war against terrorism.

Conclusion

79. The site is too risky, complicated with a very high cost involved. The weaknesses and threats of this option are overly weightier than any strengths and weaknesses. This option is therefore strongly not recommended.

3.8.3 Logistic Alternatives

80. Siting of Contractor's facilities e.g. Labour Camp site, machinery yard and material store within or outside the acquired land.

Scenario A: Labour Camp within the Acquired Land

Strengths and Opportunities

1. The contractor will get land free of cost. This cost will not be reflected in BOQ and this will reduce the overall cost of contract and therefore the project.
2. There will be very little possibility of interaction with local communities and the contractor shall have a free hand to manage his labour and works as per his schedule.
3. The contractor will not be encouraged to hire private agricultural land and therefore productive agricultural land will be saved.
4. The activities and logistics of contractor will be under full control of the project management and any possibility of adverse environmental or social spill over to outside territory will be eliminated.
5. Given the law and order and security conditions in KP due to War against terrorism, a walled and gated campus shall be far more secure than any open and exposed area.

Weaknesses and Threats

1. With the campus the space for facilities of contractor may be rather squeezed. Any permission to contractor to go out of walled and gated campus, the management may be compromising with a secure site selection and therefore with overall efficiency in the execution of the contract.
2. Getting a spacious land on lease in tribal society of Khattak Nama may not be possible physically and socially.
3. For creating enough space for contractor's facilities a situation may arise for the Project where a Resettlement gets involved. In that case heavy cost and overly complicated situation may arise.

Conclusion

81. In presence of adequate, walled and gated and encumbrance free project campus for the facilities of the contractor and for convenience of supervision and control by project management, this is an acceptable option and is therefore recommended.

Scenario B: Labour Camp outside the Acquired Land

Strengths and Opportunities

1. The contractor shall enjoy freedom of choosing the best sites for his facilities, machinery and labour.
2. By way of payment of lease money to private land owner, participation of community in project execution shall be achieved.

Weaknesses and Threats

1. The contractor may convert a productive agricultural land into a nonproductive and compacted field.

2. Out the direct control of the project proponents, the contractor may indulge in unplanned social activities which may not be acceptable to local communities. This can cause direct clash between the communities and the project. Such hostilities can stall the project.

Conclusion

82. The weaknesses and threats of this option are weightier than strengths and opportunities. This option is therefore not recommended.

3.8.4 Summary of Alternatives

83. No project option/ worst scenario option is not recommended. The option of following existing design and location is recommended. The option of siting contractor's facilities within walled and gated campus of project site is recommended.

CHAPTER - 4: DESCRIPTION OF THE ENVIRONMENTAL BASELINE

4.1 Project Area

4.1.1 General Characteristics of Project Area

84. The 220kV substation and its allied transmission line will be constructed on Cherat Cement Factory road, 10 km west of GT road, between towns of Nowshera and Pabbi. The proposed Grid Station (GS) extents over about 40 acres of land in precincts of village Spin Khak situated about 32 km from Peshawar and 21 km from Nowshera City, in Nowshera District, Khyber Pakhtunkhwa, Pakistan.

85. Nowshera District lies between 33° – 41' to 34° – 10' North latitudes and 71° - 39' to 72° - 16' East longitudes. It is bounded on the east by Attock District of Punjab province and in the west by the districts of Peshawar and Charsadda, in the north by districts of Mardan and Swabi and in the south by Kohat district. (See map as Fig 4.1)

Figure 4.1: Location Map of Nowshera District

4.1.2 Affected Administrative Units

86. As mentioned above the location of grid station and its allied transmission line falls in district Nowshera hence the only administrative unit that will be affected by the subproject is Nowshera District.

4.2 Physical Environment

4.2.1 Topography, Geography, Geology, and Soils

87. The Nowshera project area lies in border with Peshawar valley at an elevation of 295 m amsl. Nowshera District is largely barren with distant range of mountains in the background. Spin Khak is a Barani area where soil is prevalently sandy with gravel with clay on top. This makes it very suitable for ground water retention. Stratigraphically the rocks of the area are part of the Nowshera Formation of Stauffer. The Nowshera Formation consists of sandy dolomite, calcareous and dolomitic quartzite, calcareous argillite and fossiliferous limestone. The area has a rolling topography.

4.2.2 Seismology

88. Geological survey of Pakistan has divided Pakistan into five seismic zones. The project area, a part of Nowshera district, lies in seismic Zone 2B which is Moderate hazard zone corresponding to peak ground acceleration (PGA) values of 0.16 to 0.24 m/sec^2. Normally, the earthquake range between 3-5 on Richter scale. Figure 4.2 shows seismic map of Pakistan.

4.2.3 Climate, Temperature and Rainfall

89. There is no meteorological station present in Nowshera District therefore reliance has been placed on the data available from the nearest meteorological station i.e. Peshawar, which is in the same climatic zone. The temperatures in Nowshera range from 3.9 ^{o}C as mean minimum in winter to 39.25 (Celcius) as mean maximum temperature in summer. The maximum temperature in summer reaches 41.5^{o}C. In winter the minimum is 2.1^{o}C. The annual mean maximum and minimum temperatures are 29.6^{o}C and 14.6^{o}C respectively.

90. Rainfall in Nowshera varies from 30.0 to 420.0 (mm/month). The average annual rainfall at Risalpur and Cherat during 1988-2007 was recorded to be 684 and 585 mm respectively. The area receives maximum rainfall (about 60%) in the months of February, March, July and August, i.e. during summer monsoons and early spring. Winter rains contribute relatively more to groundwater recharge than monsoon rains (WAPDA, 2008).

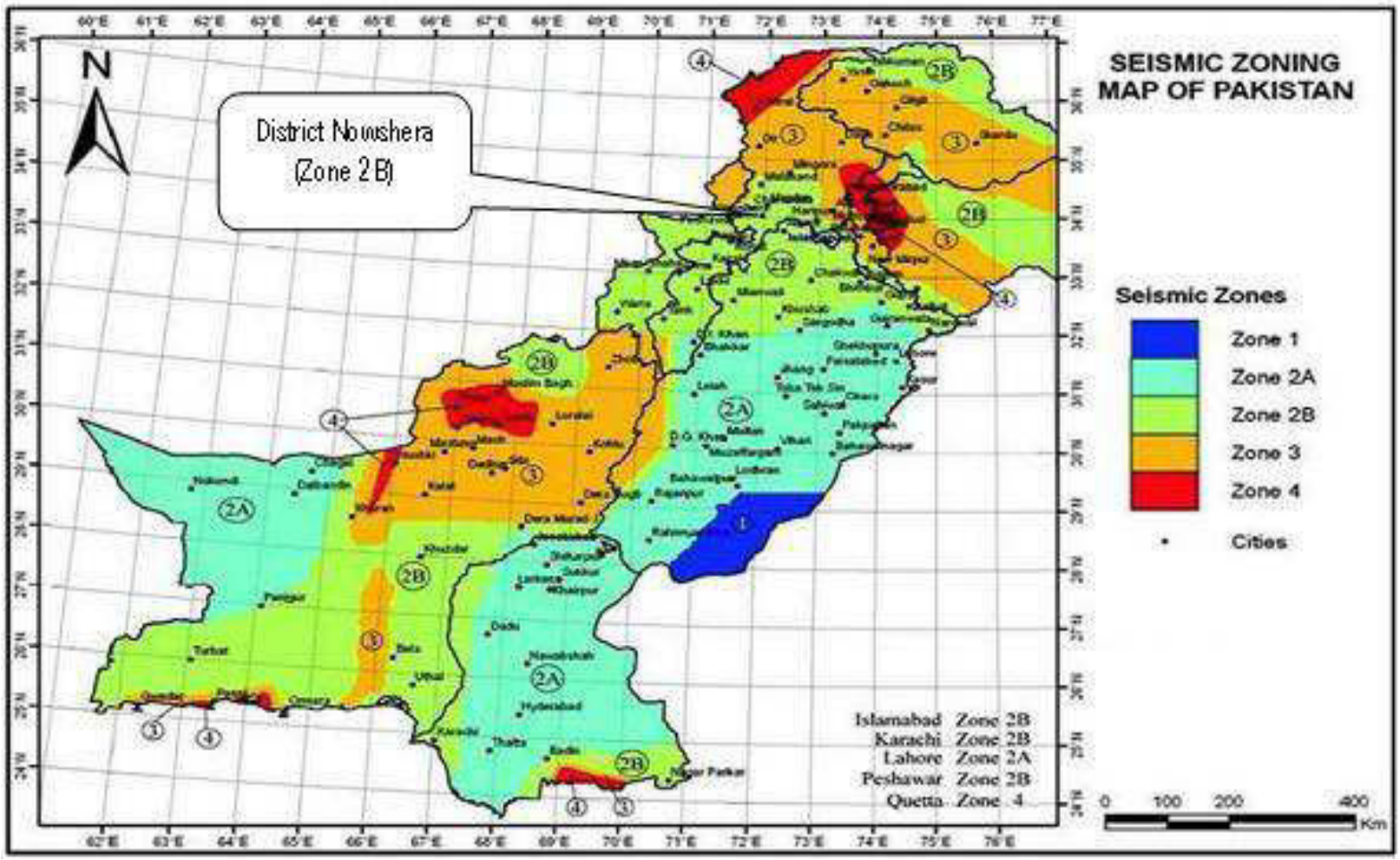


Figure 4.2: Seismic Zoning Map of Pakistan

4.2.4 Groundwater

91. Project area is a barani area. Depth to water table generally varies from 13 to 50 meters below ground level in barani areas whereas it is within 10 m in canal irrigated areas.

92. The occurrence of groundwater particularly in barani areas is controlled by hydro-geologic and climatic conditions. Rainfall is the main source of groundwater recharge. Deep percolation from fields and stream losses at various stages of flow coupled with varying properties of the upper soil strata and the underground aquifer are responsible for varied availability of groundwater across the district.

4.2.5 Surface water

93. There is no surface water body near the project site. Kabul River is almost 10 km far away from the project site.

4.2.6 Air Quality

94. Air quality in the project area is fairly clean and there is no likely source of air pollution. A cement factory is located about 5 km from project site. There may be some industrial pollution present in the vicinity of the cement factory but that has no effect on the clean air in the project area. Other than that emission from vehicles roving the factory road is also a source of pollution. Residential area is also far away from the project site hence no pollution from domestic wood or kerosene burning is anticipated.

4.2.7 Noise

95. Other than noise generated from vehicles moving on the factory road, no major source of noise is present in the project vicinity and therefore noise level will never cross the NEQS limit of 80 decibels.

4.3 Biological Environment

4.3.1 Terrestrial Habitats, Forests and Endangered Species

96. The area is located in semi-arid "Barani" tract. The flora is xerophytic and represented by following piedmont dry scrub species of tree shrubs, herbs and grasses.

Kikar	*(Acacia niloica)*
Ber	*(Zizyphus jujube)*
Bush ber or Malla	*(Zizyphus mumularie)*
Dailay	*(Capparis decidua)*
Naturalized Mesquete	*(Prosopis glandulosa)*
Pohli	*(Argemone maxicana)*
Harmel	*(Paganum harmala)*

97. Fauna typical to dry scrub areas can be seen in the area such as:

(i) Mammals
Jackels *(Canisaureus)*
Foxes (SSP. *Vulpes*)
Field rats (*Rattus norvegitus)*
Hare *(Lepus nigricollis)*

(iv) Birds
Shikra *(Accipiter badius)*
Crow *(Corvus splendens)*
Common kite *(Milbus migrans)*
Sparrow *(Passer domesticus)*

Porcupine *(Hystrix indica)*
Hedge Hog (*Erinaceinae)*
Wild cat *(Felis chaos)*

(ii) Reptiles
Cobra snake *(Naja naja)*
Rat eating snake
House gecho

(iii) Amphibians
Common Toads

Pigeons *(Columba livia)*
Dove *(Strato pielia* SSP.*)*
Parrot *(Psittacula kramerl)*
Partridges

(v) Others
Scorpios
Spiders

98. Domestic animals of significance include cows/ bulls, buffaloes, goats and sheep. There are no forests and endangered plants or animal species in the area.

4.3.2 Protected Areas/ National Sanctuaries

99. There is no protected area in the vicinity of the project area. There is a botanical garden near GT road but being 10 km away, the GS cannot cause any impact on that. There is no wildlife sanctuary in the vicinity of the project area.

4.3.3 Wildlife, Fisheries and Aquatic Biology

100. River Kabul is almost 10 km away from the project vicinity hence there is no fisheries and aquatic biology near the project area neither is there any wildlife.

4.4 Economic Development

4.4.1 Agriculture, Livestock and Industries

101. This area is a lies in semi-arid region. It is a Barani (rain fed) area with scrub vegetation. Agriculture is practiced only on the flat areas that depend on rainfall. Cultivation of wheat depends upon winter rainfall. The rolling country makes good grazing land for sheep and goats. Livestock commonly includes cows/ bulls, buffaloes, goats and sheep.

102. There are about 125-130 factories in Nowshera District of which 24 are major factories. Paper international, Colony Sarhad Textile Mills, Pakistan Tobacco Company, Cherat Cement factory and Swat Ceramics are some of the major factories present in the district. Cherat Cement factory is located just about 5 km from the project site.

4.4.2 Transportation and Tourism

103. Nowshera District is linked with the rest of the country by rail, air and roads. National Highway (N-5) enters at Khairabad and goes all along in the district. PAF Air Base at Risalpur and Pakistan Railways are worth mentioning. More than half of the motorways in KP pass through Nowshera. There is a network of farm to market roads, within the districts.

104. Project site is located adjacent to Cherat Cement Factory Road. This is a wide road used by heavy traffic for transporting the goods between the factory and the GT road.

4.4.3 Energy Sources

105. Within Nowshera district distribution lines for electrical power run to a 132 kV grid sub-station Nowshera. The existing main 220kV Grid Station is present in Mardan which supply energy to Nowshera.

4.5 Social and Cultural Resources

4.5.1 Population Communities and Employment

106. According to the census report of 1998 the total population of Nowshera District was 874,373 persons with an annual growth rate of 2.9% at that time. The district is predominantly (99%) Muslim. The next higher percentage is of Christians with 0.5%, followed by 0.3% Ahmadis and 0.1% Hindu (jati). Other minorities and scheduled castes are small in number. Areas adjacent to the project site are all from Khattak tribe and are almost 100% Muslims.

107. Pushto is the predominant language being spoken in the district, representing 91% of the population, followed by Punjabi spoken by 3.6%, Urdu 1.3% and Siraiki 0.3%. Others speak Sindhi, Balochi, Baravi and Dari.

108. Of the total economically active population 95.6% were registered as employed in 1998. Nearly two-forth (38.9%) were self-employed, 28.4% were private employees and 24.2% government employees. Unpaid family helpers were recorded as 4.4%. The difference in proportions of employed population was significant between the genders in both urban and rural residences. Only 1% of the females are economically active out of which 3.9% of the women are unemployed.

4.5.2 Education and Literacy

39. The literacy ratio in Nowshera district increased from 23.8% in 1981 to 42.5% in 1998. The literacy ratio for males is 60.6% and for females is 22.7%. Literacy is much higher in urban areas (55.6%) compared with rural areas (37.6%) for male and female.

4.5.3 Health Facilities

109. Health facilities in Nowshera City are adequate. District Headquarter Hospital, CMH are main hospitals in the city. Other than that there are a number of private doctors and hakeems present in the city.

Basic Health Unit is only 3 km away from project site. It has no maternity facility. Maternity facilities are provided by mid wives to local people.

4.5.4 Cultural Heritage and Community Structures

110. A majority of the people of the district is purely Pashtoon. The major tribe in or near the project vicinity is Khattak. Joint family structure is common in the region. Families live in a big compound with separate rooms for each sub family. The oldest family male is the head of the family and usually takes all the major decisions for his family.

111. There are no officially protected places of physical cultural heritage nor there are any historic, religious or archeologically important sites located within or near the project area.

CHAPTER - 5: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Subproject Location

5.1.1 Impact Assessment and Mitigation

112. This Tranche-IV subproject will involve the construction of 220 kV new Nowshera grid station with associated In/Out 2 Km Ghazi Brotha -Shahi Bagh transmission line. The privately owned land is almost barren except a few bushes and trees. There are no Sensitive Receivers (SR) i.e. houses, schools, Madrassas near or within 500 m distance around the site.

113. The location and scale of the works are very important in predicting the environmental impacts. Therefore, it is essential that a proper analysis is carried out during the subproject planning period. This process of impact prediction is the core of the IEE process and it is critical that the recommendations and mitigation measures are carried out according to, and with reference to the conditions on the ground in the affected areas in the spirit of the environmental assessments process. In this section the potential environmental impacts are reviewed. Where impacts are significant enough to exceed accepted environmental standards, mitigation is proposed in order to reduce residual impact to acceptable levels. In this regard, the impact prediction plays a vital role as these predictions are used for developing mitigation measures and any alternative options, if appropriate. When the detailed designs are completed, the impacts and mitigation measures will need to be further reviewed to take account of how the contracts are set up and in the light of any fine tuning of the subproject proposals.

114. The environmental management plan has been prepared based on the assessment and shall be reviewed in due course at subproject inception and through construction in order to provide a feedback on any significant unpredicted impacts. It is based on the analysis of impacts, primarily to document key environmental issues likely to arise from subproject implementation, to prescribe mitigation measures to be integrated in the subproject design, to design monitoring and evaluation schedules to be implemented during subproject construction and operation, and to estimate costs required for implementing subproject mitigation measures. The EMP must be reviewed in the subproject inception by the subproject management and approved before any construction activity is initiated, to take account of any subsequent changes and fine tuning of the proposals.

5.2 General Approach to Mitigation

115. Based on professional experience on grid station and transmission line projects, contractors have put emphasis on the financial compensation for nuisances. This may be acceptable for some social impacts where evacuation is necessary or where structures have been accidentally damaged, however, it is not best international practice to accept payment for environmental impacts. An approach whereby the subproject contractor pays money for nuisances rather than control impacts at source will not be acceptable. This practice should not be allowed and financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance.

116. During the preparation for the subproject construction phase the future contractors must be notified and prepared to co-operate with the executing and implementing agencies, subproject management, construction supervising consultants and local population in the mitigation of impacts. Furthermore, the contractor must be primed through bidding stages and the contract documentation to implement the EMP in full and be ready to engage or train staff in the management of environmental issues and to audit the effectiveness and review the mitigation measures as the subproject proceeds. The effective implementation of the EMP will be audited as part of the loan conditions and the executing agency (NTDC) must be prepared for this. In this regard,

the NTDC must fulfill the requirements of the law and guidance prepared by Pak-EPA on the environmental aspects of power subprojects and the recommendations already made for subproject in this IEE and under Pakistan's PEPA 1997

117. The location of the residences, mosques, schools, hospitals and civic, cultural and other heritage sites has been reviewed. The subproject site is clear from all type of permanent structures and hence no potential impacts in the construction stage from disturbance and significant noise and dust are envisaged. The associated line route alignment has no human settlements and structures in its ROW of 30 m. There are no sensitive receptors such as water bodies, schools, hospitals, residential areas etc. near the surroundings of the project site.

118. The grid station construction activities will be within the boundary wall. Work on the tower sites could cause some generation of air borne dust, but any nuisance from this is likely to be very localized and temporary. Other project activities, e.g. movement of heavy vehicles on unpaved tracks during the works, could generate considerable dust. Water is available in the study area, although surplus water may not always be available to suppress dust at vulnerable locations in the dry season. Therefore, as a general approach it is recommended that where works are within 15m of any residential sensitive receivers, the contractor should install segregation between the works and the edge of the sensitive receivers. The segregation should be easily erectable 2.5 m high tarpaulin sheet and designed to retain dust and provide a temporary visual barrier to the works. Where dust is the major consideration the barrier can take the form of tarpaulins strung between two poles mounted on a concrete base. These can be moved along from tower base to tower base as the work proceeds.

119. Noise from the construction of the towers should not be a major consideration unless very close to schools or hospitals where construction should be avoided at sensitive times. In addition to the physical effect of mitigating dust and noise with barriers installation of such measures should be discussed with the local population and serve as a vehicle for further public consultation at the implementation stage to assist in public relations.

5.2.1 Cultural Heritage, Mosques, Religious Sites, and Social Infrastructure

120. The location of mosques and other cultural and other heritage SR sites has been reviewed. There is no mosque, graveyard, tomb or any other religious/archaeological site within 100m boundary from the edge of the Subproject, therefore, no impact on the site is expected. There will be sufficient buffer distance between the works and all the SR such that no significant impacts can be expected. Public consultation should be undertaken at the implementation stage to ensure nuisances are not allowed to escalate.

121. The location of mosques, cultural and other heritage SR sites has been reviewed. There is neither any mosque nor religious site within or close to the DGS. The associated Transmission line will also not affect or disturb any such site.

5.3 Potential Environmental Impacts in Construction Phase

5.3.1 Encroachment, Landscape and Physical Disfiguration

122. The extent of the proposed power expansion is moderate and will not extend beyond the power corridor (RoW) created by the subproject. No significant landscape impacts are expected from construction of New 220 kV Nowshera Grid Station. The grid station construction will not pose any encroachment, because it will be constructed in a boundary wall.

123. Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction, so that no obnoxious material is produced in the scrap.

5.3.2 Cut and Fill and Waste Disposal

124. Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction. The Subproject work should not involve any significant cutting and filling but the excavations (down to 4m) and piling may be required to create the foundations for some towers (if required). It is envisaged (depending on the mode of contract) that the surface under the towers will need to be scrabbled to remove unstable materials, or to stockpile topsoil.

125. Mitigation measures must focus on the minimization of impacts. In order to allow the proper functioning of the settlement sites (access to villages) during construction, it is recommended that consideration be given to erect temporary hoardings immediately adjacent to the nearest houses and shops if they are within 15 m of the power distribution line tower construction.

126. If surplus materials arise from the removal of the existing surfaces from specific areas, these should be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside. Moreover, it will also save the cost of bringing the material from some other locations.

127. The subproject detailed designers have so far estimated that no substantial additional materials will be required subject to confirmation at the detailed design stage.

128. If any trees of religious plantations are affected the owners should be given the resources and opportunity to reinstate the woodland long term and a plantation compensation plan should be drawn up to replant the woodland/trees. In the event that the land is not suitable for plantation then other areas should be identified to replace the cut trees and sufficient areas should be identified to allow plantation of trees at a rate of say 3:1. The replacement ratio should allow for a high mortality rate among the newly planted trees in the dry environment or otherwise as based on advice from the forest authority.

129. Contractual clauses should be included to require each contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to the local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance. Mitigation measures shall seek to control the impacts at source in the first place. The engineer shall be responsible to update the subproject cut and fill estimates and create Materials Master Plan to facilitate materials exchange between the different contract areas along the power line and sub-contractors on the power line and to provide an overall balance for materials and minimize impacts on local resources.

5.3.3 Trees, Ecology and Protected Areas

130. There are no Reserved or Protected Forests or trees near the project site. The proposed subproject of Tranche-IV will require the construction of grid station and installation of towers for associated TL on the 40 acres private land at *Spin Khak*. Thus approximately 50 Kikar and Bair trees and some shrubs will be removed from the project site.

131. Trees should be enumerated species wise and compensatory plantation should be arranged along roads and paths within the campus or outside the campus through forestry. At least 3 compensatory saplings should be planted in place of one tree cut. Keeping in view 15% inflation rate each year and the estimated price rate for each sapling is 30 Rs. per plant, total cost for plantation accounts to be **50,000/- Rs** if the plantation plan is implemented after 3 years from today.

132. Mammals and reptiles will be disturbed with clearance of flora and leveling of land. Birds can easily fly away to trees outside the campus or to the trees which are retained from original flora. While constructing boundary wall around the project campus, outlets near the ground surface should be provided at suitable intervals in order to facilitate the mammals and reptiles to migrate out of the disturbed campus. As far as possible, some parts of original habitat should be retained. In spots there is absolutely no tree, birds' nests (boxes with a hole) can be fixed with poles or other installations.

133. There is no protected area, as per identification of National Conservation Strategy, inside or anywhere near the project. Hence no mitigation measure can be considered.

5.3.4 Hydrology, Sedimentation, Soil Erosion

134. The drainage streams en-route of the subproject should not be impeded by the works. The scale of the works does not warrant hydrological monitoring. No impact is expected from the project.

135. Design engineer will ensure appropriately sized drainage to avoid negative impacts on the local drain system. During construction phase, temporary drains and embankments would be necessarily made to channel the runoff appropriately.

5.3.5 Air Pollution from Earthworks and Transport

136. Field observations indicate that ambient air quality is generally acceptable and that Air pollutants would be generated during excavation of soil, civil works, movement of machinery, placement and storage of construction material Air emissions generated from machinery usage may contain Particulate matter (PM), Smoke, Dust, CO, NO2. In addition. fugitive dust emissions will be generated in the construction phase. These emissions are directly proportional to silt content of dirt tracks, vehicle speed and mean annual number of days with 0.01 inches or more rainfall.

137. Mitigation measures to be adopted to control air pollution include Regular tuning, checkup of construction vehicles and machinery to comply with NEQS, limiting the speed of the vehicles in the working area, cover trucks carrying, earth, sand, aggregate and other materials with sheet, control dust emissions by regular sprinkling of water, implementation of plantation plan for trees & plants around the Industry etc..

138. The material (cement, sand and aggregate) requirements of a typical 220 kV grid station are large that of transmission line. For grid station construction purpose, the construction material will be stored in the boundary wall and no disturbance to surrounding areas is expected. The contractor will be, however, required to provide a traffic management plan before commencement of work at site.

139. The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles (if required) should not be located within 50m of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.

5.3.6 Noise, Vibration and Blasting

140. It is anticipated that powered mechanical equipment and some local labour with hand tool methods will be used to construct the subproject works. No blasting is anticipated. Powered mechanical equipment can generate significant noise and vibration. The cumulative effects from several machines can be significant. To minimize such impacts, the contractor for subproject should be requested by the construction supervision consultants (engineer) to provide evidence and certification that all equipment to be used for construction is fitted with the necessary air pollution and noise dampening devices to meet EPA requirements.

141. Noise and vibration from the construction of the towers would not be a major consideration as there are no schools or hospitals present nearby the construction site. In addition to the physical effect of mitigating dust and noise with barriers installation of such measures should be discussed with the local population and serve as a vehicle for further public consultation at the implementation stage to assist in public relations.

Table 5.1: National Environmental Quality Standards for Noise

S No.	Category of Area/Zone	Effective from 1st July, 2010		Effective from 1st July, 2012	
		Limit in dB(A) Leq*			
		Day time	**Night time**	**Day time**	**Night time**
1.	Residential are (A)	65	50	55	45
2.	Commercial area (B)	70	60	65	55
3.	Industrial area (C)	80	75	75	65
4.	Silence zone (D)	55	45	50	45

Note:

- *Day time hours: 6 .00 am to 10.00 pm*
- *Night Time hours: 10.00 pm to 6.00 am*
- *Silence zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts and courts.*
- *Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.*
- *dB(A) Leq: time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.*

142. Noise will be controlled by monitoring at a distance of 100m from the boundary wall of any residential unit and while following the NEQS of 45dB (A).

143. Noise from construction of substations is not covered under any regulations however in order to keep in line with best international practice, it is recommended that construction should not be allowed during nighttime (9 PM to 6 AM). All noisy equipment should be located within DGS or far away from Sensitive receptors as possible to prevent nuisances to dwellings and other structures from operation. However, if the noise still exceeds NEQS then noise barriers will be installed around the equipment to reduce the effects of the noise.

144. Vibration from construction of piles to support pads may be required for some tower construction and may be a significant impact but this should be short duration. Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction. The physical effect of piling should be assessed prior to

construction and measures should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. At nearby schools, the contractor shall discuss with the school principals the agreed time for operating these machines and completely avoid machine use near schools during examination times, if such a need arises.

145. Noise barriers should be installed for the workers working more than 8 hr/day during construction activities. Noise level from construction activity can be reduced by regular maintenance of machinery. Noise can be controlled through engineering control e.g. hammering actions can be substituted by hydraulic. Ensure that the workers are wearing PPE's (ear plugs, ear muffs etc.) where engineering control is not applicable to reduce the impact of noise.

5.3.7 Sanitation, Solid Waste Disposal, Communicable Diseases

146. The main issues of concern are uncontrolled or unmanaged disposal of solid and liquid wastes into watercourses and natural drains, improper disposal of storm water and black water and open defecation by construction workers.

147. In order to maintain proper sanitation around construction sites, access to the nearby lavatories will be allowed or provision of temporary toilets will be made. Construction worker camps will be necessary, based on the scale of the works needed. The construction camp will be provided with portable lavatories or at least pit latrines.

148. Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction. The Subproject work should not involve any significant cutting and filling but minor excavations (down to 4m) and piling may be required to create the foundations for the new transformers and for some towers (if required). It is envisaged (depending on the mode of contract) that the surface under the towers will need to be scrabbled to remove unstable materials, or to stockpile topsoil.

149. Mitigation measures must focus on the minimization of impacts. In order to allow the proper functioning of the settlement sites (access to villages) during construction it is recommended that consideration be given to erect temporary hoardings immediately adjacent to the nearest houses and shops if they are within 15m of the power distribution line tower construction.

150. If surplus materials arise from the removal of the existing surfaces from specific areas, these should be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside.

151. The subproject detailed designers have so far estimated that no substantial additional materials will be required subject to confirmation at the detailed design stage.

152. Contractual clauses should be included to require each contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance. Mitigation measures shall seek to control the impacts at source in the first place. The engineer shall be responsible to update the subproject cut and fill estimates and create Materials Master Plan to facilitate materials

exchange between the different contract areas along the power line and sub-contractors on the power line and to provide an overall balance for materials and minimize impacts on local resources.

5.3.8 Disease Vectors

153. Wherever water is allowed to accumulate, in temporary drainage facilities, due to improper storm water management, or improper disposal of wastewater generated from the site, it can offer a breeding site for mosquitoes and other insects. Vectors such as mosquitoes may be encountered if open water is allowed to accumulate at the construction camp site. Temporary and permanent drainage facilities should therefore be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.

5.4 Potential Environmental Impacts in Operation Stage

5.4.1 Air Pollution and Noise from the Enhanced Operations

154. The subproject works will extend the power distribution lines but no houses, mosques or schools will be close to the new GS in the operational phase. The operation of the facility is not likely to cause any appreciable increase in the noise level already generated by the existing equipment. However, it is recommended that an acoustical check be made on the detailed design to determine of any noise barriers are required. There should be no source of atmospheric pollution from the subproject. In the operational phase any nearby industrial facilities with fuel powered mechanical equipment will be the main polluters.

155. All the emissions will be very well dissipated in the open terrain and there will be no cumulative effect from the subproject.

156. Noise impacts from the operation of the DGS equipment should be reviewed at the detailed design stage. The NEQS for noise close to residential areas will be complied with 45 dB(A) Leq (exterior, boundary of DGS).

5.4.2 Pollution from Oily Run-Off, Fuel Spills and Dangerous Goods

157. No significant impacts from oily residues such as transformer oil and lubricants are expected to arise in this subproject. However control measures will be needed for oily residues such as transformer oil and lubricants in the case of accidental or unexpected release. Transformer oil is supplied in drums from an imported source and tap tanks are topped up as necessary on site. There are facilities in some subproject DGS maintenance yards for recycling (dehydrating) oil from breakers. However the areas upon which these recycling facilities are located have no dedicated drainage which can capture run-off. Oily residues and fuel and any contaminated soil residues should be captured at source and refueling and maintenance should take place in dedicated areas away from surface water resources. Contaminated residues and waste oily residues should be disposed at a site agreed with the local authority.

158. Contaminated residues and waste oily residues should be disposed at a site agreed with the local authority. Transformer oil has a long life (typically over 15 years, which depends upon the level of load the transformer serves). Oil spills are very rare and are preempted by routine maintenance. Good housekeeping techniques should be used to control oil spillage. Responsible authority should ensure that the maintenance schedule of each piece of hardware is adhered to.

5.5 Enhancements

159. Environmental enhancements are not a major consideration within the Nowshera subproject site. However it is noted that it is common practice at many such sites to create some local hard and soft landscaping and successful planting of fruit trees and shrubs has been accomplished in many sites. This practice should be encouraged as far as practicable. Other opportunities for enhancements can be assessed prior to construction and proposed enhancements should be discussed with the local population to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. Trees removed for construction purposes should be replaced as compensation in line with best practice at ratio of three replaced for one removed however additional trees should be planted as enhancements where there is space in the DGS and along the DXL.

CHAPTER - 6: ENVIRONMENTAL MANAGEMENT PLAN AND INSTITUTIONAL REQUIREMENTS

160. In this section, the mitigation measures that are required for the Nowshera 220kV Grid Station Tranche-IV subproject, to reduce residual impact to acceptable levels and achieve the expected outcomes of the project, are discussed. The Environmental Monitoring Plan is based on the type, extent and duration of the identified environmental impacts for the proposed Tranche-IV subproject of new Nowshera 220 KV Grid Station along with about 2 km (1+1) In/Out 220 kV transmission line. The IEE has been prepared following best practice and by reference to the ADB Policy Statement 2009.

161. The IEE and Environmental Management Plan must be reviewed by the project management and approved by the EPA before any construction activity is initiated. This is also an ADB requirement in order to take account of any sub-sequent changes and fine tuning of the proposals. It is recommended that, before the works contract is worked out in detail and before pre-qualification of contractors, a full extent of the environmental requirements of the project (IEE/EIA and EMP) are included in the bidding documents. Professional experience indicates that past environmental performance of contractors and their awareness of environmentally responsible procurement should also be used as indicator criteria for the prequalification of contractors.

162. The effective implementation of the Environmental Management Plan and Environmental Monitoring Plan (Annex I & II) will be audited as part of the ADB midterm review of loan conditions and the executing agency must prepare for this at the inception stage.

163. The future contractors must be prepared to co-operate with the local population during the construction phase to facilitate in mitigation of impacts and the implementation of the EMP. Furthermore, the contractor must be primed through the contract documentation and ready to implement all the mitigation measures and engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds. The effective implementation of the EMP will be audited as part of the mid-term review of loan conditions and the executing agency must be prepared for this.

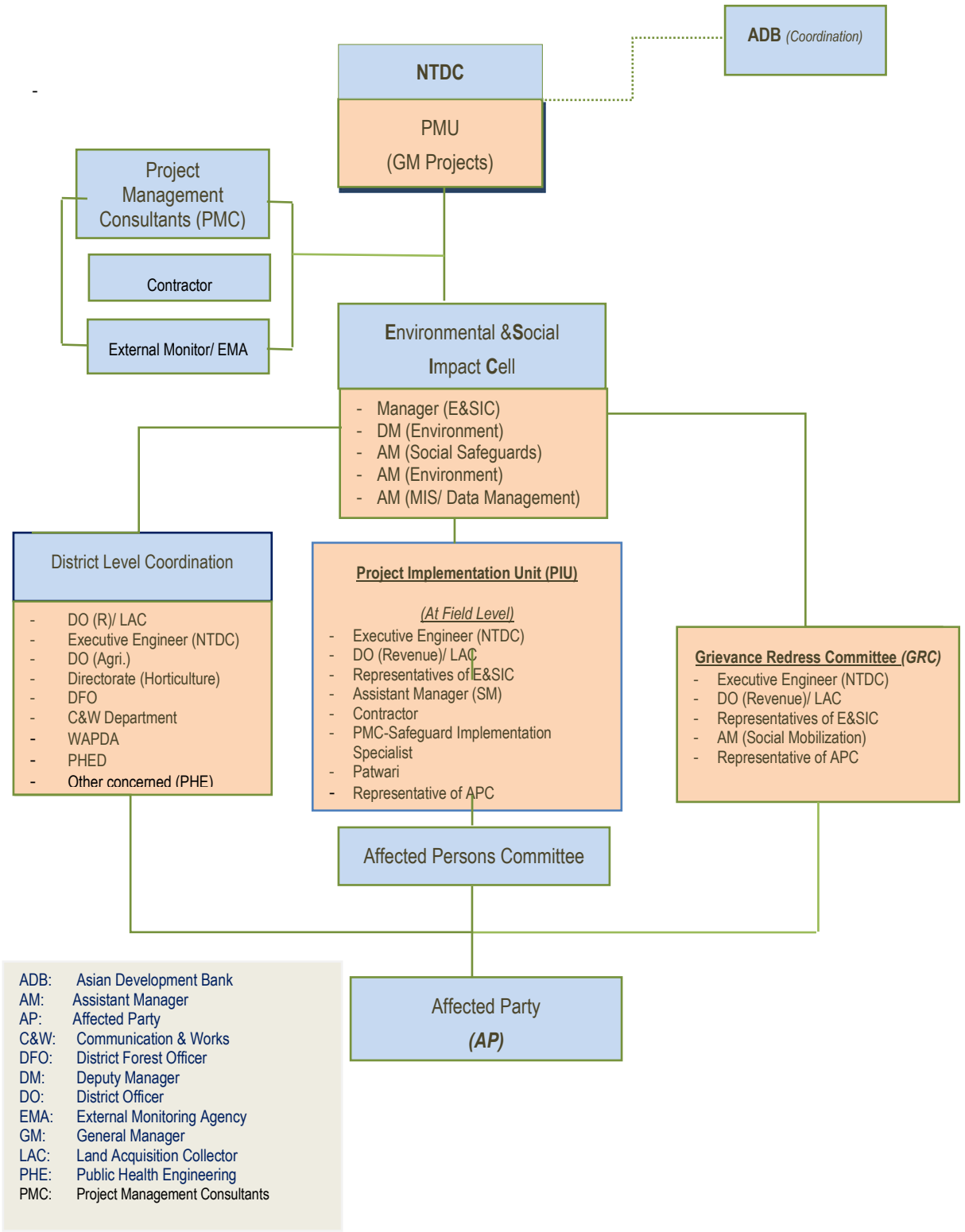
164. The impacts have been classified into those relevant to the design/preparation stage, construction stage and operation and maintenance stage. The EMP provides details of the mitigation measures recommended for each of the identified impacts, time span of the implementation of mitigation measures, an analysis of the associated costs and the responsibility of the institution. The institutional responsibility has been specified for the purpose of the implementation and the supervision. An estimation of the associated costs for the monitoring is given in table 6.1. The EMP has been prepared following best practice and the ADB Safeguard Policy Statement 2009.

165. Prior to implementation of the subproject, the NTDC needs to comply with several environmental requirements, such as obtaining EPA clearance (“No Objection Certificate”, compiling acceptable EMP and Clearance Certificate) under PEPA, 1997 (IEE/EIA guidelines and regulations 2000), securing tree removal and replanting permits from the Department of Forests and any permissions required from the Irrigation Department, Provincial Highway Department and Department of Wildlife Services. NTDC will also need to confirm that contractors and their suppliers have complied with all statutory requirements and have appropriate and valid licenses and permits for all powered mechanical equipment, permissions for use of local water supplies in line with the all environmental requirements (e.g. and local authority conditions).

6.1 Institutional Requirements

166. An organogram showing the institutional arrangements for the implementation of EMP has been illustrated through a diagram presented in Figure 6.1.

Figure 6.1: Organogram of NTDC Environment and Social Impact Cell



167. The EMP was prepared taking into account the capacity of the NTDC to conduct environmental assessments of the subprojects. But it is envisaged that the NTDC's Environmental and Social Impact Cell (ESIC) will conduct monitoring of subproject to check the compliance of EMP provisions and will obtain environmental approval from EPA Khyber Pakhtunkhwa. The ESIC is composed of one Manager, one Deputy Manager, and three Assistant Managers (refer to Fig 6.1). Most of the environmental work is delegated to consultants. Specific areas for immediate attention are in EMP auditing, environmentally responsible procurement, air, water and noise pollution management, Social and ecological impact mitigation. It is recommended that an environmental specialist should be made part of team of supervisory consultants for effective monitoring of EMP provisions.

6.2 Grievance Redressal System

168. This section describes mechanism to receive and facilitates the resolution of affected party including women' concerns and grievances. A grievance mechanism will be available to allow an AP appealing any disagreeable decision, practice or activity arising from land or other assets compensation. APs will be fully informed of their rights and of the procedures for addressing complaints whether verbally or in writing during consultation, survey, and time of compensation.

169. APs/ local community will enter their complaints/ concerns and issues formally including the information of date, name and address of complainant, description of complain. The Assistant Manager (social mobilization) at PIU will maintain a register named as *"community complaint register (CCR)"*. The register will include the information as date, name and address of complainant, description of complaints, and will enter the complaints in a date covering the minimum information of name and address of complaint, description of complaints, action taken, status of redress of complaints and reasons in case issue not resolved.

170. GRC will work at field level, while unsettled issues will be referred to the PMU at sub-project level. The field level PIU (AM Environment) will inform the affected persons about GRC and its mechanism by passing the information at known places.

171. Efforts will be made to avoid the APs/ community concerns by implementing the sub-project in accordance with the EMP, i.e. proper information disclosure, community consultations, payments as per entitlements and coordination with APs/ APC, PIU and PMU. However, a Grievance Redress Committees (GRC) will also be established to redress the unresolved issues.

172. The composition of GRC will as below:

GRC at PIU Level

i). Executive Engineer (NTDC)
ii). DO (Revenue)/ LAC
iii). Representative of E&SIC
iv). Assistant Manager (Social Mobilization)/ Social mobilizer
v). Representative of Affected Person Committee (APC)
vi). Patwari

173. A comprehensive grievance redress process regarding land compensation and other compensation is described below:

Table 6.1: Grievance Redress Process

Land / Crop Compensation Issues	Other Items Compensation Issues
• First, complaints will be redressed at field level through the involvement of PIU and APC as well as other local committees.	• First, complaints will be redressed at field level through the involvement of PIU and APC as well as other local committees.
• If issue is unresolved, then it will be lodged to the DO (Revenue)/ LAC who will have 14 day to make decision on it.	• If no solution is accomplished, then grievance will be lodged to GRC. • The GRC will provide the decision within 3 weeks. The GRC decision must be in compliance with this EMP and provisions given in the EMP.
• If issue still unsettled, then grievance will be forwarded to GRC. • GRC will provide decision within 3 weeks, which should be in compliance with the EMP and provisions given in the EMP.	• If the grievance redress system does not satisfy the APs, then, the grievance can be submitted to the GM Projects (PMU), where decision will be made in a period of 2 weeks.
• In case, the grievance redressal system does not satisfy the APs, then they can pursue by submitting their case to the appropriate court of law.	• If still APs are not satisfied, they can pursue their case to appropriate Court of law.

6.3 Environmental Management and Monitoring Cost

174. The total cost of the environmental management of the proposed project is about **2,293,250** Pak. Rupees. This includes the cost of environmental implementation of mitigation measure. Cost estimates of mitigation and other environmental management measures are summarized in Table – 6.2.

Table 6.2: Cost Estimates for Environmental Management

Particulars	Details	Total Cost (PKR)
One dedicated Environmental Officer	1 person for 2 years (60,000/month)	1,440,000
Implementation of Mitigation Measures	Provision of PPEs (Safety Goggles, shoes, safety masks, eye shields, ear muffs, etc.) and first aid kits.	300,000
	Procurement of one noise level meter	35,000
	Arrangements for daily water sprinkling	250,000
	Plantation of trees	50,000
	Arrangements for careful collection and disposal of wastes, oils, lubricants etc.	150,000
Contingency	3% contingency	
Total		**2,293,250**

CHAPTER - 7: PUBLIC CONSULTATION

7.1 Approach to Public Consultation

175. The Public Consultation (PC) process with various stakeholders has been approached so as to involve public and other stakeholders from the earliest stages. Public consultation has taken place during the planning and design and viewpoints of the stakeholders have been taken into account and their concerns and suggestions for possible improvements have been included where appropriate. Much of the PC process to date has revolved around concerns for the mitigation of construction impacts and the possible side effects from the proximity of high voltage power lines.

176. There is also a requirement for ongoing consultation for preparation of Land Acquisition and Resettlement Plan (LARP), which is being documented separately. It is expected that this process will continue through all the stages of the subproject in order to accommodate stakeholders' aspirations and to orient the stakeholders positively towards the project implementation and where possible to harness cooperation over access issues in order to facilitate timely completion.

7.2 Public Consultation Process

177. The public consultation process has commenced in the initial feasibility stages (prior to construction) in order to disclose the project information to the stakeholders and record feedback regarding the proposed sub project and preferences. The stakeholders involved in the process were the population likely to be impacted along the route of the proposed power lines; the village leaders and relevant departments.

178. Prior to the implementation of the sub project, the consultations have been carried out to support this IEE and recorded. The focus of attention has been the population near the proposed grid station and transmission line that may be affected by the subproject. The level of engagement varied from the stakeholder to stakeholder with some registering no major comment but it is noted that none registered any outright opposition to subproject

179. Public consultation (PC) about the proposed project was held at the project site on August 6, 2014, with the assistance of notables from adjacent villages namely Jabba Khan, Bhakti, Shah Kot, Kotli Kalan, Kotli Khurd an Saleh Khana. In all 27 notables participated whose names are given in section 7.4.

180. The women of the villages were consulted through elderly persons from each village because the Khattak tribe living in the area around the proposed project is tribalistic and highly conservative. The women declined to get their names in the list. However their opinion was included in the overall public suggestions.

7.3 Results of Public Consultation

Generally people were found to be aware of the benefits of the establishment of the grid station. They had some personal quarries but on overall scale almost all were in full support of the project. Local communities however expressed that they would like to be part of continuous consultation process. Various concerns expressed by the local community have already been listed in Table 7.1.

181. Local staff also joined the public consultation session and assisted in answering the public questions. Important questions asked by the public and answers answered by the consultation team are as follows:

Table 7.1: Details of Public Consultation session

Sr. No.	Question	Answer
1	If you take away my land what shall I get in return?	You will get due compensation for your land. The rate shall be equal to average of last three years sale price for similar land.
2	Can we get land for land?	There is a procedure for that but due to paveity of land in the area; the preferred method is payment of land.
3	The land is a grazing are which shall be lost. Where shall we graze our animals?	This is a very small area of about 40 acres. Grazing lands (barren lands) are in abundance in the area. For this land you will get compensation.
4	We obtain fuel wood from trees and bushes growing in the area. All these trees and bushes shall be lost. What shall we do?	Compensatory fuel wood plantation shall be carried out through forestry for which project shall supply nursery and advice.
5	Shall there be reduction in load shedding when this grid station is built? (Question from women).	Obviously there shall be a positive effect on electricity supply. The construction of this grid station is a proof that electricity production at the source shall improve.
6	Shall more land be acquired after the GS is completed?	No. the land to be acquired now shall be adequate for the project.
7	The ground water is sweet. Will enough electricity be available for installation of tube wells and expand agriculture?	Hopefully so. When the ground water is pumped out it will not only help agriculture to expand but will also help livestock and dairy farming.
8	"Hakoomat" is notorious for not paying compensation in time. How about this project?	This time Insha Allah you will have a better experience.
9	We understand that a colony shall also be built in the project. Can we use school and dispensary built there in.	Yes your children can come to colony school and dispensary.
10	How will the effluent sewage water from colony be disposed?	A sump shall be constructed. In addition, the excess water shall be treated in a tank and supplied to agricultural fields.
11	A number of people living near the project steal electricity by putting hooks. Can you stop them?	We all shall try our best that the electricity is not stolen and all villages get full load.
12	Where the electricity shall be taken from GS?	There shall be two incoming and four outgoing lines totaling to 220kV. The electricity shall be generated in Ghazi Barotha Hydroelectric dam.
13	Will project support local schools?	The project may not be able help schools outside the project area. However educational facilities within the project shall be open to all.
14	Will project support local health system?	The project will rely on the medical facilities in general area. Any dispensary service available in project shall be open to public.
15	Will electricity be available to local people	Electricity shall not be available free or at

Sr. No.	Question	Answer
	free or at concessional rates?	concessional rates.

7.4 Records of Consultation

Table 7.2: Names of Local people consulted

Sr.No.	Name of the Person	Name of the Village
1	Shan Gul	Jabba Khan
2	Fareed Gul	Jabba Khan
3	Naek Muhammad Khattak	Jabba Khan
4	Mumtaz Ali	Jabba Khan
5	Dr. Tahir	Jabba Khan
6	Habib Khan	Bakhti
7	Hameed Khan	Bakhti
8	Umar Ali	Bakhti
9	Malik H.	Bakhti
10	Imandar	Shah Kot
11	Malik Shahzad Gul	Shah Kot
12	Dr. Dildar	Shah Kot
13	Zubair	Shah Kot
14	Jaan Malik	Shah Kot
15	Subhan Khan	Shah Kot
16	Ashar Iqbal	Kotli Kalan
17	Tariq Mehmood	Kotli Kalan
18	Ghani Shah	Kotli Kalan
19	Abdur Rahim	Kotli Kalan
20	Zahid Farooq	Kotli Khurd
21	Shehzad	Kotli Khurd
22	Tariq	Kotli Khurd
23	Inam	Kotli Khurd
24	Noor e Islam	Saleh Khana
25	Ilam Khan	Saleh Khana
26	Dr. Khan	Saleh Khana
27	Iqbal Shah	Saleh Khana

CHAPTER - 8: CONCLUSIONS

8.1 Findings and Recommendations

182. This study was carried out at the planning stage of the project. Primary and secondary data were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The report has provided a picture of all potential environmental impacts associated with the Project. It was found that either potential impacts due to the project are not negative or are minor in significance and can be mitigated with suitable mitigation measures.

183. There are some further considerations for the planning stages such as obtaining clearance for the project under the Pakistan Environmental Protection Act (1997) but environmental impacts from the power enhancements will mostly take place during the construction stage though these impacts can be mitigated. Impacts during construction phase will mainly be dust pollution, noise pollution, soil contamination, waste disposal, removal of flora, disturbance to fauna, wastewater generated by labour camps. In operational phase impacts such as soil contamination due to oil/ grease or sewage and waste generation from colony are anticipated which can be controlled by Good Housekeeping, proper drainage system and proper waste disposal plan.

184. It is recommended that plans such as Waste Disposal, Traffic Control, Health and Safety, Good Housekeeping, temporary drainage system for labour camps be made before the construction phase so that these can be implemented as soon as the construction of the project starts.

185. Baseline monitoring activities should be carried out during project detailed design stage to establish the baseline of parameters for checking during the construction stage. The monitoring schedule recommends monitoring on two occasions at the site location. The results should be integrated with the contract documentation to establish performance action thresholds, pollution limits and contingency plans for the contractor's performance.

186. During the commissioning phase noise monitoring should ensure that statutory requirements have been achieved. Monitoring activities during project operation will focus on periodic recording environmental performance and proposing remedial actions to address any unexpected impacts.

8.2 Summary and Conclusions

187. As a result of overall findings of this study it is concluded that there are no major impacts associated with this project. The minor impacts that are identified can be mitigated or managed. Hence Environmental Impact Assessment (EIA) for this project is not required.

188. The New 220KV Nowshera DGS is a feasible and sustainable option from the power transmission, engineering, environmental, and socioeconomic points of view. Implementation of the EMP is required and the environmental impacts associated with the subproject need to be properly mitigated, and the existing institutional arrangements are available.

189. This IEE, including the EMP, should be used as a basis for an environmental compliance program and be included as an Appendix to the contract. The EMP shall be reviewed at the detailed design stage. In addition, any subsequent conditions issued by PEPA as part of the environmental clearance should also be included in the environmental compliance program.

APPENDICES

Appendix – I: Environmental Management Plan

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
DESIGN STAGE						
1. **Social Impacts**	To ensure that the adverse impacts on crops and trees are mitigated according to the LARP provisions.	1. NTDC to select the route in a way that minimum impact on trees and crops occur. 2. Assessment of losses of tree and crops damages (if any) during construction stage 3. Preparation of LARP for the proposed project before commencement of construction activities. 4. All the payments / entitlements are paid according to the Entitlement Matrix, prepared according to the LARP. 5. All the impacts identified by the IEE are incorporated in to the project as well as the LARP and relevant entitlements included into the Entitlement Matrix.	Before the construction of the Grid Station, associated TL and all other structures, the APs should be given sufficient time and compensation to satisfy them.	Affected Persons will be compensated by NTDC through its land acquisition officers.	NTDC	MC and External Monitors
2. **Hydrological Impacts**	To minimize hydrological and drainage impacts during constructions.	1. Hydrological flow in areas where it is sensitive, such as water courses or bridges and culverts. 2. Adequate culverts should be provided where any water channel is needed to be crossed for construction activities.	Before the commencement of construction activities/during designing stage.	Considered locations are as in the design report.	NTDC with the Design Consultant	NTDC
3. **Noise Barriers**	Ensure cumulative noise impacts are acceptable in operational phase.	1. Conduct detailed acoustic assessment for all residential buildings, schools, (other sensitive structures) within 30m of RoW. 2. If noise at sensitive receiver exceeds the	During detailed design stage, and include in the contract.	Noise sensitive locations to be identified after detailed design.	NTDC with the design consultant	NTDC and Construction Supervision Consultant

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		permissible limit, the construction activities should be monitored and controlled.				(CSC if any)
4. Waste Disposal	Ensure adequate disposal options for all waste including unsuitable soils, scrap metal.	1. Identify sufficient locations for disposal of transformer oils, unsuitable soils, scrap metal "cradle to grave". 2. Include in contracts for unit rates for re-measurement for disposal. 3. Designate disposal sites in the contract and cost unit disposal rates accordingly. 4. Prepare a PCB spill handling procedure and equip such teams with special clothing, steel containers and solvents.	1. During designing stage no later than pre-qualification or tender negotiations. 2. Include in the contract.	Locations approved by EPA and NTDC and waste disposal local authorities.	EPA and NTDC with the design consultant	NTDC and CSC
5. Temporary Drainage and Erosion Control	Include mitigation in Preliminary and detailed designs for erosion control and temporary drainage.	1. Identify locations where drainage or irrigation crossing RoW may be affected by works. 2. Include in protection works contract as a payment milestone(s).	During designing stage no later than pre-qualification or tender negotiations.	Locations based on drainage or irrigation crossing RoW.	NTDC and Design Consultant	NTDC and CSC
CONSTRUCTION STAGE						
1. Hydrology and Drainage Aspects	To ensure the proper implementation of any requirements mentioned in EPA conditions of approval letter in relation to Hydrology of the project.	1. Consideration of weather conditions when particular construction activities are undertaken. 2. Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal. 3. Use of landscaping as an integrated component of construction activity as an erosion control measure.	1. Prepare a thorough plan to be approved by SC one month prior to a commencement of construction. 2. Proper timetable prepared in	1. Locations of each construction activity to be listed by the engineer. 2. Special locations are identified along the RoW by the contractor to minimize	NTDC to actively supervise and enforce	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		4. Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.	consideration with the climatic conditions of each area, the different construction activities mentioned here to be guided.	disturbance. 3. A list of locations of irrigation channels/ drains to be compiled by the contractor.		
2. Orientation for Contractors, and Workers	To ensure that the CSC, contractor and workers understand and have the capacity to ensure the environmental requirements and implementation of mitigation measures.	1. NTDC to engage environmental specialist in the PMC to monitor and progress all environmental statutory and recommended obligations. 2. Conduct special briefing for managers and / or on-site training for the contractors and workers on the environmental requirement of the project. Record attendance and achievement test. 3. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. 4. Continuous progress review and refresher sessions to be followed.	Induction of all relevant staff required for implementation of EMP. At early stages of construction for all construction employees as far as reasonably practicable.	All staff members in all categories. Monthly induction and six month refresher course as necessary until contractor complies.	Contractor and the CSC and record details	NTDC & CSC to observe and record success
3. Water Quality	To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are	1. Compile temporary drainage management plan one month before commencement of works. 2. Proper installation of Temporary Drainage	Prior to construction, 50 m from water bodies. Timing will depend	Relevant locations to be determined in the detailed project design	1. Contractor CSC to enforce	NTDC review results

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
	managed effectively. Ensure adverse impacts on water quality caused by construction activities are minimized.	(TD) and Erosion Control (EC) before works within 50 m of water bodies. 3. Proper construction of TD and EC measures, maintenance and management including training of operators and other workers to avoid pollution of water bodies by the considerate operation of construction machinery and equipment. 4. Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies. 5. Proper disposal of solid waste from construction activities and labor camps. 6. Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies. 7. Topsoil stripped material shall not be stored where natural drainage will be disrupted. 8. Borrow sites (if required) should not be close to sources of drinking water.	on the construction timetable.		2. Contractor has to check water quality and report to NTDC. 3. CSC supervises monitoring activities.	
4. Air Quality	To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.	1. Control all dusty materials at source. 2. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. (Relevant regulations are in the Motor vehicles fitness rules and Highway Act). 3. Stockpiled soil and sand shall be slightly	All construction sites within 100 m of sensitive receivers.	A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.	Contractor should maintain acceptable standard CSC to supervise	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		wetted before loading, particularly in windy conditions. 4. Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions. 5. Vehicles transporting soil, sand and other construction materials shall be covered. 6. Limitations to speeds of such vehicles necessary. Transport through densely populated area should be avoided. 7. To plan to minimize the dust within the vicinity of orchards and fruit farms. 8. Spraying of bare areas with water. 9. Concrete plants to be controlled with statutory requirements should not be close to sensitive receptors.			activities.	
5. Noise / Ground Vibration	To minimize noise level increases and ground vibrations during construction operations.	1. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations and with effective silencing apparatus to minimize noise. 2. As a rule, the operation of heavy equipment shall be conducted in daylight hours. 3. Hammer- type percussive pile driving operations shall be not be allowed at night time. 4. Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to	Maximum allowable noise levels should be below 80 dB (A) L_{EQ} at the boundary of the construction site.	During construction stage, the most sensitive locations need special attention.	Contractor should maintain the acceptable standards CSC to supervise relevant activities.	NTDC / CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		minimize noise. 5. Well-maintained haulage trucks will be used with speed controls. 6. Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods.				
6. Soil Erosion/ Surface Run-off	Prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. To minimize soil erosion due to the construction activities of towers, stringing of conductors and creation of access tracks for project vehicles.	1. Schedule works in sensitive areas (e.g. rivers) for dry season 2. Temporary erosion control plan one month before commencement of works. 3. Proper installation of TD and EC before works within 50m of water bodies. 4. Meaningful water quality monitoring up and downstream at any tower site within a river or stream during construction. Rapid reporting and feedback to CSC. 5. Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible. 6. Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage. 7. Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes.	Because the area can be subject to un seasonal heavy rain plan before and during construction (cut and fill, land reclamation etc.) while considering the climatic conditions.	1. Locations based on history of flooding problems. 2. A list of sensitive areas during construction to be prepared by the detail design consultant in consideration with the cut and fill, land reclamation, borrow areas etc. 3. Locations of all culverts, irrigation channels, road and highway.	Contractor and CSC	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		8. In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. 9. Measures shall be taken to prevent pounding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours. 10. Contractor should arrange to adopt suitable measures to minimize soil erosion during the construction period. Contractor should consult concerned authorities in the area before deciding mitigation measures. 11. Clearing of green surface cover to be minimized during site preparation. 12. Replanting trees to be done before the site is vacated and handed back to NTDC with appropriate trees (other vegetation cover as appropriate) to ensure interception of rainwater and the deceleration of surface run-off.				
7. **Exploitation Handling, Transportation and Storage of Construction Materials**	To minimize contamination of the surroundings (Due to Implementation of works, concrete and crushing plants).	1. In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken in line with any EPA conditions/recommendations in approval. 2. Conditions that apply for selecting sites for material exploitation.	Update monthly	1. List of borrow areas to be prepared one month prior to construction. 2. List of routes of transport of construction material is to be prepared for the contract and	Contractor and CSC to agree format of reporting	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		3. Conditions that apply to timing and use of roads for material transport. 4. Conditions that apply for maintenance of vehicles used in material transport or construction. 5. Conditions that apply for selection of sites for material storage. 6. Conditions that apply for aggregate production. 7. Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.		agreed one month prior to construction. 3. Report of vehicle conditions is available. 4. Map of locations of storage is prepared by the contractor. 5. Environmental accident checklist and a list of banned substances are included in the contractor's manual.		
8. Construction Waste Disposal	Minimize the impacts from the disposal of construction waste.	1. Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works. 2. Estimating the amounts and types of construction waste to be generated by the project. 3. Investigating whether the waste can be reused in the project or by other interested parties. 4. Identifying potential safe disposal sites close to the project or those designated sites in the contract. 5. Investigating the environmental conditions of the disposal sites and recommendation	Update monthly	A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement	Contractor and CSC should supervise and take action to complete contractor's relevant activities according to EIA/IEE/ EMP requirement & environmental	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		of most suitable and safest sites. 6. Piling up of loose material should be done in segregated areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc. 7. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. 8. Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA. 9. Machinery should be properly maintained to minimize oil spill during the construction. 10. Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice			standards.	
9. Work Camp Operation and Location	To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area.	1. Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes. 2. Cutting of trees shall be avoided and removal of vegetation shall be minimized. 3. Water and sanitary facilities (at least pit	Update once a month	Location Map is prepared by the Contractor.	Contractor	NTDC/ MC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites. 4. Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed off to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission 5. The Contractor shall organize and maintain a waste separation, collection and transport system. 6. The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. 7. At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. 8. Exposed areas shall be planted with suitable vegetation. 9. NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project				

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		conditions.				
10. Loss of Trees and Vegetation Cover of the Areas for Towers and Temporary Work-space	To avoid several negative impacts due to removing of landmark, sentinel and specimen trees as well as green vegetation and surface cover.	1. Land holders will be paid compensation for their standing trees in accordance with prevailing market rates (LARP). The land holders will be allowed to salvage the wood of the affected trees. They will also be encouraged to plant suitable new trees in lieu of tree removed. 2. The contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes. 3. Clearing of green surface cover for construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized. 4. Landscaping and road verges to be re-installed on completion. 5. Compensatory planting of trees/shrubs/ornamental plants (at a rate of 3:1) to contribute to the aesthetic value of the area and compensate for the lost capability of the area to absorb carbon dioxide in line with best international practice. 6. At completion all debris and waste shall be removed. 7. All temporary structures, including office buildings, shelters and toilets shall be	Rerouting and site identification during design stage and other matters during construction of relevant activities	A list of Locations with a Map to be compiled by the design consultant during detailed design and CSC to update as necessary.	Design consultant, Contractor and CSC	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
		removed.				
11. Safety Precautions for the Workers	To ensure safety of workers	1. Providing adequate warning signs. 2. Providing workers with skull guard or hard hat. 3. Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. 4. Establish all relevant safety measures as required by law and good engineering practices.	Prior to commencement and during construction	Location to be identified by the CSC with contractor.	Contractor and CSC	NTDC/ CSC
12. Traffic Condition	Minimize disturbance of vehicular traffic and pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during works damage/maintenance problems for roads and bridges used by the haulage trucks, dust nuisance to school and hospitals.	1. Submit temporary haul and access routes plan one month prior to start of works. 2. Formulate and implementation of a plan of alternate routes for heavy vehicles. 3. Vicinity of schools and hospitals to be considered. 4. Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered. 5. Provision of culverts on water channels and drains. 6. Widening/upgrading of access paths/roads	Prior to and throughout the construction.	The most important locations to be identified and listed. Relevant plans of the Contractor on traffic arrangements are available.	Contractor and Engineer	NTDC/CSC
13. Social Impacts	To ensure minimum impacts from construction	1. Potential for spread of vector borne and communicable diseases from labor camps	Complaints of APs to be solved as	The whole project area	Contractor and the CSC	NTDC/

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
	labor force. To ensure minimum impacts on public health. To ensure minimum effects of indirect impacts of constructions to the people who are living close to the boundaries of ROW; Dust, Noise, Vibration and Rock blasting effects etc. To minimize access problems for local population during construction.	shall be avoided (worker awareness orientation and appropriate sanitation should be maintained). 2. Claims/complaints of the people on construction nuisance/damages close to ROW to be considered and responded to promptly by the Contractor. 3. Contractor should organize temporary means of access and make alternative arrangements to avoid local community impacts and to avoid such short-term negative impacts.	soon as possible. Necessary evacuations to be done as when necessary if construction impacts are of significant duration and close to APs.			CSC
14. Institutional Strengthening and Capacity Building	To ensure that NTDC officials are trained to understand and to appreciate EMP.	Capacity building activities were taken by Environmental Officer in Tranche 1 and 2. Environmental and Social Impact Cell (ESIC) was setup with in NTDC under GM (Projects) in Tranche 1. Trainings and provisions of proper monitoring facilities to ECIS are recommended.	Initiate preconstruction and continue beyond project completion	Awareness training for all management and senior staff in NTDC at senior engineer and above in PMU and related units.	NTDC	NTDC & ADB
OPERATIONAL STAGE						
1. Air Quality		No Impacts			NTDC	NTDC
2. Noise		No significant Impacts by Tranche-IV subprojects.		All subprojects of tranche-IV.	NTDC	NTDC
3. Compensatory	Maintain survival of trees	Employ landscaping contractor to monitor,		All subprojects of	NTDC	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Resp imp MM	Resp mon MM
Tree Planting	planted	waterfeed and replace dead specimens as necessary.		tranche-IV.		
4. Landslides and soil erosion	Avoid landslips and loss of productive land	No significant Impacts.		All subprojects of tranche-IV.	NTDC	NTDC
5. Water Quality	Avoid disruption to water bodies.	No significant Impacts from this subproject.		All subprojects of tranche-IV.	NTDC	NTDC
6. Crops and Vegetation	Monitor impacts from maintaining tree clearance	Track growth of large trees under the conductors.		All subprojects of tranche-IV.	NTDC	NTDC
7. Social safety Impacts	Ensure no encroachments/ construction in the project area. No violation of clearances spaces.	Necessary signboards with limits of height clearances to be placed properly. Identify and prevent any illegal encroachments in or immediate surroundings of the project area		All subprojects of tranche-IV.	NTDC	NTDC

Appendix – II: Environmental Monitoring Plan

FOR GRID STATION

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Resp PI supervision
Design & Pre-construction Phase						
1. Review of Mitigation Measures	Mitigations Matrix reviewed	During detailed design (later monthly by Contractor to cover any unidentified impacts)	By completion of detailed design.	All project alignment	Contractor	NTDC, ESIC cell / ADB*
2. Social Impacts	Inventory of losses, Property acquisition, and compensation completed to RP requirements.	*Completed prior to commencement of construction*	Before removal of houses and structures.	APs according to RP & LAFC.	NTDC's Cell	NTDC, ESIC cell /ADB*
3. Project disclosure	Design changes notified	During detailed design by Contractor to cover any access roads and alignment changes, additional Villages.	Completion of detailed design.	All project alignment.	Contractor	NTDC, ESIC cell / ADB*
4. Environmentally Responsible Procurement. (ERP)	Contract follows ADB Guidelines on ERP. Performance bond. Deposited Contractual clauses include implementation of environmental mitigation measures tied to a *performance bond*.	Once, before Contract is signed.	Before Contract is signed.	Method Statements include resources for mitigation measures.	NTDC, ESIC cell	NTDC, ESIC cell / ADB*
5. Waste disposal	Disposal options for all waste transformer oil, residually contaminated soils, scrap metal agreed with NTDC'S and local authority.	Monthly to identify sufficient locations for, storage and reuse of transformers and recycling of breaker oils and	1.Prior to detailed design stage no later than pre-qualification or tender	Locations approved by local waste disposal authorities.	NTDC, ESIC cell consultant.	NTDC, ESIC cell / ADB*

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Resp PI supervision
		disposal of transformer oil, residually contaminated soils and scrap metal "cradle to grave". 2. Include in contracts for unit rates for re-measurement for disposal. 3. After agreement with local authority, designate disposal sites in the contract and cost unit disposal rates accordingly.	negotiations 2. Include in contract.			
6. Noise and air quality mitigation in design.	Changes in the design of construction processes as approved by the Contractors and appointed engineers	During detailed design by Contractor.	Completion of detailed design.	As defined in Mitigation Plans.	NTDC, ESIC cell	NTDC, ESIC cell / ADB*
7. Hydrological Impacts	Temporary Drainage in Mitigation Measures	During detailed design by Contractor and monthly to cover any unidentified impacts	One month before commencement of construction	Considered locations to be as identified in the Detailed Drainage Report.	Contractor	NTDC, ESIC cell / ADB*
8. Temporary drainage and erosion control	Erosion Control and Temporary Drainage completed.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	All stream and river crossings and where slopes indicate erosion will be a problem.	Contractor.	NTDC, ESIC cell / ADB*.
9. Planning construction	Use of land agreed with surrounding residents & Villages.	During detailed design updated by Contractor	One month before construction	Locations agreed NTDC's cell in	Contractor/ NTDC Cell	NTDC, ESIC cell / ADB*.

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Resp PI supervision
camps		monthly to cover any unidentified impacts.	commences.	consultation with community and the Contractor.	facilitate.	
10.Traffic Condition	Temporary Pedestrian and Traffic Management Plan agreed.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	Locations agreed with NTDC'S cell in consultation with community and the Contractor.	Contractor	NTDC, ESIC cell / ADB*.
11. Institutional strengthening and capacity building	1. Strengthening plan agreed for NTDC's cell. 2. International environment specialist (IES) 3. Increase staffing of NTDC's Cell. 4. Train NTDC's Cell officials.	1. Once, 2. Once 3. Ongoing 4. Ongoing	1. As soon as practicable 2, 3, 4. No later than one month before Contract award.	Throughout the project	NTDC'S Project Cell.	NTDC, ESIC cell / ADB*
Construction Phase						
1.Orientation for Contractor, and Workers	1. Contractor agreed to provide training to professional staff and workers. 2. Special briefing and training for Contractor completed. 3. Periodic progress review sessions.	1. Once 2. Ongoing 3. Ongoing	1. Before contract is signed 2. Before construction areas are opened up 3. Every six months	All BOT staff members in all categories. monthly induction and six month refresher course	Contractor with IES assistance and record details.	NTDC to observe and record success
2. Plans to control environmental impacts	1. Drainage Management plan 2. Temp. Pedestrian & Traffic Management plan, 3. Erosion Control & Temp. Drainage plan 4. Materials Management plan,	Deliverable in final form to NTDC's cell one month before construction commences for any given stretch.	One month before construction commences.	All of NTDC'S alignment.	Contractor	NTDC, ESIC cell / ADB*.

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Resp PI supervision
	5. Waste Management plan; 6. Noise and Dust Control plan, 7. Safety Plan 8. Agreed schedule of costs for environmental mitigation.{N.B. Forest Clearance and Compensatory Planting plan is prepared by NTDC's cell}					
3. Water quality	Meaningful water quality monitoring up and downstream during construction within 100m of rivers. Rapid reporting and feedback by NTDC's	Once (line item when opening up construction near water bodies).	During detailed design by Contractor and update to cover any unidentified impacts.	Locations to be provided with the detailed designs including all bridges during construction within 100m of rivers	Independent experienced laboratory.	NTDC, ESIC cell
4. Water Resources	1. Availability of water acceptable to community. No complaints. 2. Guidelines established to minimize the water wastage during construction operations and at worker camps.	1. Monthly 2. Monthly	Prior to submission of progress reports.	All local water supply resources and rivers.	Contractor	NTDC, ESIC cell
5. Spoil disposal and construction waste disposal	1. Use of land agreed with surrounding residents & Villages. 2. Waste Management Plan implemented. 3 No open burning	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	All NTDC'S alignment.	Contractor	NTDC, ESIC cell
6. Noise	Noise mitigation measures implemented in line with guidelines for noise reduction from ISO/TR11688-1:1995(E)	Monthly (line item when opening up construction).	Maximum allowable noise levels are 45dB(A)L_{EQ}.	All NTDC's alignment.	Contractor should maintain the accepted	NTDC, ESIC cell.

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Resp PI supervision
					standards	
7. Air quality	Noise and dust control plan implemented.	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	All NTDC's alignment.	Contractor	NTDC, ESIC cell
8. Soil Contamination	Contractors workforce to instructed and train handling of chemicals	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	All NTDC's alignment.	Contractor	NTDC, ESIC cell
9. Work Camp Location and Operation	1. Use of land agreed with surrounding residents & Villages. 2. Waste Management Plan implemented. 3 No open burning	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	All NTDC's alignment.	Contractor	NTDC, ESIC cell
10. Safety Precautions for Workers	Safety Plan submitted	Once (update monthly as necessary)	One month before construction and update quarterly.	All NTDC's alignment.	Contractor.	*NTDC* (ESIC cell to actively supervise and enforce.
11. Social Impacts	1. Local labour is used and workforce 2. Local educated people for office work. 3. Complaints on construction nuisance damages close to ROW are responded to promptly by the Contractor. 4. Quarterly meetings with local VILLAGE for liaison purposes to monitor complaints.	Monthly (line item when opening up construction).	During construction. Update monthly.	All NTDC's alignment.	Contractor	NTDC, ESIC cell
12. Enhancements	Contractor has included for some enhancements in detailed designs Including planting of trees in addition to	Once (update monthly as necessary)	One month before construction and update quarterly.	All NTDC's alignment.	Contractor.	*NTDC* Cell to actively supervise and enforce.

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timing to check PI	Locations to implement PI	Responsible to implement PI	Resp PI supervision
	bioengineering such as in median					
Operational Phase						
1. Air Quality	*1. Roadworthiness of vehicles on* NTDC's *2. Monitor NO_2 and PM_{10} as indicators.*	*1. Roadworthiness of vehicles on* NTDC's *Daily during operations* *2. Yearly intervals for 3 years after opening for reassurance.*	*During operation.*	5 locations on NTDC'S alignment nearest settlements.	Contractor	NTDC / and ESIC Cell
2. Vegetation	1. Follow up on Tree Clearance and Compensatory Planting Plan. 2. Records on survival of planted trees. 3. The compensatory planting maintained 4. Audited report by ESIC cell for on-site and off-site compensatory planting.	1) Quarterly 2) Quarterly 3) Quarterly 4) Quarterly	1) Throughout project 2) Each of three years after initial planting. 3) Continuous for three years after project completion 4) For four years after initial clearance of the forest.	All NTDC'S alignment.	Contractor	NTDC

FOR TRANSMISSION LINE

Environmental concern	Performance indicator	Frequency to monitor	Timing to check	Locations to implement	Responsible to implement	Resp supervision
Construction Phase for TL						
1. Encroachment and Physical Disfiguration	Landscape Conditions, Baseline Environment	Once (update monthly as necessary)	One Month after Construction Work	All NTDC'S alignment	Contractor	NTDC, ESIC cell
2. Soil Erosion	Soil Compression, Land Clearing, Vegetation Removal	Once (update monthly as necessary)	Prior to construction. Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell
3. Soil Contamination	Fuels Spillage, Chemicals Containers	Monthly	During Construction	All NTDC'S alignment	Contractor	NTDC, ESIC cell
4. Ecological Resources	Land Clearing, Habitat destruction	Monthly	Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell
5. Loss of Barani Crops	Number of People affected due to unavailability of Opportunistic Agriculture	Once (update monthly as necessary)	During Construction	All NTDC'S alignment	Contractor	NTDC, ESIC cell
6. Local Community Work Force	Disturbance due to Stringing, Good engineering practices adopted	Once (update monthly as necessary)	Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell
7. Safety Hazards	Safety Precautions as per ILO	Monthly	Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell
Operational Phase for TL						

Environmental concern	Performance indicator	Frequency to monitor	Timing to check	Locations to implement	Responsible to implement	Resp supervision
1. Electric Current	Earthing of the Towers, Safety Plan by the contractor to be followed	Monthly	During Operation	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
2. Breaking of Conductors	Frequency of Conductors Tripping, Complaints reported	Quarterly	Throughout the Project	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
3. Towers Collapse	Soil Geology, Climatic Conditions, Records on displacement (if any)	Six Monthly	During Implementation Phase	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
4. Avifauna Movement	Reported death of Birds, Audit Report by the ESIC cell	Quarterly	After Transmission Line is erected	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
5. Safety	Security Plan, Good Engineering Practices, Complaints on the Register	Quarterly	During Operational Phase	All NTDC'S alignment	Contractor	NTDC, ESIC Cell

Note: *LAFC = Land Acquisition Compensation Fixation Committee. RAP, SIA and other engineering considerations may change, EIA=environmental impact Assessment. EPA= Environmental Protection Agency. ADB * = ADB checks that processes have been completed and signed off by* NTDC's *before moving to construction stage. MoFSC = Ministry of Forest and Soil Conservation. ESIC = Environmental and Social Impact Cell (NTDC)*

APPENDIX – III: PHOTOLOG

Photo N-1: General view of the proposed project site from road leading to Cherat Cement Factory

Photo N-2: At a number of places the water erosion during winter rains has built erosion pavement. The stones covering the soil are mostly sandstones broken off from sandstones and quartziterocks underneath.

Photo N-3: At places the top soil has totally been eroded away and no vegetation is visible on surface. At a distance towards the west of the area, a 220kV transmission line connecting Ghazi Barotha hydroelectricity with existing GS at Nowshera.

Photo N-4: Prevalent current used of the land in project area is grazing. Sheeps are preferred animals for the range land.

Photo N-5: Survey team with some local staff and some members of public who joined public consultation session.

Photo N-6: Public consultation