Environmental and Social Impact Assessment (ESIA) of Mazar Independent Power Project (Mazar IPP) (50 MW)

Client

International Finance Corporation
WORLD BANK GROUP

&

غضنفر گروپ
GHAZANFAR GROUP

Public Disclosure Authorized

Contractor

GreenTech
CONSTRUCTION & ENGINEERING

November 2018

Mazar Independent Power Producer (IPP)

Project ID:	
Document title:	ESIA Report of Mazar IPP
Revision:	03
Date:	Novembrt 2018
Client:	IFC and GHAZANFAR GROUP LLC
Project Manager:	Sayed Asghar Mosavi
Project Technical Advisor	Ethan Myer
Author:	Green Tech Construction and Engineering Company

GreenTech
Green Tech Construction and Engineering Company

Email: info@greentech.af
Website: www.greentech.af
Address: Dehbori, Saray-e-Ghazni, Kabul, Afghanistan.

Abbreviation

°C	Degrees Centigrade
ANDS	Afghanistan National Development Strategy
ARAZI	Afghanistan Land Authority
Ca	Calcium
CCCT	Combined Cycle Combustion Turbine
CHP	combined heat and power
CLOs	Community Liaison Officer(s)
CNG	Compressed Natural Gas
CO	Carbon Monoxide
COx	Oxides of Carbon
Cr	Chromium
Cu	Copper
DABS	Da Afghanistan Breshna Sherkat
dB	Decibel
DNA	Deoxyribonucleic Acid
DO	Dissolved Oxygen
EA	Environmental Assessment
EC	Electrical Conductivity
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
Fe	Iron
GG	Ghazanfar Group
GHGs	greenhouse gases
GIIP	Good International Industry Practice
GIRoA	Government of the Islamic Republic of Afghanistan
GRC	Grievance Redress Committee
H&S	Health and Safety
H2S	hydrogen sulfide
HHV	Higher Heating Value
HIV	Human Immunodeficiency Virus
HV	high voltage
Hz	Hertz
ICE	Inter-Ministerial Commission of Energy
IFC	International Finance Corporation
IPP	independent power producer
km	Kilometer
LEL	Lower Explosive Limit
m	Meter

m/s	Meter per Second
MAIL	Ministry of Agriculture, Irrigation and Livestock
MCM	Million Cube Meters
mg/l	milligram per Litre
mg/m3	Milligram per Meter Cube
ml	Milliliter
mm	Millimeter
MoEW	Ministry of Energy and Water
MoMP	Ministry of Mines and Petroleum
mph	mile per hour
MW	Megawatts
NEPA	National Environmental Protection Agency
NEPS	North East Power System
NFPP	Northern Fertilizer and Power Plant
NOx	Nitrogen Oxides
O & M	Operations and Maintenance
O3	ozone
OHS	Occupational health and safety
OP	Operational Policy
OSHA	Occupational Safety and Health Administration
PAHs	poly aromatic hydrocarbons
PM	particulate matter
PPE	Personal Protective Equipment
PPM	Parts per Million
PS	Performance Standards
RAMP	Risk Assessment Management Plan
RICE	Reciprocating Internal Combustion Engine
ROW	Right of Way
SCCT	Simple Cycle Combustion Turbine
SDS	Safety Data Sheets
SEP	Stakeholder Engagement Plan
SEPS	South East Power System
SOx	Oxides of Sulphur
SPCCP	Spill Prevention, Control and Countermeasure Plan
ST	Steam Turbine
TA	Traffic Assessment
TCMP	Traffic Control Management Plan
TCMP	Traffic Control Management Plan
TSS	Total Suspended Solids
UN	United Nations
USD	United State Dollar
VOC	volatile organic compounds
WB	World Bank
WCS	Wildlife Conservation Society
WHO	World Health Organization
WTN	Waste Transfer Note

Zn	Zinc
µg/l	Micro Gram per Liter

PART I

Executive Summary – Non-Technical Summary

Contents

Figures

Introduction

Based on Afghanistan's average annual growth rate in gross electricity demand country-wide, the importance of developing domestic energy resources is ever increasing. The proposed project represents such an opportunity, and would be one of the first privately financed gas fired power plants in the country. The 50 MW Mazar Independent Power Producer Project (the "Project" or "Mazar IPP") is proposed as a greenfield development located near Mazar-e Sharif in Afghanistan's northern Balkh Province that would primarily consist of a gas fired power plant, a gas supply infrastructure, electrical infrastructure, switchyard, gas connections points and electrical connection.

The Project would utilize natural gas to be supplied by Afghanistan's Ministry of Mines and Petroleum - Afghan Gas Enterprise from existing gas fields located 100 km west of the Project site near Sheberghan in Jowzjan Province, Afghanistan. The Project would generate electricity that would be dispatched to Da Afghanistan Breshna Sherkat, the Afghan national utility entity, under a Power Purchase Agreement over 20 years. The purpose of this Environmental and Social Impact Assessment (ESIA) is to assess the environmental and social risks and recommend whether these risks can be effectively mitigated to acceptable levels.

Policy, Legal and Administrative Framework

Planning of the Mazar IPP is being conducted with cooperation and collaboration from the Afghanistan National Environmental Protection Agency (NEPA). NEPA is an independent agency that was created under the responsibility of the President's Office in May 2005 in order to legitimize the role of environmental management within the Government of the Islamic Republic of Afghanistan (GIRoA). Therefore, this ESIA is reflective of the ESIA laws and policies of NEPA as well as the directives and regulations of other governing line ministries and agencies, and is aligned with the NEPA policy and guidelines for environmental and social impact assessment. Three national-level documents have been promulgated by the GIRoA with regard to environmental and social impact assessment:

- National Environmental Impact Assessment Policy, November 2007;
- Environmental Impact Assessment Regulations (Official Gazette No. 939, Mar. 10, 2008); and,

- Administrative Guidelines for the Preparation of Environmental Impact Assessments (June 2008).

This ESIA has been generated in compliance with these directives, all other relevant national laws, and, through direct cooperation and communication with NEPA authorities.

This ESIA also considers the policies, guidelines and standards of the IFC Performance Standards on Environmental and Social Sustainability (2012) and World Bank Performance Standards for Projects Supported by the Private Sector ("WB Performance Standards") for application to Bank support for projects (or components thereof) that are designed, owned, constructed and/or operated by a Private Entity, specifically, the World Bank Group Performance Standards for Private Sector Activities (OP 4.03). According to the terms of reference for this ESIA, the applicable IFC/World Bank Group Performance Standards and relevant parts of the IFC Environmental, Health, and Safety (EHS) Guidelines, are incorporated into the Environmental and Social Management Plan (ESMP).

Project Description

The Mazar IPP is an independent power producer scheme wherein the IPP is the Afghan Power Plant Company ("APPC"), a subsidiary of the Ghazanfar Group, a private Afghan enterprise with operations across Afghanistan, Central Asia and the Middle East and headquarters in Mazar-e Sharif, Afghanistan. On June 6, 2018 a formal lease agreement was executed between the Afghan Power Plant Company (lessee) and the GoIRA Ministry of Energy and Water (lessor) for the site property containing 200,000 m^2 (Annex 10). The agreement indicates that the lessor, being the true and lawful owner of the Project Site with full right, power and authority to enter into the lease agreement has agreed to lease and grant rights of way, easements and way-leaves with all rights and privileges, and to grant to the lessee all licenses, benefits and privileges to the property. The lease was executed by ARAZI, the national land authority, under a renewable 25 year lease. Site selection was based on regional and national government energy planning that considers proximity to domestic natural gas reserves, current and future foreign Power Purchase Agreements and high voltage (HV) electricity transmission system assets (Figure 1). In addition, the Afghan Power Plant Company also retains an Electricity Operation License duly issued by the

Ministry of Energy and Water and the Central Business Registry, dated July 10, 2018 (Annex 10).

The Project site is located in Dehdadi District, Balkh Province in northern Afghanistan (36°37'56.67''N 66°56'42.74''E), situated approximately 17 km southwest of the provincial capital Mazar-e Sharif and 15 km southeast of the town of Balkh at an elevation of 432 meters (Figure 2). The Project is one part of the larger effort towards development of an interconnected national transmission grid that utilizes available national energy resources and is synchronized with key import transmission lines to more effectively serve the population and domestic development goals.

Several projects are underway on the upstream and downstream side of the Project that will secure consistent gas supply and electricity evacuation for the Mazar IPP. The Mazar IPP will be integrated with these ongoing projects being developed by the public sector. The upstream and downstream projects are being directed by the MoMP/Afghan Gas Enterprise and DABS, with environmental and social performance and management under the jurisdiction of the Afghanistan National Environmental Protection Agency. The work being conducted on gas supply wells and gas processing plants in Sheberghan, gas transmission pipelines, electricity transmission lines and substations are occurring independently of the Mazar IPP with a view on the expansion and development of the nation’s energy infrastructure.

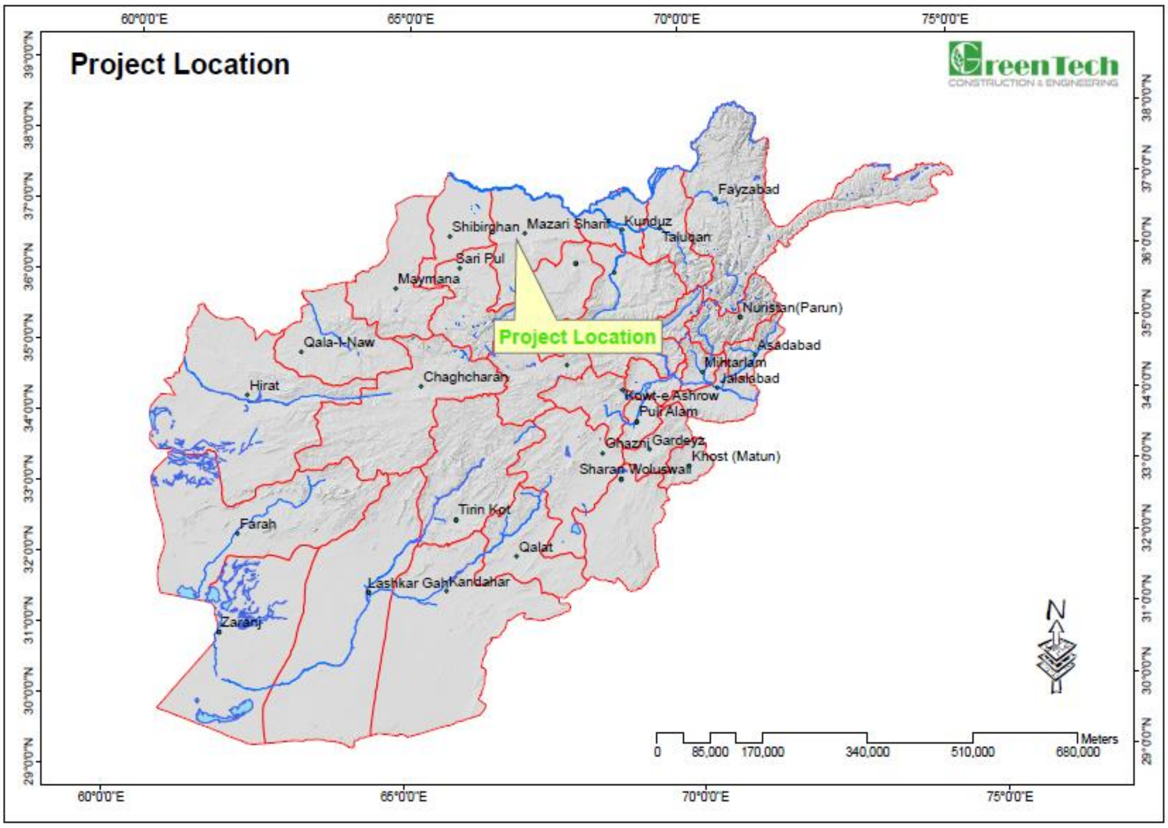


Figure 1. Project Location.

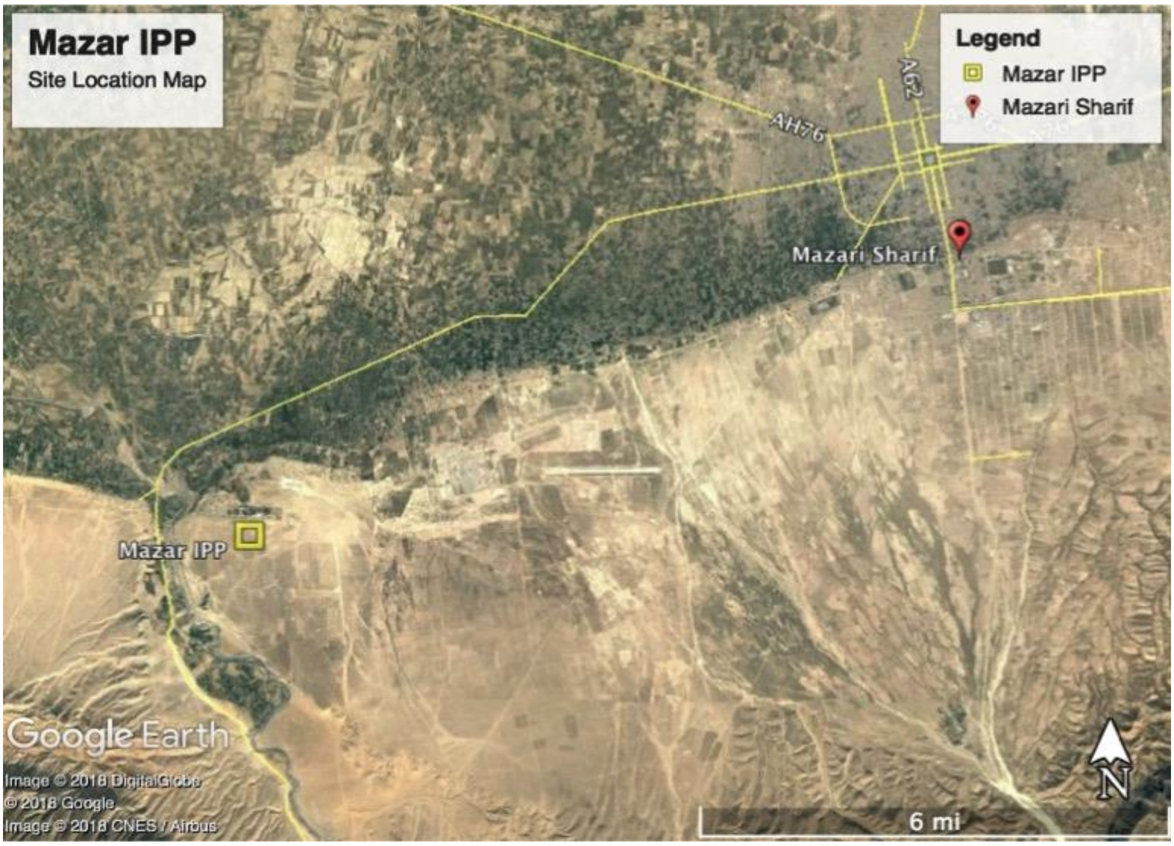


Figure 2. Site Location.

Environmental and Social Condition

The environmental baseline of the proposed Project and its surroundings has been established as part of this ESIA through consultations with relevant stakeholders, a desktop review of available literature, limited environmental testing and analysis, and site walkovers.

Geography and Climate. The geographical context for the project is northern Afghanistan, specifically Dehdadi District of Balkh Province, located within sight (roughly 5 km) of the northern foothills of the Hindu Kush Mountains that settle into the plains south of the Amu Darya River. The northern plains region is considered subtropical and semi-desert and the study area has a steppe climate, with generally dry weather, hot summers and cold winters. Maximum temperatures exceed 40°C degrees, and the minimum temperature averages at 10°C degrees. The greatest precipitation in this district is in February, March and April and the annual precipitation ranges from 300 to 350 mm. Winds are primarily northwesterly and southeasterly however easterly winds are not uncommon in the winter and fall.

Climate change projections for Afghanistan show regional differences however overall indicate a strong increase in mean annual temperature (higher than mean global temperature projections), with more rapid warming in the spring/summer seasons in the north of Afghanistan. Precipitation in the north is expected to decrease in the spring/summer and increase in the autumn/winter with overall long-term declines in average mean rainfall.

Land. Due to the complex geological history of the Hindu Kush-Himalaya mountain system both the geology and soils across the northern region are diverse and varied. In general the northern Hindu Kush mountains consist of limestone with inter-bedded marl, conglomerates, and sandstone of Upper Cretaceous/Paleocene origin, as well as later Paleocene and Miocene sedimentary and volcanic rocks. In fractured limestone areas joints can accumulate and transport water towards down-gradient springs. The northern plains consist primarily of thick Quaternary alluvial deposits containing clay, silt, sand, gravel and conglomerate. In general gravelly subsurface soils along the foothills transition towards finer graded soils moving north, however interbedded sand, clay and gravel can be encountered to depths of 150 m even towards the central northern plain. The study area is covered by

Torripsamments, a soil type commonly associated with dunes. Torripsamments consist of quartz, mixed sands, volcanic glass, or even gypsum and may have any color. Generally, they are neutral or calcareous and the vegetation supported by these soils consists mostly of xerophytic shrubs, grasses, and forbs. Natural wildlife has been severely decimated by anthropological factors and habitat loss. No protected areas, key biodiversity areas or sensitive environmental receptors are located in or around the study area.

The Project is located approximately 8.5 km north of the Alburz-Marmul fault, which is considered to be one the country's 10 potentially active faults based on historic seismic activity. Studies indicate that Mazar-e Sharif has a 2-percent chance in 50 years of exceeding a peak ground acceleration of 50, 35, 28, and 13 percent *g* respectively, and a 10-percent chance in 50 years of exceeding a peak ground acceleration of 27, 17, 7, and 7 percent *g*, respectively. While hazard values for Afghanistan are relatively more uncertain due to lack of data, in comparison, these earthquake values present risk characteristics similar to those posed by faults in the intermountain West of the United States of America.

Water. The site lies within the Balkhab watershed of the Northern Basin. The source of the Balkab watershed is the Band-e-Amir lakes, surrounded by the Zard Rand Mountains and Koh-e Hissar Mountains of Yakaolang District in Bamyan Province. The major surface water body of this watershed is the Balkh River that descends from the Hindu Kush, opens into an alluvial fan in the norther plain and is a critical source of water for the Hazdha Naha irrigation scheme that serves an area greater than 400,000 hectares through 11 major canals across Balkh, Aqcha and Jowzjan regions. In current times, the river dries up in these irrigation canals and desert sands long before reaching the Afghan border and the Amu Darya.

With regard to groundwater, the Mazar-Balkh aquifer lies below the Project area and receives recharge from the Cretaceous-Paleocene Age carbonate rock aquifer systems to the south, infiltration of surface water originating from the Balkh River and precipitation. The aquifer contains alluvial and proluvial Quaternary deposits of sand and gravel with clay, silt and loam forming confining layers (aquitards) of varying depths. The groundwater table in the Project area is estimated to be between 35-55 meters below ground surface. The thickness of this aquifer is potentially up to 120 meters in thickness and deeper aquifers (>1000 m) may be present. Based on proximity to the Balkh River located approximately 1.3 km west of the site, groundwater quality is expected to be less saline (0-1000 mg/l Total Dissolved Solids) and of good quality.

Air. According to the UN Environment Programme working in Afghanistan, dust and vehicle emissions in the country's urban areas are the main factors negatively affecting air quality. As part of its national environmental assessment UNEP carried out air sampling at urban sites in Mazar-e Sharif and the results indicated high amounts of dust and concentrations of poly aromatic hydrocarbons (PAHs) mainly attributable to vehicle emissions. At the site of the Project there is no permanent monitoring station. The National Environmental Protection Agency (NEPA) is the authority to determine the permissible limits of air pollution and while clean air protections are inherent in the Environment Law and some clean air policy is under formulation, at this time, national ambient air quality standards are substantively based on World Health Organization guidelines and no specific industry emissions regulations have been formulated.

Socioeconomics. The 2017/2018 population of Afghanistan is estimated to be 29.7 million, however no national census has been conducted post-1979 due to conflict and insecurity. In the northern region the population is comprised of several of the country's 14 major ethno-linguistic groups and includes Hazara, Pashtun, Tajik, Turkmen and Uzbek. According to 2011/2012 poverty assessment data 31.6% of the Afghan population was poor (living on levels of expenditure insufficient to satisfy basic food and non-food needs). In addition, disparities in poverty are more directly influenced by regional differences in international aid and vulnerability to weather related shocks than to the rural/urban divide. With regard to Northern Afghanistan the northeast provinces of Badakhshan, Baghlan and Kunduz are considered lagging in terms of poverty alleviation compared with the northern provinces of Balkh, Jawzjan and Samangan.

At the national level, the majority of the population is rural and roughly one quarter of rural Afghans are landless, relying on intermittent farm labor for survival. Village population sizes vary widely between 3 and 30,000 with a mean village population size of 481. The average household size is 6.3 members. The system of land ownership is often complex and exposes inequalities along ethnic and tribal/clan lines that date back centuries or longer. Land ownership in the northern region is evenly distributed between state-owned land, privately owned land and common land. The majority of households in northern Afghan communities are either landless or small-scale farmers operating farms between 0.2 and 1 ha in size (less than one-third of farmers owned land greater than 1 ha in area).

The city of Mazar-e Sharif, located approximately 17 km northeast of the Project site is the cultural and population center of Balkh Province and is a hub for trade and political activity across the northern region. The site lies in Dehdadi District which is characterized by 58 rural villages where life is centered around sustenance agriculture, livestock rearing and small-scale commerce.

Security. Security conditions in Afghanistan are dynamic and complex. According to the UK Government Country Policy and Information Note on Afghanistan (April 2018) on Afghanistan's security situation, in 2016, Mazar-e-Sharif recorded the lowest number of civilian casualties compared to other cities in Afghanistan. Trends from 2009-2015 show that Mazar-e Sharif consistently had significantly fewer civilian casualties than other cities. Between 2015-2016, the majority of security incidents (around 93 percent) in Balkh province occurred outside Mazar-e-Sharif. The UN Security Council Report publishes monthly security forecasts that pertain to recent security related developments.

The Afghan Power Plant Company will take the lead role for the Project in regard to security management. The company, under the Ghazanfar Group, will facilitate a dedicated Security Manager and has generated a Security Management Plan (Annex 2) that will govern site security for staff, contractors and visitors.

Alternatives Analysis

An alternatives analysis was conducted to address other means of completing the proposed Project. The technical engineering and economic feasibility, together with the environmental, social and safety concerns; flexibility for loading operations and expansion; regulatory and stakeholder requirements; cost effectiveness; and, ease of operation and maintenance of the system through its design life are important considerations in the overall assessment of alternatives.

A variety of alternatives were proposed and have been analyzed for the power plant Project development. Research and analysis of the natural gas resources of Afghanistan including refurbishment and expansion of the Sheberghan gas fields has been ongoing, and is well documented. For the current analysis, such resources provide value and are cited in the alternatives analysis where relevant.

With regard to fuel-type and site location alternatives, evaluation is based on the planning studies and decision-making processes that have occurred to date. For example, numerous studies have made clear that natural gas derived electricity is the likeliest candidate for large-scale addition of baseload domestic generation in the near term. As a result, several international agencies have conducted feasibility and scoping studies of the northern gas reserves and have evaluated opportunities for gas development projects. With regard to siting, the preferred option (the Project site) has been determined at the national level by parties engaged in the Power Purchase Agreement based on environmental, social, technical, logistical and security factors.

For the assessment of technology alternatives, literature review and study of the baseline conditions were used to compare steam turbine, simple cycle combustion turbine, combined cycle combustion turbine and reciprocating internal combustion engine (including dual-fuel options). The environmental evaluation determined that regardless of the specific technology selected the proposed power plant will use modern combustion technology and effective combustion to minimize the generation of NO_x and CO emissions to meet IFC/World Bank Group air quality standards and will incorporate appropriately designed stacks and stack height to ensure adequate dispersion of emissions to the atmosphere.

Furthermore, water demand should be prioritized in the overall comparative analysis. Two technologies, simple cycle combustion turbine (SCCT) and reciprocating internal combustion turbine (RICE) provide for plant operation with negligible process water demand and should be favored. Based on the fact that no detailed hydrogeological study has been conducted this decision satisfies the precautionary principle, and supports the base-line study data that indicates that the northern region has the lowest national per capita water availability and is currently below the water scarcity threshold.

The alternatives analysis also incorporates the social impacts related to technology options and environmental implications. Because the site selection (siting) for the Project has been directed by the GoIRA, and a land lease agreement has been fully executed, there are no siting alternatives provided for an assessment regarding social impacts. Based on the choice of technology, the air emissions, water use and overall safety (employee and public safety) are relevant to the discussion on social impacts.

The preferred option following environmental, social and technical evaluation is for use of 3 to 6 reciprocating engines with a power output between 8 and 19 MW to reach a net power output of approximately 50 MW. In addition, the aggregate capacity factor is estimated at 80% or 7,000 hours per year.

Environmental and Social Impact Assessment

The potentially significant impacts of the project activities during construction and operation were evaluated utilizing Good International Industry Practice (GIIP) for environmental and social impact assessment. Implementation of the risk assessment framework resulted in an assignment of impact significance that was used to guide the development of mitigation measures that are of the appropriate nature and scale, and that are commensurate with the perceived significance of the impact (critical, high, medium, low or negligible).

Following assessment, the significance of environmental and social impacts were all ranked as either *low* or *medium*. There are a combination of factors that contribute to the majority of risks being ranked as *low* following the evaluation; the most important including:

- ❖ Good project siting - over 1 km from residential communities; within an industrial land use area; and situated on non-agriculturally productive land;
- ❖ Site is not in close proximity to ecological, historical, religious or culturally sensitive areas and is over 1 km from nearest surface water body;
- ❖ Limited biodiversity impacts due to inherent characteristics of native flora and fauna;
- ❖ On a relative scale, very minimal air, liquid, solid and hazardous waste emissions would result from the preferred technology; and,
- ❖ Mitigation and management measures are well understood and achievable.

The potential impacts with a significance ranking of *medium* included:

Construction Phase

Air Quality Impacts

- Human health impacts from combustion emissions and dust
- Localized ambient air quality degradation

Occupational Health and Safety Impacts

- Construction site health and safety risks resulting in injury or death
- Construction site health and safety risks resulting in impairment or long term health impacts

Operation Phase

Solid and Hazardous Waste Impacts

- Natural resource impacts at municipal disposal site from disposition of solid or hazardous wastes

Occupational Health and Safety Impacts

- Operation phase health and safety risks resulting in injury or death
- Operation phase site health and safety risks resulting in impairment or long term health impacts

Based on the environmental and social impact assessment, the effects of *cumulative* impacts on biological and socio-economic systems is expected to be limited (some socio-economic effects will contribute to positive impacts). The cumulative effects on physio-chemical factors of wastewater, solid and hazardous waste and water resources is also likely to be very minimal. The primary cumulative impacts will concern air quality and noise, and further discussion as well as recommended mitigation and management measures for these cumulative impacts are incorporated into the ESIA.

Mitigation and Management Measures

Mitigation and management measures are recommended for all of the identified potential impacts (even those characterized as low significance) in order provide the greatest environmental and social protections. Mitigation measures are outlined separately for construction and operation phases and include standard mitigation measures for the following environmental aspects:

- Water Quality and General Environmental Impacts
- Air Quality

- Noise
- Landscape and Visual
- Flora and Fauna
- Transportation
- Public Health and Safety
- Occupational Health and Safety
- Cumulative Impacts

In addition, the mitigation measures consider the special Occupational Health and Safety hazards cited as particular concern in the IFC Thermal Power Plant Guidelines that include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards;
- Fire and explosion hazards;

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action as needed.

Environmental and Social Management System (ESMS)

The Afghan Power Plant Company (APPC) is a newly formed organization out of the Ghazanfar Group. The APPC will be organized in a manner that ensures it will meet the compliance, legal and regulatory requirements of the Government of the Islamic Republic of Afghanistan and the IFC Performance Standards. In accordance with IFC PS 1 the APPC has established an Environmental and Social Management System (ESMS) that includes policies, procedures and personnel responsible for implementing the system.

The APPC has established an Environmental and Social Management Policy (E&SM Policy) that was institutionalized by the CEO of the APPC. The E&SM Policy is included in Annex 3. The policy contains a Management Statement to Employees and a Policy Statement that defines the environmental and social objectives and principles for achieving sound environmental and social performance. Through the Policy, the APPC accepts the responsibility to comply with IFC Performance Standards, World Bank Group EHS Guidelines, ESIA/ESMP, local laws and regulations, and permits and standards.

Based on the ESMS, managers of the APPC and the contractors (EPC and O&M) will all have clearly identified roles and responsibilities in the management of environmental and social risks. While the APPC Project & Technical Manager will have direct authority over the contractors, it is expected that an Environmental and Social Management Unit (ESMU) consisting of external experts (Engineering and E&S professionals) will be contracted separately to provide training, support services, guidance and monitoring throughout the project. In addition, EPC and O&M contractors will be required to maintain full-time on-site health, safety and environmental compliance oversight personnel as part of their contractual obligations, and this will be documented in the associated Contractor Management Plans that will be reviewed by the APPC prior to implementation.

As part of the overall ESMS, a site-specific Environmental and Social Management Plan (ESMP) has been prepared in accordance with the environmental and social policies and commitments of the Ghazanfar Group, Afghan Power Plant Company, and in compliance with the legal and regulatory requirements of the Government of the Islamic Republic of Afghanistan. The primary objective of the environmental management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the mitigation measures identified earlier in order to reduce adverse impacts and enhance positive impacts from specific project activities. It is also meant to address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project. The ESMP enforces the IFC Performance Standards (PS) and is compatible with the World Bank Operational Policy 4.03.

The ESMP is separated into two plans for Construction Phase (CESMP) and Operation Phase (OESMP) and recognizes the importance of including detailed Action Plans and Contractor Management Plans that will be generated prior to Project implementation as defined in the ESMP that will consist of Chance Find Procedures, Waste Management Plans, Health & Safety Plans, Spill and Emergency Response Procedures, Traffic Management, HR Policies, Codes of Conduct, Stakeholder Engagement Plans and Grievance Mechanisms. These plans and their requirements are detailed in Section 8 of the ESIA. The ESMP also prescribes the manner and costs associated with effective monitoring and reporting throughout the life of the project.

Stakeholder Engagement

The Mazar IPP Project is not expected to have potentially significant adverse impacts on any Affected Communities. This is primarily due to the fact that the nearest villages are approximately 1 km distance from the site and that the Project site is separated from the villages by the larger NFPP industrial complex located immediately north of the Project site. In effect, the NFPP blocks the Project site from visual sight of nearby communities as well as buffering any direct environmental impacts such as noise and dust.

However, regardless of the lack of significant direct impacts on Affected Communities, the APPC has already initiated engagement with the nearest villages, and will establish a grievance mechanism for these nearby communities as one part of the ongoing external communications program. As described in the ESMS, the APPC will nominate a Project Outreach Coordinator to implement and manage the SEP and GM related-activities, and the ESMU will conduct monitoring and review to ensure that it is undertaken in a meaningful and transparent manner.

The pre-project stakeholder engagement and consultation was initiated by the ESIA team in order establish communications with stakeholders as well as the greater community and social network that surrounds the proposed Project. This stakeholder outreach and involvement will increase the probability of successful implementation of the Project and provide any potentially Affected Communities with a clear and achievable means of voicing concerns and grievances throughout the life of the project. The objectives of the stakeholder engagement include the following:

- Provide a preliminary identification and mapping of key stakeholders of the project, including vulnerable groups (if any), to be updated as the Project evolves.

- Provide a practical framework for the dialogue with stakeholders through the life of the aforementioned Project that is technically and culturally adapted to the local context.
- Ensure that the SEP is underpinned with sufficient resources, supportive institutional structure and adequate processes.

The SEP activities conducted to date on behalf of the Project Proponent were conducted between March and July 2018. The dialogue approach initiated through public meetings is documented in this ESIA and was conducted in compliance with national legislation promulgated by the Afghanistan NEPA and country norms for stakeholder engagement, as well as, according to good international industry practice and IFC PS 1. The initial outreach conducted during preparation of this ESIA (see Section 9 and Annex 9) is considered Pre-Project/Preliminary and the planned subsequent stages for outreach to all of the identified stakeholder groups will be conducted by the APPC Project Outreach Coordinator. The exact dates for the subsequent outreach events will be set after the Project timeline is determined however these events will be conducted to coincide with the following stages:

- Stage 1: Pre-Project/Preliminary (Completed by ESIA Team)
- Stage 2: Project Approval/Pre-Construction
- Stage 3: Construction Phase
- Stage 4: Pre-Start Up Operation
- Stage 5: Operation Phase

As part of the SEP a Grievance Mechanism procedure was established to receive grievances and ensure adequate response to all complaints and appeals by stakeholders from the local population affected by the Project. During the Pre-Project/Preliminary SEP stage the ESIA team documented representatives within each stakeholder group who were willing to assist with education and outreach concerning the GM within their communities. The GM for on-site workers (contractors, subcontractors and third-parties) will be institutionalized by the EPC and O&M Contractors as part of their required Contractor Management Plans and is detailed and documented in the ESIA.

PART II

Environmental and Social Impact Assessment

Contents

Table of Figures

Table of Tables

1 INTRODUCTION

1.1 Background and Brief Description

Development of a country largely depends upon its proper electricity service, as it influences the other sectors like industry, education, agriculture and so on. The power sector is considered one of the most vital sectors in Afghanistan. According to the country's Power Sector Master Plan[1] between 2011 and 2032 the average annual growth rate in gross electricity demand country-wide will be 8.7%, with the residential sector being the driving force behind this growth. In light of these projections the Afghanistan Ministry of Mines and Petroleum (MoMP) seeks to develop locally generated power at better prices with more reliability, in part to decrease dependence on imported power and at once to develop the proven energy resources inside the country while spurring economic growth and employment opportunities. Based on assessments by the MoMP and the US Geological Survey two geological formations containing natural gas in northern Afghanistan are estimated at 444bn m^3 of undiscovered recoverable gas aside from the existing identified reserves. The Power Sector Master Plan reports that if developed these resources can support multiple regional natural gas fired power plants.[1]

The purpose of this Environmental and Social Impact Assessment (ESIA) is to further evaluate one such development opportunity that is the Mazar-e Sharif 50 MW gas-to-power plant (the "Project" or "Mazar IPP"), a greenfield development near Mazar-e Sharif under an independent power producer scheme. This project will utilize natural gas to be supplied by the MoMP/Afghan Gas Enterprise from existing gas fields in Sheberghan to generate electricity, which would be dispatched to Da Afghanistan Breshna Sherkat (DABS), the Afghan national utility entity. The IPP owner is the Afghan Power Plant Company, a newly formed subsidiary of the Ghazanfar Group, which has entered into an Implementation Agreement with the Islamic Republic of Afghanistan (GoIRA) and a Power Purchase Agreement DABS.

[1] Islamic Republic of Afghanistan: Power Sector Master Plan (May 2013). Prepared by FICHTNER GmbH & Co. KG, Stuttgart, Germany.

The power plant development is expected to be comprised of gas-fired combustion engines with the electricity generated fed into a 220 kV transmission network via an on-site switchyard including high voltage transformers and circuit breakers. The natural gas supply to the site will be through an existing 12-inch gas pipeline that connects Mazar-e Sharif to the gas fields of Sheberghan located approximately 90 km west of the site. Additional Information on the status of the associated projects is presented in Section 3 of this report.

1.2 Goal and Objectives

This report has been designed to satisfy the goals and objectives of good international industry practice for environmental and social impact assessment. Specifically, to secure engagement of the World Bank Group, this report addresses the IFC Performance Standards on Environmental and Social Sustainability (2012) and World Bank Performance Standards for Projects Supported by the Private Sector ("WB Performance Standards") for application to Bank support for projects (or components thereof) that are designed, owned, constructed and/or operated by a Private Entity (as defined below), in lieu of the World Bank's safeguard policies.

Underscoring PS1 on *Assessment and Management of Environmental and Social Risks and Impacts* this ESIA aims to provide the foundation for achieving the following core objectives:

- To identify and evaluate environmental and social risks and impacts of the project.
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.
- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.

- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

In addition, under the terms of reference for this project, the ESIA process undertaken aims to verify applicable laws and regulations of the Government of the Islamic Republic of Afghanistan (GoIRA) through government stakeholder outreach and review of current statutory policy. Under the joint authority of the IFC/World Bank and the Afghanistan National Environmental Protection Agency (NEPA), the ESIA process has set out to effectively:

- Develop an Environmental and Social Management Plan (ESMP) containing recommended mitigation measures covering each main phase of the project inclusive of the project's area of influence.
- Document stakeholder engagement activities undertaken by the sponsors and ESIA consultants in accordance with IFC Performance Standards, World Bank Operation Manual OP 4.03, and Afghanistan environmental and social impact assessment policies, with outcomes recorded in a project Stakeholder Engagement Plan.

1.3 Approach and Methods

The implementation strategy has primarily been to reveal environmental and social characteristics of the project site and lay the framework for the identification and implementation of the ESMP and the Stakeholder Engagement Plan. A project screening and scoping exercise was undertaken to identify the parameters of the physio-chemical, biological and socioeconomic environment for the study area. The study included relevant issues and aspects of the environmental and social baseline identified through desk research, field reconnaissance and through primary and secondary stakeholder engagement.

The assessment of impacts involved the following:

- The prediction and assessment of impacts from the site preparation, construction, operation and maintenance phases of the project;

- Risk evaluation covering major hazards identification, risk reduction measures and risk management recommendations;
- Classification of impacts as negligible, low, medium, high or critical based on the use of Good International Industry Practice (GIIP) criteria for rating of impacts; and,
- Recommendation of control measures that are required as part of the project design and further measures for avoiding, minimizing and mitigating predicted impacts where necessary or appropriate.

The assessment and evaluation of risk resulted in an assignment of impact significance that was used to guide the development of mitigation measures that are of the appropriate nature and scale, and that are commensurate with the perceived significance of the impact. The significance of an impact was determined by the:

- Consequence of the activity,
- Likelihood of occurrence of the activity; and,
- Calculating the product of these two parameters.

Consequence and likelihood of impacts resulting from planned activities are presented in Section 6. Changes in the planned activities for the proposed Project would affect both the impact assessment and also the planned mitigation activities.

1.4 Summary of Key Impacts

The list of positive outcomes (benefits) anticipated through realization of the proposed project are as follows:

- Provide reliable and consistent power supply with the aim of better satisfying the current and projected regional and national energy demand;
- Generate an autonomous income source through taxes and increased revenue/derivations to the Local and National Governments;
- Promote indigenous Afghanistan investor-led independent power production that shifts the burden of investment capital for power generation from the public to the private sector;
- Produce a stable power supply that stimulates the development of domestic agricultural and industrial based small and medium scale enterprises and promotes further secondary social development;

- Provide direct and indirect employment opportunities on the local, regional and national scale that includes the training and capacity development of energy sector professionals on the ground, management and regulatory oversight levels; and,
- Reduce environmental emissions associated with privately owned diesel generators through development of modern cleaner burning technologies that utilize locally available fuels and enable broader electricity transmission.

The potential adverse impacts of greatest concern following the risk assessment and evaluation included:

Construction Phase

Air Quality Impacts

- Human health impacts from combustion gas emissions and dust
- Localized ambient air quality degradation

Occupational Health and Safety Impacts

- Construction site health and safety risks resulting in injury or death
- Construction site health and safety risks resulting in impairment or long term health impacts

Operation Phase

Solid and Hazardous Waste Impacts

- Natural resource impacts at municipal disposal site from disposition of solid or hazardous wastes

Occupational Health and Safety Impacts

- Operation phase health and safety risks resulting in injury or death
- Operation phase site health and safety risks resulting in impairment or long term health impacts

1.5 Stakeholder Engagement

The Stakeholder Engagement Plan (SEP) initiated by the ESIA team was conducted in order establish communications with direct and indirect stakeholders as well as the greater community and social network that surrounds the proposed Project. This stakeholder outreach and involvement will increase the probability of successful implementation of the ESMP and provide the affected community with a clear and achievable means of voicing concerns and grievances throughout the life of the project.

The list of stakeholders and the plan of engagement with various groups will be issued and revised on a regular basis to ensure that the Project Proponent/Owner is aware of those who are interested and/or concerned with the Project and, consequently, should be involved in the engagement process. Stakeholder engagement will be carried out throughout the Project in stages at key phases in order to disseminate new information on Project details and update stakeholders of timelines and upcoming activities. The initial outreach conducted during preparation of this ESIA is detailed in Section 9, which also includes explanation of the Grievance Mechanism procedure was established to receive grievances and ensure adequate response to all complaints and appeals by stakeholders including the local population affected by the Project.

1.6 Composition of Study Team

The ESIA process was implemented by the Green Tech Construction and Engineering Company Environmental and Social Impact Assessment Team, with technical information and Project details provided by the Project Proponent/Owner, as well as, relevant GoIRA ministry/agency representatives. The credentials and CVs of the key staff conducting the ESIA process are provided in Annex 6.

2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 General

This ESIA considers the policies, guidelines and standards of the IFC Performance Standards and World Bank Group Performance Standards for Private Sector Activities (OP 4.03). The requirements of the WBG Multilateral Investment Guarantee Agency (MIGA) and the International Bank for Reconstruction and Development (IBRD) essentially reflect those of the IFC Standards for private sector projects. The ESIA is also reflective of the Islamic Republic of Afghanistan (GoIRA) regulatory authorities and governing line ministries and agencies, and is aligned with the NEPA policy and guidelines for environmental and social impact assessment.

2.2 Afghanistan Environmental Laws and Regulations

The overarching Afghan Ministry of Economy's National Development Strategy (ANDS) 2008-2013, considers environment as a cross-cutting and foundational aspect of development. Accordingly, the goals and priorities for the living environment are described as:

> The ANDS strategic vision is to improve the quality of life of the people of Afghanistan through conservation of the nation's resources and protection of the environment. The main goals are to: (i) secure a clean and healthy environment; (ii) attain sustainable economic and social development while protecting the natural resource base and the environment of the country; and (iii) ensure effective management of the country's environment through participation of all stakeholders. Strengthening EIA awareness and the institutional capacity of NEPA and the line ministries will be given priority. Short term and long term outcomes linked to the thematic objectives (e.g. conservation of biodiversity, abatement of pollution, environmental awareness, etc.) will also be prioritized based on assessment of the expected environmental, social,

and health impacts and the institutional, economic and political constraints (p. 156).[2]

Planning and implementation of the Mazar IPP is being conducted with cooperation and collaboration from the Afghanistan National Environmental Protection Agency (NEPA). NEPA is an independent agency that was created under the responsibility of the President's Office in May 2005 in order to legitimize the role of environmental management within GoIRA. Therefore, all existing NEPA EIA policy will be adhered to by the project Proponent and the agency will be required to approve and certify the project prior to commencement of any activities.

2.2.1 Environmental Law

Through the work of NEPA, the Afghan Parliament ratified the nation's first overarching and legally binding environmental regulation in 2007; the Environment Law. The law is based on international standards of environmental protection and lays the framework for environmental management in Afghanistan. The Environment Law is the main source of environmental law in Afghanistan. The law provides the basic principles of environmental protection and its structure is as follows:

- **Chapter One**: General Provisions
- **Chapter Two**: Functions and Powers
- **Chapter Three**: Management of Activities Affecting the Environment
- **Chapter Four**: Integrated Pollution Control
- **Chapter Five**: Environmental Considerations Relevant to Water Resource Conservation and Management
- **Chapter Six**: Biodiversity and Natural Resource Conservation and Management
- **Chapter Seven**: Environmental Information, Education and Training, and Research
- **Chapter Eight**: Compliance and Enforcement

[2] Islamic Republic of Afghanistan; Afghanistan National Development Strategy; A Strategy for Security, Governance, Rule of Law, Human Rights, Social-Economic Growth and Poverty Reduction (2008-2013), Volume 1.

- **Chapter Nine**: Miscellaneous Orders

Regarding the proposed Project, Chapter Three, Articles 19 and 21 require project proponents to ensure adequate provisions for public participation including dissemination of project information and opportunities for affected persons to voice concerns; and, that project proponents implement international best environmental impact assessment practices in coordination with NEPA. Chapter Four, Article 28 states that NEPA shall grant pollution control licenses, with or without conditions, provided the discharge will not have significant adverse effects or the effects have been adequately mitigated. Subsequently, GoIRA has also promulgated laws for the protection of water, procedures regarding protected areas, etc., that were published for protecting the key elements of the environment.

2.2.2 National Environmental Impact Assessment Statutes

Three national-level documents have been promulgated by the GoIRA with regard to environmental and social impact assessment:

National Environmental Impact Assessment Policy, November 2007. The National Environmental Impact Assessment Policy (2007) follows on from the Environment Law and sets forth a policy vision, principles, strategy, and process for environmental assessment in Afghanistan. The emphasis is on ensuring that projects with potentially significant impacts are identified to the national environmental regulator, NEPA, and follow adequate due diligence procedures. The document provides a range of additional information on NEPA and environmental assessment in the Afghanistan context.

Environmental Impact Assessment Regulations (Official Gazette No. 939, Mar. 10, 2008). The EIA Regulations formally describe a systematic approach whereby projects will be screened by NEPA prior to implementation to determine the level of environmental risk involved. Schedule I defines the screening of activities by listing project types likely to have significant impacts (Category 1) or potentially adverse impacts (Category 2). Schedule 2 of the EIA Regulations provides the clearance certificate application form. Regardless of the funding source (donor organization, private or public), for any project that is screened as having potential significant adverse environmental impact (high risk projects), the coordination, consent and guidance of NEPA are required under the EIA Regulations, and a Certificate of Compliance must be obtained. Chapter 3, Regulation 9.3 states that the proponent granted such certificate shall commence work activities that are the subject of the application within three (3) years of the date of signature.

Based on the EIA Regulations, Schedule 1, Screening of Activities, the construction, upgrading, installation or development of thermal power generation facilities less than 200 MW are classified as a Category 2 activity wherein they have potentially significant adverse effects on human environments or environmentally sensitive areas, however, are less adverse than Category 1 activities and in most cases impacts are site specific and are reversible.

Administrative Guidelines for the Preparation of Environmental Impact Assessments (June 2008). These guidelines were prepared by NEPA under issue of the Director-General as a companion to the Environmental Impact Assessment Regulations, 2008. The guidelines provide an outline of the Interim EIA process including screening and scoping methods, and guide proponents on the various aspects of dealing with NEPA as the competent environmental authority in Afghanistan. It is noted that some flexibility in the published process flow is inherent, and that close direct communication and coordination with the Director-General's office takes precedence. Based on Section 8, the decision to approve or reject any EIA study will be the responsibility of the Executive Deputy Director General-Technical and the expected period of decision making will be 45 days from submittal of the final EIA. Section 10 describes the relationship of EIA to pollution control and management. It is implied here that as the Pollution Control Regulations are under development, an EIA Certificate of Compliance will function duly as the pollution control license required under Chapter 4 of the Environment Law. However, Section 11 states that the need for an EIA does not replace the need to gain approval from other GoIRA agencies, and that NEPA approval will combine to form a range of project approvals required from GoIRA.

2.2.3 Water Law of Afghanistan (Official Gazette No. 980, Apr. 26, 2009)

The purpose of the Water Law is to establish the conservation, equitable distribution, and efficient and sustainable use of water resources while strengthening the national economy and securing the rights of the water users. According to Article 21 a usage license or activity permit, including for government projects, is necessary and an application submission is mandatory in the following circumstances:

1. Surface and groundwater use for newly established development projects.
2. Disposal of wastewater into water resources.
3. Disposal of drainage water into water resources.
4. Use of water for commercial and industrial purposes.
5. Use of natural springs with mineral contents or hot springs for commercial purposes.
6. Digging and installation of shallow and deep wells for the commercial, agricultural, industrial and urban water supply purposes.
7. Construction of dams and any other structures for water impoundment, when the storage capacity exceeds 10,000 cubic meters.
8. Construction of structures that encroach the banks, beds, courses or protected rights-of-way of streams, wetlands, Karezes, and springs.

Based on Article 25, water usage for generating energy on micro and macro scales shall be based on a feasibility study and managed in accordance with the Water Law. Under Article 38, project proponents will require an application submittal and license or activity permit for any deep wells for agriculture, commercial, industrial and urban water supply purposes and supply wells may only be constructed after obtaining agreement of line ministries and issuance of permit/license by the Ministry of Mines (MoMP). While the MoMP holds jurisdiction over permits for deep groundwater wells, Article 39 states the Ministry of Agriculture, Irrigation and Livestock (MAIL) and the Ministry of Energy and Water (MEW) shall anticipate the source of the required water for leases of barren or undeveloped land in such a way that the water right of the downstream communities is not harmed.

2.2.4 Land Acquisition Laws

The Afghanistan Independent Land Authority (ARAZI) oversees the national Land Planning Development Program (IDPL) designed to provide a modern, transparent and sustainable land management system in Afghanistan and serve as the platform for designing and implementing government policies and plans for economic development. Land acquisition laws, while not fully administered or enforced nation-wide, describe procedures and conditions for acquisition and compensation of lands. For this Project, ownership of the land required for execution of the IPP-led activities belongs to and is being made available by the authority of GoIRA and through the cooperative agreement with the relevant line ministry (MoMP) and the national utility (DABS) that will oversee adjoining activities associated with the upstream and downstream project components. The project Proponent has obtained necessary documentation from ARAZI for transfer of land rights to establish the Mazar IPP.

2.2.5 Regulation on Reduction and Prevention of Air Pollution

Based on regulation approved by the Afghanistan Council of Ministers, the National Environmental Protection Agency (NEPA) will determine the permissible limits of air pollution and broadcast it through public media. While clean air protections are inherent in the Environment Law and some clean air policy is under formulation, at this time, national ambient air quality standards are substantively based on World Health Organization guidelines and no specific industry emissions regulations have been identified.

2.2.6 Presidential Decree regarding Protection of Lands

The Presidential Decree regarding Protection of Agricultural Lands, Gardens, Amusement Parks and Other Green Areas (No. 4252, dated 19/7/1389) was designed protect agricultural lands, gardens, parks and green areas from allocation or construction of residential development, buildings, industries, urban infrastructure or any other purpose that would damage or destroy the land and result in environmental pollution. Based on this mandate, NEPA shall have authority to monitor and supervise the execution of the decree and will provide a biannual report for the Presidential Office. As the mandated agency, an EIA Certificate of Compliance issued by NEPA would be inclusive of necessary approvals required under this decree.

2.2.7 Labour Law

The Afghanistan Ministry of Justice Labour Law (February 4, 2007) was enacted in accordance with Article 48 of the Afghanistan Constitution to regulate and explain the issues related to obligations, rights, allowances and social security of workers. The law contains 14 chapters that cover issues related to recruitment and service contracts; hours of work; right to rest and leave; salary; training; standards and guiding rules of work; work discipline; financial responsibilities of workers; occupational health and safety; women and youth; disputes; and, social security. The Afghan Power Plant Company has committed to adopting the provisions of the Labour Law in its corporate management practices, with full intentions of compliance and endorsement of this law in relation to the proposed Project. As matter of course, the provisions of the Labour Law will be referenced in all contract and subcontract documents.

2.2.8 Law on the Protection of Historical and Cultural Properties

The GoIRA Law on the Protection of Historical and Cultural Properties (May 21, 2004) was adopted pursuant to Article 9 of the Constitution in order to protect historical and cultural properties. These properties are defined in the Law as “any product of mankind, moveable or immovable, which has an outstanding historical, scientific, artistic and cultural value and is at least one hundred years old”, with a caveat for the inclusion of, “objects which are less than one hundred years old, but which because of their scientific, artistic and cultural value, should be recognized as worthy of being protected.”

The Law goes on to provide instruction for landowners with regard to procedures for protection of such products and objects:

- Whenever municipalities, urban or residential building corporations, irrigation projects, and any other government or private corporations, in undertaking construction, expansion or improvement projects, come across historical and cultural properties, they are bound to stop their work and inform the Institute of Archaeology on the issue.

- In the case that construction work endangers an archaeological property or its site, the project is suspended until a definitive solution is found for their protection.

2.3 International Laws and Conventions

The Islamic Republic of Afghanistan ratified the UN Convention Against Corruption on August 25, 2008, covering five areas including preventive measures, criminalization and law enforcement, international cooperation, asset recovery, and technical assistance and information exchange. The system of Afghanistan's legal hierarchy places international law conventions as the third source of law following the Constitution (ratified January 26, 2004) and sharia law, which no law can contrive.[3] Afghanistan's major international treaties affecting environmental management and their status are provided below:

- United Nations Convention on Law of the Sea: signed 1983; not ratified
- Kyoto Protocol: no position yet expressed
- Framework Convention on Climate Change: ratified 2002
- Convention of Biological Diversity: ratified 2002
- Vienna Convention for the Protection of the Ozone Layer: ratified 2004
- Montreal Protocol on Substances that Deplete the Ozone Layer: ratified 2004
- Convention to Combat Desertification: ratified 1995
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): date of enforcement: January 28, 1986
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposals (Basel Convention): signed 1989; not ratified
- Comprehensive Test Ban Treaty: ratified 2003
- Convention Concerning the Protection of the World Cultural and Natural Heritage: ratified 1979
- Nuclear Non-Proliferation Treaty (1968): ratified 1992

[3] Implementation Review Group, Seventh Session. Vienna, 20-24 June 2016. Review of implementation of the United Nations Convention against Corruption.

2.4 IFC/World Bank Guidelines

2.4.1 Overview

Combined with the IFC's Access to Information Policy, the IFC Performance Standards (PS) make up the overall Sustainability Framework and demonstrate a commitment to sustainable development and effective risk management. The 2012 edition of IFC's Sustainability Framework, which includes the Performance Standards, applies to all investment and advisory clients whose projects go through IFC's initial credit review process after January 1, 2012.[4] These standards are compatible with the World Bank Performance Standards for Projects Supported by the Private Sector under Operational Policy 4.03 that will be applied as applicable. The performance standards include:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety and Security
- PS 5: Land Acquisition and Involuntary Resettlement
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PS 7: Indigenous Peoples
- PS 8: Cultural Heritage

These PS provide a means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts. Based on screening and project research, the applicable IFC/World Bank Performance Standards include PS-1, 2, 3, 4 and 6. A brief on the requirements as laid down in the performance standards is described in the following subsections. In addition, the terms of reference for this ESIA cite compliance requirements with relevant parts of the IFC/World Bank Environmental,

[4] https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards

Health, and Safety (EHS) Guidelines, specifically, General Guidelines (2007); Electric Power Transmission and Distribution (2007); and Thermal Power (2008).

2.4.2 IFC Performance Standards

The Performance Standards (PS) are directed towards the party responsible for implementing and operating World Bank Group funded projects. The PS provide a structure to assist clients in identifying risks and impacts prior to implementing project activities so that systems and designs are instituted to help avoid, mitigate and manage these risks and impacts. In order to achieve the objectives of the applicable PS to this project, effective means that are appropriate to the nature and scale of the project and commensurate with the level of social and environmental risks (likelihood of harm) and impacts will be generated and incorporated into the Environmental and Social Management System (ESMS). The outline below lists the requirements under each PS that are applicable to the project. If addressed appropriately, alignment with these standards will lead to sound and sustainable environmental and social performance, and can lead to improved financial, social, and environmental outcomes.

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

- Environmental and Social Assessment and Management System
- Overarching policy defining the environmental and social objectives and principles
- Identification of Risks and Impacts
- Management Programs describing mitigation and performance measures
- Organizational Capacity and Competency
- Emergency Preparedness and Response
- Monitoring and Review
- Stakeholder Engagement
- External Communications and Grievance Mechanisms
- Ongoing Reporting to Affected Communities

PS 2: Labor and Working Conditions

- Working Conditions and Management of Worker Relationship
- Protecting the Work Force
- Occupational Health and Safety
- Workers Engaged by Third Parties
- Supply Chain

PS 3: Resource Efficiency and Pollution Prevention

- Resource Efficiency
- Pollution Prevention

PS 4: Community Health, Safety, and Security

- Community Health and Safety
- Security Personnel

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

- General
- Protection and Conservation of Biodiversity
- Management of Ecosystem Services
- Sustainable Management of Living Natural Resources

2.4.3 IFC/World Bank Group EHS Guidelines

The IFC/World Bank Group Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and sector-specific examples of good international industry practice. IFC uses the EHS Guidelines as a technical source of information during project appraisal. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology.[5] The General EHS Guidelines contain measures to manage broad environmental, health, and safety issues potentially applicable to all industry sectors and can be combined with relevant

[5] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

Industry Sector Guidelines. Stated performance levels must also be compatible with applicable national requirements or internationally accepted standards required by the host-country.

General EHS Guidelines (2007). The General EHS Guidelines cover areas pertaining to Environmental; Occupational Health and Safety; Community Health and Safety; and, Construction and Decommissioning. Based on the approach for the management of environmental issues at the Project level, the General EHS Guidelines provide the following directives:

- Identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle,
- Involving EHS professionals, who have the experience, competence, and training necessary to assess and manage EHS impacts and risks,
- Understanding the likelihood and magnitude of EHS risks, based on the nature of the project activities and the potential consequences to workers, communities, or the environment if hazards are not adequately managed,
- Prioritizing risk management strategies with the objective of achieving an overall reduction of risk to human health and the environment,
- Favoring strategies that eliminate the cause of the hazard at its source,
- When impact avoidance is not feasible, incorporating engineering and management controls to reduce or minimize the possibility and magnitude of undesired consequences,
- Preparing workers and nearby communities to respond to accidents, and
- Improving EHS performance through a combination of ongoing monitoring of facility performance and effective accountability.

In addition to these core directives, the General EHS Guidelines provide performance levels for ambient air quality that correspond to national target levels. Based on the WHO Ambient Air Quality Guidelines[6] these target levels for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM 10/2.5) and ozone (O_3) are as follows:

[6] http://www.who.int/en/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health

SO_2: 20 µg/m^3 (24-hour mean);
500 µg/m^3 (10-minute mean)

NO_2: 40 µg/m^3 (annual mean);
200 µg/m^3 (1-hour mean)

$PM_{2.5}$: 10 µg/m^3 (annual mean);
25 µg/m^3 (24-hour mean)

PM_{10}: 20 µg/m^3 (annual mean);
50 µg/m^3 (24-hour mean)

O_3: 100 µg/m^3 8-hour mean

The General EHS Guidelines go on to provide instruction on demonstrating attainment with these air quality guidelines using qualitative or quantitative assessments; instruction on design of stack height for point source emissions with consideration to other source emissions in the vicinity; and monitoring approaches for gaseous fuel-fired turbines.

2.4.4 Electric Power Transmission and Distribution

The EHS Guidelines for Electric Power Transmission and Distribution (2007) include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. In the case of this Project, the cooperative agreement established between the gas supplier (MoMP/Afghan Gas Enterprise), the national utility entity (DABS) and the Project Proponent will demarcate the roles and responsibilities for the construction of upstream and downstream components and the management of environmental and social performance including transmission and distribution of electricity produced by the Mazar IPP.

2.4.5 Thermal Power

The EHS Guidelines for Thermal Power (2008) provides guidance applicable to combustion processes fueled by gaseous, liquid and solid fossil fuels and biomass and designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of the fuel type with a total rated heat input capacity above 50 Megawatt thermal input (MWth) on Higher Heating Value (HHV) basis. These EHS guidelines apply to boilers, reciprocating engines, and combustion turbines in new and existing facilities and is structured as follows:

Section 1.0 – Industry Specific Impacts and Management
Section 2.0 – Performance Indicators and Monitoring
Section 3.0 – References and Additional Sources
Annex A – General Description of Industry Activities
Annex B – Environmental Assessment Guidance for Thermal Power Projects

While emissions guidelines applicable to facilities with a total heat input capacity of less than 50 MWth are presented in Section 1.1 of the General EHS Guidelines, Annex A of these EHS guidelines contains a detailed description of industry activities for this sector, and Annex B contains guidance for Environmental Assessment (EA) of thermal power projects that is relevant to the proposed Project.

3 PROJECT DESCRIPTION

The Mazar-e Sharif 50 MW gas-to-power plant (the “Project” or “Mazar IPP”), is an independent power producer scheme wherein the IPP is the Afghan Power Plant Company, a subsidiary of the Ghazanfar Group (“GG”), a private Afghan enterprise with operations across Afghanistan, Central Asia and the Middle East and headquarters in Mazar-e Sharif, Afghanistan. GG has been active in the petroleum and energy sector since 1998. The project will utilize natural gas that will be supplied under an existing Implementation Agreement with the MoMP/Afghan Gas Enterprise from gas fields in Sheberghan. Electricity generated by the Mazar IPP will be dispatched by Da Afghanistan Breshna Sherkat (DABS), the Afghan national utility entity, under an existing Power Purchase Agreement dated January 20, 2018 over 20 years. This Project is being supported by the World Bank Group, International Bank for Reconstruction and Development to be a privately financed independent power project.

The Mazar IPP will be a greenfield development located nearby Mazar-e Sharif, a major hub of economic activity in Afghanistan. The site selected for development is located on government land owned by the Ministry of Energy and Water (MoEW) that has been transferred to the Afghan Power Plant Company through ARAZI, the national land authority, under a renewable 25 year lease (Annex 10). According to ARAZI, the land is currently designating as an industrial area. Based on a 1975 official land survey it was previously demarcated as Grazing Land however no clear land title or ownership records exist in the current public record. The Afghan Power Plant Company received its Electricity Operation License issued by the Ministry of Energy and Water and Central Business Agency on July 10, 2018 (Annex 10).

Site selection was based on regional and national government energy planning that considers proximity to domestic natural gas reserves, current and future foreign Power Purchase Agreements and high voltage (HV) electricity transmission system assets. Currently the North East Power System (NEPS) contains the major northern and northeastern load centers in Afghanistan serving Kabul, Mazar-e Sharif, Kunduz, Baghlan and Jalalabad. Electricity generated from natural gas in the Sheberghan gas fields is expected to feed into the NEPS once online. Several regional interconnection projects are underway to link NEPS with the country's other major non-connected networks; the South East Power System (SEPS), the Turkmenistan System and the Herat System. Thus, this Project is one part of the larger effort towards development of an interconnected national transmission grid that utilizes available national energy resources and is synchronized with key import transmission lines to more effectively serve the population and domestic development goals.[7]

Regarding Afghanistan's energy sector governance the Inter-Ministerial Commission of Energy (ICE) plays the role of coordination and policy making body for energy sector activities while the Ministry of Energy and Water (MEW) is the nodal ministry for power sector development and tariff setting. The Ministry of Mines and Petroleum (MoMP) is the authority overseeing the Afghan Gas Enterprise, a secondary division of the MoMP that carries out activities such as exploitation, development, production, processing and delivery of natural gas to its clients.[8]

The Mazar IPP will be integrated with several other ongoing projects being developed by the public and private sectors. The upstream and downstream projects that have been undertaken previously or that are ongoing are directed by the MoMP/Afghan Gas Enterprise and DABS, and environmental and social performance associated with these operations is conducted under the environmental jurisdiction of the Afghanistan National Environmental Protection Agency.

IFC defines a project's area of influence as the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of a project; areas potentially impacted by cumulative impacts from further planned development of a project; and areas potentially affected by impacts from

[7] https://sites.google.com/site/iceafghanistan/neps---overview

[8] CAREC: Study for Power Sector Financing Road Map, Mobilizing Financing for Priority Projects. Afghanistan 2016. ADB TA 8727 REG.

unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without a project or independently of a project. Work being conducted on gas supply wells and gas processing plants in Sheberghan, gas transmission pipelines, electricity transmission lines and substations are currently underway and serve multiple purposes and parties. These are therefore projects occurring independently of the Mazar IPP and they are outside the area of influence.

The source of gas supplied to the Mazar IPP by Afghan Gas Enterprise will be from wells in the Shebergan gas fields located in Jowzjan Province approximately 100 km west of the Project site. Wells in these fields currently supply gas for the Northern Fertilizer and Power Plant (NFPP) in Mazar-e Sharif, Compressed Natural Gas (CNG) for use in transport and power generation, and cooking and heating in the Sheberghan area.

The NFPP, called Kod-e Barq (“fertilizer electricity” in the local language) was established in 1966 and is located adjacent to the north of the proposed Mazar IPP site (Figure 3-1). Designed to produce 48 MW of energy, the plant began power production in 1971 and production of urea fertilizer commenced in 1974. The site is operating at some capacity, however the site owners declined to comment and no information was provided to the ESIA team on the current outputs and future plans for production.

Gas supply wells

According to recent estimations by the MoMP, the gas wells of the Sheberghan gas fields are producing 400 MCM of gas from 35 wells in four fields located within approximately 20 km of Sheberghan:

- Gerquduq (sweet) (online 1980);
- Shakarak (sweet) (online 2011);
- Khoja Gogerdak (sweet) (online 1967);
- Yatimtaq (sour) (online 2015).

Most of these supply wells were drilled by Russian exploration teams and have been refurbished following abandonment in the 1990s (Figure 3-2). The gas from these wells contains varying concentrations of hydrogen sulfide (H_2S) generally in the range of 0%-

1.4%. The MoMP is committed to providing gas supplied from Sheberghan gas fields to the Mazar IPP based on the executed Implementation Agreement dated January 20, 2018. Gas samples from the Yatimtaq and Gerquduq fields were analyzed and the results are presented in Annex 8.

Gas processing plant

Aside from H_2S, other elements and compounds naturally present in raw natural gas include nitrogen, water, ethane, butane, pentane and other heavier hydrocarbon molecules. Before the natural gas can be used by an IPP, it must undergo initial processing at the gas field manifold to remove water and condensate and then be conveyed to a processing plant for "sweetening". Currently, this is accomplished for sour gas from the Yatimtaq gas field that supplies the NFPP in Mazar-e Sharif. This processing plant is an amine plant that utilizes a liquid desiccant (monoethanolamine or diethanolamine) that is passed through the natural gas to remove hydrogen sulfide and carbon dioxide (the "acid gas" fraction of raw natural gas). Further processing includes dehydrating the gas, stripping other impurities, and compressing the gas stream prior to conveyance into the gas pipeline.[9] The processing plant is operated by the MoMP under the environmental jurisdiction of the Afghanistan National Environmental Protection Agency.

Gas Transmission Pipeline

A 12-inch diameter gas transmission pipeline that was constructed in 1967 between the Khoja Gogerdak gas field and Mazar-e Sharif currently conveys natural gas from the Yatimtaq gas field to the NFPP. In order to improve operational efficiencies and increase the volume and pressure of gas supplied through this pipeline seven sections of piping totaling 15 km were repaired in 2013. According to GG, the pipeline has the capacity to supply 850,000 m^3 of natural gas per day. A figure depicting the gas pipeline transect in the vicinity of the Mazar IPP has been provided in Figure 3-1.

[9] AEAI. Sheberghan Gas Field Development Project (SGFDP). Critical Path for Sheberghan Gas Field Development. February 15, 2011.

In addition to the upstream infrastructure described above other independent projects associated with the downstream electrical infrastructure are ongoing. Currently, Afghanistan's power system operates off of numerous grid 'islands' with different power supply sources, and 110 or 220 kV links, that are not synchronized. Efforts are underway to operationalize a major backbone-forming interconnection between the North East Power Supply (NEPS) serving Kabul, Mazar-e Sharif, Kunduz, Baghlan and Jalalabad, and the Southeast Power Supply System (SEPS) serving the southern urban load centers of Kandahar and Helmand (Lashkar Gah). The Da Afghanistan Breshna Sherkat (DABS) was created in 2008 as part of the strategy to upgrade, commercialize and market a new electricity infrastructure, and is charged to operate and manage power generation, import, transmission, and distribution infrastructure on a commercial basis throughout Afghanistan.

With regard to the power produced by the Mazar IPP, DABS is expected to determine whether to utilize the power in the north to offset current imports from Uzbekistan and Turkmenistan; transmit the power into the NEPS and SEPS; or, sell power to one or more potential military or industry anchor customers in the Mazar region. There are several anticipated downstream projects associated with the Mazar IPP that are described below.

Electricity transmission lines

Currently a new 220 kV transmission line between Sheberghan and Mazar-e Sharif is underway to replace a previously damaged 110 kV line. The Mazar IPP will transmit power to this line via a new 220 kV overhead tie-in transmission line that will be constructed by DABS under the environmental regulatory requirements of the Afghanistan NEPA. DABS will be responsible to construct this approximately 11.3 km transmission line.

A map depicting the proposed location of the 220 kV overhead tie-in transmission line as well as the new 220 kV transmission line between Sheberghan and Mazar-e Sharif is presented in Figure 3-1.

Substations

The North East Power System (NEPS) grid currently imports power from Uzbekistan via a 220 kV station through the northern Afghan border at Hairatan and into the Naibabad switching station, where 33 MW is fed into the Mazar distribution system.[10] As part of the 220 kV Sheberghan to Mazar-e Sharif overhead transmission line project that is required to import power from Turkmenistan into the NEPS, the existing 220 kV substation at Mazar-e Sharif will require expansion. The 220 kV overhead transmission line is being constructed under the jurisdiction of DABS and the environmental jurisdiction of the Afghanistan NEPA.

[10] AEAI. Sheberghan Gas Field Development Project (SGFDP). Gas/Power and Related Infrastructure Assessment. April 5, 2011.

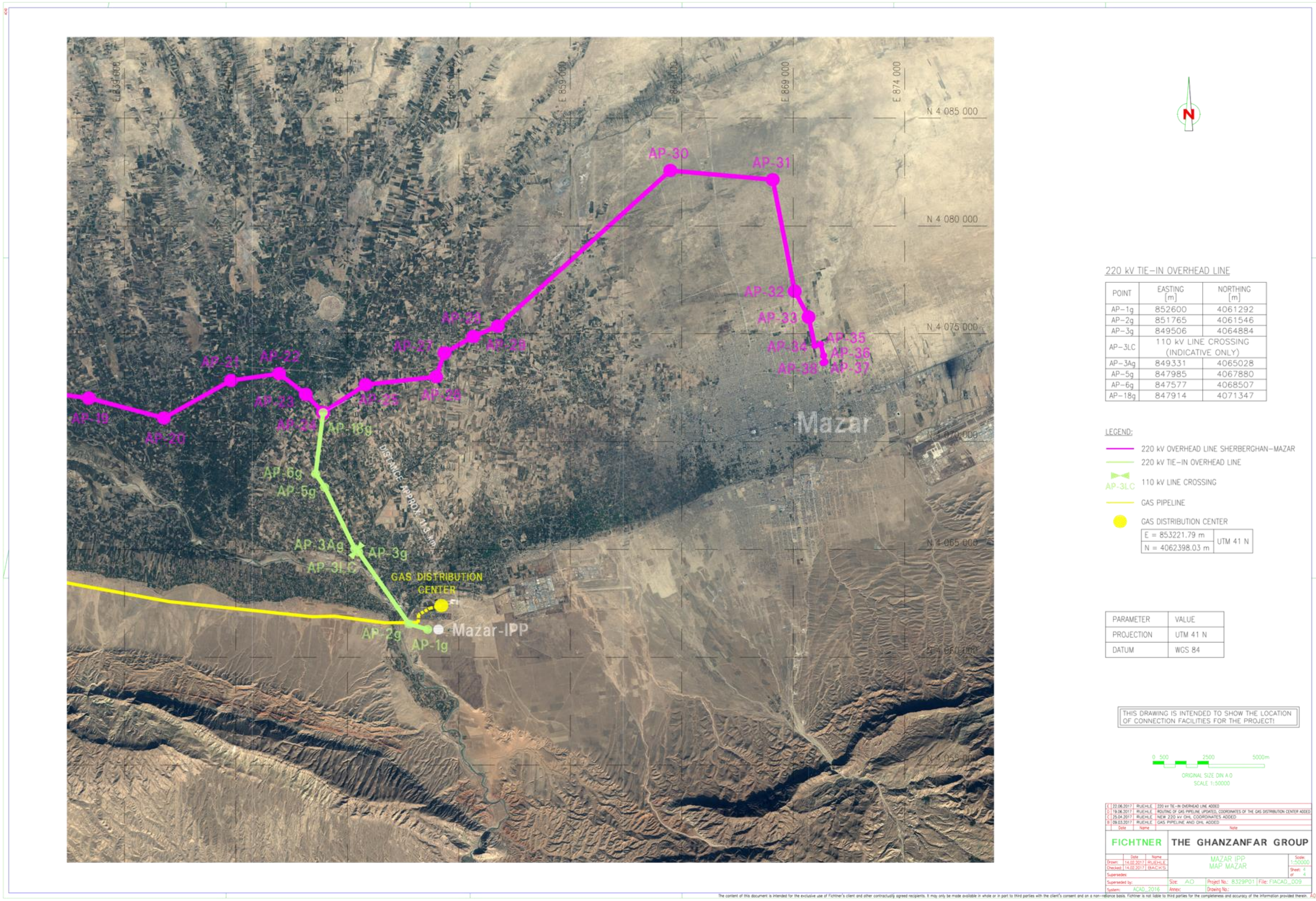


Figure 3- 1 Proposed Pipeline and Transmission ROW

3.1 Project Location

The project site is located in Dehdadi District, Balkh Province in northern Afghanistan, situated approximately 17 km southwest of the provincial capital Mazar-e Sharif and 15 km southeast of the town of Balkh at 36°37'56.67"N 66°56'42.74"E, elevation 432 m. The site is located adjacent to two industrial facilities; roughly 300 meters south of the Northern Fertilizer & Power Plant (NFPP) and 100 meters west of the Jade Glass Manufacturing Plant. The nearest residential developments are located greater than 1000 meters north of the site beyond the NFPP.

The project area consists of unproductive and undeveloped land. Geographically, the site lies on the rolling North Afghan Plain roughly 5 km north of the E'-W' ridgeline of the Alburz Mountain Range. The Balkh River is located 1.3 km west of the site, flowing north where it eventually dissipates into the canals of the northern plain.

The NFPP is accessible by an asphalt road (demarcated purple, Figure 3-4). A paved roadway for access to the site is proposed, passing around the Fertilizer Plant (demarcated red, Figure 3-4). The estimated land requirement for a 50 MW gas engine power plant is approximately 250 m x 120 m, equivalent to 3 ha as the required minimum. The designated land appropriated for the development measures approximately 420 m x 520 m, or 22 ha (demarcated green/hatch, Figure 3-4). The Project layout is presented in Figure 3-5.

Figure 3- 2 Northern Fertilizer and Power Plant

Figure 3- 3 Sheberghan Gas Well

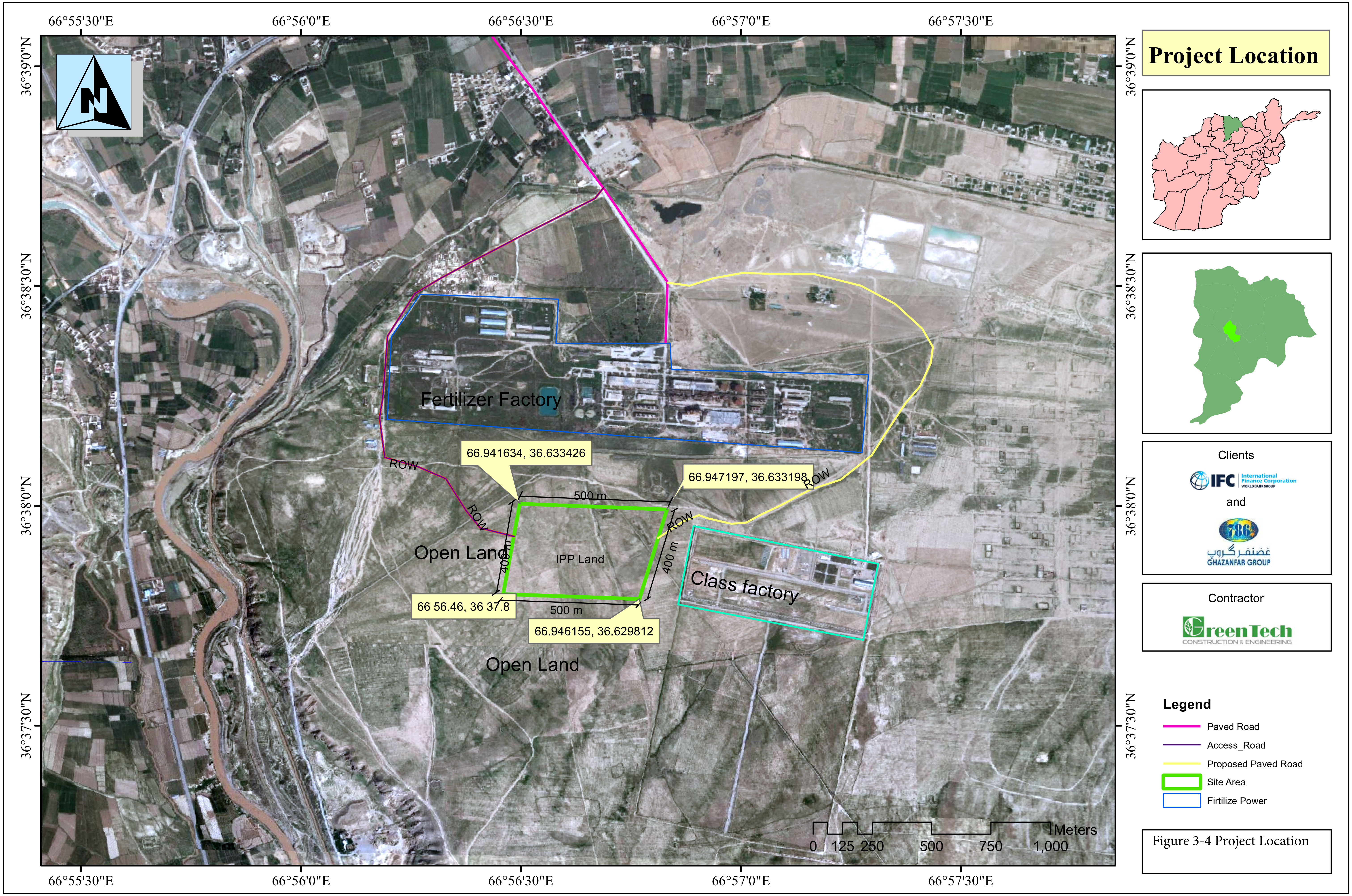


Figure 3-4 Project Location

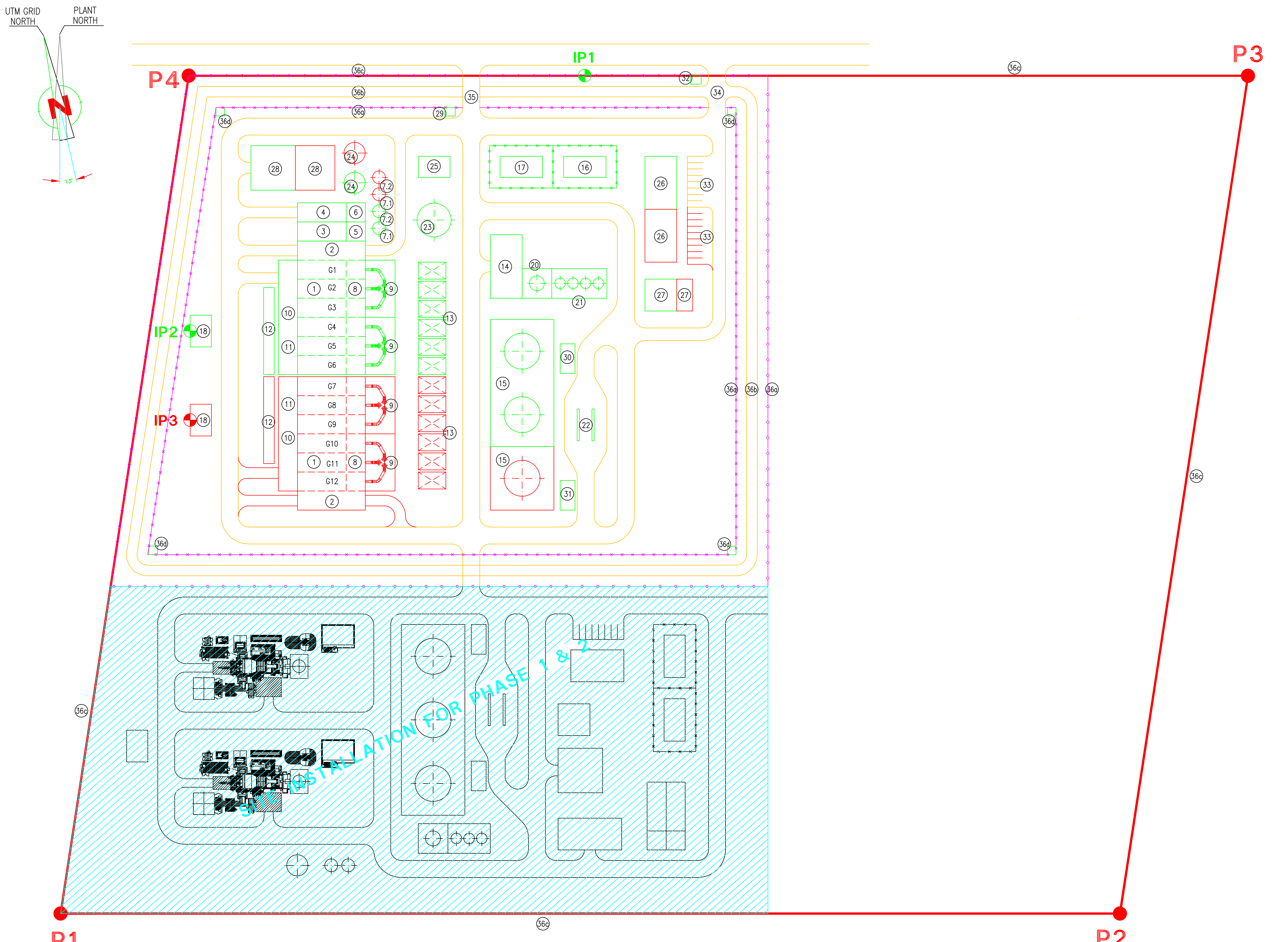


Figure 3-5 Project Site Layout

LEGEND:

1. ENGINE HALL
2. LOADING BAY
3. HEAVY PARTS CLEANING AND MAINTANCE BAY
4. WORKSHOP
5. EMERGENCY GEN–SET–ROOM
6. COOLING WATER TREATMENT
7.1 TREATED WATER TANK
7.2 TREATED WATER MAINTENANCE TANK
8. MECHANICAL AUXILIARIES – INSIDE
9. MECHANICAL AUXILIARIES – OUTSIDE / STACK
10. SWITCHGEAR & ELECTRICAL BUILDING COMPLETE WITH CABLE BASEMENT
11. CONTROL ROOM AND I&C (FIRST FLOOR)
12. AUXILIARY TRANSFORMERS / MAIN SWITCHGEAR
13. RADIATOR COOLERS
14. BUILDING WITH
    - FUEL TREATMENT*
    - OILY WASTE WATER TREATMENT
    - SEAWAGE TREATMENT
15. HEAVY FUEL OIL STORAGE TANK*
16. NATURAL GAS RECEIVING STATION
17. GAS PRESSURE REDUCING STATION
18. GRID CONNECTION SWITCHGEAR
19. not used
20. DIESEL FUEL OIL STORAGE TANK*
21. TANKS FOR:
    - FRESH OIL
    - MAINTENANCE OIL
    - OLD OIL COLLECTION
    - SLUDGE TANK*
22. FUEL UNLOADING STATION*
23. FIRE FIGHTING TANK
24. RAW WATER TANK
25. FIRE FIGHTING BUILDING
26. ADMINISTRATION BUILDING
27. SOCIAL BUILDING
28. STORE BUILDING
29. GUARD HOUSE
30. SEWAGE COLLECTOR PIT
31. SOAK AWAY PIT
32. MAIN GATE
33. PARKING
34. ROAD ACCESS FOR LIGHT MACHINERY
35. EMERGENCY EXIT & FUEL OIL TRUCK ACCESS
36. FENCING:
    - 36a ANTI PERSONNEL FENCE
    - 36b PATROL ROAD
    - 36c BOUNDARY WALL
    - 36d WATCH TOWER

INTERFACES:

IP1 GAS SUPPLY
IP2 POWER EXPORT PHASE 1
IP3 POWER EXPORT PHASE 2*

PHASE 1
PHASE 2*

*OPTIONAL

THIS DRAWING IS INTENDED TO DEMONSTRATE THE OVERALL CONCEPT OF THE PROJECT AND TO EVALUATE LAND REQUIREMENTS; THE EPC CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING THE SITE LAYOUT TO SUIT HIS OWN PLANT AND EQUIPMENT, ALTHOUGH THE MAIN PRINCIPLES SHALL BE MAINTAINED.

0 10 50 100m

ORIGINAL SIZE DIN A 1
SCALE 1:1000

PARAMETER	VALUE
PROJECTION	UTM 42 N
DATUM	WGS 84

LAND FOR MAZAR IPP

POINT	EASTING [m]	NORTHING [m]
P1	315877.0	4055757.6
P2	316375.8	4055722.4
P3	316463.8	4056112.6
P4	315965.1	4056147.7

(INDICATIVE ONLY)

	Date	Name	Note
E			
D	16.05.2018	RUEHLE	REVISED LOCATION ACCESS ROAD/SUBSTATION
C	09.05.2018	RUEHLE	REVISED FOR TENDERING
B	08.05.2018	RUEHLE	FIRST ISSUE

FICHTNER | THE GHANZANFAR GROUP

	Date	Name
Drawn:	03.05.2018	RUEHLE
Checked:	03.05.2018	ALBER

Supersedes:
Superseded by:
System: ACAD_2016

MAZAR IPP
LAYOUT POWER PLANT

Scale: 1:1000
Sheet:
of

Size: A1 | Project No.: 8329P01 | File: FIACAD_020
Annex: | Drawing No.:

A1

3.2 Project Details

Table 3- 1 Project Details

Inspection Items	Description
Project Description:	The Mazar IPP is an independent power project being developed by the Afghan Power Plant Company, a subsidiary of Ghazanfar Group ("GG"), a prominent Afghan conglomerate established in 1910 with diversified business interests including oil & gas, power, oil refinery, banking, media, trading, logistics, transport and construction sectors. The Project is being supported by World Bank Group to be a fully privately financed independent power project ("IPP") utilizing available natural gas reserves in the north of Afghanistan. The Project is supported by the Afghanistan government and collaboration and planning has been conducted with the Ministry of Energy and Water (MoEW), Ministry of Mines and Petroleum (MoMP) and Da Afghanistan Breshna Sherkat (DABS).
Project Objective:	Mazar IPP will meet a significant portion of current local demand in Mazar region, hence offsetting imported power which was previously utilized and supplied through NEPS to Kabul.
Main Project Activities:	The Afghan Power Plant Company will engineer, design, procure, procure, supply, erect, construct, install, test and commission the power plant.
Gas Supply:	The gas supply will be made available by Ministry of Mines & Petroleum through Afghan Gas Enterprise. The source of gas supplied to the Mazar IPP by Afghan Gas Enterprise will be from wells in the Shebergan gas fields located in Jowzjan Province approximately 100 km west of the Project site through an existing 12-inch pipeline currently connected to the NFPP located 300 m north of the site.

Gas Engine Specification:	The power plant technology will consist of 3-6 spark ignition (or pilot ignition in the case of dual-fuel) reciprocating gas engines with a combined electrical power output capacity of approximately 50 MW. The engine cooling shall be realized by auxiliary closed cooling water systems with radiator cooling banks dimensioned for power without heat production. Electric power will be generated by gas generating set. The engine is capable of running at rated output continuously, however, estimated power rating is 80% or 7000 hrs/year.
Transmission Lines:	A 220 kV overhead electricity transmission line will be constructed by DABS to distribute electricity to the Sheberghan to Mazar-e Sharif 220 KV transmission line located approximately 11.3 km north of the site in order to supply power to the grid.
Project Schedule:	The estimated project schedule to acquire permits and approvals is 12 months. Construction timeline is expected to be approximately 12 months.

3.3 Land Acquisition

On June 6, 2018 a formal lease agreement was executed between the Afghan Power Plant Company (lessee) and the GoIRA Ministry of Energy and Water (lessor) for the site property containing 200,000 m^2. This agreement, along with the Electricity Operation License is provided in Annex 10. The agreement indicates that the lessor, being the true and lawful owner of the Project Site with full right, power and authority to enter into the lease agreement has agreed to lease and grant rights of way, easements and way-leaves with all rights and privileges, and to grant to the lessee all licenses, benefits and privileges to the property.

On July 26, 2018, the Green Tech ESIA team conducted a meeting with the Afghanistan Independent Land Authority (ARAZI) office in Mazar-e Sharif that oversees the national Land Planning Development Program (IDPL) designed to provide a modern, transparent and sustainable land management system in Afghanistan and serve as the platform for designing and implementing government policies and plans for economic development. According to information provided by ARAZI officials the site property land was demarcated in a 1975 (1354) land survey as Grazing Area. However, at present, the site perimeter line is located adjacent to two industrial facilities, roughly 300 m south of the Northern Fertilizer & Power Plant (NFPP) and 100 m west of the Jade Glass Manufacturing Plant; and according to ARAZI this area is currently considered to be an Industrial Zone. Furthermore, ARAZI did not have any land title records or documentation of land transfer covering the Project site over the past 100 years or beyond.

Based on the fact that the stakeholder outreach meetings conducted by the ESIA team in the affected communities surrounding the site to the north did not result in any comments or complaints about the loss of use of the site ground for any purpose, it is not deemed to be a public concern. Furthermore, as shown in Figure 3-1, there is massive expanse of undeveloped land immediately south of the site that is similar in the soil type, micro-climate and ecosystem value to that of the Project site. Therefore, no impacts to grazing, agriculture or other human economic use are expected due to the site development. Based on this land acquisition assessment, IFC Performance Standard 5 is not triggered by this activity.

4 ENVIRONMENTAL AND SOCIAL CONDITION

4.1 General

The environmental baseline of the proposed Project and its surroundings has been established for each environmental aspect under consideration. This has been achieved largely through consultations with relevant stakeholders, a desktop review of available literature, limited environmental testing and analysis, and site walkovers.

The prevailing environmental conditions of the study area within which the proposed gas-to-power plant would be sited, as well as the socio-economic situation is presented in this chapter. Components described herein include:

- Physio-chemical environment (climate, geology, sediment, soil type and distribution, surface water and groundwater characteristics);
- Biological environment (fisheries, flora and fauna characteristics); and
- Socio-economic conditions describing; demographic structure, culture, social and health status of the host community.

Baseline conditions presented are based on information sourced from literature as well as findings from field sampling and surveys over two seasons (dry and wet). Also reported are laboratory analyses and interpretation of samples obtained. Information acquired during this ESIA will be used in further environmental management decisions and future monitoring of changes, if any, in the environmental characteristics.

It is important to note the limitations of the baseline study based on the site-specific conditions. Due to the nature of recent political events in the country, many public records as would typically be available regarding socio-economic data are absent from the record. For example, rigorous data on trends in baseline income levels and other socio-economic indicators are less available in the current Afghan context. In addition, certain scientific resources and infrastructure such as accredited analytical laboratories are limited or absent. This study has therefore used available resources and the knowledge of subject matter experts to extrapolate from the best available information as needed.

4.2 Physio-Chemical Conditions

The geographical context for the project is northern Afghanistan, specifically Dehdadi District of Balkh Province. Afghanistan geography is shaped by the Hindu Kush Mountains that run on a southwest-northeast transect through the middle of the country and are flanked by foothills, deserts and plains. The project area is located within sight (roughly 5 km) of the northern foothills of the Hindu Kush Mountains that settle into the plains south of the Amu Darya. The northern plain is variously referred to as the Hairatan Valley, Amu Darya Valley, or Turkistan Plain and is situated at the southern edge of the Central Asian Steppe.

4.2.1 Climate

The northern plains region is considered subtropical and semi-desert and the study area's climate is strongly influenced by topography. The area has a steppe climate, with generally dry weather, hot summers and cold winters. Maximum temperatures exceed 40°C degrees, and the minimum temperature averages near 10°C degrees. The swing seasons are unstable regarding temperature and precipitation, and the city of Mazar-e Sharif is known for variability of the weather conditions. The diurnal temperature range rarely exceeds 20°C, but during the year, the variation can reach 30° to 35°C. The following graphs and tables provide more detailed climatic information of Dehdadi District covering 2009 to 2016.[11]

Air Quality

`Outdoor air quality is affected by pollution that contains a mix of chemicals, particulate matter, and biological materials that react with each other to form tiny hazardous particles. It contributes to breathing problems, chronic diseases, increased hospitalization, and premature mortality. The concentration of particulate matter (PM) is a key air quality indicator since it is the most common air pollutant that affects short term and long term health. Two sizes of particulate matter are used to analyze air quality; fine particles with a diameter of less than 2.5 µm or PM2.5 and coarse particles with a diameter of less than 10 µm or PM10. PM2.5 particles are more concerning because their small size allows

[11] https://www.worldweatheronline.com/Dehdadi-weather-averages/ghazni/af.aspx

them to travel deeper into the cardiopulmonary system. The World Health Organization's air quality guidelines recommend that the annual mean concentrations of PM2.5 should not exceed 10 µm/m3 and 20 µm/m3 for PM10.

According to the UN Environment Programme working in Afghanistan, dust and vehicle emissions in the country's urban areas are the main factors negatively affecting air quality. During late autumn and winter, air quality is reportedly worsened by domestic emissions arising from increased use of ovens, stoves and open fires. Electricity shortages and a lack of fuelwood mean that households resort to burning some packaging materials that may cause toxic fumes. As part of its national environmental assessment UNEP carried out air sampling at urban sites in Mazar-e Sharif and the results indicated high amounts of dust and concentrations of poly aromatic hydrocarbons (PAHs) mainly attributable to vehicle emissions. A National Ambient Air Quality Management Strategy and a Clean Air Implementation Plan for Kabul and five other cities is being undertaken.

Temperature

According to the geographical location of Dehdadi District, this district generally has moderate temperature and the difference in diurnal variation does not generally exceed 20ºC. This temperatures are quite variable in spring and fall, and can exceed 40ºC in summer and 10ºC in winter. Table 4-1A and figure 4-1B show the temperature of Dehdadi District.

Table 4- 1 Monthly Temperature Data

Month	Year																							
	2009			2010			2011			2012			2013			2014			2015			2016		
	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min
Jan	10	6	1	13	9	4	8	4	-1	7	4	-1	8	5	0	10	6	1	11	8	4	15	12	7
Feb	14	10	5	11	8	3	9	6	1	5	2	-2	13	10	5	5	1	-4	15	12	8	17	14	7
Mar	22	18	11	23	18	11	18	13	6	15	11	6	19	16	10	17	14	8	18	15	10	23	19	14
Apr	22	19	13	29	25	20	28	24	16	27	23	17	24	21	15	25	22	16	28	25	20	27	24	19
May	32	29	22	33	30	25	34	30	24	31	28	21	31	28	22	33	30	25	34	31	27	35	32	28
Jun	35	32	15	37	34	27	37	34	27	35	32	26	37	34	28	38	35	29	39	36	32	39	36	31
Jul	40	36	28	39	36	28	37	34	27	38	35	28	38	35	29	39	35	29	40	37	33	40	37	32
Aug	38	34	26	37	33	26	37	34	27	37	34	27	37	33	27	37	34	28	37	35	30	37	35	30
Sep	33	29	22	31	27	20	31	28	21	30	27	21	35	32	25	34	31	24	32	29	24	36	33	28
Oct	26	21	14	27	23	15	24	21	15	24	21	15	26	22	16	24	21	15	27	24	19	25	21	16
Nov	17	13	8	18	14	7	13	11	7	16	13	8	18	14	9	15	12	7	17	14	10	17	13	7
Dec	13	9	3	13	8	2	7	4	0	9	6	2	10	7	3	12	8	3	13	10	6	15	12	7

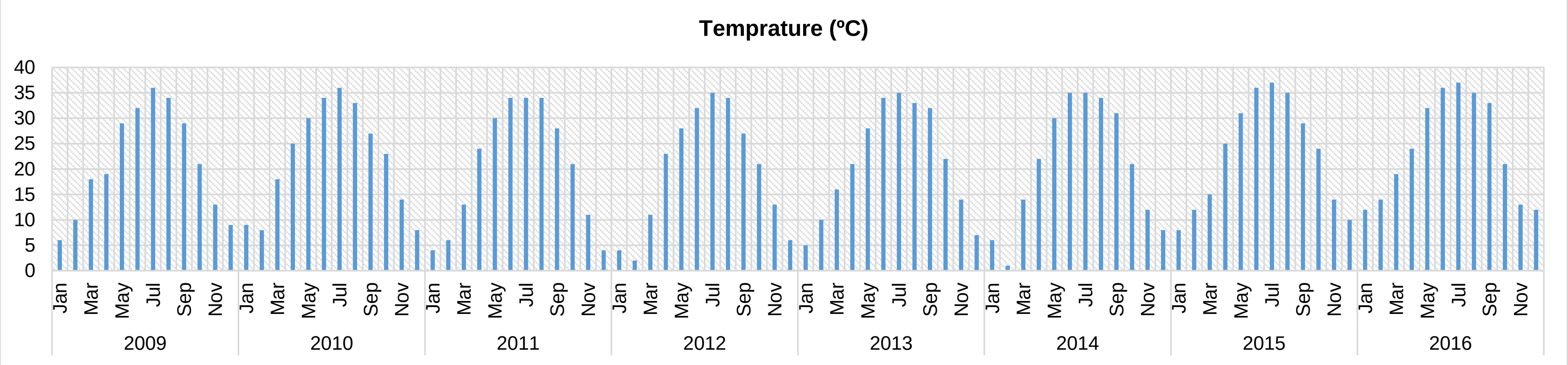


Figure 4- 1 Temperature Data

Rainfall

The following table and figure provides the rainfall of Dehdadi district from 2009 to 2016. The highest rainfall in this district is in February, March and April. The annual precipitation average in Dehdadi district is 300 to 350 mm.

Table 4- 2 Rainfall Data

Month	Year								
	2009	2010	2011	2012	2013	2014	2015	2016	Average
Jan	59.62	14.1	21.92	68.41	36.17	24.39	39.06	15.18	34.85
Feb	111.74	92.33	99.67	95.57	56.71	45.72	54.26	9	70.625
Mar	40.61	37.6	47.63	74.13	58.76	99.3	33.84	50.93	55.35
Apr	84.44	61.4	31.8	111.64	25.43	72.9	10.9	35.05	54.195
May	33.64	44.57	21.41	53.52	16.81	53.94	28.19	35.66	35.96
Jun	2.81	1.71	6.2	10.49	7.67	7.6	1.12	9.47	5.88
Jul	0	0	0	0	0	0	0.3	1.2	0.1875
Aug	0	1.87	0	1	0.1	0	0.3	0	0.40875
Sep	0	6.62	0.1	0.29	0	0.49	0	0	0.9375
Oct	7.69	6.4	25.24	12.6	8.82	14.9	6.05	3.1	10.6
Nov	49.28	1.8	81.48	68.01	13.39	55.55	30.24	12.5	39.03125
Dec	58.14	8.41	7.49	53.68	43.1	21.9	10.18	8.9	26.475

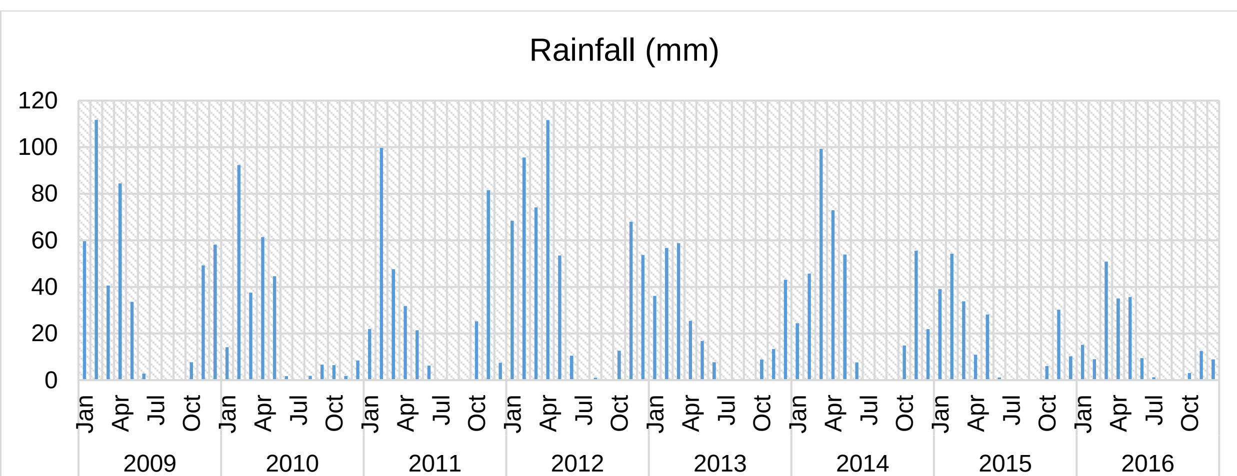


Figure 4- 2 Rainfall Data

Snowfall

In Dehdadi district snowfall generally occurs during the last month of the fall season and continues until late winter and the highest snowfall is in January and February.

Table 4- 3 Snowfall Data

Month	Year								
	2009	2010	2011	2012	2013	2014	2015	2016	Average
Jan	5.8	2.5	3.7	18.4	4.6	1.8	0.9	0.7	4.8
Feb	3.1	10	6.8	14.1	2.3	30	10.1	3.3	9.9625
Mar	0	0	5.4	5.4	11.9	3.2	0	0	3.2375
Apr	0	0	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0	0	0
Jun	0	0	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0	0	0
Aug	0	0	0	0	0	0	0	0	0
Sep	0	0	0	0	0	0	0	0	0
Oct	0	0	0	0	0	0	0	0	0
Nov	0	0	12.6	0	0	0	0	6.3	2.3625
Dec	2.9	0	1.7	17	8.3	1.2	0.7	2.4	4.275

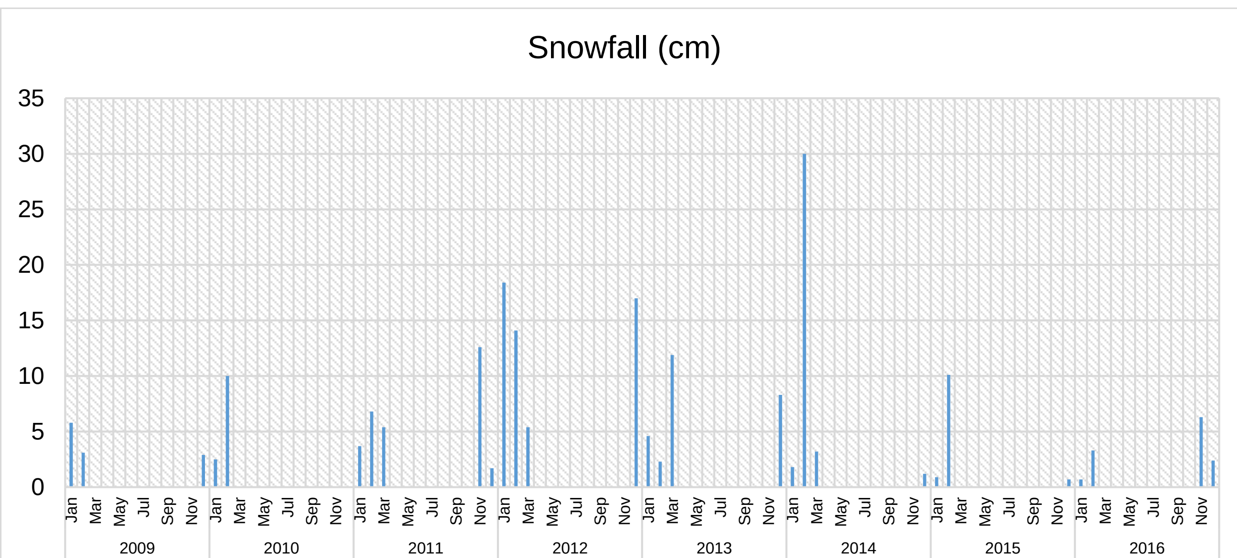


Figure 4- 3 Snowfall Data

Wind

Winds are primarily northwesterly and southeasterly however easterly winds are not uncommon in the winter and fall. Prevailing wind speeds average 7.35 mph, and while infrequent gusty winds can occur in late spring or early summer, winds are generally stable. Table 4-4 and Figure 4-4 presents monthly wind speeds.

Table 4- 4 Wind Data

Month	Year (mph)							
	2009	2010	2011	2012	2013	2014	2015	2016
	Ave	Ave	Ave	Ave	Ave	Ave	Ave	Ave
Jan	6.3	6.9	5.8	7.8	8.3	6	7.4	7.6
Feb	7.6	8.1	6.9	8.7	8.3	6.5	8.3	6.9
Mar	6.9	7.8	6.5	9.6	8.3	8.3	7.8	8.1
Apr	7.6	6.5	6	6.9	7.4	7.4	8.1	7.4
May	6.3	6	8.1	6.5	6.9	7.2	7.8	7.4
Jun	7.4	6.5	8.3	7.4	8.1	7.4	8.1	8.1
Jul	8.5	8.5	9.2	8.5	8.7	9.8	10.5	9.8
Aug	8.3	7.2	8.9	7.8	9.4	8.1	8.7	8.7
Sep	7.4	6.3	7.2	6.9	6.9	7.2	6.9	6.7
Oct	6.7	5.6	6.7	5.6	6.7	7.4	6.7	6.5
Nov	7.6	4	6.7	6.3	5.8	6.3	7.4	6.9
Dec	6	5.1	6.9	7.4	7.6	6.5	7.2	8.1

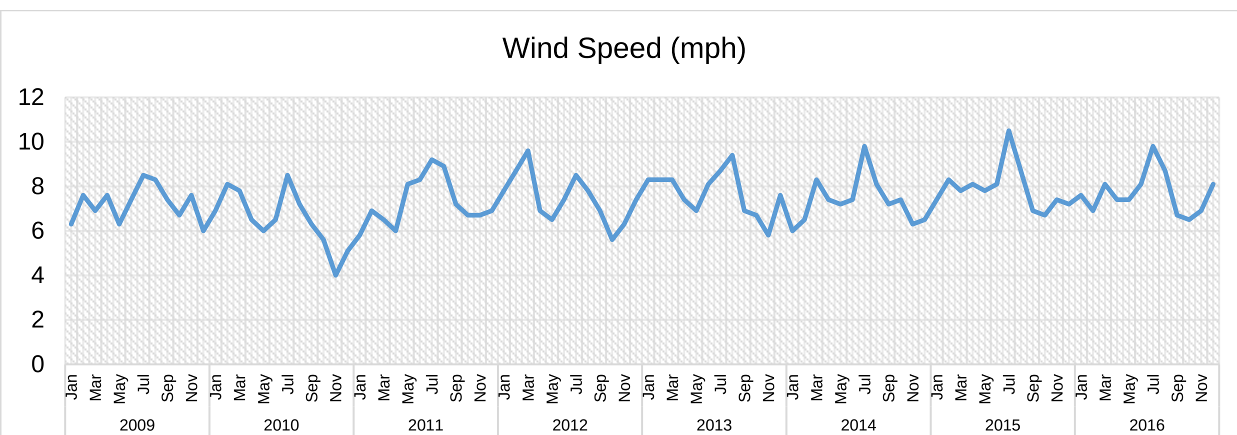


Figure 4- 4 Monthly wind speed of Dehdadi Districts

Humidity and Cloud Cover

The cloud cover has two opposing seasonal patterns, coinciding with winter and summer seasons. In the winter season, the cloud cover is at a maximum ranging from 20-30% and in summer, the sun is more intense with cloud cover ranging from 0-20%. Humidity follows a similar seasonal pattern with low moisture levels in summer and increasing humidity throughout the winters. Table 4-5 and Figure 4-5 show the cloud cover of Dehdadi District.

Sun Hours and Sun Days

As shown in Table 4-6 and Figure 4-6, the average relative frequency of sunny hours/days per month follow the seasonal patterns that characterize humidity and cloud cover with sunnier summers and less sun hours/days in the winter months. The highest average sun hours/days occur in June, July and August.

Climate Change

Climate change projections for Afghanistan show regional differences however overall indicate a strong increase in mean annual temperature (higher than mean global temperature projections), with more rapid warming in the spring/summer seasons in the north of Afghanistan. Precipitation in the north is expected to decrease in the spring/summer and increase in the autumn/winter with overall long-term declines in average mean rainfall. Projections also indicate an increase in the intensity and frequency of flooding due to heavy precipitation events and increased thawing of snow/ice pack. The effects of flooding are further exacerbated by poor land use practices including overgrazing and deforestation. Further, drought is expected to increase in frequency from the historical trend of droughts occurring in approximately 15-year cycles lasting for 2-3 years. In short, drought is expected to become more of a norm as opposed to a cyclical event. The impact on agriculture is expected to increase agricultural water demand due to lower soil moisture levels and increased evapotranspiration.[12]

[12] USAID. *FAA 119 Biodiversity Assessment with Summary Assessment of Climate Vulnerability and other Environmental Threats and Opportunities to Inform USAID/Afghanistan Program Design*. February 2017.

Table 4- 5 Humidity and Cloud Cover Data

Month	2009		2010		2011		2012		2013		2014		2015		2016	
	Cloud	Humidity	Cloud	Humidity	Cloud	Humidity	Cloud	Humidity	Cloud	Humidity	Cloud	Humidity	Cloud	Humidity	Cloud	Humidity
Jan	32	68	29	50	32	58	30	61	28	59	33	58	35	54	26	44
Feb	32	62	36	70	49	72	37	68	34	56	31	72	34	57	18	37
Mar	19	42	22	49	25	54	32	54	27	50	33	56	28	49	26	47
Apr	27	55	17	44	13	34	16	40	23	41	23	45	16	37	16	42
May	12	33	13	35	8	25	11	33	6	24	11	27	13	25	11	28
Jun	6	18	4	18	3	17	4	20	3	16	4	17	1	12	4	21
Jul	2	13	2	15	0	13	1	15	1	14	1	12	3	14	2	17
Aug	1	17	13	15	1	14	2	15	3	18	1	13	3	14	1	15
Sep	4	23	6	23	3	19	3	18	1	17	2	17	2	19	1	18
Oct	6	25	9	33	17	37	11	30	10	31	11	32	9	32	9	28
Nov	20	47	8	45	35	67	23	52	20	41	24	55	27	48	23	39
Dec	30	64	15	43	18	54	30	55	27	60	20	48	23	41	22	49

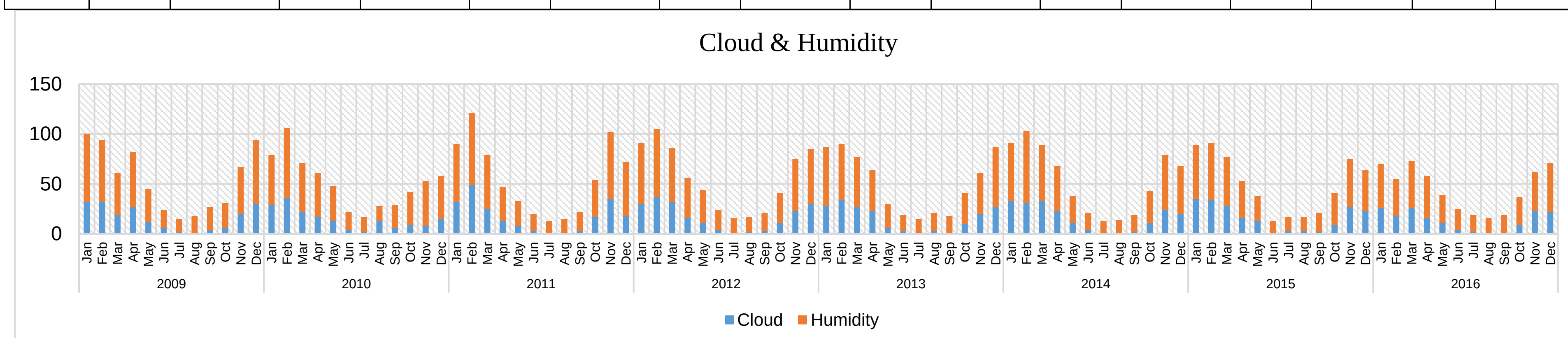


Figure 4- 5 Humidity and Cloud Cover Data

Table 4- 6 Sun Hours and Sun Days Data

Month	Year															
	2009		2010		2011		2012		2013		2014		2015		2016	
	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day	hr	day
Jan	82.5	13	88.3	23	81.3	17	84.8	14	86.8	15	83.8	17	75.3	13	84	18
Feb	71.5	11	73.5	5	61.8	7	70.5	11	74.8	9	71.3	15	74	6	81	25
Mar	122.3	20	121.5	15	119	13	108.8	9	119.5	11	112.3	10	114	10	117.3	8
Apr	137	11	148.8	12	145.8	17	148.3	12	144	9	144.3	11	142.8	12	147	7
May	152.5	22	154	15	155	20	154.8	13	154.5	23	154.5	14	152.8	16	152.8	11
Jun	150	26	150	20	148.5	26	149.8	25	150	25	150	27	150	27	150	18
Jul	155	31	155	31	155	31	155	31	155	31	155	31	155	30	155	27
Aug	155	31	149.3	29	155	31	155	30	155	30	155	31	155	29	155	31
Sep	140	30	137.5	26	141	29	140	29	140	30	141	28	141	30	140	30
Oct	97	28	96.8	22	95	18	94.3	28	96	24	95.8	25	96.8	21	93.8	25
Nov	86	16	89.5	27	74.5	12	85.5	16	87.3	21	84	19	79.5	8	83.8	19
Dec	84.8	15	90.3	24	90	23	81.8	20	85.3	18	88	17	79.8	23	87.5	17

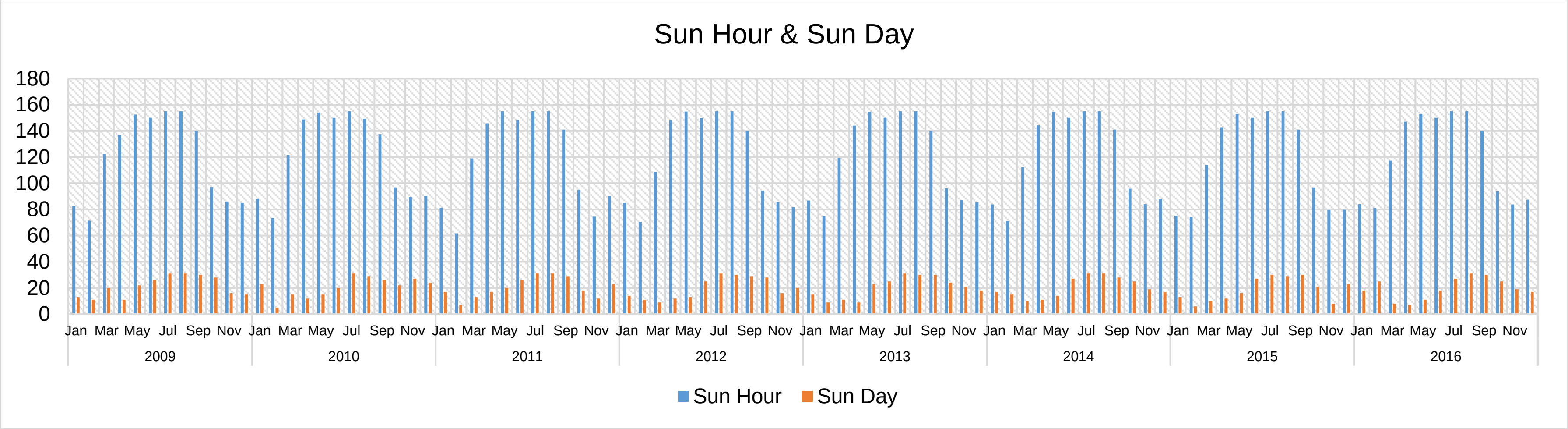


Figure 4- 6 Sun hours and Sun days Data

4.2.2 Geological Studies

Due to the complex geological history of the Hindu Kush-Himalaya mountain system both the geology and soils across the northern region are diverse and varied. In general the mountains forming the northern foothills consist of limestone with inter-bedded marl, conglomerates, and sandstone of Upper Cretaceous/Paleocene origin, as well as later Paleocene and Miocene sedimentary and volcanic rocks. The northern plain consists primarily of thick Quaternary alluvial deposits containing clay, silt, sand, gravel and conglomerate. In general gravelly subsurface soils along the foothills transition towards finer graded soils moving north, however interbedded sand, clay and gravel can be encountered to depths of 150 m even towards the central northern plain.

Tectonic Segmentation

The geology of Afghanistan is structurally complicated, consisting essentially of a succession of narrow northeast-trending terranes of continental fragments of Paleozoic to Tertiary age. These have moved northward, colliding obliquely with the Asian continental land mass. The last arriving fragment was the large Indian continental block. It docked obliquely, imparting much additional folding and Faulting and causing changes in structural trends. The accreted blocks are separated by sutures along which ophiolites are present. The latter apparently are the only remnants of subducted oceanic crust, representing oceanic spaces of unknown widths.

The following structures have been established on the territory of Afghanistan by Shareq and Chmyriov (1980);

1. Regions of Hercynian Folding
2. Epi-Early Cimmerian Platform
3. The Region of Middle Cimmerian Folding
4. Median masses;
5. Regions of Alpine Folding.

The project is located in Epi-Early Cimmerian Platform.

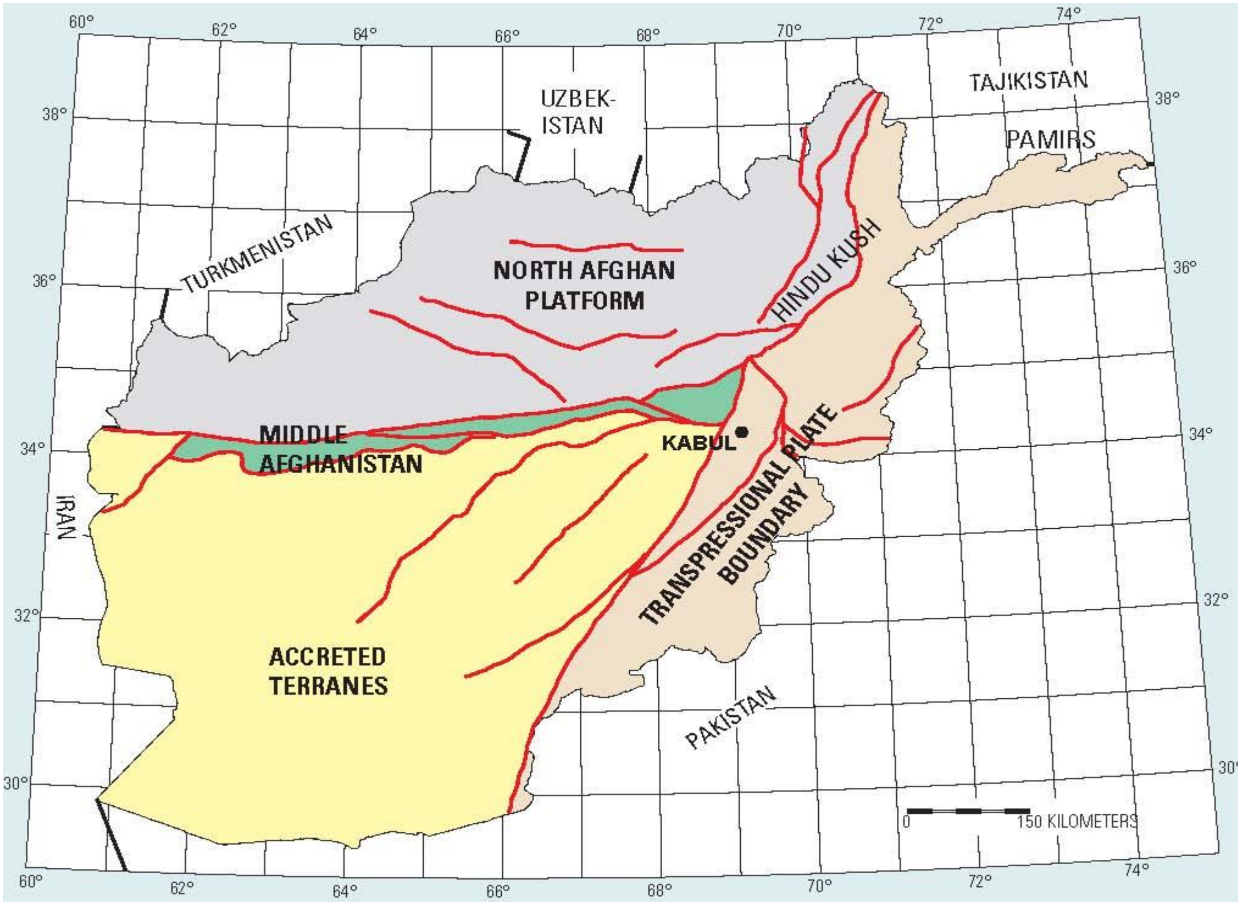


Figure 4- 7 Tectonic Map of Afghanistan

Earthquakes

The greatest concentration of large and small crustal earthquakes is in and around northeastern Afghanistan beneath the Hindu Kush and Pamir. At mantle depth, seismicity is almost exclusively beneath the Hindu Kush and Pamir. Pegler and Das (1998) computed joint hypocenter locations for nearly 6000-mantle earthquake beneath the Hindu Kush and Pamir. Their improved relative locations, as well as the large number of earthquakes, showed that the seismicity occurs within a steeply dipping tabular zone approximately 30 km thick and 700 km long. In its southwestern part, beneath the Hindu Kush, the tabular zone of seismicity dips 50 - 90 northwest and is at depths of 100 – 300 km. In contrast, in the northeast, beneath the Pamir, the zone dips 50 - 60 southeast and mostly is at shallower depths of 80–200 km. Pegler and Das showed the complex geometry of the tabular zone in a series of 12 maps and 20 cross sections, which cannot be reproduced here. Pegler and Das concluded that the entire seismicity zone is an effect of northwestward subduction of the Indian plate beneath the Eurasian plate. They also concluded that the northeastern part of the zone, which dips steeply southeast beneath the Pamir, was overturned from its original northwest dip by northward flow in the mantle that is driven by continuing northward motion of India.

The three general origin zones in Afghanistan affect different intensity wide areas of seismicity in the country. Seismicity models in these areas reveal ancient coastal ocean subduction zones occurring at depth. The North Afghan platform is also an active plate boundary. There are different mechanisms of earthquakes in the region both strike-slip and reverse. Tahernia and Gheitanchi, 1384, state that the Hindu Kush seismic zone along the northwestern border of Pakistan to the northeastern border of Afghanistan and Tajikistan, is one of the most active average depth seismic regions that occurs via subduction of continental crust over the long-term, releasing seismic energy every year. While earthquakes are frequent in the central Hindu Kush due to their great depth the intensity is generally low and earthquakes occurrences are more prevalent near the major faults. Therefore the study and location of active faults and tectonic structures are effective in understanding earthquake occurrence and intensity. The intensity of earthquakes with different depths are shown in the following Figure 4-8.

Earthquake of Project Area

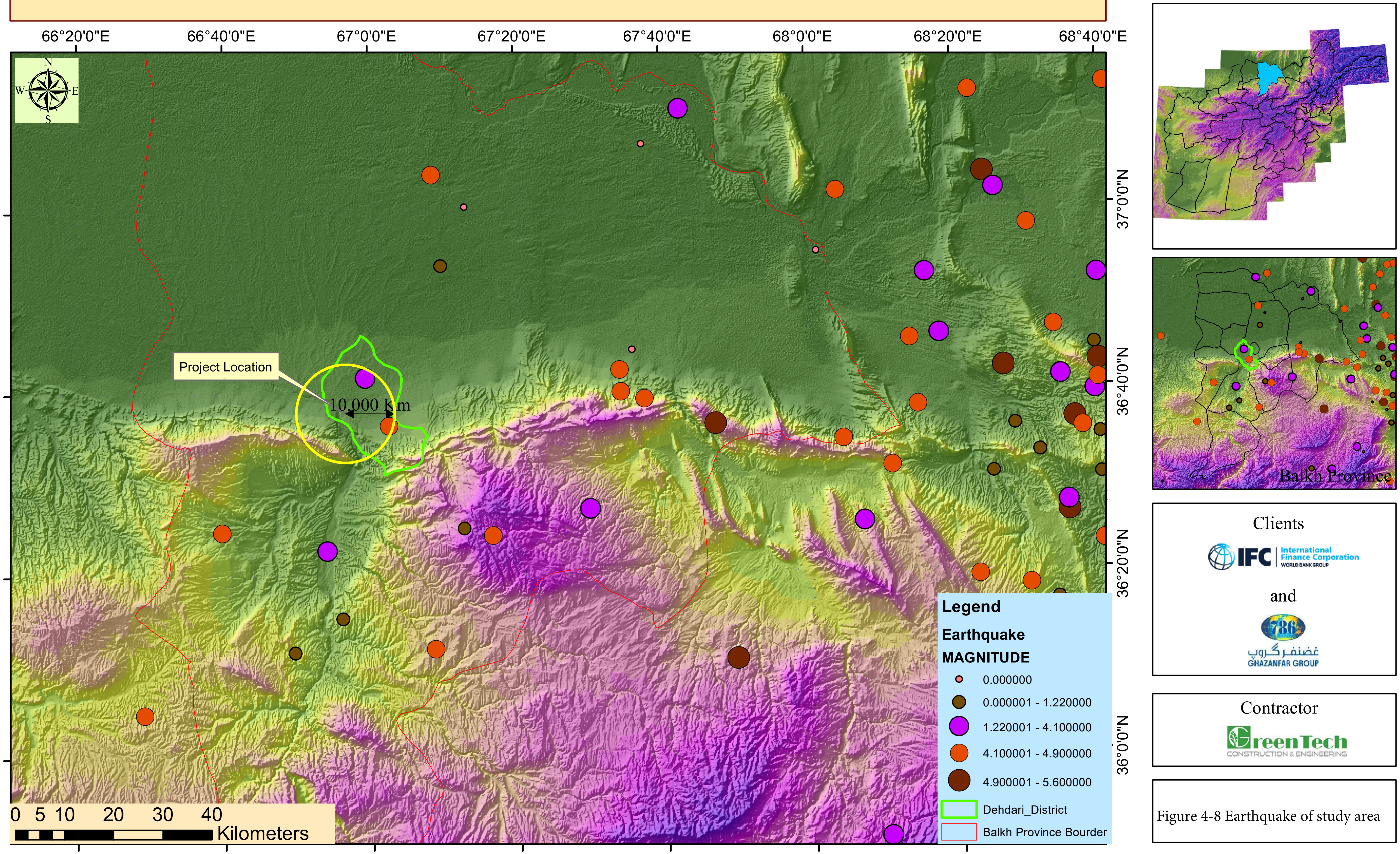


Figure 4-8 Earthquake of study area

Faults

In general, active faults are useful in a hazard assessment to the degree that they allow either estimation of the locations, sizes, and dates of large prehistoric earthquakes, or estimation of the rate of fault slip averaged over several earthquake cycles. Wheeler and others (2005)[13] suggest that 10 large Afghan faults are seismically active.

The 10 large Afghan faults that are active include: Alburz Marmul (AM); Andarab; Chaman (CH); Central Badakhsan (CB); Darafshan (DS); Darvaz (DZ); Hari Rod (HR); Konar (KO); Panjshir (PJ); and, Sarobi (SA).

Active Faults in the Study Area

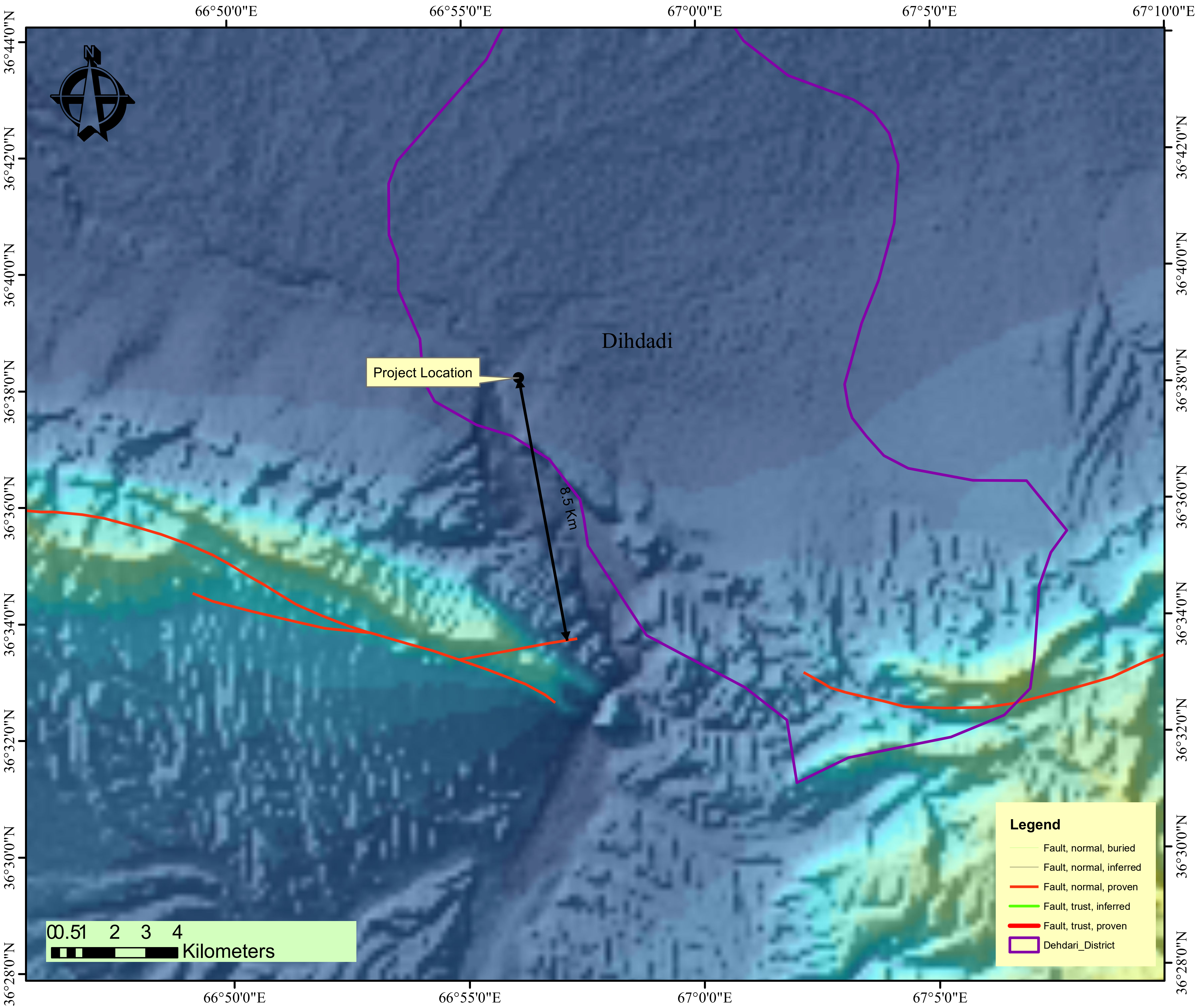
Alburz Marmul Fault

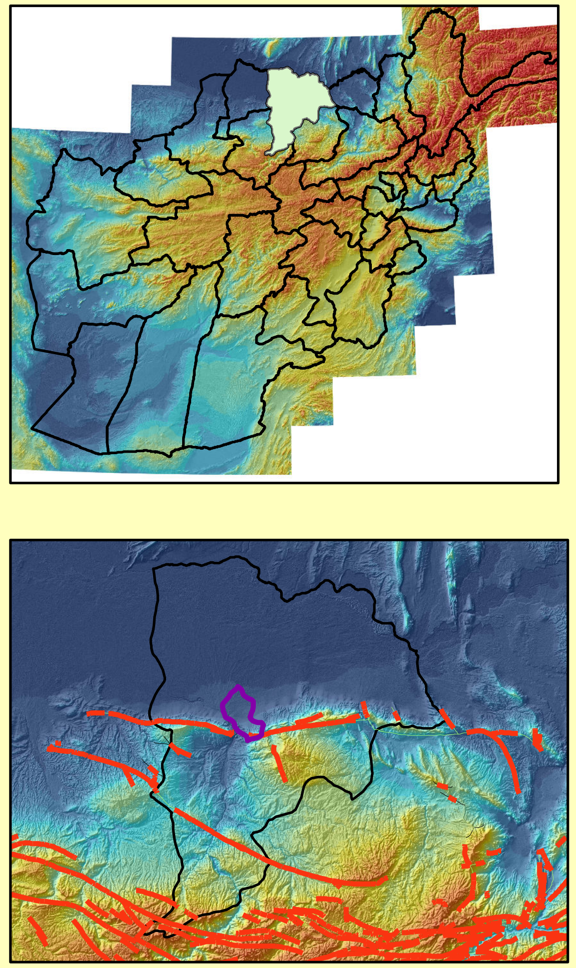
The Alburz-Marmul fault lies in the north of Afghanistan. The Alburz-Marmul fault may be left-lateral transpression zone (Thomas and others, 1996). The project is located approximately 8.5 km north of the Alburz fault. Figure 4-9 depicts the location of the project site and Dehdadi District in relation to the Alburz-Marmul fault. Boyd and others (2007)[14], generated a Preliminary Earthquake Hazard Map of Afghanistan that concluded that Mazar-e Sharif has a 2-percent chance in 50 years of exceeding a peak ground acceleration of 50, 35, 28, and 13 percent *g* respectively, and a 10-percent chance in 50 years of exceeding a peak ground acceleration of 27, 17, 7, and 7 percent *g*, respectively. While hazard values for Afghanistan are relatively more uncertain due to lack of information, in comparison these values are similar to the risk characteristics posed by faults in the intermountain West of the United States of America.

[13] Wheeler, R. L., Bufe, C. G., Johnson, M. L., Dart, R. L., & Norton, G. A. (2005). *Seismotectonic map of Afghanistan, with annotated bibliography*. US Department of the Interior, US Geological Survey.

[14] Boyd, O. S., Mueller, C. S., & Rukstales, K. S. (2007). Preliminary earthquake hazard map of Afghanistan. *US Geological Survey Open-File Report*, *2007*, 1137.

Fault of Study Area





Clients

IFC International Finance Corporation WORLD BANK GROUP

and

786 غضنفر گروپ GHAZANFAR GROUP

Contractor

GreenTech CONSTRUCTION & ENGINEERING

Figure 4-9 Alburz Marmul Fault

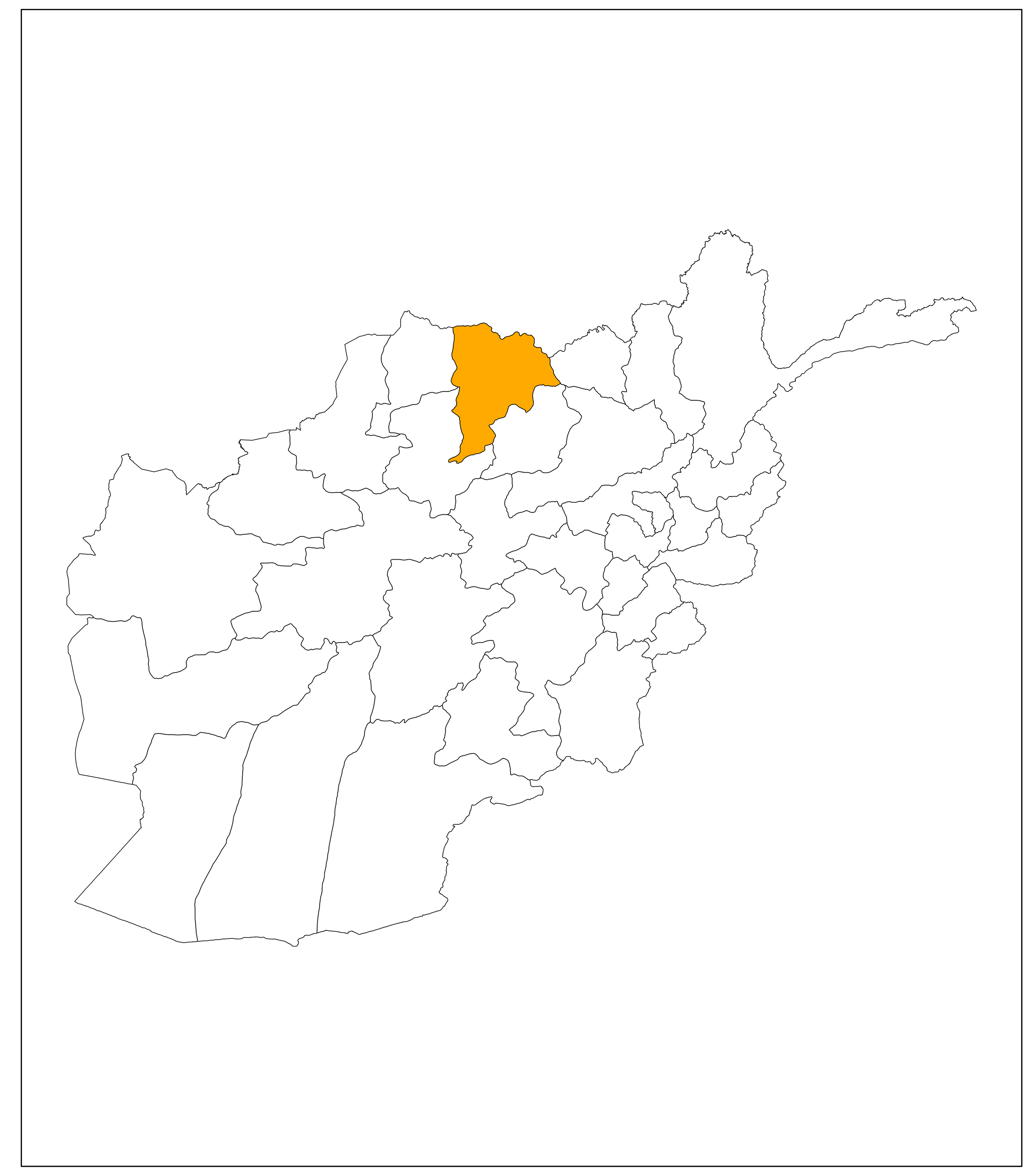
Soil

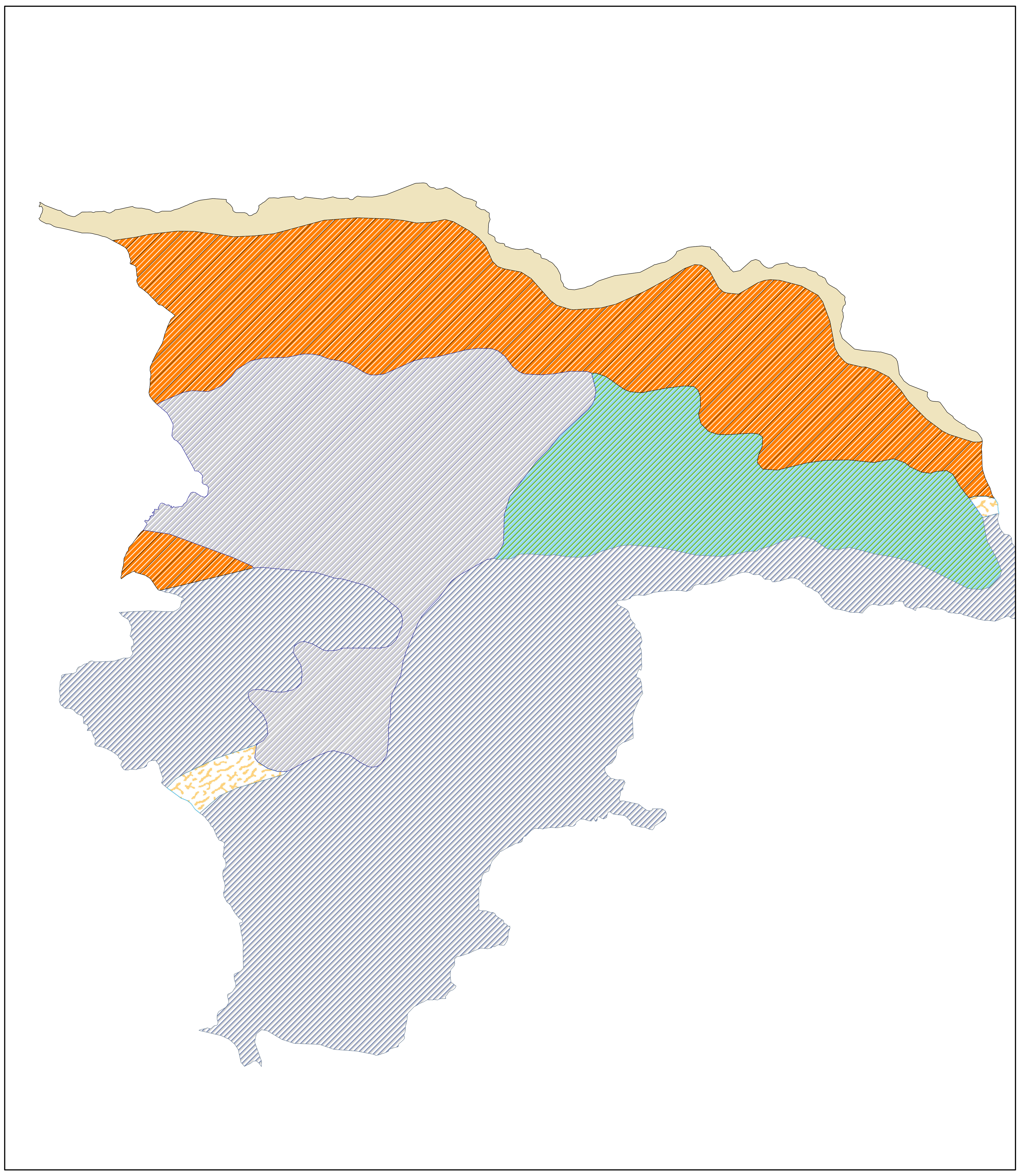
The study area is covered by Torripsamments with dunes soil.

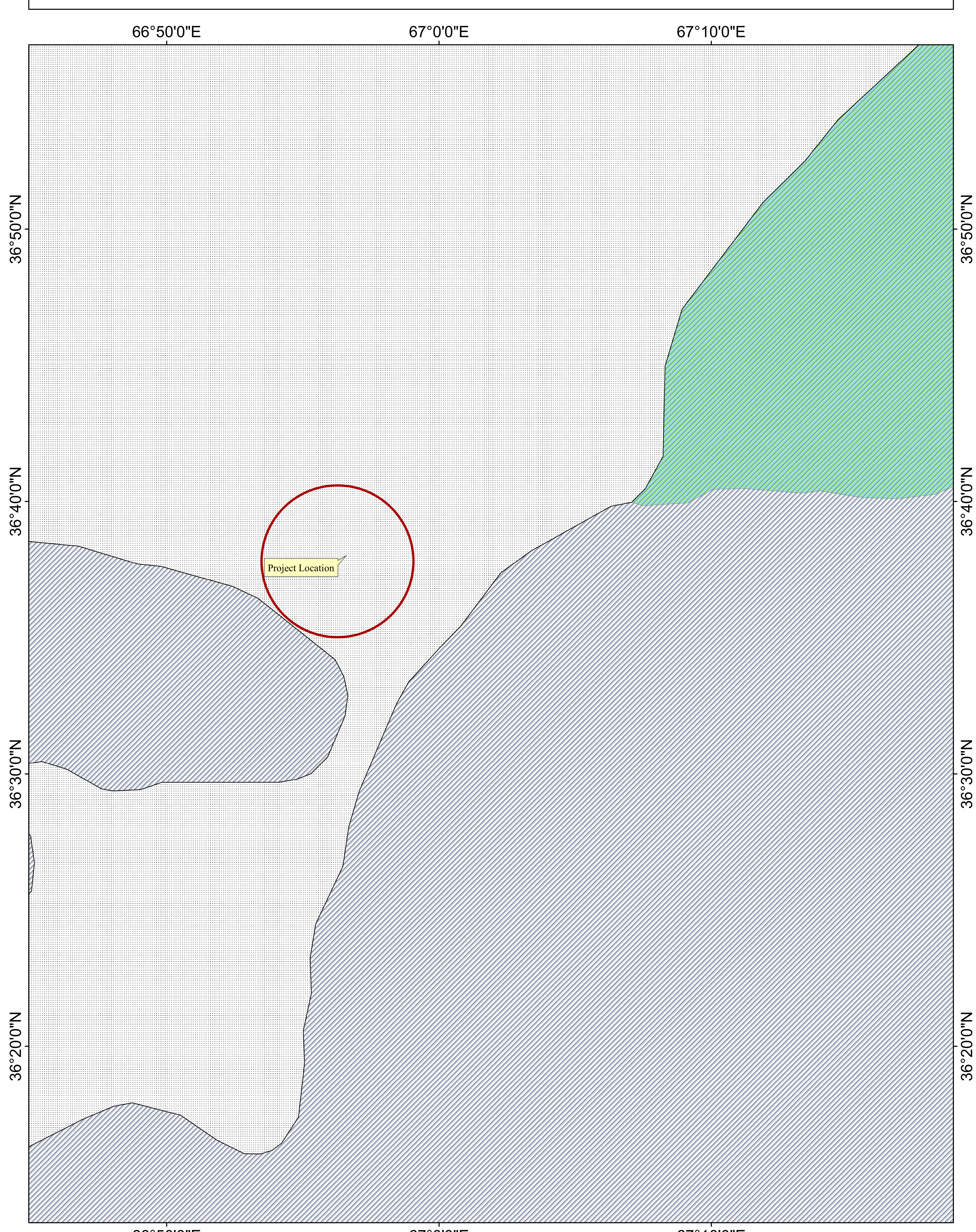
Torripsamments

Torripsamments are the cool to hot Psamments of arid climates. They have an aridic (or torric) moisture regime and a temperature regime warmer than cryic. Many of these soils are on stable surfaces, some are on dunes, some are stabilized, and some are moving. Torripsamments consist of quartz, mixed sands, volcanic glass, or even gypsum and may have any color. Generally, they are neutral or calcareous and are nearly level to steep. The vegetation supported by these soils consists mostly of xerophytic shrubs, grasses, and forbs. Many of these soils support more vegetation than other soils with an aridic moisture regime, presumably because they lose less water as runoff. Some of the soils on dunes support a few ephemeral plants or have a partial cover of xerophytic and ephemeral plants. The shifting dunes may be devoid of plants in normal years. Most of the deposits are of late-Pleistocene or younger age. These soils are used mainly for grazing. Dunes are hill of drifted sand. The Figure 4-10 shows the types of soil in the study area.

Types of Soil







Client

IFC International Finance Corporation WORLD BANK GROUP

and

786 غضنفر گروپ GHAZANFAR GROUP

Contractor

GreenTech CONSTRUCTION & ENGINEERING

Legend

- Torripsamments_with_Dunes
- Xerorthents_with_Xeropsamments
- Torriorthents_with_Torrifluvents
- Rocky_land_with_Torriorthents
- Rocky_land_with_Lithic_Cryorthents
- Natrixeralfs_with_Halaquepts
- Haplocambids_with_Torriorthents
- Project Location

0 0.03 0.06 0.12 0.18 0.24 Decimal Degrees

Figure 4-10 Soil Map of study area

4.2.3 Hydrogeology

Without question water availability is a limiting factor in the development of the Afghan economy. In northern Afghanistan precipitation at higher elevations (mountains and foothills) is the source of surface water flows and groundwater recharge through direct infiltration and seepage from losing rivers and irrigation canals. The following recharge mechanisms have been identified:

a. Pre-Palaeogene bedrocks may be recharged more or less directly by infiltration of precipitation at high altitudes where evaporation is less than run-off for many months of the year (and where snow cover may be persistent).

b. Neogene/Quaternary aquifers are likely to be recharged in foothills by rivers and streams descending from the high mountains and infiltrating into dominantly coarse-grained alluvial fans. The recharge is likely to be highest during snowmelt season. Thus groundwater recharge is highly dependent on quantities of winter snowfall.

c. Further away from the mountains, some recharge to Neogene/Quaternary aquifers is likely to take place by infiltration of water through the bed of perennial rivers.

d. In irrigated areas, substantial recharge is likely to occur via leakage from irrigation channels.[15]

With regard to long-term water availability, monitoring of snowpack in recharge areas indicates a recession of perennial snowcaps. Reduction in glacier size caused by a series of recent droughts and increasing air temperatures poses long-term problems due to climate change. In the past 50 years larger glaciers in the Pamir and the Hindu Kush have already shrunk by 30%, while some smaller ones have vanished.[16] There is risk that if this trend continues concurrent with land degradation and poor irrigation and on-farm water management practices, water yields at the furthest extent of irrigation networks may progressively decline.

[15] Chemonics International & The Cadmus Group. *Environmental Assessment of the Proposed Mazar Foods Agricultural/Irrigation Development Balkh Province, Afghanistan*. February 4, 2008.

[16] Eurasia Environmental Associates and Cadmus Group. FAA 119 Biodiversity Assessment with Summary Assessment of Climate Vulnerability and other Environmental Threats and Opportunities to inform USAID/Afghanistan program design. 2017. Prepared for USAID.

The northern basin has the smallest annual flow contribution in Afghanistan, with only 2 percent of the total, but all of the water is used within the national boundaries of the country. The basin is composed of watersheds of short perimeters that take their sources in the high mountains of the central highlands. In current times, these rivers dry up in irrigation canals or desert sands long before reaching the Afghan border and the Amu Darya River. It should be noted that in the event of exceptional floods, the Balkhab River may at times drain water into the Turkmenistan lowlands just across the Afghan border. Historically, in the northern Turkistan plain, the river deltas were close to the Amu Darya, but with the development of traditional irrigation schemes centuries ago, these rivers no longer contribute to this river, drying up in canals 50-100 km from the border. Therefore, a non-drainage area exists between the Northern river basin (Shirin Tagab, Sare Pul, Balkhab and Tashkurghan Rivers) and the Amu Darya River. The Balkh River, located approximately 1.3 km west of the site is a critical source of water for the Hazdha Naha irrigation scheme that serves an area greater than 400,000 hectares through 11 major canals across Balkh, Aqcha and Jowzjan regions.

Studies indicate that the population of the Northern river basin is currently below the water scarcity threshold with 676 m^3 of water per capita per year and the basin is entirely exploited. This suggests that ecological requirements are not being respected and environmental sustainability is at risk.[17]

Balkhab Watershed

Balkhab watershed is enumerated as a part of the northern basins. This watershed has the smallest share in the annual flow of water basins in the country. The source of the Balkab watershed is the Band-e-Amir lakes, surrounded by the Zard Rand Mountains and Koh-i Hissar mountains of Yakaolang District in Bamyan Province. Above Band-e-Amir, the river is called Darya-e-Chakari. Below the Band-e-Amir lakes, the river is called Rod-e-Band-e-Amir and is supplemented by a number of small torrents such as the Kashandara stream in Kohistanat. Below, in Kohistanat and Balkhab districts, the river bears the name of Balkhab River, while further downstream, from Keshindi District in Balkh Province, the river is simply called the Balkh. Between Keshindi and Sholgara District centers, the Balkh River is supplemented by a tributary, the Dara-e-Suf River, which takes its source from the Samangan province highlands.

[17] Centre for Policy and Human Development Kabul University. Afghanistan Human Development Report. 2011.

The Balkh River (Figure 4-11) opens in the Turkistan plain in Dehdadi District and irrigates large stretches of land in the oases of Balkh, Fayzabad, Aqcha, Mingajik, and Mardyan Districts. The Balkhab watershed is the largest of the northern river basin, and the Balkhab watershed is the longest watershed in the north, at over 460 km.[18]

Figure 4- 11 Balkh River

Hydrometric Station

The only existing hydrometric station identified in the study area is the Balkh hydrometric station in Robat Bala. The station altitude is about 432 meters above sea level. This station is located south of the project location. Data from this station is presented in Table 4-7 and the location of the site in relation to adjacent water bodies within Balkhab Watershed is shown in Figure 4-11.

[18] Watershed Atlas of Afghanistan, 2004.

Table 4- 7 Hydrometric Data

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Min	Max	Mean	Runoff
1964							66.10	128.00	97.20	52.30	36.80	37.50	36.80	128.00	72.84	
1965	40.20	39.50	37.00	36.60	37.80	42.80	52.80	110.00	131.00	66.20	42.60	42.50	36.60	131.00	60.47	1786
1966	45.00	45.90	47.30	47.30	48.20	55.90	61.80	73.70	67.60	44.00	37.60	37.30	37.30	73.70	51.61	1608
1967	42.10	41.70	40.90	37.80	37.60	40.00	61.70	104.00	112.00	54.20	40.40	39.30	37.60	112.00	57.24	1713
1968	42.20	41.60	39.00	35.70	33.50	37.00	54.90	88.60	120.00	56.10	45.20	40.30	33.50	120.00	56.26	1669
1969	39.80	40.50	40.30	36.00	39.10	55.20	104.00	147.00	168.00	104.00	65.00	55.40	36.00	168.00	78.45	2354
1970	51.10	53.50	45.30	43.00	35.50	40.70	50.20	64.60	46.50	29.70	26.70	31.10	26.70	64.60	43.51	1362
1971	34.90	35.80	34.70	31.90	30.30	28.90	42.10	52.40	29.90	19.80	19.80	20.80	19.80	52.40	32.39	1002
1972	23.70	26.30	27.40	29.00	29.60	35.50	45.60	91.50	121.00	41.40	31.00	30.00	23.70	121.00	48.34	1401
1973	30.00	29.50	28.30	25.50	28.30	37.70	68.90	142.00	108.00	44.90	34.70	35.30	25.50	142.00	55.76	1614
1974	33.40	32.90	34.50	33.40	32.00	35.80	44.60	79.00	55.20	34.00	32.70	32.70	32.00	79.00	42.23	1264
1975	34.60	33.70	32.60	29.90	27.90	34.80	55.50	117.00	124.00	54.80	38.40	39.40	27.90	124.00	55.32	1638
1976	40.10	38.50	37.50	36.80	36.70	38.40	72.30	150.00	125.00	50.50	34.10	31.90	31.90	150.00	62.41	1822
1977	32.70	31.70	29.10	33.10	38.50	36.20	49.20	66.50	48.00	25.40	23.10	24.40	23.10	66.50	37.68	1150
1978	22.60	26.00	27.10	27.50	31.70	34.90	61.00	107.00	74.40	38.10	29.10	31.30	22.60	107.00	45.74	1342
Mean	36.6	36.9	35.8	34.5	34.8	39.6	59.4	101.4	95.2	47.7	35.8	35.3				1551.8

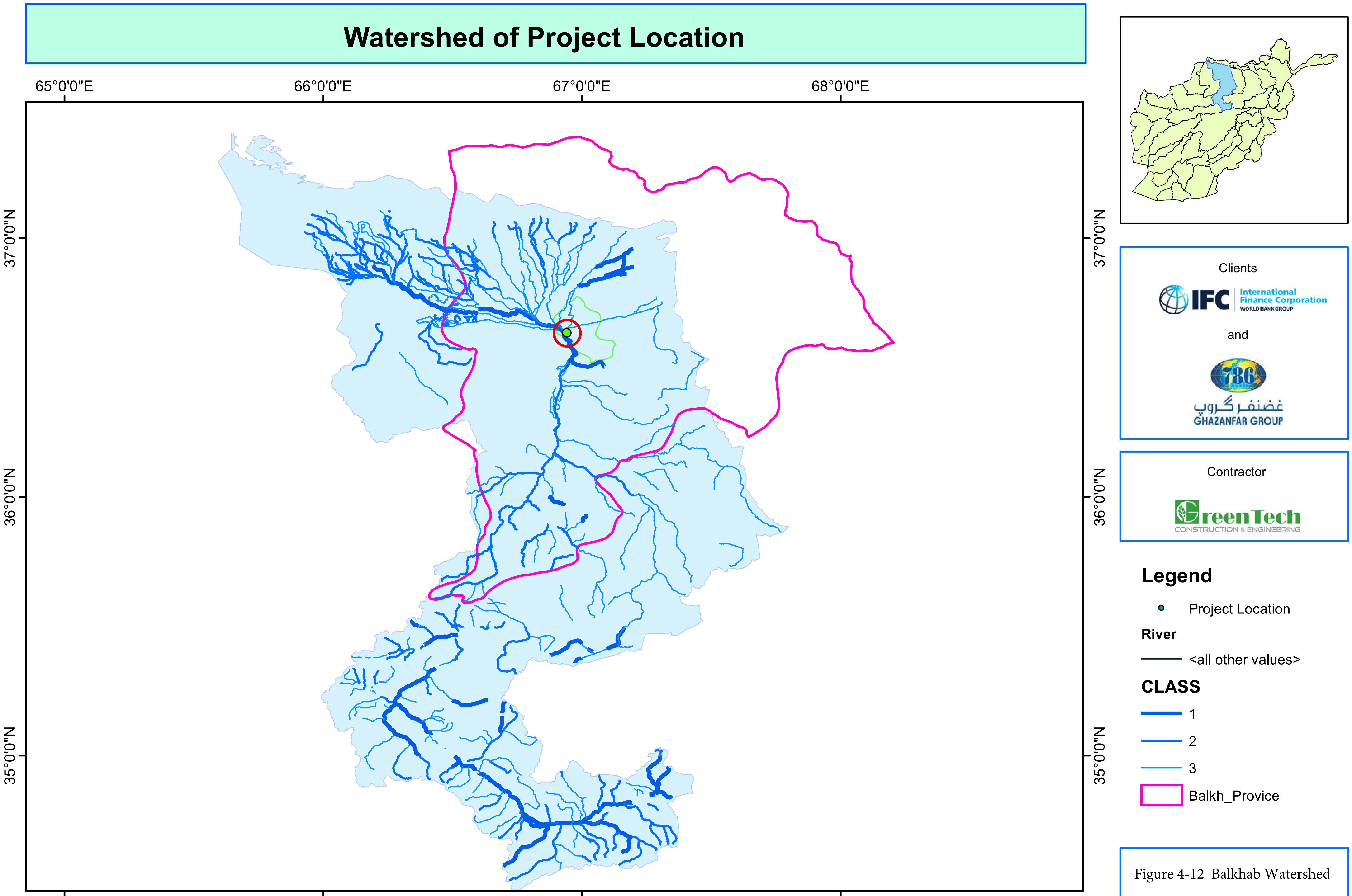


Figure 4-12 Balkhab Watershed

Groundwater

The northern basin receives groundwater recharge from losing streams that flow north from the mountains. Aquifers that are nearby these rivers receive a near-continuous source of recharge that consists of fresh water, whereas areas at further distance can contain limited groundwater resources or saline water unfit for human and/or agricultural uses. The Mazar-Balkh aquifer lies below the project area and receives recharge from the Cretaceous-Paleocene Age carbonate rock aquifer systems to the south and infiltration of surface water originating from the Balkh River and precipitation. The aquifer contains alluvial and proluvial Quaternary deposits of sand and gravel with clay, silt and loam forming confining layers (aquitards) of varying depth. The shallow groundwater in the study area is estimated to be between 3-55 meters below ground surface. The thickness of this aquifer is potentially up to 120 in thickness and deeper aquifers (>1000m) may be present.[19] Based on proximity to the Balkh River located approximately 1.3 km west of the site, groundwater quality is expected to be less saline (0-1000 mg/l Total Dissolved Solids) and of good quality.

Detailed hydrogeological studies have not been conducted to determine whether the aquifer beneath the site is currently exploited by domestic, agricultural and industrial groundwater extraction and to what degree current withdrawals are sustainable.

Field Observation, Sampling and Measurement

A soil, groundwater and vegetative sample collection and analysis program including an air quality and noise assessment survey, was conducted to document baseline conditions in and around the proposed Project site. Samples were collected, observed and documented in fieldwork notebooks with still photographs attached (where necessary). Field locations of all water, air and noise samples collected as part of the ESIA are presented in below.

Surface Water Sampling

Surface water samples were collected and sent to the Greentech water quality laboratory in Kabul for analysis. The results are provided in Tables 4-8, 4-9, and 4-10.

[19] Uhl, Baron, Rana Associates, Inc. An overview of groundwater resources and challenges. 2003.

These surface water samples from the Balkh River were collected from locations upstream and downstream of the site. The Afghanistan National Standardization Authority (ANSA) has published water quality standards for surface and ground water to be used for irrigation of crops, vegetables and orchards.

Figure 4- 13 Surface Water Sampling

Figure 4- 14 PH Testing

Ground Water Sampling

Ground water is available in the entire project area although its depth varies. Ground water samples were collected from various locations and sent to the Greentech water quality testing laboratory in Kabul. These samples were collected from a drinking water well in the region. The results of analysis are provided in Table 4-10.

The water samples collected were analyzed for their suitability for drinking purpose and all necessary physical, chemical and biological parameters. The test results show that all samples are generally fit for drinking.

Figure 4- 15 Groundwater Sampling

Water Quality

The quality of a groundwater sample and surface water sample from the study area was analyzed in the Kabul lab. The following tables show the results of water testing.

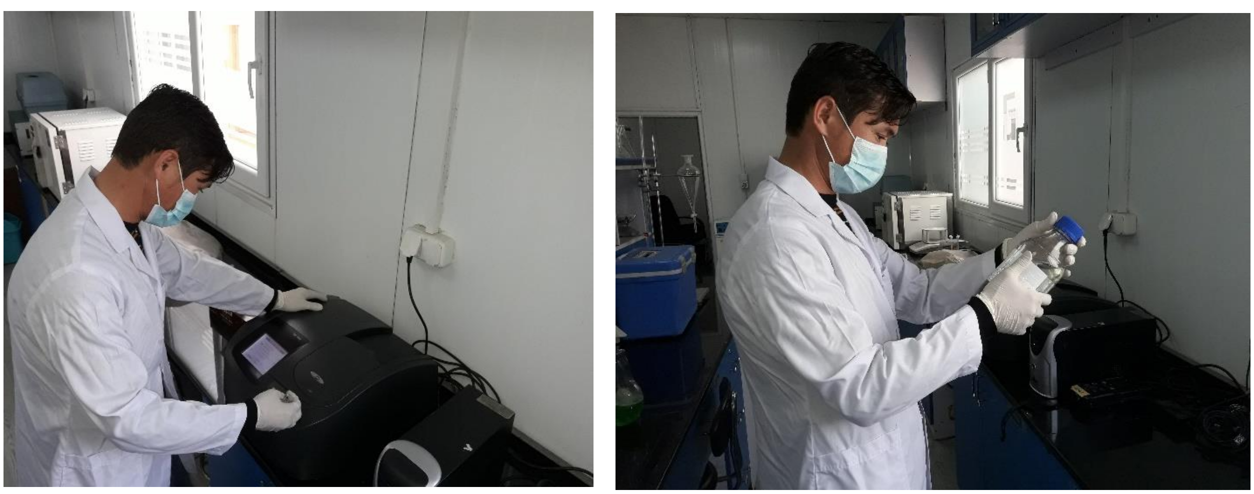


Figure 4- 16 Water Test Analysis

Table 4-8 Surface Water Quality Data

Analytical Report							
Project: Mazar IPP ESIA Client: IFC & GHAZANFAR GROUP				sample no : GT-F-18-36 Sampling location: Northern Fertilizer & Power Plant Sampling date: 25.03.2018			
Type of Sample: water ☒ wastewater ☐ Sample Source: well ☐ Surface Water ☒ Source type: municipal ☒ industrial ☐				lab receipt time: 09:30 AM lab receipt date: 28.03.2018			
Chemical analysis							
Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
Physical Test							
PH	7.7	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Total Dissolve Solid (TDS)	280	mg/l	D5907-10		2540 C	1000	1000
Conductivity	578	µs/cm	D1125-91		2510 B	-	-
Salinity	0.28	%	-		2520 B	-	-
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Hardness	196	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	56.1	mg/l	D511-09		3500-Ca	75	-
Magnesium	13.6	mg/l	D511-09		3500-Mg	30	-
Total Alkalinity (PH 4.5)	142	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0.0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	142	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Iron, Total	0.02	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Copper	0.03	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Chloride	36	mg/l	D512-10		4500-Cl C	250	250
Sulfate	71	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Nitrate	1.1	mg/l NO_3	D3867-09	300.1	4500-NO_3	50	10
Potassium	4.3	mg/l	D4192-08		3500-K C	10	50

Microbiological Test		
Test	Result	Method
Total coli form	0 MPN/100mL	Standard Methods-9221
Fecal coli form	Absent	Standard Methods-9230
E-coli	Absent	Standard Methods-9223 F
MCL-Maximum contaminant level for drinking purpose.		

Technical Evaluation:

Sample meet safe drinking water standards. The water is potable water.

Reporting Date: 31/03/2018

Table 4-9 Surface Water Quality Data

Analytical Report

Project: Mazar IPP *Client: IFC & Ghazanfar Group*	*sample no : **GT-F-18-39*** *Sampling location: **Downstream of River*** *Sampling date: 24.03.2018*
Type of Sample: water ☒ wastewater ☐ *Sample Source: well ☒ Surface Water ☒* *Source type: municipal ☒ industrial ☐*	*lab receipt time: 09:30 AM* *lab receipt date: 28.03.2018*

Chemical analysis

Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
Physical Test							
PH	7.92	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Total Dissolve Solid (TDS)	266	mg/l	D5907-10		2540 C	1000	1000
Conductivity	548	µs/cm	D1125-91		2510 B	-	-
Salinity	0.27	%	-		2520 B	-	-
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Hardness	191	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	54.9	mg/l	D511-09		3500-Ca	75	-
Magnesium	12.8	mg/l	D511-09		3500-Mg	30	-
Total Alkalinity (PH 4.5)	164	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0.0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	164	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Iron, Total	0.02	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Copper	0.03	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Chloride	37	mg/l	D512-10		4500-Cl C	250	250
Sulfate	61	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Nitrate	2.3	mg/l NO_3	D3867-09	300.1	4500-NO_3	50	10
Potassium	3.4	mg/l	D4192-08		3500-K C	10	50

Microbiological Test

Test	Result	Method
Total coli form	17 MPN/100mL	Standard Methods-9221
Fecal coli form	Present	Standard Methods-9230
E-coli	present	Standard Methods-9223 F

MCL-Maximum contaminant level** for **drinking purpose.

Technical Evaluation: Total Coli form, fecal and E-Coli are present. Total suspended solid is present.

Sample does not meet safe drinking water standards. Pre-Treatment and Disinfection are needed to meet the safe drinking water standard.

Reporting Date: 31/03/2018

Table 4-10 Surface Water Quality Data

Analytical Report							
Project: Mazar IPP ESIA **Client: IFC & Ghazanfar Group**				sample no : **GT-F-18-38** Sampling location: **Upstream of River** Sampling date: **24.03.2018**			
Type of Sample: water ☒ wastewater ☐ **Sample Source:** well ☐ Surface Water ☒ **Source type:** municipal ☒ industrial ☐				lab receipt time: 09:30 AM lab receipt date: 28.03.2018			
Chemical analysis							
Test	**Result**	**Unit**	**Method**			***MCL as Per ANSA**	***MCL as Per WHO**
			ASTM	**EPA**	**Standard method**		
Physical Test							
PH	7.95	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Total Dissolve Solid (TDS)	276	mg/l	D5907-10		2540 C	1000	1000
Conductivity	569	µs/cm	D1125-91		2510 B	-	-
Salinity	0.28	%	-		2520 B	-	-
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Hardness	195	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	55.2	mg/l	D511-09		3500-Ca	75	-
Magnesium	13.3	mg/l	D511-09		3500-Mg	30	-
Total Alkalinity (PH 4.5)	161	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0.0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	161	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Iron, Total	0.03	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Copper	0.03	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Chloride	38	mg/l	D512-10		4500-Cl C	250	250
Sulfate	63	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Nitrate	2.0	mg/l NO_3	D3867-09	300.1	4500-NO_3	50	10
Potassium	3.8	mg/l	D4192-08		3500-K C	10	50

Microbiological Test		
Test	**Result**	**Method**
Total coli form	14 MPN/100mL	Standard Methods-9221
Fecal coli form	Present	Standard Methods-9230
E-coli	present	Standard Methods-9223 F
MCL-Maximum contaminant level for **drinking purpose.**		

Technical Evaluation: Total Coli form, fecal and E-Coli are present. Total suspended solid is present.

Sample does not meet safe drinking water standards. Pre-Treatment and Disinfection are needed to meet the safe drinking water standard.

Reporting Date: 31/03/2018

Table 4-11 Groundwater Quality Data

Analytical Report

Project: **Mazar IPP** **Client:** **IFC & GHAZANFAR GROUP**	sample no : **GT-F-18-37** Sampling location: **Barakha Village** Sampling date: 24.03.2018
Type of Sample: **water** ☒ **wastewater** ☐ **Sample Source:** **well** ☒ **Surface Water** ☐ **Source type:** **municipal** ☒ **industrial** ☐	lab receipt time: 09:30 AM lab receipt date: 28.03.2018

Chemical analysis

Test	Result	Unit	Method			*MCL as Per ANSA	*MCL as Per WHO
			ASTM	EPA	Standard method		
Physical Test							
PH	7.82	Standard unit	D1293-95	150.2	4500-H+ B	6.5-8.5	6.5-8.5
Total Dissolve Solid (TDS)	271	mg/l	D5907-10		2540 C	1000	1000
Conductivity	557	µs/cm	D1125-91		2510 B	-	-
Salinity	0.28	%	-		2520 B	-	-
Chemical Test							
Arsenic	0	µg/l	D2972-08	200.5	3500-As	50	10
Hardness	193	mg/l as $CaCO_3$	D1126-12		2340 C	500	500
Calcium	55.4	mg/l	D511-09		3500-Ca	75	-
Magnesium	13.1	mg/l	D511-09		3500-Mg	30	-
Total Alkalinity (PH 4.5)	105	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Carbonate	0.0	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Bicarbonate	105	mg/l as $CaCO_3$	D1067-11		2320 B	-	-
Iron, Total	0.04	mg/l	D1068-10	200.5	3500-Fe	0.3	0.3
Copper	0.06	mg/l	D1688-07	200.5	3500-Cu	2	1-2
Chloride	41	mg/l	D512-10		4500-Cl C	250	250
Sulfate	68	mg/l	D4327-11	200.5Rev	4500-SO_4^{2-}	250	400
Nitrate	0.9	mg/l NO_3	D3867-09	300.1	4500-NO_3	50	10
Potassium	4.1	mg/l	D4192-08		3500-K C	10	50

Microbiological Test

Test	Result	Method
Total coli form	16 MPN/100mL	Standard Methods-9221
Fecal coli form	Absent	Standard Methods-9230
E-coli	Absent	Standard Methods-9223 F

MCL-Maximum contaminant level for **drinking purpose.**

Technical Evaluation: Total Coli form is present.

Sample does not meet safe drinking water standards. Disinfection is needed to meet the safe drinking water standard.

Reporting Date: 31/03/2018

Air Quality

During the monitoring, the priority pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter (PM10) were monitored and the results are provided in Table 4-12. The locations of air sample collection points are provided in Annex 11.

Noise

Noise levels exceeding 85 dB are generally harmful to human health. Excessive noise levels damage the eardrum and very high noise levels damage human lungs. Continuous exposure to excessive noise causes depression and can damage the nervous system. There are no industries or other major noise sources currently present on the Project site. The NFPP and the Jade Glass Factory are located within several hundred kilometers north and east of the site, respectively. Traffic from vehicles in the vicinity of the area is very low and does not contribute significantly to background noise. The sound levels were monitored at the Project site using a portable digital sound meter (Table 4-12) and the locations of noise monitoring points are provided in Annex 7.

Figure 4- 17 Air Monitoring

Figure 4- 18 Air and Noise Monitoring

Table 4- 12 Air Quality and Noise Data

Air & Noise Test

Parameter	Equipment/ Method	Date& Time of sampling		Sampling point	Test results	Unit	ANSA Standard	
							Time Weighted Average	Concentration in Ambient Air, maximum
PM_{10}	Signal Street Box PM Meter	25.03.2018	10:30 AM	N 36⁰ 31.941´ E 066⁰ 56.884´	30.05	µg/m³	Annual	70
							24-hour	150
$PM_{2.5}$	Signal Street Box PM Meter				46.66	µg/m³	Annual	35
							24-hour	75
NO_2	Signal Street Box Gas monitor				0.542	mg/m³	Annual	40
							24-hour	80
SO_2	Signal Street Box Gas monitor				0.123	µg/m³	24-hour	50
CO_2	SERIES 200 Portable Air Quality Monitor				2.03	mg/m³	30 Min	60
							1-hour	30
Noise level	SDL600 Sound Level Meter				53.6	dB	Day	55

4.3 Biological Conditions

4.3.1 Fauna

In Afghanistan, many factors such as loss of forest cover, soil erosion, desertification, pollution from transboundary air-borne particulates, agriculture and industry and the steady drainage of wetlands in the quest for more fertile arable land, have disturbed the natural environment of the wild animals and plants. In addition, Afghanistan has a culture in which the collection of plants, trapping of birds for the caged bird trade, and hunting of birds and animals are unregulated, resulting in excessive removal and even in some cases in extermination of the animal and plant species. Animal skins, including those of internationally protected or endangered species such as tigers, leopards, foxes and jackals, are traded daily in the markets all over the country. Recently, trade in birds of prey like eagles and falcons has become a common practice, endangering the overall existence of some of these species endemic to the Hindu Kush. Pleasure hunting of gazelles, mountain goats and other mammals by foreigners is another business that is unregulated and encouraged by warlords and profit seekers.

Using explosives for fishing or so-called dynamite fishing is another trend that has become very popular during the past 22 years and is common practice all over the country. This not only endangers the population of endemic fish species of the mountain streams, but threatens the life and the existence of many other species of animals that live in or around the waters.

All these activities together contribute to the sharp decline in numbers of animals and plants and a contraction in their ranges, with the result that a disturbing number should be listed as endangered. The most important task for the Afghans and concerned parties should be to immediately put an end to these irresponsible and rootless practices. Taking a holistic view, wildlife in Afghanistan is endangered to an unprecedented extent; a problem that has to be addressed by a joint effort of national and international institutions.

During the site surveys conducted as part of this study no mammals or birds were observed, however there are insects, rodents and some small mammals that are known in the area and that have been observed in the vicinity of the site. The majority of animals in the study area are domesticated livestock and poultry.

Figure 4- 19 Fauna Survey

4.3.2 Flora

The diversity of the geographical environment of Afghanistan has created a variety of ecological conditions that have evolved over time. Historically, the project area was native grassland however land use and climate change have altered the natural landscape. Several factors such as depth, temperature, moisture and type of soil affect the vegetative conditions supporting flora. The northern plains region of the country is primarily subtropical steppe that support semi-desert plants such as *Alhagi Canolrum*, *Saliconicum Haloxycon*, *Maritina Artomisia*, *Acacia Modosta*, *Colotropis Procora* and *Viscosa Dodonaoa* and *Ziziphus jujube.* Based on temperate weather and annual rainfall levels the project area has a great variety of vegetation, however the vicinity of the site is limited to native grasses and shrubs that emerge following the onset of the spring wet season.

Agriculture and Orchards

Agriculturally, the northern plains are able to produce winter clovers, alfalfa (*Medicago sativa*) and shaftal (*Trifolium resupinatum*) and hay-making is common for winter feed production of small ruminants. Irrigation of riparian and near-river areas is common with orchards complimenting cereals and vegetable production. Where irrigated and tended nearby villages, mulberry, poplars, Russian olive (*Elaeagnus sp.)* and *Ailanthus* trees are found. The northern region retains numerous biogeographically indigenous fruit and nut trees. Native and introduced varieties of pomegranate, walnut, apple, mulberry, fig, apricot, nectarine, prune, plum, peach, lemon and almond are grown locally. The vegetation pattern of Dehdadi District is closely related to the topographic relief, soil features and climatic conditions. No forested, agricultural areas or orchard are located on or immediately adjoining the Project area; therefore, no agriculture lands will be affected.

Figure 4- 20 Flora Survey

Shrubs and Grasses

In the study area ground cover is sparse, consisting of drought resistant grasses (needle grass, sheep fescue, blue grass, and sedge). These grasses emerge following spring rains and die off during the summer resulting in a barren desert with sparse shrubs. Shrubs grow in the spring season and cover the hillsides of the northern foothills south of the Project site and several extend their habitat into the northern plain. Shrubs include *Phragmites australis*, *Chara*, *Tulipa*, *Brassica* spp., *Cynareae*, *Eremurus*, *Merendera, Absinthium, Plantago major*, *Gagea*, *Cousinia, Alhagi, Astragalus*, and *Arundo*.

Figure 4- 21 Shrubs of Study Area

Herbs and Medicinal Plants

Medicinal plants and herbs include indigenous species of short grasses and short leaved forbs that appear in the spring after the rains around Dehdadi District. These include *Cinnamomum, Asteraceae, Puneh, Shirin boya, Badian, Kharkhasak, Ronas, Apiaceae*, *Badraj boye and Thymus*. Most have high ecological amplitude and grow in a variety of conditions.

Figure 4- 22 Esfand plant (Peganum harmala)

4.3.3 Biodiversity

The World Database of Key Biodiversity Areas™ (KBAs) hosts data on the world's high value and unique biodiversity land areas. The database supports strategic decisions on protected areas by governments and civil society and guides the identification of sites under international conventions and in the setting of private sector policies and standards. The database is managed by the KBA Partnership, which comprises 11 founding partners and is served by the KBA secretariat hosted jointly by BirdLife International and the IUCN.

Sites qualify as global KBAs if they meet one or more of 11 criteria, clustered into five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria can be applied to species and ecosystems in terrestrial, inland water and marine environments. Although not all KBA criteria may be relevant to all elements of biodiversity, the thresholds associated with each of the criteria may be applied across all taxonomic groups (other than micro-organisms) and ecosystems. Afghanistan has 16 sites that are documented KBAs. The closest KBA to the Project site is Imam Sahib (37º 15' 0" N, 68º 49' 59" E) located approximately 180 km northeast along the Amu Darya river and is not expected to be impacted by the Project.

NEPA, with help from the Wildlife Conservation Society, Kabul University, and the Ministry of Agriculture, Irrigation and Livestock, created the Afghanistan Wildlife Executive Committee (AWEC) to facilitate the listing process for protected species. NEPA's national role includes managing these protected species by writing up recovery plans for the threatened species. Listed species are then evaluated every five years to monitor whether populations have recovered to the point where they can be removed from the protected species list. The 33 species on the list include 20 mammals, seven birds, four plants, an amphibian and an insect, and all are protected against illegal hunting or harvest. According to the IUCN Red List[20], seven of these species have ranges overlapping the vicinity of the Project site. Information provided by the IUCN on the status of these seven species is provided below:

- Gray wolf (Canis lupus). Although the Grey Wolf still faces some threats, its relatively widespread range and stable population trend mean that the species, at global level, does not meet, or nearly meet, any of the criteria for the threatened categories.
- Saker falcon (Falco cherrug). This species has been up listed to Endangered because a revised population trend analysis indicates that it may be undergoing a very rapid decline. This negative trend is a result of a range of anthropogenic factors including electrocution on power lines, unsustainable capture for the falconry trade, as well as habitat degradation and the impacts of agrochemicals, and the rate of decline appears to be particularly severe in the species' central Asian breeding grounds.

[20] http://www.iucnredlist.org/

- Eastern barbastelle (Barbastella leucomela). This species is listed as Least Concern. Although it seems to be rare, it is very widespread and is unlikely to be declining fast enough to qualify for listing in a more threatened category.

- Blanford's fox (Vulpes cana). This species is listed as Least Concern as available evidence suggests that Blanford's fox has a relatively wide distribution albeit largely confined to mountainous regions. It is fairly common in some parts of its range, and while the species may possibly be undergoing some localized declines, there is at present no evidence to suggest any range-wide decline that would meet the thresholds for a threatened category or for Near Threatened.

- Eastern imperial eagle (Aquila heliaca). This species has a small global population, and is likely to be undergoing continuing declines, primarily as a result of habitat loss and degradation, adult mortality through persecution and collision with powerlines, nest robbing and prey depletion. Estimated range covers approximately 15,400,000 km^2.

- Marbled teal (Marmaronetta angustirostris). This species appears to have suffered a rapid population decline, evidenced in its core wintering range, as a result of widespread and extensive habitat destruction. It therefore qualifies as Vulnerable. Estimated range covers approximately 14,600,000 km^2.

- Sociable lapwing (Vanellus gregarious). This species is listed as Critically Endangered because its population has undergone a very rapid reduction, for reasons that are poorly understood but are likely to be at least partly due to hunting along the migration flyway. Estimated range covers approximately 1,670,000 km^2.

Based on these assessments it appears that the species of most concern to the Project site are the Saker falcon, Eastern imperial eagle, and Sociable lapwing, due to habitat destruction, hunting and persecution and collision with powerlines.

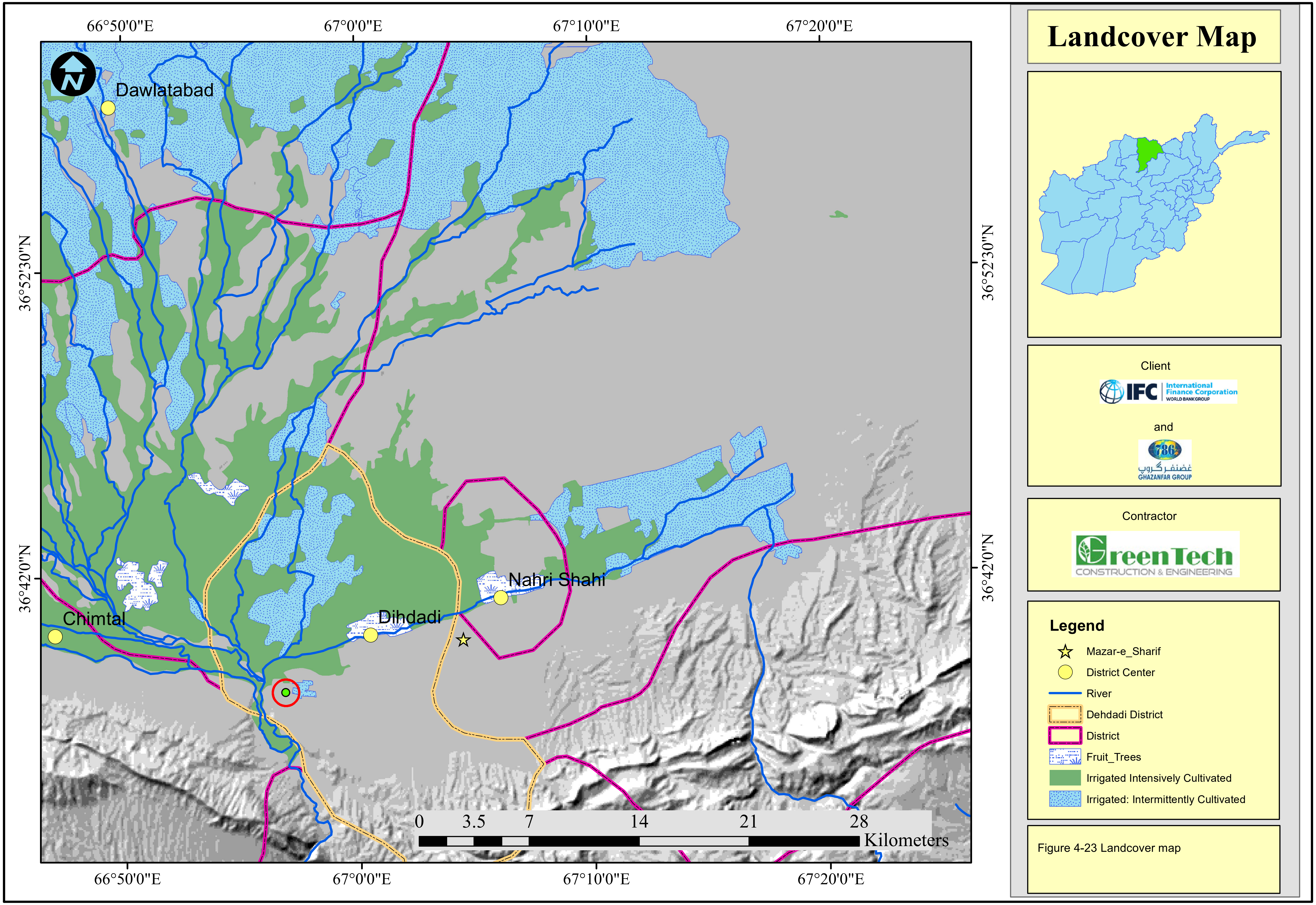


Figure 4-23 Landcover map

4.4 Social-Economic Conditions

4.4.1 Overview

The 2017/2018 population of Afghanistan is estimated to be 29.7 million, however no national census has been conducted post-1979 due to war and conflict. In the northern region the population is comprised of several of the country's 14 major ethno linguistic groups and includes Hazara, Pashtun, Tajik, Turkmen and Uzbek. According to 2011-12 poverty assessment data 31.6% of the Afghan population was poor (living on levels of expenditure insufficient to satisfy basic food and non-food needs).[21] In addition, disparities in poverty are more directly influenced by regional differences in international aid and vulnerability to weather related shocks than to the rural/urban divide. With regard to Northern Afghanistan the northeast provinces of Badakshan, Baghlan and Kunduz are considered lagging in terms of poverty alleviation compared with the northern provinces of Balkh, Jawzjan and Samangan.

At the national level, the majority of the population is rural and roughly one quarter of rural Afghans are landless, relying on intermittent farm labor for survival. Village population sizes vary widely between 3 and 30,000 with a mean village population size of 481. The average household size is 6.3 members. The system of land ownership is often complex and exposes inequalities along ethnic and tribal/clan lines that date back centuries or longer. Land ownership in the northern region was evenly distributed between state-owned land, privately owned land and common land. The majority of households in northern Afghan communities are either landless or small-scale farmers operating farms between 0.2 and 1 ha in size (less than one-third of farmers owned land greater than 1 ha in area).[22]

With regard to gender, while women account for approximately 43% of the agricultural labor force, they suffer extreme social and economic disparity in terms of access to inputs,

[21] The World Bank. *Poverty Status Update, An analysis based on National Risk and Vulnerability Assessment (NRVA)*. 2007/08 and 2011/12.

[22] USAID Afghanistan Office of Agriculture and Office of Project and Program Development. *Preliminary Inventory and Assessment for Irrigation and Watershed Management in the North, South and West Regions of Afghanistan*. February 2015.

outputs and markets. Traditionally, men are more involved with cash crop production and seasonal farm labor while women maintain the sustenance-based household plots, care for small livestock and only occasionally access markets for income generation. Tackling disparity is complex due to the wide differences among women's roles based on age, ethnicity, region and socio-economic strata. Institutionalizing the role of women in decision-making is being addressed through support for policy reform and mainstreaming of inclusion-based strategies by international and government agencies.

In light of these statistics, the city of Mazar-e Sharif is the cultural and population center of Balkh Province, is a hub for trade and political activity across the northern region, and is located along the nation's major highway system between the cities of Maimana and Pul-e-Khumri. Balkh province has common borders with Tajikistan and Uzbekistan to the north, Kundoz and Samangan Provinces to the east, Jawzjan Province to the south and with Sar-e-pol and Samangan Provinces to the west. The population of Balkh Province based on central statistics in 2017 is 1.38 million people.

Figure 4- 24 Land Use Conditions

4.4.2 Demography and Population

Population Profile

According to provincial profile data23 Balkh Province has an estimated population of 1.38 million residents with 705,351 male and 676,804 female. Around 64% of the population are rural and 36% are urban.

The total population of Dehdadi District is 71,154 people including 36,608 males and 34,546 females and the district is entirely rural. The ethnic groups residing in Dehdadi District are Pashtuns, Hazara, Uzbek, Turkmen and Arabs. Dari is the dominant language spoken in the district while Pashtu and Uzbeki are spoken to a lesser degree.

Table 4- 13 Gender Population Data

District	Urban			Rural			Total population		
	Male	Female	Both	Male	Female	Both	Male	Female	Both
Balkh	391.916	378.22	770.156	313.415	298.584	611.999	705.331	676.804	1382.155
Mazar-e Sharif	216.369	211.278	427.647	-	-	-	216.369	211.278	427.647
Dehdadi	-	-	-	36.608	34.546	71.154	36.608	34.546	71.154
Nahrn Shahin	-	-	-	24.281	23.073	47.354	24.281	23.073	47.354
Char Kent	-	-	-	24.156	22.702	46.858	24.156	22.702	46.858
Marmul	-	-	-	6.101	5.923	12.024	6.101	5.923	12.024
Balkh	56.281	53.922	110.203	8.406	8.094	16.5	64.687	62.016	126.703
Sholgara	56.136	53.179	109.335	5.602	5.488	11.09	61.738	58.667	120.425
Chimtal	-	-	-	49.433	47.258	96.691	49.433	47.258	96.691
Dawlat Abad	51.052	48.366	99.418	5.871	5.625	11.496	56.923	53.991	110.914
Khulm	12.078	11.475	23.553	26.947	26.068	53.015	39.025	37.543	76.568
Char Bolak	-	-	-	43.705	41.705	85.41	43.705	41.705	85.41
Shortepa	-	-	-	21.541	20.234	41.775	21.541	20.234	41.775
Kaldar	-	-	-	10.833	10.241	21.074	10.833	10.241	21.074
Kishindeh	-	-	-	26.273	25.047	51.32	26.273	25.047	51.32
Zari	-	-	-	23.658	22.58	46.238	23.658	22.58	46.238

[23] UNDSS Provincial Assessment provided by UNAMA

According to regional data, the majority of the population in the study area are considered non-migrant. Afghan Central Statistics Organization data shows that in Dehdadi District, 10.1% of the population are migrants, defined as those who had resided elsewhere for at least six months in another district within Balkh, in another province of Afghanistan, or abroad. According to the household survey conducted by the ESIA team, the majority of nearby residents to the study area have spent the greatest part of their lives in these communities. Most of the respondents are considered 'natives' of the communities and out migration is very uncommon with the exception of temporary periods for work.

Villages

The total area of Dehdadi District is 254 km^2 and it contains 58 villages. The nearest villages to the site in the vicinity of the Project area are Barakha, Posht-e Bagh, Tohkta and Kod-e Barq. The location of these villages is presented in Figure 4-23.

Household Composition, Structure and Size

The household, rather than family, has been used as the unit of inquiry for gathering some of the primary socio-economic data in the nearby villages. The household, in this study, has been defined by the following:

- They live together and share or depend on a common source, to which one, two or more of them contribute, i.e. 'eating from one pot;
- They accept the authority of one head; and
- They have lived together in this relationship for some time before this study. Staying together is not time specific, but none of the members of the household is a visitor who has come for a brief stay.

The typical household in the study area has a head who is the father or in the case of his demise, his wife or adult son. It comprises the father, mother, and children.

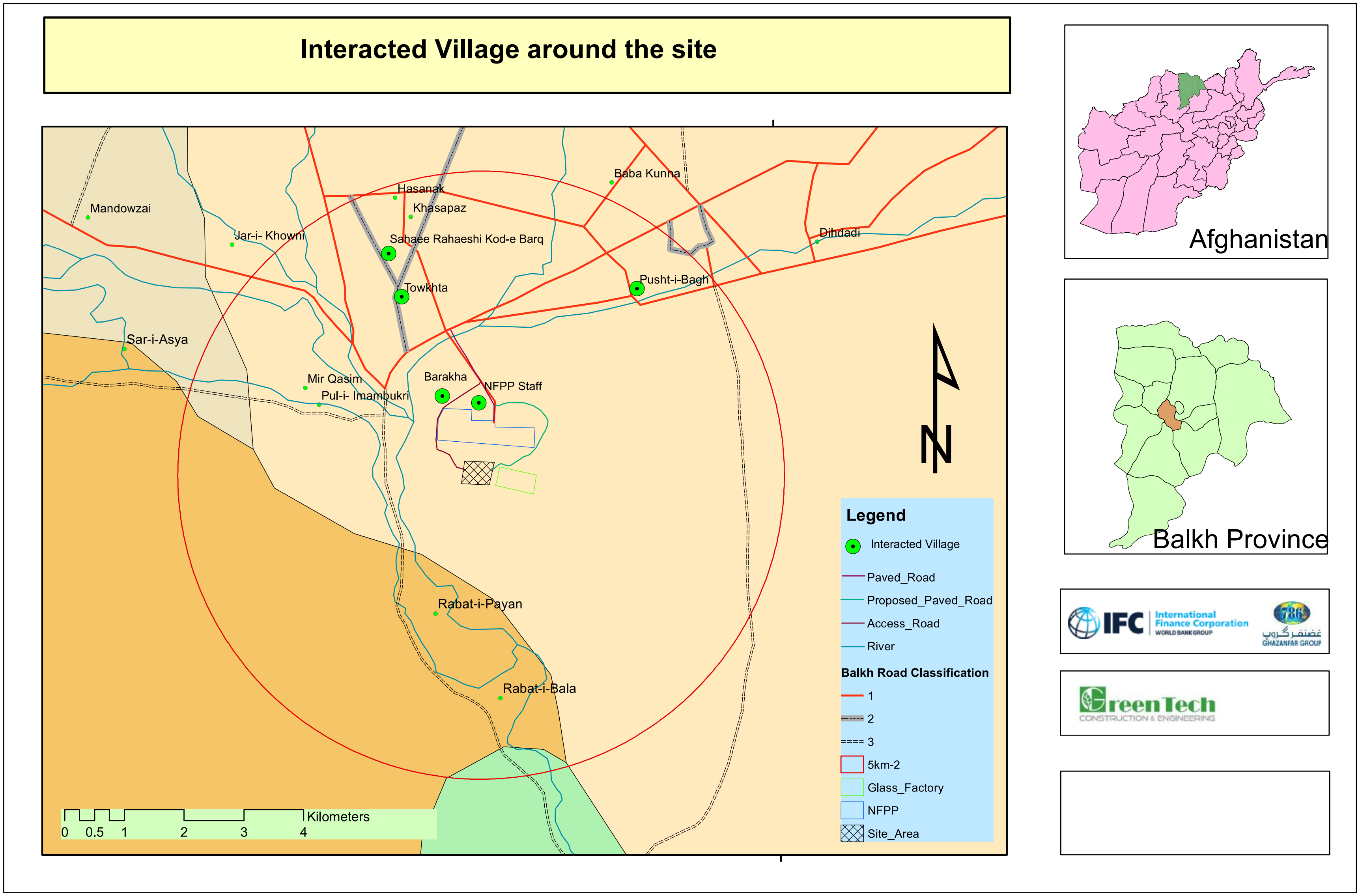


Figure 4- 25 Village Map

4.4.3 Economic Conditions

Occupation / Agriculture

The main occupation of the inhabitants of the Dehdadi District is agriculture. However, a few educated people are engaged in the government sector or private service. Afghan Central Statistics Organization data shows that in Dehdadi District, the major employment sector for men is skilled agriculture, hunting, forestry and fishing, while for women the predominant sector is community, social and personal services.

For much of this local population livelihoods consist of sustenance agriculture and livestock rearing. The livestock serves as an income source which they sell to meet their needs. The people of the district live a simple life including the standard of their clothing and their diet. Unemployment, lack of potable water, basic health and education facilities, electricity and roads are the major issues for the people of the District. Because the mode of agriculture is irrigation, the land available for cultivation by these communities is limited by water supply, which in turn is determined by access to irrigation infrastructure, resources to access suitable ground water, and/or harvesting precipitation. Because rivers within the northern basins are losing rivers that feed into aquifers, and some shallow aquifers have become to saline for use in irrigation. Roughly half of the Province consists of irrigated, cultivated land. Once irrigated, the soil and climate provide good conditions for diverse cereal and vegetable crops and the north has been termed the bread basket of the country.

Income

Under the prevailing socio-economic conditions in the District, the income of an average household is very low. However, there are a small percentage within these communities with higher incomes. According to the social impact assessment survey, the majority of the people in the surrounding villages belong to the low income group. The average monthly income ranged between 5,000 to 20,000 Afghanis (approximately 70-280 USD).

Livestock

The maintenance of domestic animals such as cattle, sheep and goats is common. Farmers raise milking cows, sheep, goats, donkeys, horses, ducks and chickens for production of milk, cheese, yoghurts, meat, eggs, wool and transportation. This practice supports basic family consumption as well as providing easily marketable goods in times of excess.

Figure 4- 26 Local Occupations

Industry

In Balkh Province industry has become well developed particularly in the districts of Kaldar and Shortapah. In Balkh Province, roughly 106 companies are engaged in the traditional carpet sector, supported approximately 20,000 residents. In addition to the carpet, commercial industries have emerged around copper, gold and silversmithing, textiles including handkerchiefs and clothing and other types of furniture, woodcrafts and ornaments. A special women's trade market is located along the road of Shadian in the city of Mazar-e Sharif, where a large number of women sell their handicrafts. Several industrial parks are also located in Mazar-e Sharif, supporting various small to medium scale enterprises such as recycling, plastics, food, beverages and various agribusinesses.

4.4.4 Social Infrastructure and Services

Health Facilities

There are 51 basic health centers, 14 comprehensive health centers and 767 pharmacies in Balkh Province. There are 537 doctors (171 female and 366 male) and 113 medical specialists.[24] In Dehdadi District, 40% of the residents have access[25] to health centers and at the district-level there are 74 doctors (40 male and 34 female), 21 nurses and 94 health employees providing health services in one hospital (Kodi Barq Hospital) three health centers (Dihdadi DHC, Sherabad BHC, Mashi BHC), four free health centers, 47 health stations and 30 pharmacies. The average distance to the nearest health center is 4 km. Ear and throat diseases and diarrhea are the most prevalent reason for health visits in the area.

Literacy and Schooling

Among the Balkh districts, Mazar-e Sharif had the highest literacy rate for population 10 years and older compared to other districts. The overall literacy rate for this district was 67.1% (75.5% for males and 58.4% for females). Dehdadi had the second highest literacy rate at 52.0% (60.7% for males and 43.0% for females). Shortepa had the lowest literacy rate at 15%; 25.3% among males and 3.4% among females. Literacy statistics are presented in Figure 4-24. Schooling statistics from the Afghan Central Statistics

[24] Central Office of Statistics of Afghanistan 2017

[25] Here, access refers to utilization. The extent to which a population has access to health centers is dependent on financial, organizational and social or cultural barriers that limit the utilization of services. Thus access measured in terms of utilization is dependent on the affordability, physical accessibility and acceptability of services and not merely adequacy of supply.

Organization reveal that of the population >25 years or greater, 69.7% have had no schooling.

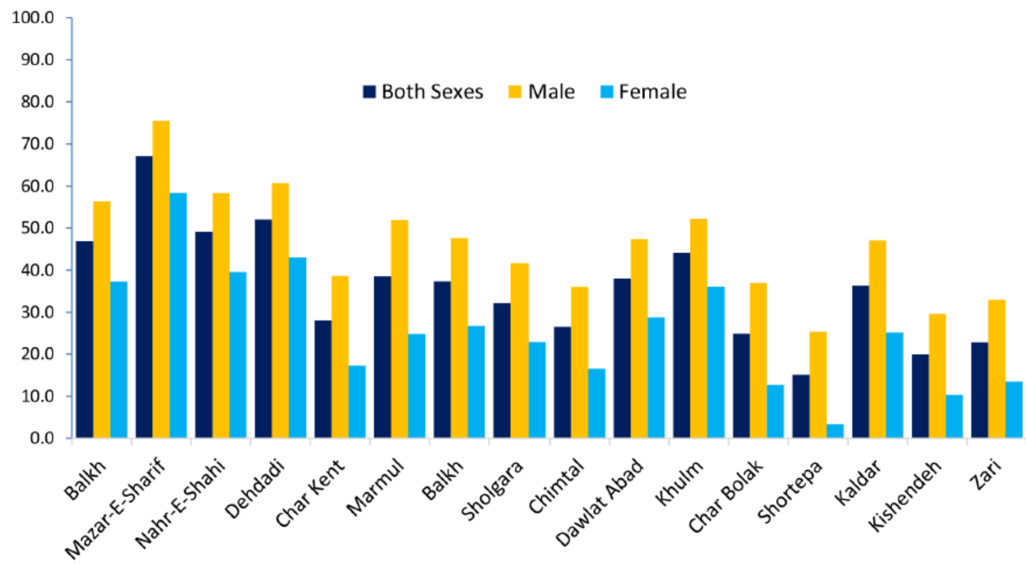


Figure 4- 27 Literacy Data

Main Source of Water

Improved drinking water sources include piped water into dwelling/yard or compound/neighbor, tube well borehole, protected dug well and protected spring. According to the Central Statistics Organization more than half (53.%) of the households in Balkh Province have access to improved sources of drinking water. In Dehdadi District Dehdadi access to improved drinking water is 62.6%, specifically, 31.2% piped water, 13.6% public tap, 27.7% tube well, 20.6% dug well, 0.5% water from spring, 19.2% surface water and, 0.7% other.

Electricity

Most of the communities (92.9%) in the area of have access to electricity. In the few communities that do not have access to electricity, the power supply is sporadic.

Communication

Dehdadi District has sufficient numbers of telephone and internet exchanges spread over the region. Most of these services are well functioning. Also, in and around the project area there are adequate telecommunication services. The services of all the mobile providers are available in the area. In Dehdadi District 84% of the households have access to a mobile telephone, 72.6% of households own a television set, followed by a radio at 21.7%. Very few (6.9%) households had access to internet.

Road Network

There is a chain of national, district and rural roads available in the Dehdadi District. Farms are linked to markets by road network. The length of asphalt road in the district is 13 km and Dehdadi district is well linked with Mazar-e Sharif and the national highway ring road. A baseline study of traffic on the road network that will be used to access the Project site during construction and operation phases was conducted in the field and the results are presented in Section 7-1-3.

4.4.5 Cultural Heritage

Balkh Province has more than 6,000 years of history before Islam, which provides rich historic tradition and value. The most famous historical monuments of Balkh Province are: Abu Huraira, Altin Dilyar Tepe, Aq Kupruk, Aq Tepe, Narawid, Balkh Bala Hissar, Balkh Haji PIrada Mosque, Balkh Khawaja Abu Nasr Parsa Shirine, Balkh Khwaja Aghacha Mosque, Balkh Sayed Saubhan Quil Khan Madrasa, Chehel Dukhtaran, Darra-i Dadil, Imam Sahib, Jiga Tepe, Kuhna Khulm, Nadir Tepe, Tash Guzar and Zadiayan. No historical, archeological, religious or cultural artifacts, monuments, structures or relics were observed or are suspected to be present on the project site.

4.5 Sensitive Protected Areas

With regard to protected areas the USAID Biodiversity Assessment[26] provides the following summary:

- Around 15 protected areas enumerate natural areas whose protection exists in name only, one (Band-e-Amir National Park) has been gazetted by GoIRA;

[26] Eurasia Environmental Associates and Cadmus Group. FAA 119 Biodiversity Assessment with Summary Assessment of Climate Vulnerability and other Environmental Threats and Opportunities to inform USAID/Afghanistan program design. 2017. Prepared for USAID.

- Two areas (Small Pamir and Waghjir Valley) have been proposed as protected areas by the Wildlife Conservation Society (WCS), but do not appear in the World Database of Protected Areas, and are now amalgamated in the Wakhan National Park;
- Shah Foladi, declared in 2015, is the newest protected area.

Of the proposed protected areas and sites, only three are located in the northern region; Imam Sahib Wildlife Managed Reserve in Kunduz, Nuristan Nature Reserve in southern Badakhshan and the amalgamated areas of the Wakhan National Park in eastern Badakhshan. These areas are all located outside of Dehdadi District and will not be affected by project activities.

4.6 Vulnerable Groups

According to IFC Performance Standard 1, good ESIA practice requires the identification of individuals and groups that may be directly and differentially or disproportionately affected by the project based on their disadvantaged or vulnerable status. Based on the stakeholder engagement with affected communities conducted as part of the ESIA process (Section 9), it was identified that these communities include residents from vulnerable groups including youth, elderly, women, disabled, IDPs/returnees and local minorities, however, there is a lack of statistical data on the numbers of disadvantaged or vulnerable individuals and groups within these affected communities.

The best available information identified on social data and statistics for the area of influence is the 2015 Socio-Demographic and Economic Survey (SDES) for Balkh Province[27] published by the Central Statistics Organization (CSO) of Afghanistan with support from the United Nations Population Fund (UNFPA). This report provides district-wide statistics and includes data on categories of the population with varying types of vulnerability, specifically, youth, women, people with disabilities and migrants. To some extent, the disabled group encompasses the elderly, or at least the elderly that are most vulnerable, as described below.

[27] https://afghanistan.unfpa.org/en/publications/balkh-socio-demographic-and-economic-survey

Youth. Demographically, Balkh Province is very young, with about 43.7% of its population below 15 years old at the time of the 2015 survey. While results are similar for Dehdadi District, the majority of the population does fall within the working age group of 15-64 years old as shown in Table 4-14. The aged-child ratio is the ratio of persons aged 65 years and over to the number of children under 15 years.

Table 4- 14 Dehdadi District Population by Age Group

	Total	Age Group			Age-Child Ratio %
		0-14	15-64	>65	
Dehdadi District	100	45	52.2	2.8	6.2

The SDES found that in Balkh Province, 7.0% of children aged 5-17 years worked at any time during the 12 months prior to the survey, while the remaining 93.0% did not work. In Dehdadi District these numbers were similar, with 94.9% having not worked. Boys (10.7%) were more likely to work than girls (3.1%). The percentage of the population in Balkh aged 15 and over that had worked for at least 6 months out of the 12 months prior to the survey was 40.3% (69.7% of men, and 10.7% of women). These statistics reveal that child labor exists for a minority of the underage population and that for working age adults, there is a high unemployment rate with a significant gender imbalance favoring men in the formal work force.

Women. The sex ratio in Dehdadi District is 104 (104 men to every 100 women), which is just below the national average of 105. According to the SDES, populations with marked deviations in sex ratio (generally accepted to be < 95 ,or, >110, can be explained by sex-selective migration, female infanticide, sex-selective abortion, sex-selective under-reporting, economic activities, or a special feature of the area such as the presence of a large military installation, an institution confining a particular sex, or war mortality.

Statistics regarding education, literacy and employment show women to be far behind their male counterparts. Within the Dehdadi District, literacy rates for those over 10 years of age are 60.7% of males and 43% of females. The percentage of the population over the age of 25 with no schooling is 57.7% for men and 82.3% for women. While nationally women account for approximately 43% of the agricultural labor force, they constitute only

16.1% of the overall workforce in Balkh Province. In general, Afghan women suffer extreme social and economic disparity in terms of education, as well as, access to inputs and outputs required to engage in formal economic markets.

These statistics suggest that while sex-selective factors may have less of an impact on the sex ratio imbalance than the war/conflict, there is religio-cultural influence over the role of women with regard to schooling, education level and formal employment.

Disabled. The SDES provides data on those individuals with functional impairment. According to the study, the functionally impaired are those individuals with difficulty in functioning who may have activity limitations, which may range from a slight to a severe deviation in terms of quality or quantity in executing an activity in a manner or to the extent that is expected of people without the health condition. In general, functional difficulties experienced by people may be due to their health condition (such as disease or illness), other health problem (such as a short or long-lasting injury), a mental or emotional problem or a problem with alcohol or drug use. A health condition may also include other circumstances, such as pregnancy, aging, stress or congenital anomaly. Difficulty is usually manifested when a person is doing an activity with increased effort, discomfort or pain, slowness or changes in the way the activity is typically done.

The SDES reported that Dehdadi District had a functional impairment rate of 1.8% (compared to the Provincial average of 1.9%) for the population aged 5 years or older at the time of the survey. These individuals had a functional difficulty in at least one of the following: seeing, hearing, walking, remembering, communicating, and self-caring. The proportion was higher among males (2.1 percent) than among females (1.7 percent).

In general, statistics on disability rates are difficult to pinpoint due to inherent threshold uncertainties in reporting, and the actual means of surveying (self-reporting versus diagnostic methods). A World Health Survey[28] conducted in 2004 found that the average prevalence rate for adults with very significant difficulties was estimated at 2.2% or about 92 million people in 2004. In this context it is possible that the total disability rate (including very significant and less severe cases) in Balkh Province is below the global average,

[28] http://www.who.int/disabilities/world_report/2011/report/en/

however it is difficult to make hard comparisons across different studies. In fact, due to the war/conflict in Afghanistan's recent history, it would be expected that disability rates would lean towards the higher end.

Migrants. Although the majority of the population of Balkh Province are non-migrants, some 436 thousand residents of Balkh are migrants, which comprised 26.0% of the total population of the province. Migrants are defined as those who had resided elsewhere for at least six months in another district within Balkh, in another province of Afghanistan, or abroad. The corresponding proportion among the male population (27.6%) was higher compared to the female population (24.5%). Within Dehdadi District, 10.1% of the population are migrants, with the majority (53.4%) coming from other Districts of Balkh Province.

Due to the nature of the conflict in Balkh Province (with relatively better security in closer proximity to the city) and the increased economic and livelihood opportunities available in Mazar-e Sharif, it would be expected that in migration to Dehdadi District serves these purposes for those who in-migrate from other districts within Balkh and elsewhere. Additionally, based on the proximity to Mazar-e Sharif it would be conceivable that migrants residing in Dehdadi District are relatively less vulnerable than those further afield.

4.7 Security Risk Assessment

Security conditions in Afghanistan are dynamic and complex. According to the UK Government Country Policy and Information Note Afghanistan: Security and humanitarian situation report (April 2018)[29] on Afghanistan's security situation, in 2016, Mazar-e-Sharif recorded the lowest number of civilian casualties compared to other cities in Afghanistan. Trends from 2009-2015 show that Mazar-e Sharif consistently had significantly fewer civilian casualties than other cities. Between 2015-2016, the majority of security incidents (around 93 percent) in Balkh province occurred outside Mazar-e-Sharif. The UN Security

[29] https://www.gov.uk/government/publications/afghanistan-country-policy-and-information-note

Council Report[30] publishes monthly security forecasts that pertain to recent security related developments.

The APPC will take the lead role for the Project in regard to security management. The company, through the Ghazanfar Group, will facilitate a dedicated Security Manager and has generated a Security Management Plan (Annex 2) that will govern site security for staff, contractors and visitors to the Project site as well as during transport to and from the site.

[30] https://www.securitycouncilreport.org/afghanistan/

5 ALTERNATIVES ANALYSIS

5.1 Overview

Alternatives are different means of completing the proposed project while still meeting the purpose and need for the proposed activity. Furthermore, the alternatives analysis is intended to address other means of completing the proposed project that could avoid or minimize adverse impacts that would be associated with the proposed project.

A variety of alternatives were proposed and have been analyzed for the power plant Project development. The technical engineering and economic feasibility, together with the environmental, health and safety concerns, flexibility for loading operations and expansion, regulatory and stakeholder requirements, cost effectiveness and ease of operation and maintenance of the system through its design life are important considerations in the overall assessment of alternatives. Research and development of the natural gas resources of Afghanistan including refurbishment and expansion of the Sheberghan gas fields has been ongoing, and much of this analysis is existing and well documented. For the current analysis, such resources provide value and will be cited in the alternatives analysis where relevant.

5.1.1 Fuel Type Alternatives

In accordance with PS 1, paragraph 11, where the project involves specifically identified physical elements, aspects and facilities that are likely to generate environmental and social impacts, the identification of risks and impacts will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence.

With regard to fuel-type, the alternatives analysis is weighted on the planning studies and decision-making processes that have occurred to date. For example, the Power Master Sector Plan completed by Fichtner[31] for the GoIRA in 2013 concluded that natural gas derived electricity is the likeliest candidate for large-scale addition of baseload

[31] Islamic Republic of Afghanistan: Power Sector Master Plan (May 2013). Prepared by FICHTNER GmbH & Co. KG, Stuttgart, Germany.

domestic generation in the near term. As a result, several international agencies including USAID[32] and World Bank[33] have conducted feasibility and scoping studies of the northern gas reserves and have evaluated opportunities for gas development projects. Table 5-1 provides a summary of the comparison of natural gas with other potential sources of fuel that could be used to generate electricity in northern Afghanistan.

5.1.2 Site Location Alternatives

With regard to site location alternatives, project economics and land availability are identified as key criteria of importance when assessing land for power plant construction. Adding to this, the availability of suitable development lands in close proximity to the existing gas grid network and electricity transmission network is a key factor in considering and determining a suitable site location for this development. In addition, it is necessary to carefully consider not only the technical issues, but also the impact on the natural environment, local economy and nearby communities.

With regard to siting, the preferred option was determined at the national level by GoIRA ministries/agencies engaged in the Implementation and Power Purchase Agreements. Based on technical, logistical and security factors, the rationale for the site's proposed location in proximity to existing pipeline infrastructure supplying the NFPP, electrical infrastructure for evacuation of power, and an adjacent manufacturing facility with plans to utilize the energy source, is apparent.

This analysis of project siting compares site characteristics to critical issues used in evaluating power plant project locations. Attributes of the site include that it is not located in ecologically critical areas including human settlements, forest sanctuaries, national parks, game reserves, mangroves, forested areas, wetlands, unique wildlife habitats, archaeological sites, ancient monument sites, key biodiversity areas or other ecologically sensitive areas. Furthermore, the preference for power plant projects is to be located on

[32] AEAI. Sheberghan Gas Field Development Project (SGFDP). Critical Path for Sheberghan Gas Field Development. February 15, 2011. Prepared for USAID.
AEAI. Sheberghan Gas Field Development Project (SGFDP). Gas/Power and Related Infrastructure Assessment. April 5, 2011. Prepared for USAID.
[33] Hill International. Evaluation of Investment Options for the Development of Oil and Gas Infrastructure in Afghanistan. Final Report. March 28, 2005. Prepared for the International Bank for Reconstruction and Development.

non-productive land and the site is outside existing and proposed agriculture land. Finally, the site is located on an amply large parcel of ground with no directly adjoining developed properties and is therefore eligible for expansion as well as separated by a greater than 1 km buffer zone from human settlements and agricultural land.

5.2 Alternative Sources of Electricity Generation

The suitability of generation technologies has been assessed against the following criteria:

- Readiness/availability;
- Size;
- Reliability;
- Environmental performance; and
- Compliance with local and national policy.

The summary of the key issues identified by the criteria in relation to the power generation options available in Afghanistan is given in Table 5-1 below.

Table 5- 1 Summary of Key Issues

Fuel Type	Location	Positive	Negative	Availability
Gas	Afghan Gas Enterprise is currently producing approximately 450,000 cubic meters of natural gas per day. The majority of this natural gas is still transported through a 90 kilometer pipeline (commissioned in 1974) connecting the Khoja Gogerdaq natural gas field near Sheberghan, Jowzjan province, to the Northern Fertilizer and Power Plant in Mazar-e Sharif, Balkh province. The remaining natural gas is distributed through a network of small diameter pipelines to domestic customers in Sheberghan, Khoja Dokho, Aqcha and other villages in Jowzjan.	• Relatively low cost fuel option when available. • Significant local resource in northern of Afghanistan. • Generators are very compact. • Produces less CO_2 than coal or oil. • Clean and reliable resource.	• Finite resource. • Susceptible to price fluctuation risk. • Extensive and expensive pipeline would be required. • Produces CO_2.	Available in-country.
Coal	Afghanistan is reported to have coal reserves totally 100-400 million tons. These mines are located from Badakhshan and extend up to Herat Province. Afghanistan has more than 11 coal reserves.	• Relatively low cost fuel option. • Significant resource available in-country. • Generally, provides continuous baseload power.	• Finite resource. • Not sustainable as coal reserves are limited. • Susceptible to price fluctuation risk. • Produces highest CO_2 per kWh (twice as much carbon dioxide when	Long-term solution

		• Is not susceptible to weather-related generation fluctuations. • Proven technology. • By-products of burning coal can be reused in other industries.	compared with natural gas). • Release higher level of harmful emissions, including a higher ratio of carbon emissions, nitrogen oxides (NOx) and Sulphur dioxide (SO_2) and ash particles. • Requires disposal of significant volumes of ash by-product. • Coal can have significant Sulphur and lesser heavy metals and organic content. • A major cause of acid rain if high Sulphur levels in coal. • Mining of coal results in the destruction of habitat and scenery, and can	

			result in community displacement.	
Geothermal Power	An area of vast untapped potential lies in the heat energy locked inside the earth in the form of magma or dry, hot rocks. Geothermal energy for electricity generation has been used worldwide for nearly 100 years. The technology currently exists to provide low-cost electricity from Afghanistan's geothermal resources, which are located in the main axis areas of the Hindu Kush. These run along the Herat fault system, all the way from Herat to the Wakhan corridor in the North. With efficient use of the natural resources already abundantly available in Afghanistan, alternative energy sources could be directed into industrial use, supply the energy needs of the nation and build economic self-sufficiency.	• Sustainable. • No significant environmental impacts. • Non-polluting. • Generally, provides continuous baseload power. • Is not susceptible to weather-related generation fluctuations.	• It can only be developed in selected volcanic areas where geothermal systems are present. • Transmission infrastructure and investment required. • Limited geothermal resource site currently known in-country.	Available in-country.
Hydropower	Hydroelectric plants in Afghanistan were built between the 1950s and the mid-1970s, which included the Sarbobi hydroelectric power plant in Kabul Province, the Naghlu in the eastern Nangarhar Province, the Kajaki in Helmand Province and a number of others. Other	• Renewable resource • Proven technology	• Climate dependent and prone to generation shortfall during droughts • Can be susceptible to climate change.	Available

	hydroelectric facilities that were operational as of 2002 included plants at Puli Khumri, Darunta in Nangarhar Province, Dahla in Kandahar Province, and one in Mazar-e Sharif. Also in operation was the Breshna-Kot Dam in Nangarhar, which had a generating capacity of 11.5 MW. Construction of two more power stations, with a combined capacity of 600 kW, was planned in Charikar City. A number of other dams are being built in different parts of the country, which are mainly for irrigation purposes. Two new dams are under construction in Kunar Province, one of which has the capacity of 1500 MW in Surtak area of the subjected province.		• Major hydropower systems can have significant adverse environmental and social impacts • Potential for flood risk.	
Solar Power	In 1991, a new 72-collector solar installation was completed in Kabul at a cost of $364 million. The installation heated 40,000 liters of water to an average temperature of 60^0 C around the clock. The use of solar power is becoming widespread in Afghanistan. Solar-powered street lights are seen in several Afghan cities and towns, including the capital Kabul. Many villagers in	• Sustainable. • Proven technology. • Size and location of solar fields is flexible, essentially limited only by demand and transmission infrastructure.	• High energy (and CO_2) intensity manufacturing process. • Efficiency and output is weather dependent. • Conventional peaking (likely diesel) capacity would be required for low sun conditions.	Long-term solution, but limited capacity due to current technology costs and lack of feed in tariff support

	rural parts of the country are also buying solar panels and using them.		• Daytime production only. • Relatively high cost electricity option that would likely require feed in tariff support to develop significantly.	
Wind Power	At least one wind farm was successfully completed in Panjshir Province in 2008, which has the potential to produce 100 kW of energy. United States Agency for International Development has teamed up with the United States National Renewable Energy Laboratory to develop a wind map of Herat province. They have identified approximately 158,000 MW of untapped potential wind energy. Installing wind turbine farms in Herat could provide electricity to much of western Afghanistan. Smaller projects are wind pumps that already have been attached to water wells in several Herat villages, along with reservoirs for storing up to 15 m3 of water.	• Sustainable. • Non-polluting. • It is a proven technology.	• Efficiency and output is weather dependent. • Conventional peaking (likely diesel) capacity is required for low wind conditions. • Locations for application limited on wind speed and ability to interconnect to the grid. • Lack of country policy, legal or regulatory framework.	Medium to long-term solution.

5.3 Alternative Technologies for Natural Gas Power

The core criteria used for considering and choosing between technological/design alternatives for natural gas generation are as follows:

- Overall safety of the personnel working in the proposed project facility and the public living in the vicinity of the project area;
- Environmental impact of the proposed project with respect to its effects on air quality, underground water, soil, geographical terrain, vegetation, wildlife, socioeconomics, noise and other environmental aspects;
- Potential impacts to communities, their health, lifestyle and activities such as businesses, transportation, recreation, etc.;
- Best available/practicable technologies that is not only familiar, but also acceptable within the applicable area in order to ensure effective operation, maintenance and sustainability;
- Feasibility of construction, operation and maintenance in view of satisfactory and cost effective practices;
- Availability and reliability of fuel supply for the proposed plant operation such as the use and volume of natural gas or diesel requirements;
- Mitigation, management and monitoring requirements that will ensure safe and environmentally sound operations;
- Acceptance by stakeholders with due considerations of technical, environmental, regulatory and cost implications of implementation and maintenance of proposed project; and,
- Other institutional, regulatory, national and international requirements of proposed project.

The technology options assessed consist of the steam turbine, simple cycle combustion turbine, combined cycle combustion turbine and reciprocating internal combustion engine.

5.3.1 Steam Turbine (ST)

The steam turbine has as its advantages that include high overall electrical generating efficiencies of up to 75% when utilized in a combined heat and power (CHP) application through the reuse of the waste heat. However, there are no potential sources for waste heat so CHP is not an option and typical upper limits of steam turbine efficiencies are around 37%.

Other disadvantages include cost, slow start up times, the risk of corrosion of the pipes and other factors dealing with heat transfer in the steam turbine. The efficiency of a steam turbine is limited by the maximum temperature of the steam produced and is not directly a function of the fuel used. Significant cooling is required for steam condensation and auxiliary stations, which needs either large water quantities (which are not available at the site) or more inefficient air cooling.

Cooling can produce significant waste heat which if not utilized in cogeneration reduces overall efficiencies and can have negative environmental impacts if cooling water is disposed into surface waters, increasing the temperature of the receiving water body. The equipment takes a lot of energy to heat up, therefore increasing start up times, and is usually heavy compared to other engines like gas, diesel, or electric.

5.3.2 Simple Cycle Combustion Turbine (SCCT)

The simple cycle combustion turbine is relatively simple to install, operate and maintain. It is capable of producing large amounts of useful power for a relatively small size and weight. Since motion of all its major components involve pure rotation (i.e. no reciprocating motion as in a piston engine), its mechanical life is long and the corresponding maintenance cost is relatively low. Although the gas turbine must be started by some external means (a small external motor or other source, such as another gas turbine or diesel generator), it can be brought up to full-load (peak output) conditions in minutes as contrasted to a steam turbine plant whose start up time is measured in hours. In addition the process water demand for this technology is negligible.

A major disadvantage of the gas turbine in simple cycle is that the waste heat is not recovered, leading to thermal efficiency in the range of 33%. Operating in combined cycle mode with a heat recovery steam generator will increase the thermal efficiency to about 55%.

5.3.3 Combined Cycle Combustion Turbine (CCCT)

In combined cycle gas turbine power generation, the steam produced by the waste heat of the gas turbine rotates an auxiliary steam turbine that also generates electricity resulting in higher operating efficiency and lower fuel consumption than a gas turbine in simple cycle. These gains are countered by high capital costs per kW of electricity produced and by high process water requirements. Air-cooling as opposed to wet-cooling may be used to reduce process water demand however the technology is not common due to higher costs and lower operating efficiency.

5.3.4 Reciprocating Internal Combustion Engine (RICE)

RICE engines are designed either as spark-ignited (SG) or compression-ignited (CI). The SG uses a spark plug to ignite an air-fuel mixture, whereas with CI air is compressed until the temperature rises to the auto-ignition temperature of the fuel. RICE may utilize a variety of fuels including natural gas and fuel oils, and depending on fuel source, SG and CI will vary in efficiency and emissions characters regarding nitrogen oxides (NOx), sulfur dioxide (SO2), and particulate matter (PM). Engine designs are available that provide CI with more of the lean burning characteristics and low emissions profiles of SG, and dual-fuel engines are available that utilize both liquid and gaseous fuels. Dual-fuel and gas-diesel engine options can utilize highly compressed gas which is injected after liquid pilot fuel is ignited and these engines allow for the use of lower quality gas.

Dual-fuel engines are predominantly fueled by natural gas with a small percentage of diesel oil added however, such engines can be switched to 100 percent diesel operation. Dual-fuel engines provide multi-use options - using cheaper and cleaner burning natural gas when available, while operation on 100 percent diesel allows the engine to act as emergency generators when required. As with the performance of gas turbines, the output and efficiency of reciprocating engine performance decreases as ambient temperature or site elevation increases.

In relative terms gas fired generators offer low capital cost, high operating efficiency, easy start-up and operation, and proven reliability. There are several types of catalytic exhaust gas treatment processes that are applicable to various types of reciprocating engines for post combustion exhaust gas cleanup. In addition, this technology utilizes air, water, or coolant cooling and water demand is negligible.

Natural gas-fired reciprocating engines are separated into three major design classes: 2-cycle (stroke) lean-burn, 4-stroke lean-burn, and 4-stroke rich-burn. Two-stroke engines complete the power cycle in a single crankshaft revolution as compared to the two crankshaft revolutions required for 4-stroke engines. All engines in these categories are spark-ignited. In a 2-stroke engine, the air-to-fuel charge is injected with the piston near the bottom of the power stroke. The intake ports are then covered or closed, and the piston moves to the top of the cylinder, compressing the charge. Following ignition and combustion, the power stroke starts with the downward movement of the piston. As the piston reaches the bottom of the power stroke, exhaust ports or valves are opened to exhaust, or scavenge, the combustion products, and a new air-to-fuel charge is injected. Two-stroke engines may be turbocharged using an exhaust-powered turbine to pressurize the charge for injection into the cylinder and to increase cylinder scavenging. Non-turbocharged engines may be either blower scavenged or piston scavenged to improve removal of combustion products. Historically, 2-stroke designs have been widely used in pipeline applications. However, current industry practices reflect a decline in the usage of new 2-stroke engines for stationary applications.

Four-stroke engines use a separate engine revolution for the intake/compression cycle and the power/exhaust cycle. These engines may be either naturally aspirated, using the suction from the piston to entrain the air charge, or turbocharged, using an exhaust-driven turbine to pressurize the charge. Turbocharged units produce a higher power output for a given engine displacement, whereas naturally aspirated units have lower initial costs and require less maintenance.

Rich-burn engines operate near the stoichiometric air-to-fuel ratio (16:1) with exhaust excess oxygen levels less than 4 percent (typically closer to 1 percent). Additionally, it is likely that the emissions profile will be considerably different for a rich-burn engine at 4 percent oxygen than when operated closer to stoichiometric conditions. Considerations such as these can impact the quantitative value of the emission factor presented. It is also important to note that while rich-burn engines may operate, by definition, with exhaust oxygen levels as high as 4 percent, in reality, most will operate within plus or minus 1 air-to-fuel ratio of stoichiometry. Even across this narrow range, emissions will vary considerably, sometimes by more than an order of magnitude.

Other characteristics that determine the classification of engines include the following:

- Ignition of the fuel (spark ignited (SI), and compression ignited (CI)),

- Air to fuel ratio and oxygen in the exhaust gas (lean burn, and rich burn).
- Fuel type (natural gas, landfill gas, fuel oil, gasoline, diesel oil and dual fuel
- Method of fuel addition (carbureted, and fuel injected)
- Charge pressure (naturally aspirated and turbocharged)

5.4 Alternatives Analysis Summaries

5.4.1 No-Action Alternative

The no-action alternative would mean that the project does not go ahead. In this case there would not be any impact associated with the Project (air, noise, flora, fauna and others), however, in this case the no-action alternative would almost certainly mean that domestic energy resources go undeveloped in favor of importation of diesel fuels, and foreign electricity. The current and perseverant negative socio-economic consequences resulting from the no-action alternative are discussed in Section 4-4.

5.4.2 Sources of Electricity

The proposed Project will use natural gas, an existing domestically abundant fuel stream to generate electricity. The use of natural gas offers a number of environmental benefits over other sources of energy, particularly other fossil fuels. For example, coal and oil are composed of much more complex molecules with a higher carbon ratio and higher nitrogen and Sulphur contents. This means that when combusted, coal and oil release higher levels of harmful emissions, including a higher ratio of carbon emissions, NO_X and Sulphur dioxide (SO_2). Combustion of coal and fuel oil also releases particulate matter to atmosphere. The combustion of natural gas, on the other hand, releases negligible quantities of Sulphur and nitrogen oxides (about 60% less than plants that use coal assuming emission reductions measures are not employed), virtually no ash or particulate matter, and lower levels of CO. Regardless of the specific technology selected the proposed power plant will use modern combustion technology and effective combustion to minimize the generation of NO_X and CO emissions to meet IFC/World Bank Group air quality standards and will incorporate appropriately designed stacks and stack height to ensure adequate dispersion of emissions to the atmosphere.

5.4.3 Technology Alternatives for Natural Gas Power

Ultimately the technology selection for the proposed Project must employ technology that minimizes environmental impacts, is recognized as being the most economically appropriate for power production on the scale proposed and maximizes public and occupational health and safety. The following summary will present this top-down approach, leading with an Environmental Evaluation that is based on central findings of this ESIA, followed by a Technical Evaluation and Social Evaluation.

Environmental Evaluation. Water demand should be prioritized in the overall comparative analysis. Two technologies, simple cycle combustion turbine (SCCT) and reciprocating internal combustion turbine (RICE) provide for plant operation with negligible process water demand and should be favored. Based on the fact that no detailed hydrogeological study has been conducted this decision satisfies the precautionary principle, and supports the base-line study data that indicates that the north region has the lowest national per capita water availability and is currently below the water scarcity threshold.[34] In addition, with regard to long-term water availability, the occurrence of successional droughts is real and is coupled with data that indicates a recession of perennial snowcaps and current glacial retreat approaching 30%.[35] There is risk that if this trend continues water yields at the furthest extent of irrigation networks in the northern region may progressively decline. The regional impact of climate change on agriculture is an expected increase of agricultural water demand due to lower soil moisture levels and increased evapotranspiration. Because the Balkh River, located approximately 1.3 km west of the site is a critical source of water for irrigation in the northern plain and that the majority of the regional population relies on agriculture, large scale, long-term ground water extraction that is not well researched or monitored has the potential to reduce stream flows and impart a significant negative cumulative impact on the livelihoods of this population.

Comparative analysis of SCCT and RICE with regard to water use efficiency reveals that while both require negligible process water in relation to steam and combined cycle turbines, they can be further differentiated when considering site setting. In high ambient temperature installations such as would be experienced during Balkh summers, SCCTs may require an inlet air cooler, which will require high purity (demineralized) water, thereby increasing water demand and operating costs. Generally, reciprocating engines will utilize an external cooling circuit in a closed-loop

[34] Centre for Policy and Human Development Kabul University. Afghanistan Human Development Report. 2011.
[35] Eurasia Environmental Associates and Cadmus Group. FAA 119 Biodiversity Assessment with Summary Assessment of Climate Vulnerability and other Environmental Threats and Opportunities to inform USAID/Afghanistan program design. 2017. Prepared for USAID.

system with minimal make-up water needs. Finally, with regard to emissions, both RICE and SCCT technologies can be installed with selective catalytic reduction (SCR) systems to reduce NO_x and CO to acceptable IFC/World Bank Group standards if utilized effectively.

Technical Evaluation. Engineering, procurement and construction costs are included in the technical evaluation. Based on a comparative analysis[36] of SCCT and RICE for mid-sized generating facilities in the range of 50 MW, several factors related to site setting are meaningful.

- Combustion turbines require much higher inlet gas pressure than RICE (300-600 psig for SCCT compared to 75-150 psig for RICE). If the site has access to a high pressure natural gas line, this may not be of much concern otherwise gas compressors will be required for a SCCT installation.
- When the hours of operation and load range are closer to intermediate load than to a high-cycling type of operation, the lower capital and O&M costs for the SCCT typically result in a higher return on investment, despite the lower efficiency. When the load profile is more volatile, the lower fuel and O&M costs for the RICE typically results in a higher return on investment, despite the higher installed cost.
- Because a 50-MW plant would utilize a single SCCT versus multiple reciprocating engines, the RICE installation has inherent reliability and resiliency advantages in producing power when one unit is down. Additionally, RICE facilities can be used for black-start support, as they can be started without auxiliary power. Combustion turbines require auxiliary power to start system components.
- Due to the smaller size of the RICE units, it is far more practical to incrementally expand capacity by adding one engine at a time than it is for SCCT. If incremental expansion is a possibility for a facility, RICE will permit that expansion, whereas additional SCCTs will result in major step changes.

[36] Power Engineering. Mid-Sized New Generation: Reciprocating Internal Combustion Engines or Combustion Turbine. January 1, 2018. https://www.power-eng.com/articles/print/volume-122/issue-1/features/mid-sized-new-generation-reciprocating-internal-combustion-engines-or-combustion-turbine.html

- If grid instability including fast variations in consumption, errors in forecasting, and unexpected disturbances in capacity or loads is expected a RICE facility can ramp quickly in response, and is the rational choice if the goal of the plant is frequency stabilization. Furthermore, they do not decrease in efficiency at reduced load operation, and can withstand many load changes and starts and stops without penalizing maintenance costs.

Social Evaluation. Because the site selection (siting) for the Project has been directed by the GoIRA, and a land lease agreement has been fully executed, there are no siting alternatives provided for an assessment regarding social impacts. Impacts on the affected communities are relevant to the technology and environmental characteristics of the power plant. Based on the choice of technology, the air emissions, water use and overall safety (employee and public safety) are relevant to a discussion on social impacts.

With regard to air quality impacts, all of the technologies would be designed to meet IFC emissions standards, and air dispersion modelling will be conducted to ascertain relative ground level emissions in the area of influence. With regard to relative emissions, both of the environmentally favorable technologies (RICE and SCCT technologies) can be installed with selective catalytic reduction (SCR) systems to reduce NO_X and CO to acceptable IFC/World Bank Group standards if utilized effectively.

Regarding water use and water use efficiency, the alternative technologies vary substantially. Comparative analysis of SCCT and RICE with regard to water use efficiency reveals that while both require negligible process water in relation to steam and combined cycle turbines, they can be further differentiated when considering site setting. In high ambient temperature installations such as would be experienced during Balkh summers, SCCTs may require an inlet air cooler, which will require high purity (demineralized) water, thereby increasing water demand and operating costs. Generally, reciprocating engines will utilize an external cooling circuit in a closed-loop system with minimal make-up water needs.

Finally, based on employee and public safety, all the technologies are considered safe with proper design, installation and operation. Pressurized gas pipelines, gas tanks and combustion or turbine technologies require safe handling of natural gas in design, installation and operation for the complete lifecycle of the power plant.

5.4.4 Preferred Option

In light of these considerations, the preferred option following environmental, technical and social evaluation is for use of RICE units. Gas engine power plants are self-contained, light weight and they do not require bulk water. They can be quickly installed at a lower cost than other types of power plants and units require less space, have lower installation and maintenance cost and have simple lubrication and ignition systems. Specific fuel consumption does not increase with time in gas engine plants as rapidly as other IC engine based power plants. Also, poor quality of fuel can be readily used in gas engines. Their disadvantages are poor part load efficiency, special metal requirements, special cooling methods and short life. Gas engine power plants are the most suitable plants that can be installed at selected load centers with fewer auxiliaries. Gas engines can be brought on load quickly and surely.

At this time the Project Proponent/Owner has not determined the engine manufacturer or specified the classification characteristics presented above on RICE engine technology. The power plant will consist of 3 to 6 reciprocating engines with a power output between approximately 8 and 19 MW to reach a net power output 45-55 MW. In addition, the aggregate capacity factor is estimated at 80% or 7,000 hours per year.

6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

6.1 Overview

The following section assesses the foreseeable potential environmental and social impacts of the Project. Activities will occur in two distinct stages of the Project life cycle, specifically, the construction of the plant (Construction Phase) and the operation and maintenance of the plant (Operation Phase). While numerous mitigation and management measures are linked to and prescribed for the pre-construction phase, no major adverse environmental or social impacts are anticipated or assessed herein.

Section 7.2.5 describes the potential impacts, assessment of impacts and mitigation plan for the decommissioning phase. In general, decommissioning will depend on the options available at the time of expiry of the Implementation and Power Purchase Agreements between the Afghan Power Plant Company, MoMP/Afghan Gas Enterprise and DABS. If the Land Lease Agreement and the other relevant agreements are not extended or renewed and an alternative economical fuel is available, the power plant may be retrofitted to support alternative power generation. This option would be possible, provided that the required retrofits and new emission rates meet the applicable standards and guidelines. If retrofitting is not a feasible option, and the operational life of the power plant expires, the power plant will be decommissioned according to the requirements of the authorities at that time.

6.2 Evaluation and Assessment of Risk

The potentially significant impacts of the project activities during construction and operation will be evaluated utilizing Good International Industry Practice for environmental and social impact assessment. Implementation of the framework will result in an assignment of impact significance that will be used to guide the development of mitigation measures that are of the appropriate nature and scale, and that are commensurate with the perceived significance of the impact. The significance of an impact is determined by:

- Consequence of the activity,
- Likelihood of occurrence of the activity; and,
- Calculating the product of these two parameters.

Consequence and likelihood of impacts resulting from planned activities are discussed below. Changes in the planned activities for the proposed Project would affect both the impact assessment and also the planned mitigation activities.

Consequence

Table 6-1 presents the consequence assessment criteria for impact assessment. The level of consequence for each identified impact is determined by examining a number of factors relating to the activity. Each category has a number of parameters as follows:

- Perception of the activity,
- Ability of physio-chemical, biological or socio-economic environment to absorb the impact (i.e. adapt to change) based on its natural dynamics and resiliencies; and/or,
- Whether or not the activity results in a breach of legislation, regulation or standards to which the project must comply and/or a breach in operator policy.

It should be noted that in assessing an impact, the assigned level of consequence might be different for different consequence criteria. Where this has been found to be the case for this Project's proposed activities, a rule has been established that the highest ranking criteria establish the overall consequence ranking for the impact in question.

Table 6- 1 Categories and Consequence Levels

Category	Ranking	Definition
Critical	5	▪ Very serious effects with impairment of physio-chemical, biological or socio-economic function. ▪ Long-term, widespread effects on significant environment (e.g. unique habitat, national park) ▪ Restitution time >100 years and requiring extreme substantial intervention.
Major	4	▪ Serious social or environmental effects with some impairment of system function (e.g. displacement of human or animal species). ▪ Relative widespread medium–long term impacts. ▪ Habitat restitution time >10 years and requiring substantial intervention.

		▪ Potential for continuous non-compliance with environmental regulations and/or company policy.
Moderate	3	▪ Moderate social or environmental effects but not affecting overall system function. ▪ Moderate short-medium term widespread impacts ▪ Habitat restitution time 1-5 years (possible limited and local areas up to 10years) with potential for full recovery and limited or no intervention required. ▪ Potential for short to medium term noncompliance with environmental regulations and/or company policy.
Minor	2	▪ Minor social or environmental effects. ▪ Minor short-medium term damage to small area of limited significance ▪ Full recovery in < 1 year without intervention required. ▪ Any potential non-compliance with environmental regulations and/or company policy would be minor and short-term.
Low	1	▪ No lasting social or environmental effect. ▪ Low-level impacts on physical or biological environment. ▪ Limited damage to minimal area of low significance ▪ Compliance with environmental regulations and/or company policy at all times. ▪ Possible beneficial effect or ecosystem improvement.
None	0	▪ No impact or social/environmental damage. ▪ No compliance requirements for environmental regulations and/or company policy. ▪ Possible beneficial effect or ecosystem improvement.
Limited Positive	+	▪ Some beneficial improvement to social or environmental system. ▪ Benefits to specific social, physical or biological components of environment.
Modest Positive	++	▪ Moderate beneficial improvement to social or environmental system.

		▪ Medium benefits to specific social, physical or biological components of environment.
Significant Positive	+++	▪ Major beneficial improvement to social or environmental system ▪ Significant benefits to specific social, physical or biological components of environment.

Likelihood

The following Table 6-2 presents criteria for level of likelihood of the occurrence of an activity. The level of likelihood for each identified impact is determined by estimating the probability of the activity occurring.

Table 6- 2 Likelihood of Occurrence and Ranking of Impacts

Impact and Likelihood	Ranking	Definition of Impact	Frequency
Almost Certain (80-100%)	5	▪ The activity will occur under normal operating conditions.	▪ Very frequent (high likelihood of ongoing occurrence)
Very Likely (60-80%)	4	▪ The activity is very likely to occur under normal operating conditions.	▪ Frequent (occurs with a regular frequency)
Likely (40-60%)	3	▪ The activity is likely to occur at some time under normal operating conditions.	▪ Occasional (only occasional likelihood of occurrence)
Unlikely (20-40%)	2	▪ The activity is unlikely to, but may occur at some time under normal operating conditions.	▪ Few (unlikely to occur even occasionally)
Very Unlikely (0-20%)	1	▪ The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.	▪ Rare (highly unlikely to ever occur)

Impact Significance

The significance of an impact is then determined by calculating the consequence and likelihood of occurrence of the activity, expressed as follows:

$$\text{Significance} = \text{Consequence} \times \text{Likelihood}$$

The above two tables illustrate all possible scenarios for the different consequences and likelihood categories. The possible significance rankings are presented in the following Table 6-3.

Table 6- 3 Impact Significance Rankings

Ranking (Consequence x Likelihood)	Significance
>16	Critical
9-16	High
6-8	Medium
2-5	Low
<2	Negligible

Risk Matrix

The resulting risk matrix demonstrates the various relationships between consequence, likelihood and significance ranking (Table 6-4).

Table 6- 4 Risk Assessment Matrix

Likelihood/Frequency		Consequence/Severity				
		Low	Minor	Moderate	Major	Critical
	Almost certain	Low	High	High	Critical	Critical
	Very likely	Low	Medium	High	High	Critical
	Likely	Low	Medium	High	High	High
	Unlikely	Low	Low	Medium	Medium	High
	Very unlikely	Negligible	Low	Low	Low	Low

6.3 Impact Assessment - Construction Phase

The major activities during the construction phase of the gas fired power plant may be broadly classified into the following: (i) mobilization of equipment, materials and personnel; (ii) site preparation; and (iii) civil construction and electromechanical installation/erection. In this study, the effects of the project activities on the physical-chemical, ecological and socio-economic facets of the environment will be assessed separately. The potential impacts that could occur during the construction phase of the project are summarized in the discussion below.

6.3.1 Physio-Chemical Impacts – Construction Phase

The important physio-chemical environmental parameters that are likely to be affected by the project activities during construction phase include water and soil quality, air quality, and noise level. The potential impacts of the project activities on these physio-chemical environmental parameters are described in this Section.

Water Quality and General Environmental Impacts

Solid waste and generated during the construction phase of the project will include but not be limited to spoils, construction debris (metal, wood, rock and plastic), packaging, domestic sanitary wastes, and other solid wastes associated with equipment and machinery. In addition, if temporary housing is installed for on-site construction work camp use, the domestic solid and liquid wastes generated from the installations will require management through proper infrastructure (waste receptacles and septic tanks) and disposal management plans.

Most of it will be generated toward the end of the construction phase during carrying out of the finishing works, while the site will be cleared of waste materials. The volume of such construction wastes is likely to be significant. Indiscriminate storage and disposal of these construction debris and wastes could create local water logging and ponding by blocking drainage lines and would be aesthetically displeasing. Proper disposal of these wastes, as described in the mitigation measures, is therefore necessary.

Liquid wastes could include impacted stormwater runoff, sanitary wastewater and chemical byproducts and fluids from equipment and machinery. These liquid wastes could lead to pollution of soil, surface and groundwater and the general environment, if not properly containerized, cleaned-up and ultimately disposed.

Furthermore improper disposal of solid and liquid waste could adversely affect human health and wellbeing of construction workers and visitors at the construction site by increasing the risk of disease transmission. Proper disposal of wastewater should therefore be managed as recommended in the mitigation measures.

Regarding soil erosion, clearing and grubbing activities within the limits of the project site could result in soil erosion, however, because of the relatively flat topography of the construction site, it is expected that soil losses will be minimal. Temporary drainage will be used during the course of construction to accommodate anticipated rainfall and runoff from the disturbed areas.

Temporary drainage will be used during the course of construction to accommodate anticipated rainfall and runoff from the disturbed areas.

Air Quality Impacts

The most significant issues that could potentially impact ambient air quality during construction are combustion gas emissions and nuisance dust. The principal sources of combustion gases would include the operation of a concrete batch plant, diesel powered construction machinery, and vehicle exhaust.

As with any construction site, dust may be generated as a result of surface preparation and earthworks, including earth moving and materials handling. Internal site traffic moving on un-surfaced routes/roads within the development site may cause sufficient disturbance of loose surface materials to generate dust, particularly during the dry season. However, most roads to the proposed project site are paved and, therefore, dust emissions from traffic movement would be restricted to the site itself.

Heavy-duty diesel trucks would be used to transport raw materials such as sand, aggregate and cement to the project site for concrete production. Diesel exhaust is known to contain several compounds that may be detrimental to human health over the long-term with repeated exposure. Diesel exhaust emissions from construction vehicles and equipment for the project would be generated on an intermittent and short-term basis, and would primarily be a risk for on-site workers as opposed to off-site receptors. Because work will be conducted outdoors, in most circumstances gaseous emissions would disperse prior to building up to dangerous levels.

Due to the nature of the construction process, potentially dust emitting activities would not be constant and emissions would be limited to the operating periods for each item of plant and the combination of machinery being used at any one time. Air emissions from construction activities are not expected to significantly affect the air quality in the region outside the proposed project site. The nearest residential receptors are over 1.0 km from the development site and are therefore unlikely to be affected by construction phase emissions which will be highly localized. The main risks from dust and particulate air emissions generated during construction would be to construction site workers and personnel on a short-term or limited basis. Nevertheless, implementation of the recommended mitigation measures to minimize dust and diesel emissions impacts will be required.

Noise Impacts

The IFC General EHS Guidelines: Environmental for Noise Management recommend that noise levels do not exceed the limits presented in below in Table 6-5.

Table 6- 5 IFC Noise Guidelines

IFC Noise Level Guidelines		
Receptor	1-hour L_{Aeq} (dBA)	
	Daytime (0700-2200)	Nighttime (2200-0700)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

The most significant noise emissions during construction would be associated with the following activities:

- Earthworks and Site Preparation;
- Creation of Hard Standings;
- Construction of Foundations;
- Building Erection; and
- Creation of Roads.

The above construction works are estimated to generate high noise levels in the range 83-87 dB at a distance of 10 m. Therefore, personal hearing protection will be required for all construction workers in the vicinity of these activities.

The noise modelling conducted for the operation phase (See Annex 7) of the Project activities demonstrate that the nearest residential, institutional and educational receptors (located > 1 km to the west, north and east directions) will not be impacted above the thresholds provided by the IFC EHS Guidelines, however, mitigation measures to reduce noise impacts for on and off-site receptors are recommended and included below as a best construction management practice.

In addition to noise emissions from major construction work, there may also be some noise emissions from increased traffic movements. Heavy-duty diesel trucks would be used to transport raw materials such as sand, aggregate and cement to the project site for concrete production. These impacts would be short-term and the duration of impacts on the surrounding environment would also be temporal in nature (e.g. passing vehicles). Standard measures for the management of the impact of construction and traffic noise are recommended are presented below. Furthermore, baseline noise monitoring was conducted on-site in order to quantify and monitor the level of noise impacts during construction and operation phases of work.

Landscape and Visual Impacts

In general a construction site includes visual impacts such as the increase of traffic and the presence cranes, diggers and scaffolding, as well as, the erection of the power plant itself, which will result in negative impacts on the surrounding landscape. Visual impacts due to landscape modification will likely be experienced both by local residents and at settlements further afield.

The impact of construction-related visual effects from the project will have limited short-term effects and result ultimately in long-term visual modification of the landscape. However, the circa 1970 NFPP is currently present north of the site, and will serve to impede the view of the Project site both during construction and operation phases from the communities located to the north (no residential or commercial developments are located south of the Project site).

6.3.2 Biological Impacts – Construction Phase

Impacts to Fauna and Flora

Construction impacts to habitats and species and may arise from:

- Clearance of vegetation;
- Vehicular traffic;
- Presence of people;
- Ground and excavation works;
- Construction of hardstanding and structure;
- Noise and vibration from use of machinery;
- Emissions to the air from machinery and dust;
- Lighting of the development (on nocturnal species);
- Disturbance to hydrology (sedimentation, drainage); and
- Environmental incidents and accidents (e.g. spillages).

These activities could have some adverse impacts (direct and indirect) on the existing terrestrial fauna due to their reactive behavior in response to disturbance occurring at or near their habitat. Faunal species that are sensitive to direct (human activity and traffic) or indirect disturbance (noise) would be most impacted. Habitat disturbance would reduce habitat availability and effectiveness over a certain period of time for mammals, reptiles, birds and their predators. There are also some possibilities of direct mortality and displacement of reptiles, birds and mammals from the use of vehicles or machinery over terrestrial faunal habitats. Quantification of these losses is difficult; however, the impact is expected to be limited. Based on the baseline review, it is highly unlikely that there are existing plant or animal species that are unique to the project site.

Vegetation will have to be removed from the construction area for the power plant and the associated facilities. Uncontrolled movement of heavy machinery used for setting up project facilities might cause damage to natural vegetation. Such impacts will be primarily confined to the project sites and during initial periods of construction and need to be minimized by adopting appropriate mitigation measures.

Based on the nature of flora and fauna biodiversity in the vicinity of the site the potential for irreversible impacts on these species or their ecological systems is limited. Impacts would be localized and in some cases displaced species may disperse to surrounding undisturbed land that borders the site. Further, based on the location and neighboring land uses, site development is not expected to limit or impede migratory pathways for any known fauna. Nevertheless, mitigation measures to minimize ecological effects of construction works are recommended and included.

6.3.3 Socio-Economic Impacts – Construction Phase

In many development projects, the most significant loss of income results from loss of land (due to land acquisition) and income. However, for the proposed Project, no land will be acquired as the IPP will be established on undeveloped, non-agricultural land that is transferred from GoIRA to the Afghan Power Plant Company through a Land Lease Agreement executed by the Ministry of Energy and Water. Through this agreement the Project Proponent is entitled to engineer, design, procure, supply, erect, test, construct, commission, operate, maintain and insure an approximately 50 MW gas-fired power generation plant and all associated facilities required for its facilitation. Therefore, there will be no loss of private land or property and no displacement of population or resettlement requirements.

Additionally, the site is not used for income generation activity and therefore, no direct loss of income will be incurred. The impacts of the project activities during construction phase on important socio-economic parameters are summarized below. With regard to improving socio-economic conditions in the vicinity of the Project site, the APPC is committed to the generation and implementation of a site-specific community development plan. These activities will include planning of humanitarian and development projects, designing feasibility studies, and management of community-based interventions for the development of target communities through best practices. An example of the community development agenda, potential projects to be selected following collaboration with communities during the stakeholder engagement process, and the rationale for this development is provided in Annex 12.

Also, there are no indications following research and stakeholder/government engagement that any monument, shrine, archaeological, historical or culture heritage sites are located on/adjacent to the Project area, however, a Chance Find Procedure will be implemented and documented as a mitigation measure in the Construction ESMP.

Transport Impacts

During the construction phase, additional traffic will be generated for bringing in construction material and equipment. This traffic will primarily be coming from the eastern direction. The roads that are expected to be impacted are those where Project site traffic will be concentrated, specifically, the primary access road that connects the NFPP to the secondary highway, and the secondary highway between the access road and the city of Mazar-e Sharif, where most equipment, supplies and personnel will be sourced and located (Figure 6-1).

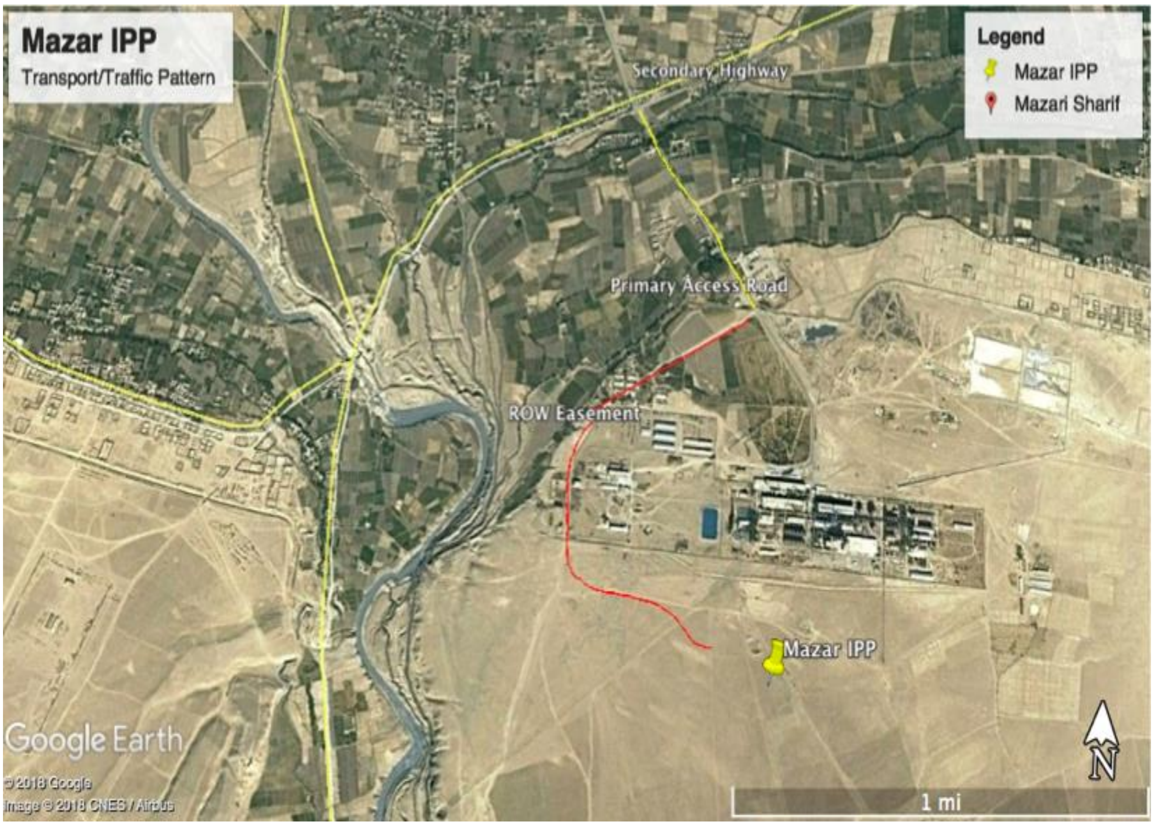


Figure 6- 1 Transport and Traffic Pattern Map

Traffic flow to and from the project site during the construction phase will include cars, trucks and heavy load vehicles that will be carrying construction materials, equipment, machinery and personnel. These vehicles will generate noise impacts for on-site workers and the surrounding communities, contribute to exhaust emissions and fugitive dust generation, and pose potential human and animal health risks due to fast speeds and accidents.

During the baseline study a traffic survey was conducted of the Secondary Highway and the Primary Access Road that will be most impacted by the increase in traffic during construction activities from transport vehicles. The location of the traffic survey points is depicted in Figure 6-2. The study involved recording the number of vehicles passing the survey point in either direction over the course of a 15-minute period during separate morning and afternoon events (see Table 6-6).

Table 6- 6 Traffic Survey Data

Location	Morning Survey 08:30 – 08:45 am	Afternoon Survey 16:00 – 16:15 pm
Secondary Highway	91	107
Primary Access Road	33	30

Figure 6- 2 Traffic Survey Points

Based on construction traffic analysis it is expected that traffic increases during the construction phase will vary by activity and can generally be characterized by three main phases of work, namely, Grading/Excavation, Framing/Superstructure and Finishes/Landscaping. Based on conservative estimates, Table 7-2 presents an estimate of the number of workers and number of vehicles that will be associated with each phase per day.

Table 6- 7 Construction Traffic Estimates

Phase	Workers Per Day[37]	Total Vehicles Per Day
Grading/Excavating	15	40
Framing/Superstructure	140	20
Finishes/Landscaping	125	5

[37] To reflect the maximum construction traffic generation at the site and on the surrounding road network, it is assumed that the construction workers will park on-site during the entire construction period.

Based on these estimates in relation to the traffic survey results, traffic increases during the busiest construction phase will more than double the baseline traffic load on the Primary Access Road and increase traffic on the Secondary Highway by approximately one-half. However, during the construction period, the delivery trucks would access/egress the project site during non-peak hours and construction workers will primarily arrive via local shuttles to the project site. Likewise, it is expected that on-site construction activity will fluctuate on a weekly basis, depending largely on the number of workers and construction trucks needed for the activities during each time period.

Because the roads where the majority of traffic will be concentrated are located in a sparsely populated, semi-rural, agricultural area with low population density, traffic is not currently considered heavy or congested. Furthermore, the NFPP and Jade Glass factory located adjacent to the site utilize the same primary access road and this road network currently accommodates large vehicles and equipment. Construction traffic impacts will be intermittent throughout the construction period and short-term in nature, however, in order to minimize the public safety and nuisance issues related to the increase in traffic, standard mitigation measures are recommended and included in the Construction ESMP. These measures include a requirement for the EPC Contractor to develop traffic management plans as part of the site-specific Health & Safety Plan.

Public Health and Safety Impacts

Construction activities have the potential to impact human health and well-being due to increased noise pollution and vibration, and local air pollution within and around the Project site. Construction activities will generate dust, and noise pollution and vibration will be generated from additional traffic and operation of construction equipment. Because the closest residential and agricultural areas are over 1.0 km from the site (to the west and north), these impacts are expected to be limited in nature. Furthermore, during much of the year the prevailing winds are northwesterly and the closest developed land in the east direction is located at nearly 4.5 km. Other potential adverse public health issues that may arise during the construction phase include improperly managed solid wastes and accidents or releases of hazardous materials. These issues and the recommended management measures to mitigate these impacts are further detailed in Section 7.

Security Impacts

There is risk associated with security breach or targeting by anti-government groups. The Project Proponent, Ghazanfar Group/Afghan Power Plant Company, will provide security services during construction and operation. The security team will be responsible for generating and implementing a Security Management Plan including emergency procedures for mitigating these risks and will be responsible for conducting the training and communications with all on-site employees and third parties entering the site. The Project Proponent has prepared a Security Management Plan that is included in the Annex 2 section of the ESIA.

Employment Impacts

Employment created during construction is considered a beneficial effect of the Project. During construction and operation phases, employment impacts are considered to be largely positive. The major construction works are expected to be completed within a 12 month period. During plant erection and equipment installation roughly 140 skilled; semi-skilled and daily wage labors are expected to be employed by the EPC Contractor and indirect job opportunities will be generated for drivers, hotels, restaurants, cleaners, etc. Therefore, the project will have a beneficial impact on employment during construction both in the project area of influence, and in the wider geographical region.

Temporary on-site housing is not anticipated however in limited cases during special works that would require overnight accommodation, the responsible contractor will be required to manage the accommodation of workers and provide basic services to workers in line with the provisions of IFC PS 2 and to follow the guidance note on worker's accommodation published by IFC (Worker's Accommodation: Processes and Standards[38]).

With regard to indirect employment, construction workers and contractors will require numerous vendors, suppliers and service providers to meet the daily operating needs of the Project together with the domestic needs of its employees. This could include goods and services such as food vendors, laundry, supply of vehicles and transportation services, security patrols, as well as some construction equipment.

[38] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

While there is potential that the temporary increase in the local population will impose stress on public service systems such as health clinics and food markets, this impact is limited due to the size and scale of the construction project. Opportunities for utilizing local goods and services for the project and related activities are expected to be positive.

With recommended management measures employment opportunities will be maximized by training of the local workforce and minimizing potential adverse social and health related impacts from an influx of migrant workers. The APPC has committed to meeting with elders and representatives from the surrounding villages who have been identified and have agreed to coordinate with the project staff (APPC Project Outreach Coordinator) on conducting stakeholder outreach. Through these existing channels, APPC will identify eligible individuals from the immediately surrounding villages who are qualified for receiving training and employment. The APPC recognizes the multi-faceted benefits of employing workers from surrounding villages in terms public acceptance, social inclusion and security.

APPC also has identified and is familiar with the websites and job site search engines used by the local community, and will post positions as appropriate in order to actively involve and offer employment opportunities to the local Afghan workforce.

Notwithstanding, there are also potential positive impacts from bringing different groups of people together (residents and migrant or outside workers), which has the potential to encourage development of relationships. It is hoped that interactions will lead to the exchange of knowledge and information, and increased knowledge of other places and people.

In all cases of direct or indirect employment through contractors or subcontractors, there will be explicit reference to the compliance requirements to the 2007 Afghanistan Labour Law (see Section 2.2.7). The articles in this Law will provide for the control and legal requirement pertaining to child labor, forced labor, transportation of workers to and from site or workers camps, human resources (HR) policy (e.g., hiring, termination, retention policies, grievance mechanisms etc.), occupational health and safety (OHS) policy and requirements, sub-contractor management, workers' organizations and working conditions.

Occupational Health and Safety Impacts

The construction phase of the proposed project will involve activities including, but not limited to: excavation, erection of temporary facilities, foundation preparation, and electrical and mechanical work. These activities will expose the workforce to potential hazards. Potential occupational health and safety issues during construction activities include:

- Falls and slips;
- Failures of support systems and/or platforms;
- Collision with mobile plant or vehicles;
- Road safety relating to water trucks;
- Exposure to dust and to hazardous materials;
- Burns;
- Crushing by heavy plant or collapse of structures;
- Falling debris;
- Adverse weather conditions;
- Falls into voids during piling; and
- Contact with concrete.

Hazards cited as of particular concern in IFC Thermal Power Plant Guidelines that were relevant to the study include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards; and,
- Fire and explosion hazards.

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action if needed. Occupational health and safety hazards can be severe since work around heavy equipment and machinery, electrical hazards and some chemicals can result in serious injury or death if hazards and associated risks are not managed. Therefore mitigation and management measures (including both technological and institutional) are recommended and presented in Section 7. In addition, guidance for contractors who will be required to detail OHS measures in their site-specific H&SPs is presented in Annex 5.

Impacts to Vulnerable Groups

Drawing from the baseline data regarding vulnerable groups (Section 4.6), it is apparent that youth, women, persons with disabilities and migrants are present in the affected communities. The factors that contribute to the vulnerability of these groups include the ongoing conflict, physical displacement, environmental degradation, climate change, lack of development, religio-cultural gender norms and poverty. Addressing such pervasive and somewhat intangible issues requires broad support from many actors, and interventions on many fronts. Most importantly, institutionalizing support for these vulnerable groups requires policy reform and mainstreaming of inclusion-based strategies by international and government agencies.

With regard to the proposed Project and the requirements of IFC Performance Standard 1, this assessment should seek to identify whether the vulnerable individuals and groups in the affected communities may be directly and differentially or disproportionately affected by the Project because of their disadvantaged or vulnerable status. The assessment of risk from potential Project impacts during the construction and operations phases are presented in Tables 6-9 and 6-12, respectively. These assessments are based on a ranking system that integrates the impact's consequence level, likelihood of occurrence and impact significance with mitigation[39]. Based on these assessments, the issues that receive a medium rank - on a scale of negligible, low, medium, high and critical - relate to air quality impacts, solid and hazardous waste impacts, and occupational health and safety impacts. The remaining impacts that could potentially stem from the Project were ranked as low risk given specified mitigation measures. The following table (Table 6-8) presents an assessment of whether the impacts that are ranked as medium will affect vulnerable groups differentially or disproportionately.

[39] Mitigation using standard industry practices considered achievable under site-specific conditions by competent contractors with environmental oversight.

Table 6- 8 Vulnerability Assessment

Potential Impact Category	Potential Impact (Outcome/Receptor)	Impact potential to differentially or disproportionately affect vulnerable groups			
		Youth	Women	Disabled	Migrants
Solid and Hazardous Waste Impacts	Disposal site natural resource impacts from disposition of solid or hazardous wastes	Yes	No	No	No
Air Quality Impacts	Human health impacts from combustion gas emissions and dust	Yes	No	Yes	No
	Localized ambient air quality degradation	Yes	No	Yes	No
Occupational Health and Safety Impacts	Construction or Operation phase health and safety risks resulting in injury or death	No	No	No	No
	Construction or Operation phase health and safety risks resulting in impairment or long-term health issues	No	No	No	No

Vulnerability Summary of Solid and Hazardous Waste Impacts. The disposal of solid and hazardous waste at the municipal disposal site has the potential to disproportionally affect youth due to the fact that many of the informal waste pickers at Afghan disposal sites are children (identified through personal observations by the ESIA team and anecdotal evidence). Therefore, mitigation measures are required to reduce such exposure and risk. Several standard mitigation measures are incorporated into the ESMP (Section 8) that address this potential exposure risk, including the following:

- Avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project through modifying, substituting, or eliminating their use, and recycle all hazardous materials to the extent feasible;
- Properly containerize all hazardous waste planned for transport and disposal at the municipal disposal site, if possible, using leak proof and secure containers or receptacles;

- Provide advance notice to the municipal authorities (and NEPA) of any and all hazardous wastes that will be planned for disposal at the municipal disposal site and actively find all reasonable alternatives including recycling and beneficial reuse; and,
- Conduct verification through monitoring and documentation that staff or third-party subcontractors are following the established waste management and disposal protocols outlined in the Contractor's required Waste Management Plan.

Because the ability to control the age of waste pickers and their access to the municipally managed disposal sites is generally outside the immediate control of the Project Proponent and EPC/O&M Contractors, the above stated mitigation measures, if implemented and monitored for effectiveness, represent a level of due diligence commensurate with the nature and scale of the issue.

Vulnerability Summary of Air Quality Impacts. The impacts relating to air quality could result from both construction related activities and from ongoing operations. In general air quality impacts will differentially affect children, the elderly and those with acute or long-term respiratory conditions. Therefore, mitigation measures are required to reduce such exposure risk. Several standard mitigation measures are incorporated into the ESMP (Section 8) that address this potential exposure, including the following:

Construction Phase

- Cover stockpiles and loads to avoid fugitive dust emissions;
- Minimize idling of vehicles and operation of combustion machinery and equipment to greatest extent possible;
- Hard pack or spray access roads and driveway areas to reduce dust generation; and,
- Place washed stone at site exit to minimize off-site tracking of soil and debris.

Operations Phase

- Conduct air modelling computations of the ground level concentrations to simulate the effect of emissions from continuous point sources on neighborhood air quality and include in a supplemental report to this ESIA;

- Include the results of air modelling along with other design considerations including engine quantity and specification, gas characteristics and IFC emissions (priority pollutant and GHG) standards when determining the appropriate emissions control technology; and,
- As per design specifications, after commissioning of the plant, the stack emissions are expected to satisfy the IFC emissions standards for NOx, CO and Particulate Matter (PM).

Based on the Project site location, the distance to nearby residential areas and the availability of mitigation measures to address public exposure at large, the level of risk from air quality impacts is not expected to be a cause of concern for the groups deemed differentially vulnerable. Furthermore, the air quality impacts that may result from the Project, when compared with the other sources of outdoor air quality impacts in the area of influence (i.e. automobiles, dust), are expected to represent a minor contribution to cumulative air quality impacts.

Vulnerability Summary of Occupational Health and Safety Impacts. The impacts associated with long-term health issues or death resulting from occupational activities on-site during construction or operation phases of work are primarily a risk to on-site workers. While on-site workers are expected to be comprised of working age youth, women, disabled and migrants (in order to ensure that vulnerable groups are able to share in the benefits of the Project), it is not expected that these groups will be affected differentially or disproportionately by OHS impacts if staffing is conducted appropriately and mitigation measures are implemented and monitored for effectiveness.

Vulnerability - Conclusion. On a broader scale, vulnerability can also relate to the public at large within the area of influence, beyond the traditionally assigned vulnerable groups. Communities may already have sensitivities related to safeguarding traditional livelihoods and income levels, creating opportunities for employment and contracting, or accessing amenities and housing. There are also sensitivities related to maintaining ethnic balance, degradation of the local language and culture, and ensuring respect for human rights. Lastly, vulnerability is also impacted by lifestyle and lifestyle choices that can be a result of socio-economic conditions including social vices, alcohol, drug abuse, and hygiene. In light of these sensitivities the proposed Project is not expected to be of a nature or scale that would have a discernable or measurable impact on affected communities. Furthermore, identifying trends in the community response to these types of sensitivities requires in-depth and long-term sociological studies that are outside the scope of this ESIA.

However, the Stakeholder Engagement Plan (SEP) developed as part of the ESIA is designed to establish open communication and dialogue with the affected communities and to discern whether any of the potentially vulnerable groups or potential impacts described above are actual risks based on community perception. The ESMP has been created in order to not only mitigate predicted issues and outcomes, but to proactively identify and respond to unanticipated impacts that are occurring within the affected communities. To this end, the SEP and the grievance redress mechanism have been established so that individuals, leaders and representatives from the surrounding communities may alert the Project Proponent to unforeseen impacts, including for vulnerable groups. In addition, in an effort to ensure inclusion of gender equality and women's participation in the project, specific women's groups and representatives were disaggregated in the SEP for decision making input and input into the grievance redress mechanism.

This vulnerability assessment also seeks to ascertain (and mitigation measures should address) whether the vulnerable groups will be disadvantaged in sharing development benefits and opportunities. With regard to the long-term benefits associated with the Project's outputs (electrification), the majority of Dehdadi District residents (~92.9%) currently have access to electricity. In addition, decisions regarding the distribution of electricity produced from the Mazar IPP are with the Government of Afghanistan/DABS and not within the control of the project.

Land Mines

Afghanistan is one of the most mined countries in the world with estimates of up to 640,000 land mines laid since 1979. Mines were laid by the warring factions during the civil war years 1990-1996 and again during fighting between the Taliban and the Northern Alliance 1996-2001. The geography of the conflict meant that different factions mined the same areas at different times. Currently, almost 80% of all recorded mine and UXO contaminated land in Afghanistan has been cleared. Much progress has been made, though the remaining 570 square kilometers requires attention.[40]

The national Mine Action Coordination Center of Afghanistan (MACCA) has seven Area Mine Action Centers (AMACs) in Gardez (Southeast), Herat (West), Jalalabad (East), Kabul (Central), Kandahar (South), Kunduz (Northeast), and Mazar-e Sharif (North) that coordinate, oversee, and monitor demining activities at the regional and provincial levels. The regional offices also work directly with communities, UN offices, government representatives, and development organizations to ensure that operations are coordinated and meet local needs. Regional coordination meetings are held once a month and national coordination meetings are held every one or two months.

In 2015, as part of MACCA's work, the Mine Action Programme of Afghanistan launched a nationwide Mine/Explosive Remnants of War (ERW) Impact Free Community Survey (MEIFCS). MEIFCS includes a non-technical survey of contaminated areas, immediate action on destruction of known spot ERW endangering the lives and safety of people, as well as communication of key mine/ERW risk education messages to the communities. The area of the Project site was included in the MEIFCS and is now classified as 'completed', wherein no new or existing suspected hazards are located in the area that require clearance operations.

In addition, the Project Proponent has previously contracted a full-site geotechnical investigation in 2018 and a final report was submitted on May 6, 2018 by Omran Geotechnical Company and Fichtner Consulting Engineers Ltd. This comprehensive study of the land across the site included carrying out site condition inspections and observations, drilling boreholes and test pit excavation, soil sample collection, and laboratory testing of representative samples. This study and documented report did not result in any findings of, or risks related to, suspected hazards from mines or ERW.

Labor Influx Impacts

Based on the fact that the majority of unskilled workers will be sourced from local villages and from Mazar-e Sharif city, there is no significant risk to nearby communities anticipated as a result of labor influx. The majority of workers will be living in their homes and commuting to the site (center city Mazar-e Sharif drive time to Dehdadi District is approximately 18 minutes via existing asphalt road). Aside from locals, there

[40] https://www.halotrust.org/where-we-work/central-asia/afghanistan/

will be a small fraction of workers who will be skilled specialists from outside the region. These workers are expected to reside in established hotels in downtown Mazar-e Sharif and will provide benefits to the local economy.

The population of Mazar-e Sharif is approximately 693,000. The maximum number of workers on site per day (for limited periods during the construction phase) is 140. Therefore, the labor influx for the area is 0.02% of the total population.

6.3.4 Risk Evaluation – Construction Phase

The risk evaluation table below presents the assessment of risk during the construction phase for physio-chemical, biological and socio-economic categories based on the identified potential impacts. The assessment presents the potential issues and the anticipated outcome or receptor that could be affected. The risk matrix elements (consequence, likelihood and significance ranking) are presented, as well as, the adjusted significance ranking once mitigation measures are instituted.

Table 6- 9 Summary of Risk Assessment - Construction Phase

Evaluation of Risk – Construction Phase					
Physio-Chemical Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation***
Water Quality and General Environmental Impacts	Solid waste leading to water logging and blockage of drainage lines	Minor	Unlikely	Low	Low
	Liquid waste and contaminated stormwater leading to pollution of soil, surface and groundwater	Minor	Likely	Medium	Low
	Solid and liquid waste mismanagement leading to risk of disease transmission	Moderate	Unlikely	Medium	Low
	Clearing and grubbing activities leading to soil erosion	Minor	Unlikely	Low	Low
Air Quality Impacts	Human health impacts from combustion gas emissions and dust	Minor	Likely	Medium	Medium
	Localized ambient air quality degradation	Minor	Likely	Medium	Medium
	Regional ambient air quality degradation	Minor	Unlikely	Low	Low
Noise Impacts	On-site human health impacts from construction noise	Minor	Likely	Medium	Low
	Off-site (residential, institutional, educational) human health impacts from construction noise	Minor	Very Unlikely	Low	Low
	Off-site (industrial, commercial) human health impacts from construction noise	Minor	Very Unlikely	Low	Low
	General nuisance (non-health impact) from construction noise	Low	Very Likely	Low	Low
Landscape and Visual Impacts	Short-term quality of life impacts from alteration of existing landscape	Low	Likely	Low	Low

* Mitigation using standard industry practices considered achievable under site-specific conditions by competent contractors with environmental oversight

	Long-term quality of life impacts from alteration of existing landscape	Minor	Unlikely	Low	Low
Biological Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Impacts to Flora and Fauna	Short-term destruction of habitats and displacement of fauna	Low	Likely	Low	Low
	Long-term destruction of habitats and displacement of fauna	Low	Likely	Low	Low
	Short-term destruction of flora	Low	Likely	Low	Low
	Long-term destruction of flora	Low	Likely	Low	Low
	Irreversible impacts to ecological systems or functions	Low	Unlikely	Low	Low
Socio-Economic Impacts					
Potential Impact Category	**Potential Impact (Outcome/Receptor)**	**Consequence Level**	**Likelihood of Occurrence**	**Impact Significance**	**Impact Significance with Mitigation**
Transport Impacts	Public health and safety impacts from vehicles moving at high speeds and accidents	Moderate	Unlikely	Medium	Low
	Vehicle noise impacts for surrounding community and on-site workers	Minor	Likely	Medium	Low
	Human health impacts from vehicle exhaust and fugitive dust	Minor	Likely	Medium	Low
	Road congestion and nuisance issues for surrounding community	Low	Likely	Low	Low
Public Health and Safety Impacts	Human health impacts from construction noise, vibration and air pollution	Minor	Unlikely	Low	Low
	Human health impacts from improper management of solid and liquid wastes	Minor	Unlikely	Low	Low
	Human health and safety impacts from release or mismanagement of hazardous materials	Moderate	Unlikely	Medium	Low

	Safety risk associated with security breach and targeting by anti-government groups	Major	Unlikely	Medium	Low
	Vulnerable individuals and groups in the affected communities being differentially or disproportionately affected by the Project because of their disadvantaged or vulnerable status	Moderate	Unlikely	Medium	Low
Employment Impacts	Health and safety impacts from improper management of labor camps	Moderate	Unlikely	Medium	Low
	Adverse social and health related impacts from influx of outside workers	Minor	Unlikely	Low	Low
	Impacts/stress on local public service systems (health centers, food markets, etc.)	Moderate	Very unlikely	Low	Low
Occupational Health and Safety Impacts	Construction health and safety risks resulting in injury or death	Major	Likely	High	Medium
	Construction health and safety risks resulting in impairment or long-term health issues	Moderate	Unlikely	Medium	Medium

6.4 Impact Assessment - Operation Phase

The following section presents the assessment of the foreseeable environmental and social impacts of the Project during the operation and maintenance of the plant (Operation Phase). In this study, the effects of the project activities on physio-chemical, biological and socio-economic parameters have been assessed.

As noted in the previous section, the Project site is located on non-agricultural land and is adjacent to two industrial facilities. It does not appear to be ecologically sensitive. The impact of project activities on most ecological parameters (e.g., fauna, flora, ecosystem function) have been ranked as low in the construction phase impact assessment. Since there will be no thermal discharge (or other forms of discharge from the power plant) into the Balkh River, the operation of the power plant is not expected to affect the water quality or quantity in the river, or the aquatic ecosystem of the river.

The impact of the power plant Project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have a positive impact on industrial and commercial activities and employment. This section addresses the foreseeable adverse impacts of project activities on environmental and social parameters. The methods of evaluation and risk matrix used for the operations phase assessment is consistent with that used for the construction phase.

6.4.1 Physio-Chemical Impacts – Operation Phase

Noise Impacts

Prolonged exposure to high level of noise may cause significant damage to human hearing organ and may cause neurological damage. United States OSHA noise exposure limits for the work environment provides a guideline for the time of noise exposure at the work environment which may be adopted to prepare an environmental management plan (Table 6-7).

Table 6- 10 OSHA Noise Exposure Limits

Noise (dBA)	Permissible Exposure* (hours and minutes)
85	16 hrs
87	12 hrs and 6 min
90	8 hrs
93	5 hrs and 18 min
96	3 hrs 30 min
99	2 hrs 18 min
102	1 hr 30 min
105	1 hr
108	40 min
111	26 min
114	17 min
115	15 min
118	10 min
121	6.6 min
124	4 min
127	3 min
130	1 min

Noise assessment during the operational phase for the preferred option technology is essential for adopting adequate management and mitigation measures. Using an estimated engine noise specification a noise modelling study has been prepared for the Project. The noise modelling reports are included in Annex 7. The results of the modelling indicate that at the distance of the nearest current or planned residential, institutional or educational receptor, the unmitigated cumulative engine noise level is below the IFC Noise Level Guideline (see Table 6-5) for both day and night time standards.

While the cumulative noise from the power plant will include other intermittent and long-term equipment and machinery, the plant will be designed to mitigate noise pollution through use of walls, buildings and barriers that will significantly reduce the engine noise levels from the unmitigated value used in the modelling exercise. Furthermore, ground cover or normal unpacked earth (i.e., a soft site) exists between the site and all surrounding receptors, and therefore the ground becomes absorptive to sound energy and results in an additional noise reduction of 1.5 dB per doubling of

* Note: Exposure above or below the 90dB limit have been "time weighted" to give what OSHA believes are equivalent risks to a 90 dB eight-hour exposure. Source: https://www.osha.gov/SLTC/noisehearingconservation/

distance. With regard to on-site workers, it is expected that hearing protection as a standard mitigation measure will be required in order to safeguard workers and achieve the permissible OSHA exposure levels referenced above. Necessary PPE for on-site workers will be detailed in the EPC and O&M Contractor’s Health & Safety Plans as a requirement of the ESMP.

Wastewater Impacts

Wastewater can pose a number of potential risks if humans consume or are otherwise exposed to pathogenic microorganisms, heavy metals, or harmful organic chemicals such as endocrine-disrupting compounds. Of these, pathogenic microorganisms are generally considered to pose the greatest threat to human health. A wide variety of pathogenic microorganisms may be found in wastewater, including bacteria, viruses, protozoans and parasitic worms. Amongst many others, diseases associated with such pathogens may include typhoid, dysentery, gastroenteritis, diarrhea, vomiting, and malabsorption. The concentration of pathogens in wastewater is dependent on the source population. The susceptibility to infection by such pathogens can vary between human individuals, for example, children, the elderly and those who are already sick may succumb to infection more easily or experience more serious symptoms.

Wastewater from the project if not properly treated could result in the risk of disease or health effects as described above. A key potential receptor susceptible to the discharge of waste effluent from the site would be a community water supply borehole located down (hydraulic) gradient from the site. If appropriate mitigation measures are not employed, there is the potential for contaminants to infiltrate to groundwater and migrate to the community water supply.

The gas engine component of the power plant does not generate any thermal effluent which needs to be discharged in the environment. A closed cycle cooling system using coolant, cooling towers and condensers will dissipate the waste heat into the ambient air rather than a surface water body. Only the intermittent losses of water from the engines and cooling system will be supplemented and there will not be a discharge of water out of the system into a water body.

Wash down water from cleaning the plant and equipment will be conveyed into a stormwater treatment system that will consist of an oil/water separator and sedimentation basin. Sanitary wastewater from the domestic accommodations on-site will be conveyed into a lined septic tank and disposed at the municipally approved disposal site by a certified local waste hauling service provider. Wastewater management practices will be required in order to mitigate impacts to land and water resources.

Solid and Hazardous Waste Impacts

The IFC General EHS Guidelines (Waste Management) contains information about what should be considered in waste management planning. Firstly the waste should be characterized according to:

- Composition
- Source
- Type of waste
- Generation rate
- Alternatively according to what local regulations require.

Further to effectively plan and implement waste management strategies the following things should also be done:

- A risk analysis that considers potential EHS risks during the waste cycle and the availability of facilities that can handle waste in an environmentally safe way
- Definition of opportunities for reducing, reusing and recycling waste
- Definition of how waste is safely stored onsite
- Definition of how waste is finally treated and disposed of

Internal combustion gas-fired power plant processes generate very little solid waste relative to other technologies and fuels since the ash content in gas is negligible. Maintenance of the power plant will generate periodic spare part and engine overhaul wastes that are not regularly generated, and therefore careful accounting and planning for waste management is required and is predictable. The following table provides a comprehensive list of the solid and hazardous wastes that will be generated throughout the operational phase of the power plant.

Table 6- 11 Solid and Hazardous Waste Characteristics

Waste source	Waste type	Description / Example waste
Engine spare parts	Metal scrap	By mass the large majority of spare parts are metal, therefore all engine spare parts were considered metal. The rest is mainly plastic and rubber.
Auxiliary system spare parts	Metal scrap	Majority of mass made up by metal.
	Electronic	Majority of mass made up by electronics.
	Hazardous	Majority of mass made up by material considered hazardous.
	Other	Majority of mass made up by material that is not metal, electronic or hazardous. Examples: rubber, plastic, glass fiber, graphite, porcelain, etc.
Non-hazardous waste	Domestic garbage	Food scraps, small articles, plastic bottles, food packaging, etc.
	Paper	Dry and clean printing paper, magazines, newspapers, etc.
	Glass	Bottles, jars, etc.
	Waste to landfilling	Inert waste like car tires, mineral wool, PVC-plastic, etc.
	Metal scrap (excl. spare parts)	Empty containers (that have not contained hazardous material), old tools, etc.
	Used process ventilation filters	Bag filters from process ventilation. (To be handled with caution due to dust content.)
Packaging material	Cardboard	Boxes, etc.
	Plastic	Wrapping plastics, packages, etc.
	Wood	Boxes, pallets, supports, etc.
	Polystyrene	Protective sheets, etc.
	Urea packaging material	Bags and big bags.

Hazardous waste	Contaminated rags	Contaminants: Oil, solvents or other hazardous product.
	Contaminated cans, containers and drums	Contaminants: Oil, solvents, paint, etc.
	Lighting equipment and lamp ballasts	Fluorescent tubes, energy- saving lamps, etc.
	Batteries and accumulators	Nickel-cadmium, lead, etc.
	Gas filters	Gas filters situated on engines, gas modules and pressure reduction stations.
	SCR elements	Catalyst elements from selective catalytic reduction (contain vanadium pentoxide).
	Oxidation catalyst elements	Catalyst elements from the oxidation catalysts.
	Used charge air filters	Depending on filter type the filter elements can be contaminated with oil from the filter.
	Used fuel oil filters	Non-washable fuel oil filter elements from fuel oil filters on 32 engines.

Estimates for hazardous waste accounting for the power plant will vary by engine manufacturer and power plant design however based on the size and scale of the preferred technology the following estimates are provided. With regard to engine spare part waste, based on the size and scale of the engine technology, it is anticipated that between 1-3 kg/MW_e of waste (mostly metal) will be generated by 8000 hours of operation (roughly 1 year at full operation).

There are several fractions of waste that are considered hazardous. The average amounts of contaminated rags are 0.0074 kg/MWh_e and 0.0313 kg/MWh_e for gas and HFO power plants respectively. The average amounts of contaminated containers are 0.0018 kg/MWh_e for gas power plants and 0.0110 kg/MWh_e for HFO power plants. For lighting equipment, battery and other hazardous waste produced in gas and HFO power plants the average monthly results for gas and HFO power plants respectively are 0.00028 kg/MWh$_e$ and 0.00024 kg/MWh$_e$ of lighting equipment waste, 0.00010 kg/MWh$_e$ and 0.00007 kg/MWh$_e$ of battery waste and 0.00016 kg/MWh$_e$ and 0.00030 kg/MWh$_e$ of other hazardous waste. Finally, with regard to electronic waste the average results for gas and HFO power plants are 0.22 kg/person and 0.075 kg/person respectively. Depending on the selection of emissions control technology (typically Selective Catalytic Reduction (SCR) or oxidation catalysts), additional hazardous wastes require accounting.[41]

Domestic waste is more difficult to estimate quantitatively due to socio-economic, cultural and behavioral variation in trash production and it is likely that due to consumer habits in Afghanistan, domestic waste generation from on-site workers would be less than the global average. However, research suggests that the domestic solid waste stream is characterized by a large organic fraction (approximately 70%) and national solid waste generation rates have been measured in the range of 0.31 and 0.43 kg/capita/day.[42]

The scale and severity of solid waste impacts from the operation and maintenance activities is dependent upon the nature of the waste and the medium into which they are disposed. This is also true of accidental release of waste. Mitigation measures for appropriate handling and storage of waste on-site are required and presented below. The ultimate disposition of solid and hazardous wastes from the power plant is expected to be at the municipally approved disposal site. In Mazar-e Sharif the new municipal land disposal site is located approximately 15 km west of the down town and is unlined, however groundwater is estimated to be greater that 25 meters below ground surface and the potential for impacts to human receptors at this location is relatively low. The following photograph provides a view of the Mazar-e Sharif municipal landfill (view looking south).

[41] Smart, H. (2016). Solid Waste from 4-stroke Medium Speed Engine Power Plant Operation.
[42] https://asu.pure.elsevier.com/en/publications/characterization-of-the-municipal-solid-waste-stream-in-kabul-afg

Figure 6- 3 Mazar-e Sharif Municipal Landfill

As there are no watercourses present in the immediate vicinity of the Project site (Balkh River is located >1 km west of the site) the risks to surface water is considered to be extremely limited, however there is the potential for spills to migrate into groundwater and potentially contaminate the local groundwater supply. Accidental spills could also result in localized soil contamination. Given the relatively low quantities and the nature of the hazardous materials stored and used in the operation phase, it is not envisaged that any potential contamination impacts would be significant or long-term. With the implementation of appropriate management and mitigation measures, including prompt emergency response following an accidental release, no long-term impacts to land or water quality are expected and short-term impacts would be limited and localized. The O&M Contractor will be required as a condition of the ESMP to generate a Waste Management Plan, as well as, spill prevention, control and countermeasure plans that will be included in the site-specific H&SP.

Water Resource Impacts

The water demand for internal combustion gas engine power plants is significantly less than technologies of similar scale, as described in the Alternatives Analysis section. The power plant technology will consist of 3-6 reciprocating gas engines and cooling shall be realized by closed-loop coolant systems. The water demand for the power plant operations will therefore primarily be used for make-up water to compensate for loss by evaporation and leakage, for routine wash down of plant equipment and surfaces and for domestic purposes (toilets, sinks, etc.) The process water demand is estimated at 1 m^3/hour, or 7,000 m^3/year if operating at an 80% capacity factor. According to the Project Proponent, water will be supplied by the municipality. This public water supply pipe will be connected to the Project site and the Proponent will establish a contract to purchase water with the local municipality. A water quality analysis report was requested from the municipality however it is pending and will be used to by the EPC Contractor in final specifications to determine potential water treatment requirements.

The source of this public water supply is expected to be groundwater, which is the most common source of industrial and domestic water in the northern region. Groundwater recharge in the Northern River Basin is estimated to be 2.14 km^3/year[43]. If a conservative estimate for total site water demand of 50,000 m^3/year is used, this represents 0.0002% of the annual groundwater recharge and is not a significant draw on the groundwater aquifer. While this represents a small impact in relative terms it must be highlighted that excessive use of groundwater for a variety of purposes has significantly depleted water tables and aquifers throughout Afghanistan and, if the trend is not reversed, the country will face a severe shortage of drinking water. The recurrent droughts, low precipitation and poor water management have exacerbated the water crisis. Therefore, regardless of demand, judicious use of water is critical and mitigation measures that maximize water use efficiency and minimize wastage from leakage and misuse must be implemented.

Air Quality Impacts

The proposed 50 MW gas fired power plant is a relatively cleaner technology for electricity production, especially when natural gas with low sulfur content is used as fuel. Natural gas consists of a high percentage of methane (generally above 85 percent) and varying amounts of ethane, propane, butane, and inerts (typically nitrogen, carbon dioxide, and helium). The average gross heating value of natural

[43] Favre, A., & Kamal, G. M. (2004). Watershed atlas of Afghanistan.

gas is approximately 1,020 British thermal units per standard cubic foot (Btu/scf), usually varying from 900 to 1,100 Btu/scf. Two samples of the natural gas that will be used at the power plant from the Yatimtaq and Gerquduq gas fields was analyzed in April 2017 and the result of these tests are provided in Annex 8.

The primary criteria pollutants from natural gas-fired reciprocating engines are oxides of nitrogen (NOx), carbon monoxide (CO), and volatile organic compounds (VOC). The formation of nitrogen oxides is exponentially related to combustion temperature in the engine cylinder. The other pollutants, CO and VOC species, are primarily the result of incomplete combustion. Particulate matter (PM) emissions include trace amounts of metals, non-combustible inorganic material, and condensable, semi-volatile organics which result from volatized lubricating oil, engine wear, or from products of incomplete combustion. Sulfur oxides are very low since sulfur compounds are removed from natural gas at processing plants. However, trace amounts of sulfur containing odorant are generally added to natural gas at city gates prior to distribution for the purpose of leak detection.

The ESIA team conducted preliminary modelling of air emissions based on the specifications provided by the Project Proponent’s design engineer. The AERMOD model was used for the power plant's air pollution simulation. The model calculation is based on Gaussian distribution equation in a steady state and employs AERMAP and AERMET preprocessors that analyze and sort topographic and meteorological data, respectively. The report and results of the modelling are presented in Annex 11.

Based on Guidance Note 3 of IFC PS 3, the potential environmental impacts associated with the emissions of greenhouse gases (GHGs) are considered to be among the most complex to predict and mitigate due to their global nature and therefore clients should consider their potential contribution to climate change when developing and implementing projects and develop a strategy to help reduce it. Various international lender organizations including the IFC give guidance on the scale of a project’s GHG emissions based on thresholds of annual emissions that clarify requirements for quantifying, reporting and mitigating project GHG emissions.

With regard to greenhouse gas (GHG) emissions, CO_2, CH_4, and N_2O emissions are all produced during natural gas combustion. In properly tuned engines, nearly all of the fuel carbon in natural gas is converted to CO_2 during the combustion process.

This conversion is relatively independent of engine type. Fuel carbon not converted to CO_2 results in CH_4, CO, and/or VOC emissions and is due to incomplete combustion. The amount of CH_4, CO, and VOC produced is insignificant compared to CO_2 levels. While the amount of CO_2 emitted is a function of both fuel carbon content and system efficiency, for estimating emissions, the fuel carbon content of natural gas is the same as that converted to CO_2 in the exhaust; 53 kg CO_2/MM Btu. Because emissions can vary significantly between different engine models, the engine specifications are required prior to actually estimating yearly CO_2 emissions.

Emission factors provide a means of relating pollutant releases to the atmosphere based on an activity associated with the release of that pollutant. The U.S. Environmental Protection Agency's (U.S. EPA's) Compilation of Air Pollutant Emission Factors (AP- 42)[44] provide emissions factors for 2 and 4-stroke lean burn engines and 4-stroke rich burn engines that report the estimated individual pollutant contributions in pounds per million standard cubic feet (lb/MMscf) of fuel, and these factors may be used to quantify emissions once the number, type and specifications of the engines is determined. It should be emphasized that the actual emissions may vary considerably from the published emission factors due to variations in the engine operating conditions. This variation is due to engines operating at different conditions, including air-to-fuel ratio, ignition timing, torque, speed, ambient temperature, humidity, and other factors. It is not unusual to test emissions from two identical engines in the same plant, operated by the same personnel, using the same fuel, and have the test results show significantly different emissions.

Three control techniques have been developed for reciprocating engines: parametric controls (timing and operating at a leaner air-to-fuel ratio); combustion modifications such as advanced engine design for new sources or major modification to existing sources (clean-burn cylinder head designs and pre-stratified charge combustion for rich-burn engines); and post-combustion catalytic controls installed on the engine exhaust system. Post-combustion catalytic technologies include selective catalytic reduction (SCR) for lean-burn engines, nonselective catalytic reduction (NSCR) for rich-burn engines, and CO oxidation catalysts for lean-burn engines.

[44] https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

Utilizing the design specifications provided to the ESIA team, an air emissions modelling study has been completed and includes an estimate of GHG emissions for project accounting. The description, methods and calculations used in modelling, as well as, the results and summary analysis are included in Annex 11. As per design specifications, after commissioning of the plant, the stack emissions are expected to satisfy the IFC emissions standards for NO_x, CO and Particulate Matter (PM).

6.4.2 Biological Impacts – Operation Phase

Impacts to Fauna and Flora

As noted in previous section, the Project site is located on non-agricultural land and is adjacent to two industrial facilities. It does not appear to be ecologically sensitive. The impact of project activities on most ecological parameters (e.g., fauna, flora, ecosystem function) have been ranked as low in the construction phase impact assessment and not expected to increase during the operation phase (outside of duration). Since there will be no thermal discharge (or other forms of discharge from the power plant) into the Balkh River, the operation of the power plant is not expected to affect the water quality or quantity in the river, or the aquatic ecosystem of the river.

However, thermal emission from the power plant may have some adverse impact on homestead vegetation in the surrounding areas. Operation phase impacts related to thermal emissions and traffic will be mitigated using standard design and operational measures.

6.4.3 Socio-Economic Impacts – Operation Phase

The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial activities and employment. With regard to improving socio-economic conditions in the vicinity of the Project site, the APPC is committed to the generation and implementation of a site-specific community development plan. These activities will include planning of humanitarian and development projects, designing feasibility studies, and management of community-based interventions for the development of target communities through best practices. An example of the community development agenda, potential projects to be selected following collaboration with communities during the stakeholder engagement process, and the rationale for this development is provided in Annex 12.

Employment Impacts

In terms of job creation, it is expected that during operation the permanent employment opportunities will be 45-50 people (excluding security staff) within the proposed facility, and will consist primarily of local staff with expats and contractors to a lesser degree. No major administrative offices or headquarters are planned on-site, and the work force will be primarily trained laborers, technicians and operators. During certain maintenance operations, including engine overhauls or upgrades, the employment level will increase and will be comprised mostly of expats and contractors. Of the local laborers, the Project Proponent will hire from the local region (primarily local residents and citizens of Mazar-e Sharif who will be trained by subject matter experts.

Additionally, a number of indirect jobs will be created in the service industry in the local area to facilitate the development. It is considered that the revenue generated from the additional employment within the region will result in revenue generation and positive impacts on financial security.

Public Health and Safety Impacts

The predominant impacts to the surrounding community will be mitigated using the measures described herein for management of fugitive dust, solid and hazardous wastes, wastewater and air quality. If implemented and effective, these measures will protect the community from the most common types of impacts resulting from power plant operation. The greatest significant risk to the surrounding community would be in the case of fire or explosion resulting from gas and fuel storage tanks or engines and auxiliary equipment, or from other accidental spills and releases. In order to mitigate these risks, the Project Proponent is requiring the O&M Contractor to generate emergency response plans as part of the site-specific Health & Safety Plan. These plans will be used to direct response actions at the Mazar IPP covering responses to natural phenomena, fires, medical emergencies, fuel and hazardous material spills/releases, and any other reasonably foreseeable incidents that would affect the health and safety of the plant personnel and/or the general public.

In addition, these emergency response plans will establish the responsibility for handling emergency situations promptly, minimizing hazards, and disseminating information to all plant personnel and regulatory authorities (as required). This program will be annually reviewed and updated as appropriate by the O&M Contractor and will include as a prerequisite input from local public safety officials, local first responders, and public security managers. Plant personnel will review this emergency response plans at least annually during routine health and safety training and following an actual emergency or drill, a critique of the emergency response will be conducted to evaluate and improve the plan, as needed. The following relevant hazards will be accounted for in the ERP:

<u>Natural</u>

Earthquake

Landslide, mudslide, subsidence

<u>Meteorological Hazards</u>

Flood, flash flood

Drought

Snow, ice, hail, sleet, arctic freeze

Windstorm, dust storm

Extreme temperatures (heat, cold)

Lightning strikes (wildland fire following)

<u>Biological</u>

Foodborne illnesses

Pandemic/Infectious/communicable disease (Avian flu, H1N1, etc.)

Human-caused events

<u>Accidental</u>

Hazardous material spill or release

Explosion/Fire

Building/structure collapse

Entrapment and or rescue (machinery, confined space, high angle, water)

Transportation Incidents (motor vehicle, railroad, watercraft, aircraft, pipeline)

Intentional (To be developed in collaboration with the Afghan Power Plant Co. Project Security Manager)

Demonstrations, civil disturbance

Bomb threat, suspicious package

Terrorism

Security Impacts

The Afghan Power Plant Company will provide security for the facility during construction and operation, and a Project Security Manager will be hired to conduct coordination and training with contractors and subcontractors. The Facility will be manned 24 hours per day, 7 days per week. The operational labor force will consist of trained employees who will be on-site at all times that will be available to provide initial security response support. The perimeter of the facility site will be secured with a chain link fence or perimeter wall, sliding gates and surveillance equipment so as to permit only authorized access to the facility's service drive, structures and operations. One gate would provide access into the Project site, thereby restricting access to this area. The gate would be locked during normal operations with access provided by facility personnel. Normal plant lighting and emergency temporary lighting would be provided throughout the facility. Security will be controlled by the facility's operators in the control room 24 hours per day, 7 days per week, and 365 days per year. All site security personnel will be equipped with communication equipment to maintain contact with construction and operations management personnel and/or the local emergency responders. The Afghan Power Plant Company will be required to document in the security measures in the site-specific Security Management Plan and will be responsible for ensuring that training and communications is conducted with all on-site contractors, subcontractors and visitors.

Occupational Health and Safety Impacts

The relevant hazards cited as of particular concern in IFC Thermal Power Plant Guidelines include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;

- Electrical hazards; and,
- Fire and explosion hazards;

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, health and safety plan implementation, safety oversight and monitoring, and corrective action if needed. Occupational health and safety (OHS) hazards can be severe since work around power plants and machinery, electrical hazards and some chemicals can result in serious injury or death if hazards and associated risks are not identified and managed. Guidance on OHS is provided in Annex 5.

6.4.4 Cumulative Impacts

Based on the environmental and social impact assessment, the effects of cumulative impacts on biological and socio-economic systems is expected to be limited (some socio-economic effects will contribute to positive cumulative impacts). The cumulative effects on physio-chemical factors of wastewater, solid waste and hazardous waste and water resources is also likely to be minimal. The primary cumulative impacts will impact air quality and noise, and further discussion as well as recommended mitigation and management measures for these cumulative impacts are presented in Section 7.

6.4.5 Risk Evaluation – Operation Phase

The risk evaluation table below presents the assessment of risk during the operation phase for physio-chemical, biological and socio-economic categories based on the identified potential impacts. The assessment presents the potential issues and the anticipated outcome or receptor that could be affected. The risk matrix elements (consequence, likelihood and significance ranking) are presented, as well as, the adjusted significance ranking once mitigation measures are instituted.

Table 6- 12 Summary Assessment of Risk - Operation Phase

Evaluation of Risk – Operation Phase					
Physio-Chemical Impacts					
Potential Impact Category	Potential Impact (Outcome/Receptor)	Consequence Level	Likelihood of Occurrence	Impact Significance	Impact Significance with Mitigation*
Noise Impacts	On-site human health impacts from operation noise	Minor	Likely	Medium	Low
	Off-site (residential, institutional, educational) human health impacts from operation noise	Minor	Very Unlikely	Low	Low
	Off-site (industrial, commercial) human health impacts from operation noise	Minor	Very Unlikely	Low	Low
	General nuisance (non-health impact) from operation noise	Low	Very Likely	Low	Low
Wastewater Impacts	Risk of disease and human health impacts from accidental release of wastewater contaminants	Moderate	Unlikely	Medium	Low
	Natural resource impacts from discharge of impacted stormwater or wash down water	Minor	Likely	Medium	Low
	Natural resource impacts from mismanagement of sanitary wastewater	Moderate	Unlikely	Medium	Low
Solid and Hazardous Waste Impacts	On-site natural resource impacts from mismanagement of solid or hazardous wastes	Moderate	Unlikely	Medium	Low
	Disposal site natural resource impacts from disposition of solid or hazardous wastes	Moderate	Likely	High	Medium
	Natural resource impacts from accidental release of solid or hazardous wastes	Moderate	Unlikely	Medium	Low

* Mitigation using standard industry practices considered achievable under site-specific conditions by competent contractors with environmental oversight

Water Resource Impacts	Water availability impacts from over extraction of municipal supply groundwater resources	Major	Very Unlikely	Low	Low
Air Quality Impacts	Local/regional human health impacts from natural gas emission pollutants	Moderate	Likely	High	Low
	Human health or environmental impacts from emission of greenhouse gases	Major	Unlikely	Medium	Low
Biological Impacts					
Potential Impact Category	Potential Impact (Outcome/Receptor)	Consequence Level	Likelihood of Occurrence	Impact Significance	Impact Significance with Mitigation
Impacts to Flora and Fauna	Impacts to homestead vegetation from thermal emissions	Low	Likely	Low	Low
	Impacts to flora and fauna from site traffic	Low	Unlikely	Low	Low
Socio-Economic Impacts					
Potential Impact Category	Potential Impact (Outcome/Receptor)	Consequence Level	Likelihood of Occurrence	Impact Significance	Impact Significance with Mitigation
Public Health and Safety Impacts	Human health impacts from fire or explosion on-site	Moderate	Unlikely	Medium	Low
	Human health impacts from accidental spills or releases	Minor	Unlikely	Low	Low
	Human health impacts from natural hazards impacting site	Moderate	Unlikely	Medium	Low
	Human health impacts from biological hazards impacting site	Low	Unlikely	Low	Low
	Human health impacts from accidental hazards impacting site	Moderate	Unlikely	Medium	Low
	Human health impacts from intentional hazards impacting site (including security breach or targeting by anti-government groups)	Major	Unlikely	Medium	Low
Occupational Health and Safety Impacts	Operation health and safety risks resulting in injury or death	Major	Likely	High	Medium

	Operation health and safety risks resulting in impairment or long-term health issues	Moderate	Unlikely	Medium	Medium
Cumulative Impacts					
Potential Impact Category	Potential Impact (Outcome/Receptor)	Consequence Level	Likelihood of Occurrence	Impact Significance	Impact Significance with Mitigation
Cumulative Impacts	Human health impacts resulting from cumulative effect of air emissions	Minor	Likely	Medium	Low
	Human health impacts resulting from cumulative effect of noise pollution	Minor	Unlikely	Low	Low
	Nuisance issues resulting from cumulative effect of noise pollution	Low	Likely	Low	Low

6.5 Environmental and Social Impact Assessment Summary

As presented in the summary tables for construction and operation phases, the significance of environmental and social impacts are ranked as either *low* or *medium*. There are a combination of factors that contribute to the majority of risks being ranked as *low* following the evaluation, the most important including:

- Good project siting - over 1 km from residential communities and within an industrial land use area;
- Site is not in close proximity to ecologically, historically or culturally sensitive areas;
- Limited biodiversity impacts due to characteristics of native flora and fauna;
- Relatively minimal air, liquid and solid waste emissions resulting from preferred technology; and,
- Well understood and achievable mitigation and management measures.

The potential impacts with a significance ranking of *medium* included:

Construction Phase

Air Quality Impacts

- Human health impacts from combustion gas emissions and dust
- Localized ambient air quality degradation

Occupational Health and Safety Impacts

- Construction site health and safety risks resulting in injury or death
- Construction site health and safety risks resulting in impairment or long term health impacts

Operation Phase

Solid and Hazardous Waste Impacts

- Natural resource impacts at municipal disposal site from disposition of solid or hazardous wastes

Occupational Health and Safety Impacts

- Operation phase health and safety risks resulting in injury or death
- Operation phase site health and safety risks resulting in impairment or long term health impacts

The following section presents the recommended mitigation measures.

7 MITIGATION AND MANAGEMENT MEASURES

7.1 Mitigation Measures - Construction Phase

7.1.1 Physio-Chemical Impacts – Construction Phase

At large, the Project Owner and Owner's Engineer is responsible for ensuring that design, construction and operation of the structural elements or components of the project are in accordance with good international industry practice, taking into consideration safety risks to third parties or affected communities. Part of this responsibility involves conducting rigorous and continuous oversight of contractors throughout the construction period through implementation of a structured Environmental and Social Management System (ESMS), site-specific Environmental and Social Management Plan (ESMP) and monitoring system. The EPC and O&M Contractors will be contractually obligated to complete the specified Contractor Management Plans and to follow the Afghan Power Plant Company's Action Plans and ESMP.

Water Quality and General Environmental Impacts

Project construction activities will result in generation of a considerable amount of inert solid wastes including lumber, excess concrete, metal and glass scrap, and empty containers used for hazardous and non-hazardous substances. Management of these wastes will be the responsibility of the Contractors. Typical management practices include recycling, proper temporary storage of waste and debris, and good housekeeping of work areas. The wastes left after recycling will be transported to the municipal disposal area. Based on common construction practices in Afghanistan, recycling and reuse rates for construction debris are relatively high due to demand for building materials.

The solid wastes of domestic nature generated mainly by the laborers should be collected and stored separately (i.e., without mixing it with construction wastes/debris) in appropriate containers within the construction site. The solid wastes should be disposed of at the municipal disposal area at the responsibility and verification of the Contractor. For assessing quantity of solid waste (of domestic nature) to be generated at the construction site, a generation rate of 0.2 kg per worker per day may be used and calculations based on this rate may be utilized for selection of appropriate waste receptacles and scheduling of disposal services.

In addition, if temporary housing is installed for on-site construction work camp use, the domestic solid and liquid wastes generated from the installations will require management through proper infrastructure (waste receptacles and septic tanks) and disposal management plans. In Afghanistan the domestic solid waste stream is characterized by a large organic fraction (approximately 70%) and generation rates have been measured in the range of 0.31 and 0.43 kg/capita/day for workers housed on-site.

The human wastes at the construction site should be appropriately disposed of through construction of sanitary latrines connected to appropriately designed septic tank systems (consisting of septic tank and soakage pit). For this purpose, a wastewater generation rate of 50 liters per person per day (lpcd) may be assumed. Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such wastewater may be carried out by ensuring that appropriate conveyance systems are installed that minimize soil erosion and allow for timely infiltration to reduce standing water.

Because of the relatively level topography soil erosion and transport is not likely, however basic construction site erosion measures can be employed as necessary and should include:

- Covering of stockpiled topsoil, installation of wind fences and silt fences, and implementing fugitive dust control or resurfacing of disturbed areas;
- Reseeding and replanting of areas disturbed by construction activities with vegetation similar to that removed; and,
- Final site grade will be designed to facilitate drainage and avoid flooding or pooling.

With regard to management of chemicals and potentially hazardous materials (i.e. waste oil, paint, solvents, degreasers, etc.) mitigation should be conducted to protect against accidental release of chemicals in the soil and groundwater, the following mitigation measures will be employed:

- Workers will be trained in the handling, storing and disposal of hazardous and non-hazardous materials;
- In the event of an accidental release of hazardous materials, emergency procedures and management plans will be in place so that any spills or leaks can be contained immediately;

- Storage of potentially hazardous construction materials will take place on hard surfacing and within appropriate containers. Where necessary, these would be covered and incorporate spill or leak containment measures; and,
- The waste oil, lubricants and containers will be taken from site and disposed of at the nearest suitable recycling facility.

Finally, in reference to cultural, archeological and religious sites, while there are no indications following research and stakeholder/government engagement that any monument, shrine, archaeological, historical or culture heritage sites are located on/adjacent to the Project area, the Afghanistan Law on the Protection of Historical and Cultural Properties does not allow any actives which endanger Registered Archaeological sites or buildings. Therefore a Chance Find Procedure will be prepared in the context of the Project by the EPC Contractor as specified in the ESMP.

Air Quality Impacts

Localized air quality impacts from construction sites can be mitigated using common and standard mitigation measures and management practices. Because it is unlikely that fugitive dust or combustion emissions would reach off-site receptors over 1 km to the northwest, north and northeast, it is primarily for the health and safety of on-site workers that the air quality mitigation is essential. However, dust and combustion emissions from traffic entering and exiting the site may lead to off-site impacts and will also require mitigation. The following mitigation measures will be implemented to ensure air quality impacts are minimized:

- Construction materials at the site should be properly covered while hauled and stored, roads properly cleaned and water sprayed in order to minimize visible dust in air (fugitive dust);
- Vehicle movement to and from the site should be properly managed to ensure that it is does not significantly aggravate the traffic problem and local air pollution;
- Minimize idling of vehicles and equipment to reduce duration of combustion emissions; and,
- Access route should be well compacted with gravel or asphalt or through use of environmental benign additives to minimize dust from transport vehicles; and,

- Utilize washed stone at the entrance point of the site to minimize tracking of soil off-site.

Noise Impacts

The proposed mitigation measures to mitigate construction site noise from the use of equipment and heavy machinery operations for construction works are listed below:

- Normal working hours of the contractor will be between 06:00 and 21:00 hours from Saturday to Thursday;
- Only well-maintained equipment should be operated on-site;
- Machines and construction plant items (e.g. trucks) that may be in intermittent use should be shut down or throttled down between work periods;
- Low noise equipment should be used as far as practicable;
- Noise enclosures should be erected around stationary equipment; and,
- Material stockpiles and other structures should be utilized, where practicable, to screen noise from on-site construction activities.

7.1.2 Biological Impacts – Construction Phase

Impacts to Fauna and Flora

Impacts associated with the loss of vegetation as a result of the proposed project will be minimized through the implementation of the following mitigation measures:

- The limits of clearing will be delineated on appropriate scale site maps and the limits of clearing flagged to clarify to site workers the extents of the vegetation removal required, and thus minimize the loss of natural vegetation;
- Trees and shrubs that are to be retained will be marked with flagging, and compaction of the adjacent soils will (where possible) be avoided;
- Local, native plant species will be used in areas to be landscaped. Native species are best adapted to the local conditions, are more likely to become established, require minimal maintenance, and are less likely to cause problems from the introduction of non-native species (due to competition with native species);
- Salvaged and stockpiled topsoil will be used to the extent possible in re-vegetation efforts, erosion control, and landscaping; and,

- Use temporary fencing to prevent inadvertent damage to habitats adjacent to the construction area.
- Strictly prohibit the hunting, harming or taking for falconry or any other purpose of any bird species found on or around the site.

7.1.3 Socio-Economic Impacts – Construction Phase

Transport Impacts

During construction phase, some additional traffic will be generated for bringing in construction material and equipment. This traffic will primarily be coming from the eastern direction (Mazar-e Sharif) and will utilize a secondary highway and enter to the site from the primary access road that leads to the NFPP and around the NFPP on a ROW easement that has been granted to the Mazar IPP. In order to mitigate traffic impacts, the EPC Contractor is required to generate traffic management plans that will be included in the site-specific Health & Safety Plan, as specified in the ESMP. Traffic management plans will include, but not be limited to, the following mitigation measures:

- To the extent feasible haulage routes should be selected away from sensitive establishments such as residential areas, schools and hospitals;
- Where routes pass through sensitive sites it is recommended to install barriers to protect sites from noise and emission;
- Maintenance of engines and exhaust systems are recommended to minimize emission; and,
- In order to prevent noise and air pollution it is recommended to construct permanent hard surfaces in the roads connecting to the construction site. It is also recommended to inspect the roadway regularly.

Public Health and Safety Impacts

The following mitigation measures are recommended to reduce potential community health and safety effects:

- All project operations vehicles and contractor vehicles will have a speed limit set for travel through settlements and areas where there are no posted speed limits;
- EPC Contractor will generate an HR Policy and Code of Conduct including rules on inappropriate conduct and prescribed actions for conduct violations

including prohibition of gender based violence and any discrimination based on ethnicity, tribe or religion;

- EPC Contractor will generate and implement an employee grievance mechanism (GM) for complaints;
- EPC Contractor will collaborate with the Afghan Power Plant Company Project Security Manager, affected communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations;
- Workers will be trained on emergency response related to traffic accidents and potential releases of chemicals and other hazardous materials.

Employment Impacts

It will be critical that Contractors are monitored to ensure that they promote safe and healthy working conditions and meet all of the IFC PS 2 requirements, including, providing workers with documented information that is clear and understandable regarding their rights under national labor and employment law and any applicable collective agreements, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur. In addition, safety and security will require ensuring that security staff are deployed to protect the site, staff and property. Although employment impacts are anticipated to be beneficial, the following enhancement measures will be included in the EPC Contractor's HR Policy to ensure that the employment process is well managed and the community conflicts are minimized.

- Ensure a transparent hiring process is conducted help the community to understand strategic staffing decisions for the project to avoid conflict;
- Establishment and implementation of a worker grievance mechanism for complaints;
- Contractor shall give preference to local community members in the Project Area of Influence, to the extent feasible, with respect to the employment of unskilled labor;

- Provision of local job opportunities should be consulted with local authorities but not be screened by construction contractor chairman (i.e. no gate-keeping); and,
- Although not anticipated, if temporary on-site housing is installed for construction work camp operation, the responsible contractor will be required to manage the accommodation of workers and provide basic services to workers in line with the provisions of IFC PS2 and also follow the guidance note on worker's accommodation published by IFC (Worker's Accommodation: Processes and Standards[45]).

With recommended management measures employment opportunities will be maximized by training of the local workforce and minimize potential adverse social and health related impacts from an influx of migrant and expat workers.

Occupational Health and Safety Impacts

The Afghanistan Ministry of Justice generated the Labor Law of that was adopted by GoIRA in February 2007. This law has been enacted by Presidential Decree No. 94, in accordance with Article 48 of the Constitution of Afghanistan to regulate and clarify the obligations, rights, privileges and social security of employees. Based on Chapter 10 of the Labor Law, employers are charged with providing continuous training to employees on work place safety and must provide medical service free of charge to employees injured on the job. Employers are also required to make provisions at no cost to the employee to ensure work place safety and health, as described in Article 112.1 and 2:

- Where the work carried out is under conditions harmful to health or under special temperature or refrigeration or where there is the likelihood of contamination of employees, special clothes and footwear, masks, eye glasses, gloves and other protective devices as well as preventive and curative foods will be put at the disposal of employees free of charge.

[45] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

- The organization is responsible for supplying, maintenance, cleaning, sterilisation, drying and repair of special working clothes and other protective devices.

The EPC Contractor will meet the following requirements that will be documented in their site-specific Health & Safety Plan:

- Observe and maintain standards of Health and Safety towards all employees not less than those laid down by the national standards or statutory regulations; and,
- Report to the Engineer promptly and in writing particulars of any accident or unusual or unforeseen occurrences on the site, whether these are likely to affect progress of the work or not.

Additional guidance on the establishment of Occupational Health and Safety Plans is provided in Annex 5.

7.2 Mitigation Measures - Operation Phase

7.2.1 Physio-Chemical Impacts – Operation Phase

Noise Impacts

Based on the IFC General EHS Guidelines (Noise Management), noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. At the design stage of a project, equipment manufacturers should provide design or construction specifications in the form of “Insertion Loss Performance” for silencers and mufflers, and “Transmission Loss Performance” for acoustic enclosures and upgraded building construction. In general, the noise level limit is represented by the background or ambient noise levels that would be present in the absence of the facility or noise source(s) under investigation. In this case background site noise measured on-site during daytime hours was measured at 53.6 dB and noise monitoring may be used for verifying operational phase noise impacts.

During the operational phase high noise levels are expected to be generated within close proximity of the engines and generator installations. Prolonged exposure to such high level of noise may cause permanent hearing loss. Therefore, proper protective measures will be adopted by the O&M Contractor during the operation and inspection of this equipment:

- Restrict access to installations without proper protective gear including ear muffs, and post warning signs alerting workers and visitors of the requirement for personal protective equipment (PPE).

Wastewater Impacts

Potential wastewater impacts identified in the impact assessment included the potential to contaminate an existing or future community water supply borehole located down (hydraulic) gradient from the site. If appropriate mitigation measures are not employed, there is the potential for contaminants to infiltrate to groundwater and migrate to the community water supply. The following mitigation measures will be used to mitigate this risk:

- Establish a spill prevention, control and countermeasure plans as part of the site-specific H&SP covering all potential hazardous and aqueous compounds stored on-site;
- Ensure all tanks and storage vessels containing such materials are designed with secondary containment to contain 110% of the tank or vessel capacity;
- Train workers on emergency response related to potential releases of chemicals and other hazardous materials and maintain Safety Data Sheets (SDS) for all chemicals stored on-site;
- Ensure that effective septic tanks are included in the design of all sanitary wastewater infrastructure; and,
- Treat stormwater and wash down water effluents prior to release using oil/water separators and grease traps where appropriate.

Solid and Hazardous Waste Impacts

Performance Standard 3 (Resource Efficiency and Pollution Prevention) is the standard which most directly addresses waste. One of the objectives of this standard is to avoid or minimize pollution from project activities which can have negative impact on the environment and human health. Another objective is to address a more sustainable use of resources. Generated waste which is considered hazardous according to international conventions or local legislation, should be treated in facilities that have adopted GIIP. It is the client's responsibility to make sure that third parties taking care of the client's hazardous waste are reputable and legitimate companies that are licensed by relevant government regulatory agencies. The client should also ensure that he receives documentation that the waste has reached its final destination. If the client finds out that the used contractor's disposal sites are not operated according to accepted standards, he needs to consider other safe disposal options.

The O&M Contractor is required to generate a stand-along Waste Management Plan as well as spill prevention, control and countermeasure plans that are included in the site-specific Health & Safety Plan. Mitigation and management for storage, transport and disposal of solid waste and Small Quantities of Hazardous Waste (as defined in the IFC General EHS Guidelines) should be conducted in a manner to prevent or control accidental releases to air, soil, and water resources and therefore the following mitigation measures will be required:

- Workers will be trained in the handling, storing and disposal of hazardous and non-hazardous materials;
- In the event of an accidental release of hazardous materials, emergency procedures and management plans will be in place so that any spills or leaks can be contained immediately;
- Storage of potentially hazardous materials will take place on hard surfacing and within appropriate containers. Where necessary, these would be covered and incorporate spill or leak containment measures; and,
- The waste oil, lubricants and containers will be taken from site and disposed of at the nearest suitable recycling facility.

With regard to off-site disposal of solid and hazard wastes generated during the operation phase, it is expected that municipal disposal site will be utilized. In order to mitigate the impacts to natural resources from waste at this site the following measures should be utilized:

- Properly containerize all hazardous waste planned for transport and disposal at the municipal disposal site, if possible, using leak proof and secure containers or receptacles;
- Provide advance notice to the municipal authorities (and NEPA) of any and all hazardous wastes that will be planned for disposal at the municipal disposal

site and actively find all reasonable alternatives including recycling and beneficial reuse;

- Conduct verification through monitoring and documentation that staff or third-party subcontractors are following the established waste management and disposal protocols; and,
- Ensure that all on-site and service contract workers handling and transporting hazardous wastes are trained on the Safety Data Sheet, or if not available, on the appropriate response protocols if spills, releases or accidents occur.

Water Resource Impacts

Water will be supplied by the municipality that is sourced from groundwater aquifer. This public water supply pipe will be connected to the Project site and the Proponent will establish a contract to purchase water with the local municipality. Judicious use of water is critical and mitigation measures that maximize water use efficiency and minimize wastage through leakage and misuse must be implemented:

- Ensure that piping and plumbing is constructed and maintained in order to eliminate leaks and wastage; and,
- Audit water use and identify and train on-site workers on water conservation and water efficiency practices that can be implemented.

Air Quality Impacts

The IFC General EHS Guidelines (Air Emissions and Ambient Air Quality) specify NO_x limits for Gas Engines from 3-50 MWth at 200 mg/Nm^3 (spark ignition), 400 mg/Nm^3 (dual-fuel), and 1,600 mg/Nm^3 (compression ignition). No guidelines are specified for Particulate Matter (PM) or SO_2. Additional recommended monitoring approaches for engines include annual stack emission testing only for NO_x for gaseous fuel-fired engines. In addition, Annex 1.1.3 of this guideline provides Good International Industry Practice (GIIP) for stack height design. Based on the gas analysis and the final engine design and operation specifications it will be estimated whether emissions of NO_x will exceed IFC guidelines and what appropriate air emissions controls will consist of.

Three control techniques have been developed for reciprocating engines: parametric controls (timing and operating at a leaner air-to-fuel ratio); combustion modifications such as advanced engine design for new sources or major modification to existing sources (clean-burn cylinder head designs and pre-stratified charge combustion for rich-burn engines); and post-combustion catalytic controls installed on the engine exhaust system. Post-combustion catalytic technologies include selective catalytic reduction (SCR) for lean-burn engines, nonselective catalytic reduction (NSCR) for rich-burn engines, and CO oxidation catalysts for lean-burn engines.

Because several of these engine specifications have yet to be determined (i.e. rich/lean burn and emissions controls technologies) that will have a significant influence on the outcome of modelling, the effect of stack emissions (NO_x, CO and PM during operation) of the gas fired power plant on ambient air quality has been modelled using preliminary specifications provided to the ESIA team as a part of the ESIA. The results of this modelling are presented in Annex 11. As per design specifications, after commissioning of the plant, the stack emissions are expected to satisfy the IFC emissions standards for NO_x, CO and Particulate Matter (PM).

7.2.2 Biological Impacts – Operation Phase

Impacts to Fauna and Flora

As noted in previous section, the Project site is located on non-agricultural land and is adjacent to two industrial facilities. It does not appear to be ecologically sensitive. The impact of project activities on most ecological parameters (e.g., fauna, flora, ecosystem function) have been ranked as low in the construction phase impact assessment and not expected to increase during the operation phase (outside of duration). Since there will be no thermal discharge (or other forms of discharge from the power plant) into the Balkh River, the operation of the power plant is not expected to affect the water quality or quantity in the river, or the aquatic ecosystem of the river.

However, thermal emission from the power plant may have some adverse impact on homestead vegetation in the surrounding areas. Operation phase impacts related to thermal emissions and traffic will be mitigated using standard design and operational measures:

- Minimize the thermal emissions from equipment and machinery heat sources through use of barriers, buffers and landscape design features; and,

- Ensure that site traffic is managed to reduce impacts to non-driveway areas and implement and enforce safe speed limits for all on-site traffic.
- Strictly prohibit the hunting, harming or taking for falconry or any other purpose of any bird species found on or around the site.

7.2.3 Socio-Economic Impacts – Operation Phase

The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial activities and employment.

Public Health and Safety Impacts

The predominant impacts to the surrounding community will be mitigated using the measures described above for management of fugitive dust, solid and hazardous wastes, wastewater and air quality. If implemented and effective, these measures will protect the community from the most common types of impacts resulting from power plant operation. The greatest significant risk to the surrounding community would be in the case of fire or explosion resulting from gas and fuel storage tanks or engines and auxiliary equipment, or from other accidental spills and releases. In order to mitigate these risks, the O&M Contractor is required to generate emergency response plans as part of the site-specific Health & Safety Plan in order to direct response actions at the Mazar IPP covering responses to natural, meteorological, biological, accidental and intentional causes (intentional causes will be responded to through collaborative planning on the part of the Project Proponent’s Project Security Manager and the O&M Contractor). The Security Management Plan and the Contractor’s emergency response plans will serve to establish the responsibility for handling emergency situations promptly, minimizing hazards, and disseminating information to all plant personnel and regulatory authorities (as required). Required mitigation measures include:

- Ensure facility will be manned 24 hours per day, 7 days per week and that the perimeter of the facility be secured to permit only authorized access to the facility;

- All site security personnel will be equipped with communication equipment to maintain contact with construction and operations management personnel and/or the local emergency responders; and,
- Document in the Security Management Plan the organizational structure of who will implement emergency preparedness and response actions;
- Project Proponent's Project Security Manager will engage private security contractors as necessary to manage risk associated with security breach or targeting by anti-government groups including training and contingency planning for all on-site personnel.

Occupational Health and Safety Impacts

Occupational Health and Safety guidelines to assist in protecting workers during the operation of the plant are as follows:

- Occupational health and safety guidelines presented in Section 2.0 of the General EHS Guidelines published by IFC. The General EHS Guidelines of IFC covers various OHS aspects including General facility design and operation; Communication and training; Physical hazards; Chemical hazards; PPE; Special hazard environments; and OHS Monitoring and record keeping programs;
- Occupational health and safety guidelines presented in Section 1.2 of the EHS Guidelines for Thermal Power Plants published by IFC for the health and safety impacts particular to operation of power plants.

Relevant hazards cited as of particular concern in IFC Thermal Power Plant Guidelines include:

- Non-ionizing radiation;
- Heat;
- Noise;
- Confined spaces;
- Electrical hazards;
- Fire and explosion hazards;

The risks associated with these hazards require careful examination and mitigation through use of activity hazard analyses, O&M Contractor Health & Safety Plan implementation, safety oversight and monitoring, and corrective action if needed. Occupational health and safety (OHS) hazards can be severe since work around power plants and machinery, electrical hazards and some chemicals can result in serious injury or death if hazards and associated risks are not identified and managed. Therefore OHS guidance is provided in Annex 5.

7.2.4 Cumulative Impacts

Based on the environmental and social impact assessment, the effects of cumulative impacts on biological and socio-economic systems is expected to be limited (some socio-economic effects will contribute to positive cumulative impacts). The cumulative effects on physio-chemical factors from wastewater, solid and hazardous waste and water resources is also likely to be minimal. The primary cumulative impacts will impact air quality and noise, and will be discussed below.

Air Quality Impacts

In this study, efforts have been made to assess cumulative impacts of the proposed power plant on air quality, however due to the fact that the engine and emissions control specifications are not yet available, numerical forecasting of pollutant load and dispersion modelling has been conducted using preliminary specifications provided to the ESIA team at this time. There are two emissions sources (e.g., NFPP and Jade Glass Factory), immediately surrounding the Mazar IPP that will utilize the same natural gas supply to power operations and all three developments will contribute to air pollution.

In addition, there are small to medium scale emission sources in the vicinity of the site however these would not be classified as major emissions sources for the purposes of modelling and are not significant contributors to air pollution. Data on the nature and rate of outputs and emissions from the nearby sources (NFPP and Jade Glass) is not entirely existent however best estimates should be used in assessing the cumulative impact on ambient air quality using equivalent concentrations of the power plant pollutants from U.S. EPA AP 42 manuals[46]. Based on this modelling study, the relative contribution (%) of air emissions from the Mazar IPP to the local airshed could be quantified.

In order to aid in the air modelling study that is recommended as a supplemental deliverable to this ESIA following technology selection, several additional baseline

[46] https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

air quality samples were collected in the field. Four air samples were collected from the site perimeter line at the northwest, northeast, southeast and southwest corners. In addition, two air samples were collected from the northeast and northwest corners of the NFPP property (sample locations are presented in Annex 11). All samples were analyzed for NO_2, SO_2, CO, PM2.5 and PM10 and the results are presented in Table 7-1. These samples will also be used for baseline data in evaluation of impacts during construction and operation phase air quality monitoring.

Noise Impacts

The effect of the noise to be generated by the proposed gas-fired power plant during the operation phase has been modelled during the study (Annex 7). These modelled values are for conditions where there would be no noise barriers, such as buildings or trees between the source. Since there are a number of buildings, boundary walls and trees present, in addition to the soft site absorption factor, the receptors are expected to experience noise much less than this modelled value. The nearest noise receptors in relation to the Mazar IPP are located to the northwest, north and northeast at greater than 1 km. Therefore, the cumulative effect of the NFPP and Jade Glass Factory, located north and east of the site, respectively will contribute to the noise level for these same receptors.

In general, the cumulative effect of all three of these proposed plants at a common point is expected to be dominated by the noise generated by the source nearest to the receptor. Partially due to the fact that the Mazar IPP is under consideration, there are currently significant uncertainties regarding future operations and output levels at the NFPP and Jade Glass Factory that must also be determined prior to conducting meaningful cumulative noise modelling from these multiple sources on existing receptors. Once this can be achieved, necessary mitigation measures are expected to be effective at reducing noise levels to IFC standards.

Once the number of engines and engine specifications are selected, it may be necessary to conduct additional cumulative noise modelling to determine the appropriate noise mitigation infrastructure that should be included in the power plant design. Based on the design specification from the technology manufacturer, mitigation options for confining noise may include full or partial enclosures around the engine bay and generators, barrier walls, sound proof canopies or landscaping in the form of mounds and vegetation.

In order to aid in any future noise modelling study several additional baseline noise level samples were collected in the field. Four noise tests were conducted from the site perimeter line at the northwest, northeast, southeast and southwest corners. In addition, two noise tests were collected from the northeast and northwest corners of the NFPP property. All results are presented in Table 7-1. These tests will also be used for baseline data in evaluation of impacts during construction and operation phase noise monitoring.

7.2.5 Decommissioning

Environmental and social impacts during decommissioning of the Project infrastructure will depend on the options available at the time of expiry of the power purchase agreement between Afghan Power Plant Company and the MoMP/Afghan Gas Enterprise. If the Power Purchase Agreement, Land Lease Agreement, Gas Supply Agreement and the other relevant agreements cease to be extended or renewed, decommissioning of the plant may be required. Alternatively, if the operational life of the Power Plant expires and retrofits are not economically feasible, the power plant will be decommissioned. Under both scenarios, the Project Owner will be required under national environmental laws to meet the decommissioning and safe repurposing of the site according to the requirements of the national authorities.

Most critically, decommissioning of the plant would require coordination with the MoMP/Afghan Gas Enterprise to cease the gas supply to the site and cap or reroute the gas supply according to national gas transmission protocols and requirements at that time. In addition, when electricity production ceases, DABS would be required to de-electrify and disconnect electrical transmission infrastructure at the site in accordance with their electrical generation and transmission protocols.

With regard to on-site infrastructure, it is expected that continued demand for building materials and recyclable metals in Afghanistan would result in all salvageable materials being repurposed for beneficial reuse (e.g. steel, aluminum and plastics recycling). Based on the new land use plan at that time, the site would likely be razed and or cleared to the existing grade. The recommended decommissioning process will unfold in three key phases as follows:

- Pre-decommissioning activities: includes the detailed planning (development of a Decommissioning Plan, Site Closure and Restoration Plan) and identification of permit and approval requirements;

- Decommissioning activities: removal of all infrastructure (including piping, cables, pylons, footers and erections for the connection to the existing utilities). Machinery, steel and dismantled materials will be recycled where possible and disposed of at licensed disposal sites; and any hazardous substances properly contained and managed according to regulatory authority directives;

- Post-decommissioning activities: site survey, close out report and field monitoring as necessary.

During decommissioning, the mitigation and monitoring requirements detailed in the Construction ESMP (Section 8) regarding requirements to meet applicable performance standards, engage with stakeholders and implement the GRM will be incorporated in the Decommissioning Plan. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated; however, the initial plant life will be designed for 25 to 30 years. Upgrades during the life of the plant can increase the design life to 50 or more years. A Decommissioning Plan will only be developed during the latter stages of the production life of the facility. The assessment of the significance of the environmental and social impacts associated with decommissioning will need to be conducted by the ESMP Management Unit once the Decommissioning Plan is finalized. In general, the level of impacts and risk posed by decommissioning activities will be commensurate with those during the construction phase and the standard mitigation measures outlined in Section 8 will be applicable in their management.

Table 7- 1 Supplemental Air Quality and Noise Level Data

Site Perimeter Air Samples

	Parameter	Read 1	Read 2	Read 3	Unit	Coordinate
Point 1	No2	0.177485	0.02362	0.182266	ppm	36°37.987′66°56.831′
	Co	0.382935	0.3865	0.304774	ppm	
	So2	-0.18892	0.188921	-0.14732	ppm	
	PM10	29.8892	29.8822	28.9822	µg/m3	
	PM2.5	25.2466	25.2466	23.7837	µg/m3	
		Max	Min			
	Sound	78	60.3		dB	

	Parameter	Read 1	Read 2	Read 3	Unit	Coordinate
Point 2	No2	-0.14167	-0.17308	-0.13045	ppm	36°37.999′66°56.503′
	Co	0.479021	0.477165	0.438501	ppm	
	So2	-0.12395	-0.08711	-0.09731	ppm	
	PM10	36.731	36.731	36.731	µg/m3	
	PM2.5	32.344	31.7546	31.7546	µg/m3	
		Max	Min			
	Sound	63.3	54.6		dB	

	Parameter	Read 1	Read 2	Read 3	Unit	Coordinate
Point 3	No2	-0.4029	0.075718	-0.0673	ppm	36°37.793′66°56.435′
	Co	0.4967	0.38367	0.373768	ppm	
	So2	-0.11969	-0.12883	-0.15923	ppm	
	PM10	67.364	73.2331	66.8059	µg/m3	
	PM2.5	201.173	201.173	201.173	µg/m3	
		Max	Min			
	Sound	57.37	52.8		dB	

	Parameter	Read 1	Read 2	Read 3	Unit	Coordinate
Point 4	No2	-0.29387	-0.20081	-0.12742	ppm	36°37.762′66°56.768′
	Co	0.300787	0.39642	0.356049	ppm	
	So2	-0.09455	-0.10142	-0.09491	ppm	
	PM10	54.2965	54.2965	55.6384	µg/m3	
	PM2.5	216.184	216.183	216.183	µg/m3	
		Max	Min			
	Sound	58.1	53.7		dB	

NFPP Air Samples

	Parameter	Read 1	Read 2	Read 3	Unit	Coordinate
northeast	No2	-0.14335	-0.144	-0.17105	ppm	36°38.383′66°56.886′
	Co	0.838521	1.131891	1.41324	ppm	
	So2	23.984	39.6077	39.6077	ppm	
	PM10	29.8892	29.8822	28.9822	µg/m3	
	PM2.5	42.3803	28.3708	28.3708	µg/m3	
		Max	Min			
	Sound	79	68		dB	

	Parameter	Read 1	Read 2	Read 3	Unit	Coordinate
northwest	No2	0.101154	-0.1367	0.094455	ppm	36°38.469′66°56.524′
	Co	14.9457	5.46507	4.52246	ppm	
	So2	-0.19544	-0.10779	-0.13764	ppm	
	PM10	38.2166	432792	19.7395	µg/m3	
	PM2.5	24.4193	24.4193	24.4193	µg/m3	
		Max	Min			
	Sound	55.8	49.6		dB	

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

8.1 Introduction

The Afghan Power Plant Company (APPC) is a newly formed organization out of the Ghazanfar Group. The APPC will be organized in a manner that ensures it will meet the compliance, legal and regulatory requirements of the Government of the Islamic Republic of Afghanistan and the IFC PSs. In accordance with IFC PS 1 the APPC has established an Environmental and Social Management System (ESMS) that includes policies, procedures and personnel responsible for implementing the Project. This section describes the Project-specific ESMS and its component parts including the Environmental and Social Management Plan (ESMP) that has been generated for the Mazar IPP project.

8.2 Environmental and Social Management Policy

The APPC has established an Environmental and Social Management Policy (E&SM Policy) that was institutionalized by the CEO of the APPC. The E&SM Policy is included in Annex 3. The policy contains a Management Statement to Employees and a Policy Statement that defines the environmental and social objectives and principles for achieving sound environmental and social performance. Through the Policy, the APPC accepts the responsibility to comply with IFC Performance Standards, EHS Guidelines, ESIA/ESMP, local laws and regulations, and permits and standards. In addition, the APPC accepts responsibility for ensuring that any contractor providing services of any kind duly follows these requirements throughout the duration of the contract, including any activity or services performed by subcontractors or third parties undertaking a contract from the contractor.

With regard to improving socio-economic conditions in the vicinity of the Project site, the APPC is committed to the generation and implementation of a site-specific community development plan. These activities will include planning of humanitarian and development projects, designing feasibility studies, and management of community-based interventions for the development of target communities through best practices. An example of the community development agenda, potential projects to be selected following collaboration with communities during the stakeholder engagement process, and the rationale for this development is provided in Annex 12.

8.3 Organizational Structure

The organizational structure that will be allocated to take responsibility and ensure conformance and implementation of the ESMS and ESMP is provided below Figure 8-1.

Mazar IPP
ESMS Organogram

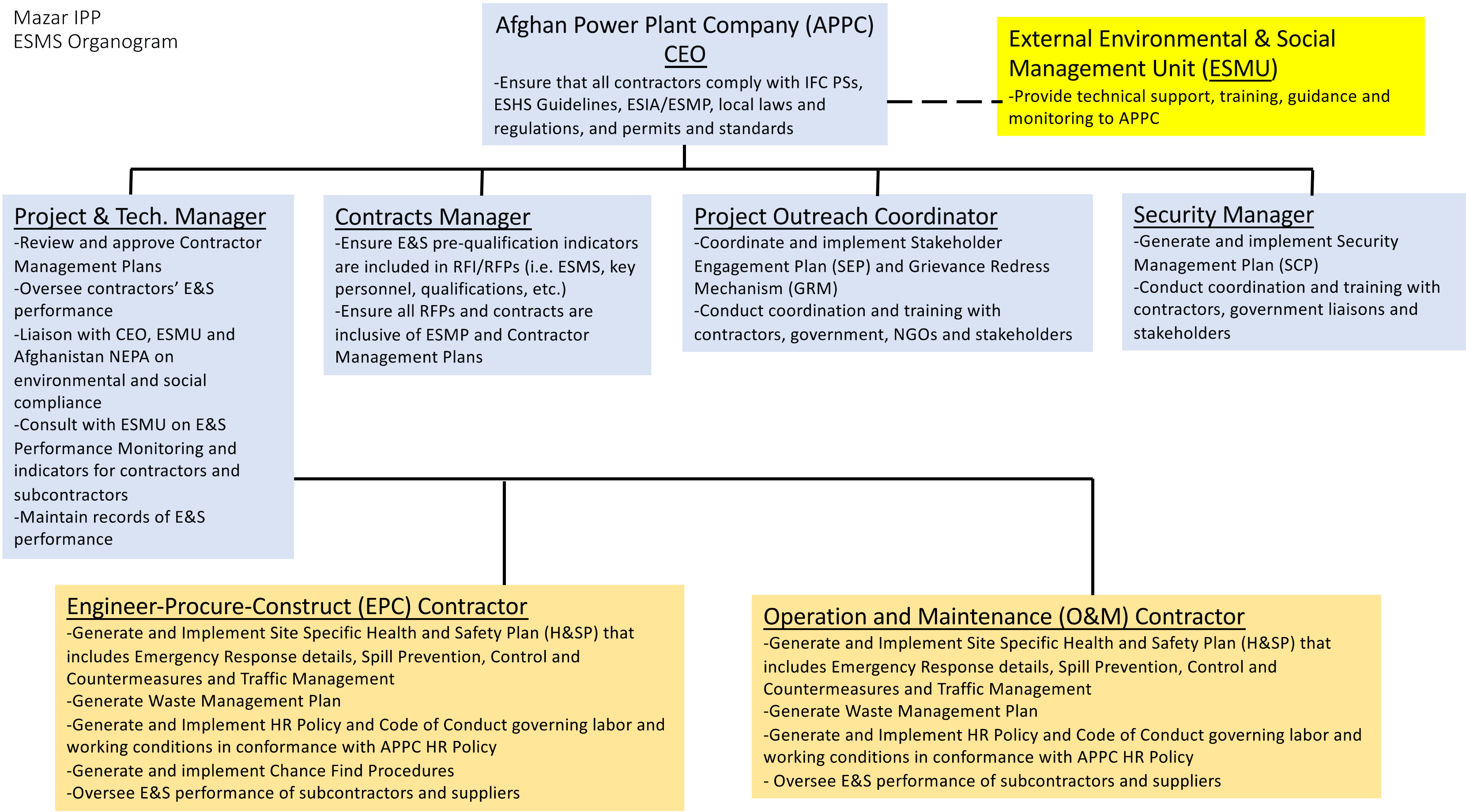


Figure 8- 1 ESMS Organogram

As depicted above, the high level managers of the APPC and the contractors (EPC and O&M) will all have clearly identified roles and responsibilities in the management of environmental and social risks. While the APPC Project & Technical Manager will have direct authority over the contractors, it is expected that an Environmental and Social Management Unit (ESMU) consisting of E&S professionals will be contracted separately to provide training, support services, guidance and monitoring throughout the project. In addition, ESP and O&M contractors will be required to maintain full-time on-site health, safety and environmental compliance oversight personnel as part of their contractual obligations, and this will be documented in the associated Contractor Management Plans that will be reviewed by the APPC prior to implementation.

Through coordination with the CEO and the other APPC managers the ESMU is expected to play a key role in effective implementation of the ESMP, and through the authority of the CEO, clear lines of control between the ESMU and APPC managers will be established. Table 8-1 provides more detail on the roles and requirements of the ESMU.

Table 8- 1 Environmental and Social Management Unit Description

Creation of ESMU by Project Proponent/Owner
The Project Proponent/Owner (Ghazanfar Group; Afghan Power Plant Company) will create a management unit consisting of the Owner's Engineer and/or Environmental Consultant to ensure that the ESMP is implemented over the life of the project. The unit may include the Engineer's field manager(s) and/or the Consultant's field technician(s) who collect samples, conduct monitoring and engage in communications, however, these staff would be directed by the responsible individuals named in the Management Unit. The Owner's Engineer or Environmental Consultant should be a qualified and certified Health & Safety Specialist, preferably OHSAS 18001:2007, NEBOSCH or similar certified.
ESMU Roles
The ESMU will be responsible for high level monitoring and quality assurance with regard to E&S performance. This will entail ensuring that the actions and measures described in the ESMP are incorporated into the contracts and plans of all on-site contractors, and that the ESMP is fully implemented throughout the life of the project. The ESMU will assist the APPC Project & Technical Manager to review, comment and ultimately approve the plans developed by contractors and sub-contractors to assure compliance with the ESMP. The contractors/subcontractors will be responsible for surveillance during their involvement in the project and are

responsible for implementation of their approved plans, while the ESMU will assess their performance and fulfill the role of overall environmental monitoring throughout the life of the project. The ESMU will also be responsible for monitoring that community relations, public outreach, grievance mechanisms and communications with local authorities are conducted as planned. The ESMU will report directly to the APPC CEO.
ESMU Responsibilities
The ESMU will maintain records related to ESMP performance during the course of the construction and operational phase of the Project and provide reports containing the results of monitoring. These will include dates of incidents or accidents; spills, releases or other environmental damage; public complaints or grievances; and, any revisions to the ESMP including changes or additions to specific measures outlined in the ESMP that are modified to improve performance in response to site conditions or circumstances. If necessary, the ESMU, as well as, the APPC Project & Technical Manager have the authority to issue corrective action orders, work improvement notices, or to temporarily suspend work being conducted by contractors or subcontractors (even if this results in project delays).
External Auditors
Environmental, Social, Health and Safety Audits conducted by the Financial Institution are expected to be carried out during the course of the project at periodic intervals and the ESMU will support these audits by responding to information requests and assisting in coordination and scheduling of site visits, if tasked to do so.

In summary, the ESMU, contracted by the Project Proponent/Owner will have a key role in ensuring that the ESMP is implemented by the APPC and its contractors/operators through a process of thorough supervision and training, as well as, engaging with APPC managers and supervisors.

8.4 Environmental and Social Management Plan (ESMP)

The primary objective of the environmental management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the mitigation measures identified earlier in order to reduce adverse impacts and enhance positive impacts from specific project activities. It is also meant to address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project. The ESMP enforces the IFC Performance Standards (PS) and is compatible with the World Bank Operational

Policy 4.03. The primary Performance Standards that apply to project activities are identified as:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety and Security
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

The ESMP is separated into a construction phase plan (CESMP) and an operation phase plan (OESMP), which are presented in the Tables 8-2 and 8-3, below. The first column of the ESMP is directly linked to the environmental aspects and risks that were identified by the ESIA and presented in Section 6 (Environmental and Social Impact Assessment). The second column is directly linked to each action/mitigation measure that was identified in Section 7 (Mitigation and Management Measures).

The third column identifies the party, and, as relevant, the plan or document that will be used for ensuring that the measure is included in the ESMP. It should be recognized that when the EPC and O&M Contractors are referenced in the ESMP, it includes not only direct employees but subcontractors and third parties under their direction. The APPC Project & Technical Manager will have direct authority to oversee the contractors and subcontractors on-site.

The fourth column links the environmental aspect and mitigation measure back to the applicable standard or reference. These references identify how each action is directly linked to Good International Industry Practice (GIIP) or the applicable regulatory laws and policies. These references also reinforce the obligation and authority of the APPC CEO and the ESMU to ensure that the actions are effectively implemented, including through corrective action orders, work improvement notices or postponing and/or withholding payment to contractors for failure to comply with the ESMP.

8.4.1 Construction ESMP

Table 8- 2 Construction Environmental and Social Management Plan (CESMP)

Environmental Aspect	Action/Mitigation Measure	Responsible Party and Management Plan	Standard/Reference
Water Quality and General Environmental Impacts	Recycle waste to the maximum extent, provide for the proper temporary staging and storage of waste and debris on-site and implement good housekeeping in work areas	EPC Contractor; Waste Management Plan (WMP)	PS3 Wastes/Pollution Prevention PS4 Ecosystem Services
	Transport, or oversee the subcontract for transport, of non-recyclable waste to the municipally approved disposal site and periodically verify delivery	EPC Contractor; Waste Management Plan (WMP)	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease
	Segregate domestic waste in appropriate receptacles and dispose at municipally approved disposal site and manage sanitary waste systems in a manner protective of human and environmental health	EPC Contractor; Waste Management Plan (WMP)	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease
	Provide advance notice to the municipal authorities (and NEPA) of any and all hazardous wastes that will be planned for disposal at the municipal disposal site and actively find all reasonable alternatives including recycling and beneficial reuse	EPC Contractor; Waste Management Plan (WMP)	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease
	Minimize erosion, grade and replant disturbed areas	EPC Contractor; ESMP	PS4 Ecosystem Services
	Protect against accidental releases of hazardous materials through training, spill prevention measures, recycling and if appropriate, timely cleanup and disposal	EPC Contractor; Waste Management Plan (WMP)	PS3 Hazardous Materials Management PS4 Hazardous Materials Management and Safety
	Enforce Chance Find Procedures and cease work if historic/archeological finds are encountered	EPC Contractor; Chance Find Procedure	PS8 Protection of Cultural Heritage in Project Design and Execution
	Design, construct, operate, and decommission the structural elements or components of the project in accordance with good international industry practice,	EPC Contractor; ESMP	PS4 Infrastructure and Equipment Design and Safety

	taking into consideration safety risks to third parties or affected communities		
Air Quality Impacts	Ensure that air emissions meet the IFC EHS and Thermal Power Guidance standards criteria	EPC Contractor; Design Specifications	PS3 Pollution Prevention
	Cover stockpiles and loads to avoid fugitive dust emissions	EPC Contractor; ESMP	PS3 Pollution Prevention
	Minimize idling of vehicles and operation of combustion machinery and equipment to greatest extent possible	EPC Contractor; ESMP	PS2 Occupational Health and Safety PS3 Resource Efficiency PS3 Pollution Prevention
	Hard pack or spray access roads and driveway areas to reduce dust generation	EPC Contractor; ESMP	PS3 Pollution Prevention
	Place washed stone at site exit to minimize off-site tracking of soil and debris	EPC Contractor; ESMP	PS3 Pollution Prevention
	Include the results of air modelling along with other design considerations including engine quantity and specification, gas characteristics and IFC emissions (priority pollutant and GHG) standards when determining the appropriate emissions control technology	EPC Contractor, APPC Project & Technical Manager and ESMU; ESMP	PS4 Community Health and Safety PS4 Community Exposure to Disease PS4 Ecosystem Services
Noise Impacts	Implement noise control measures at the source through design elements including, but not limited to, silencers, mufflers, acoustic enclosures, upgraded building design and landscape features (mounds, trees, etc.)	EPC Contractor; Design Specifications	PS4 Infrastructure and Equipment Design and Safety
	Set and enforce standard daytime working hours, recommended to be 06:00 to 21:00	EPC Contractor; ESMP	PS2 Protecting the Workforce PS4 Community Health and Safety
	Maintain equipment and use low noise equipment and methods where feasible	EPC Contractor; ESMP	PS3 Resource Efficiency PS4 Community Health and Safety
	Enclose or fix barriers around noise-generating stationary equipment	EPC Contractor; ESMP	PS2 Occupational Health and Safety PS4 Community Health and Safety
Impacts to Flora and Fauna	Minimize removal of vegetation and replant disturbed areas using native plant species	EPC Contractor; ESMP	PS4 Ecosystem Services PS6 Protection and Conservation of Biodiversity
	Use fencing, flagging and site boundary controls during construction to minimize disturbance of off-site habitats	EPC Contractor; ESMP	PS4 Ecosystem Services

			PS6 Protection and Conservation of Biodiversity
	Strictly prohibit the hunting, harming or taking for falconry or any other purpose of any bird species found on or around the site	EPC Contractor; ESMP	PS6 Protection and Conservation of Biodiversity
Transport Impacts	Manage haulage routes to avoid sensitive establishments and use barriers as appropriate	EPC Contractor; Traffic Control Management Plan	PS4 Community Health and Safety PS4 Community Exposure to Disease
	Maintain vehicles in good working condition	EPC Contractor; Traffic Control Management Plan	PS4 Community Health and Safety PS4 Community Exposure to Disease
Public Health and Safety Impacts	Set and enforce speed limits to avoid public health impacts to surrounding communities	EPC Contractor; Traffic Control Management Plan	PS4 Community Health and Safety
	Institute and enforce Code of Behavior Policy in Contractor Health and Safety Plans which includes guidance on inappropriate conduct and prescribed actions for conduct violations to include prohibition of sexual exploitation and assault (SEA) and gender based violence (GBV) and any discrimination based on ethnicity, tribe or religion	EPC Contractor; Health and Safety Plan (HSP)	PS2 Occupational Health and Safety PS4 Community Health and Safety
	Implement public grievance mechanism and conduct public outreach and notification as appropriate	APPC Project Outreach Coordinator; Stakeholder Engagement Plan (SEP) and Grievance Mechanism (GM)	PS4 Community Health and Safety
	Collaborate with the affected communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations	APPC Project Outreach Coordinator; Stakeholder Engagement Plan (SEP)	PS4 Emergency Preparedness and Response

	Engage security manager to manage risk associated with security breach or targeting by anti-government groups including training and contingency planning for all on-site personnel	APPC CEO	PS4 Emergency Preparedness and Response
Employment Impacts	Consult with local authorities on hiring local workers and enforce a transparent "no-gatekeeping" policy	APPC Project Outreach Coordinator; Stakeholder Engagement Plan (SEP)	ESIA Mitigation Measure
	Provide workers with clear understandable documentation explaining worker's rights and refrain from harassment, intimidation and exploitation. Enforce Human Resource policies specifically outlawing underage workers and forced labor	EPC Contractor, HR Policy	PS2 Non-Discrimination and Equal Opportunity PS2 Human Resource Policies and Procedures
	Implement employee grievance mechanism for on-site workers as part of worker's rights program	EPC Contractor; HR Policy	PS2 Grievance Mechanism
	Ensure proper security protocols and staff are in place throughout construction to provide security and safeguard property	APPC Security Manager; Security Management Plan (SMP)	PS4 Security Personnel
	While not anticipated, temporary on-site housing is the responsibility of the EPC Contractor in line with the provisions of IFC PS 2 and the guidance note on worker's accommodation published by IFC (Worker's Accommodation: Processes and Standards)	EPC Contractor; HR Policy	PS2 Working Conditions and Terms of Employment
Occupational Health and Safety Impacts	Generated a comprehensive Health and Safety Plan and submit to APPC for approval prior to conducting work	EPC Contractor; Health and Safety Plan (HSP)	PS2 Occupational Health and Safety
	Report all accidents and injuries and near misses to APPC Project & Technical Manager within 24 hour of incident	EPC Contractor; ESMP	PS2 Workers Engaged by Third Parties
Social Impacts	Ensure that the provisions for compliance with the Afghanistan Labour Law (2007) are promoted as a	APPC Contracts Manager; Contracts	PS2 Working Conditions and Terms of Employment

	Project standard through inclusion in all contract and subcontract documents		
	Conduct correspondence with community outreach groups and request input on positive/negative impacts to local businesses, road infrastructure, local health care facilities and the communities at large	APPC Project Outreach Coordinator; Stakeholder Engagement Plan (SEP)	PS4 Community Health and Safety ESIA Mitigation Measure for identification and tracking social impacts

8.4.2 Operation ESMP

Table 8- 3 Operation Environmental and Social Management Plan (OESMP)

Environmental Aspect	Action/Mitigation Measure	Responsible Party	Standard/Reference
Noise Impacts	Operate and maintain noise control elements including, but not limited to, silencers, mufflers, acoustic enclosures, upgraded building design and landscape features (mounds, trees, etc.)	O&M Contractor; ESMP	PS2 Occupational Health and Safety PS4 Community Health and Safety
	Restrict access to installations without proper provision of personal protective equipment (i.e. ear muffs) and post noise warning signs at perimeter of noise exposure area	O&M Contractor; ESMP	PS2 Occupational Health and Safety
Wastewater Impacts	Prevent and control the release and cleanup of all potential hazardous and aqueous compounds stored on-site	O&M Contractor; Spill Prevention, Control and Countermeasure Plan (SPCCP)	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease
	Ensure all tanks and storage vessels containing such materials are designed with secondary containment to contain 110% of the tank or vessel capacity	O&M Contractor; Spill Prevention, Control and Countermeasure Plan (SPCCP)	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease

	Train workers on emergency response related to potential releases of chemicals and other hazardous materials and maintain Safety Data Sheets (SDS) for all chemicals stored on-site	O&M Contractor; Health and Safety Plan (HSP)	PS3 Hazardous Materials Management PS4 Hazardous Materials Management and Safety
	Ensure that effective septic tanks are operated and maintained for all sanitary wastewater infrastructure	O&M Contractor; Waste Management Plan	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease
	Treat stormwater and wash down water effluents prior to release using oil/water separators and grease traps where appropriate	O&M Contractor; Waste Management Plan	PS3 Wastes/Pollution Prevention PS4 Community Health and Safety PS4 Community Exposure to Disease
Solid and Hazardous Waste Impacts	Provide worker training on the handling, storing and disposal of hazardous and non-hazardous materials	O&M Contractor; Health and Safety Plan (HSP)	PS3 Hazardous Materials Management PS4 Hazardous Materials Management and Safety PS2 Occupational Health and Safety PS4 Community Health and Safety
	Maintain a Spill Prevention, Control and Countermeasure Plan (SPCCP) as part of the site-specific Health & Safety Plan covering all potential hazardous and aqueous compounds stored on-site	O&M Contractor; Health and Safety Plan (HSP)	PS3 Hazardous Materials Management PS4 Hazardous Materials Management and Safety PS2 Occupational Health and Safety PS4 Community Health and Safety
	Avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project through modifying, substituting, or eliminating their use, and recycle all hazardous materials to the extent feasible	O&M Contractor; Waste Management Plan	PS3 Hazardous Materials Management PS3 Pollution Prevention
	Properly containerize all hazardous waste planned for transport and disposal at the municipal disposal site, if possible, using leak proof and secure containers or receptacles	O&M Contractor; Waste Management Plan	PS2 Protecting the Workforce PS4 Community Health and Safety
	Provide advance notice to the municipal authorities (and NEPA) of any and all hazardous wastes that will be planned for disposal at the municipal disposal site and	O&M Contractor; Waste Management Plan	PS3 Resource Efficiency PS4 Community Health and Safety PS4 Ecosystem Services

	actively find all reasonable alternatives including recycling and beneficial reuse		
	Conduct verification through monitoring and documentation that staff or third-party subcontractors are following the established waste management and disposal protocols	O&M Contractor; Waste Management Plan APPC Project & Technical Manager and ESMU; monitoring records	PS4 Community Health and Safety PS4 Ecosystem Services
Water Resource Impacts	Maximize water use efficiency and minimize wastage through leakage and misuse by ensuring that piping and plumbing is constructed and maintained in order to eliminate leaks and wastage	O&M Contractor; ESMP	PS3 Resource Efficiency
	Audit water use and identify and train on-site workers on water conservation and water efficiency practices that can be implemented	O&M Contractor; ESMP	PS3 Resource Efficiency
Air Quality Impacts	As per design specifications, after commissioning of the plant, ensure that the stack emissions satisfy the IFC emissions standards for NOx, CO and Particulate Matter (PM)	O&M Contractor; ESMU APPC Project & Technical Manager and ESMU	PS4 Community Health and Safety PS4 Community Exposure to Disease PS4 Ecosystem Services
Impacts to Flora and Fauna	Minimize the thermal emissions from equipment and machinery heat sources through use of barriers, buffers and landscape design features	Project Owner, Design Engineer	PS4 Ecosystem Services PS6 Protection and Conservation of Biodiversity
	Ensure that site traffic is managed to reduce impacts to non-driveway areas and implement and enforce safe speed limits for all on-site traffic	O&M Contractor; ESMP	PS4 Ecosystem Services PS6 Protection and Conservation of Biodiversity
	Strictly prohibit the hunting, harming or taking for falconry or any other purpose of any bird species found on or around the site	O&M Contractor; ESMP	PS6 Protection and Conservation of Biodiversity
Public Health and Safety Impacts	Generate an Emergency Response Plan (ERP) to direct response actions at the Mazar IPP covering responses	O&M Contractor; O&M Emergency	PS4 Community Health and Safety PS4 Emergency Preparedness and Response

	to natural, meteorological, biological, accidental and intentional causes (see template in Section 7)	Response Plan (ERP)	PS4 Security Personnel
	Collaborate with the affected communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations	APPC Project Outreach Coordinator; Stakeholder Engagement Plant (SEP)	PS4 Community Health and Safety PS4 Emergency Preparedness and Response
	Institute and maintain proper security protocols throughout operation to provide security and safeguard property by ensuring facility will be manned 24 hours per day, 7 days per week and that the perimeter of the facility be secured to permit only authorized access to the site	APPC Security Manager; Security Management Plan (SMP)	PS4 Emergency Preparedness and Response PS4 Security Personnel
	Institute a public grievance and redress mechanism to respond to community issues and concerns and take appropriate actions to remedy and compensate for social impacts	APPC Project Outreach Coordinator; Stakeholder Engagement Plant (SEP)	PS4 Community Health and Safety
	Manage risk associated with security breach or targeting by anti-government groups including training and contingency planning for all on-site personnel	APPC Security Manager; Security Management Plan (SMP)	PS4 Emergency Preparedness and Response
	Institute and enforce Code of Behavior Policy in Contractor Health and Safety Plans which includes guidance on inappropriate conduct and prescribed actions for conduct violations to include prohibition of sexual exploitation and assault (SEA), gender based violence (GBV) and any discrimination based on ethnicity, tribe or religion	O&M Contractor; Health and Safety Plan (HSP) and HR Policy	PS2 Occupational Health and Safety PS4 Community Health and Safety
Occupational Health and Safety Impacts	Generate a comprehensive Health and Safety Plan and submit to APPC Project & Technical Manager for approval prior to conducting work	O&M Contractor; Health and Safety Plan (HSP)	PS2 Occupational Health and Safety

	Report all accidents and injuries to APPC Project & Technical Manager within 24 hour of incident	O&M Contractor; Health and Safety Plan (HSP)	PS2 Workers Engaged by Third Parties
Social Impacts	Ensure that the provisions for compliance with the Afghanistan Labour Law (2007) are promoted as a Project standard through inclusion in all contract and subcontract documents	O&M Contractor; HR Policy	PS2 Working Conditions and Terms of Employment
	Conduct correspondence with community outreach groups and request input on positive/negative impacts to local businesses, road infrastructure, local health care facilities and the communities at large	APPC Project Outreach Coordinator; Stakeholder Engagement Plant (SEP)	PS4 Community Health and Safety ESIA Mitigation Measure for identification and tracking social impacts

8.4.3 Action Plans and Contractor Management Plans

Action Plans will be used to describe the documents or processes that the APPC will take the lead roles and responsibilities in generating and/or overseeing. These will include the APPC Contracts Manager ensuring that E&S Performance Management requirements are included in RFI, RFQ, bid documents and contracts so that Contractors are properly vetted and committed to providing the level of competency required to undertake the measures described in the ESMP. The APPC Project Outreach Coordinator will be responsible for managing and enacting the Stakeholder Engagement Plan and the Community Grievance Redress Mechanism (see Section 9). Finally, the APPC Security Manager will be required to generate and fulfill the necessary security functions for all personnel on-site. This will include training APPC staff and contractors/subcontractors, engaging with local emergency response and military organizations, and working with the APPC Project Outreach Coordinator to ensure that affected communities are involved in and educated on the necessary security details.

As referenced in the ESMPs, the EPC and O&M Contractors will be required to generate Contractor Management Plans. These will be discussed herein. With reference to Occupational Health and Safety (OHS), the mitigation measures that will be required are dependent upon the stage and phase of work, the nature of the activity and the outcomes of site-specific activity hazard analyses. Therefore, the ESMPs do not provide specific measures, outside of the requirement that the EPC and O&M Contractors and in some cases subcontractors will generate comprehensive Health and Safety Plans (H&SP). These H&SP will explicitly contain detail and direction on Emergency Response Plans (ERP), Spill Prevention, Control and Countermeasure Plans (SPCCP), and Traffic Management Plans (TMP) on and around the site. Annex 5 contains guidance for Contractors on the topics, risks and directives that will be required in their H&SPs.

With regard to Waste Management, each Contractor will inherently be dealing with different types, volumes and quantities of solid and liquid wastes. The management of these waste streams, both on-site and off-site, will require careful planning and consideration, as well as, training and directives for employees. The Waste Management Plans generated by the Contractors will contain this detail and will include provisions for supervising and monitoring that waste is managed and disposed according to their APPC-approved Waste Management Plans. In order to provide general guidance on waste management considerations, an overview is provided for contractors in Annex 4.

In addition to H&SPs and Waste Management Plans, the EPC and O&M Contractors will be responsible for providing Human Resource Policies (HR Policies) outlining their commitments to maintaining GIIP regarding Labor and Working Conditions that are commensurate with the IFC PS 2 and the Ghazanfar and APPC Human Resources Policy (see Annex 1). The HR Policies will be required to include the Contractor's Employee and Third Party Grievance Mechanism (as well as the provision of staff and training to manage the GM) and a specific Code of Conduct relevant to local working conditions and the surrounding communities.

Finally, the EPC Contractor will also be required to generate a Chance Find Procedure highlighting the precautions and procedures that will be enacted to protect cultural and historical heritage. While no historically or culturally significant sites or artifacts are expected to be encountered at the site, it is imperative that the construction contractor has specific procedures in place in case of a chance find – including stoppage of work, reporting to the relevant local/national authorities, and taking prescribed measures to protect and appropriately preserve other potential significant artifacts or sites in the vicinity of the chance find.

Contractors will submit their management plans to the responsible APPC manager for approval according to the schedule provided in Table 8-4 below. It is expected that APPC managers will involve the ESMU in the review, comment and approval process for all Contractor Management Plans.

As indicated in the ESMP the following documents, action plans and contractor management plans are official required deliverables based on the ESIA/ESMP. The responsible parties, plan name, approver and schedule are indicted in Table 8-4.

Table 8- 4 Action and Management Plan Responsibilities

Responsible Party	Action or Management Plan	Approval/Oversight	Schedule
APPC Contracts Manager	Contracts – Ensure that E&S Performance Management requirements are included in RFI, RFQ, bid documents and contracts	ESMU	Prior to issuing contracts
APPC Project Outreach Coordinator	Stakeholder Engagement Plan (SEP) and Grievance Redress Mechanism (GRM)	ESMU	As indicated in SEP and GRM
APPC Security Manager	Security Management Plan (SMP)	APPC CEO	Prior to project implementation
EPC Contractor	Waste Management Plan	APPC Project & Technical Manager and ESMU	Prior to project implementation
EPC Contractor	Chance Find Procedure	APPC Project & Technical Manager and ESMU	Prior to project implementation
EPC Contractor	Human Resources Policy (HR Policy) including Employee Grievance Mechanism and Code of Conduct	APPC Contracts Manager	Prior to issuing contract
EPC Contractor	Health & Safety Plan (HSP) including provisions for Emergency Response, Spill Prevention and Control, and Traffic Management	APPC Project & Technical Manager and ESMU	Prior to project implementation
O&M Contractor	Waste Management Plan	APPC Project & Technical Manager and ESMU	Prior to project implementation
O&M Contractor	Human Resources Policy (HR Policy) including Grievance Mechanism and Code of Conduct	APPC Contracts Manager	Prior to project implementation
O&M Contractor	Health & Safety Plan (HSP) including provisions for Emergency Response, Spill Prevention and Control, and Traffic Management	APPC Project & Technical Manager and ESMU	Prior to project implementation

8.5 Monitoring and Management

Monitoring will be a multi-faceted component of the ESMP. Monitoring is required to ensure that the actions specified in the ESMP to mitigate environmental and social impacts are effective. Monitoring must be undertaken on a specified schedule depending on the nature, scale and extent of the impacts and mitigation measures being monitored (e.g. hourly, daily, weekly, monthly, etc.). As noted in Section 8-2, the Contractors/Subcontractors will be responsible for surveillance during their involvement in the project and are responsible for implementation of their approved plans, while the APPC and ESMU will assess their performance and fulfill the role of overall environmental monitoring throughout the life of the project. The specific monitoring roles of the Contractors will be detailed in their Contractor Management Plans that require prior approval. The monitoring actions that will be required of the APPC and ESMU will include:

- Identifying monitoring plans and schedules per Contractor based on the nature and duration of activities being undertaken;
- Establishment of an Environmental Management Procedure (EMP) to ensure the implementation of the necessary CESMP and OESMP actions to achieve these objectives;
- Cooperation and coordination with outside environmental auditors based on directives from the Project Owner and International Finance Institution (IFI) to assess the performance of the EMP;
- Conducting OHS leadership and training when multi-employer worksite scenarios are encountered to ensure effective coordination and management and reinforce the shared responsibilities for environmental and social protection; and,
- Preparing reports of monitoring observations and records for submittal to the Project Owner, national regulators (i.e. NEPA) and to the IFI, when specified.

In addition to monitoring, it may be required to establish additional detailed management plans for an activity or specific phase of work on-site that is currently unforeseen or requires special attention following the commencement of work activities. The need for these additional plans will be determined by the APPC Project & Technical Manager and the ESMU. The costs associated with implementation of any additional plans will be negotiated or incorporated into new bid documents and contracts as needed. The APPC and ESMU will review and approve these plans prior to the contractor starting work on the activities involved.

Finally, it should be noted that the ESMP is a working document and will be updated in line with any changes to Project requirements or as a result of actions required by internal/external audits. The Contractors/Operators are responsible for ensuring that changes are incorporated into the relevant procedures and plans and the APPC and ESMU is responsible for directing such changes.

As the Project progresses and detailed design is concluded, a greater level of certainty will be available regarding the project's likely impacts and understanding of the environmental and social aspects requiring management during all phases of work. Where any additional issues are identified, these will be assessed and included as necessary through an update to the ESIA and subsequent amendments of this ESMP and associated detailed contractor management plans. Any amendments to the ESIA/ESMP will be re-submitted to the NEPA and made available to the public.

8.5.1 Estimated Monitoring Costs

The estimated costs for the contractors' environmental management and monitoring activities included in the CESMP and OESMP will be included in bid/contract documents, and responses to RFI/RFQs. The estimated costs associated with the roles and responsibilities of the ESMU are set out in Table 8-5 below. The cost estimates are based on a 1-year construction period (12 months) and 1-year of operational oversight. Costs may be adjusted based on construction schedule updates and Project operational timelines or delays. The compliance monitoring and management of the Project activities is principally a tool to ensure that the environmental and social control measures identified during the ESIA are strictly adhered to during the project execution. Various aspects of the compliance monitoring will include, but not be limited to:

- Systematically observe the activities undertaken by the contractors or any other persons associated with the project;
- Verify that the activities are undertaken in compliance with the ESIA and ESMP and initiate corrective actions as needed;

- Document and communicate the observations to the concerned person(s) of the Project Owner, International Financing Institution, local and national regulatory agencies, Contractors, Operators and the Public;
- Maintain a record of all incidents of environmental and social significance and related actions and corrective measures;
- Maintain contact with the APPC Project Outreach Coordinator regarding social impacts and as needed, engage with the affected communities, solicit their views and concerns, and discuss them during meetings (including management and fulfillment of the grievance redress mechanism); and,
- Prepare periodic reports of the environmental and social performance of project for the APPC CEO and Project & Technical Manager.

Table 8- 5 Cost Estimate for ESMU Monitoring

Description	Cost (USD)
Construction ESMP Monitoring and Management	
ESMU: EMP Generation and Initiation Input on Bidding Documents & Contracts Contractor(s) Plan Review and Approval Training and Capacity Building On-site Monitoring and Testing Technical Evaluation and Reporting	60,000.00
Public Affairs and Communications Unit: Community Affairs Management Stakeholder Outreach/Communication Monitoring of Grievance Mechanism Regulatory Affairs Management External Audit Coordination	20,000.00
Operation ESMP Monitoring and Management	
ESMU: EMP Generation and Initiation Input on Bidding Documents & Contracts Operator(s) Plan Review and Approval Training and Capacity Building On-site Monitoring and Testing Technical Evaluation and Reporting	90,000.00

Public Affairs and Communications Unit: Community Affairs Management Stakeholder Outreach/Communication Monitoring of Grievance Mechanism Regulatory Affairs Management External Audit Coordination	10,000.00
Total CESMP & OESMP Management:	**180,000.00 USD**

8.5.2 Monitoring Methods and Parameters

In general terms, the ESIA predicts the impacts of the proposed project on the basis of information available at the time of conducting the assessment and the natural processes that link various environmental and social parameters. Based on this prediction, mitigation measures are introduced such that the predicted residual effects do not exceed acceptable levels. However, there can be an element of uncertainty in such predictions, for example, due to an insufficient grasp of the processes, limitations in prediction techniques, or inadequate data on the environment. This is true for the physio-chemical, biological, as well as socio-economic environment. Consequently, it is possible that even if the mitigation measures are implemented fully, the negative impacts of the project could exceed predicted levels or acceptable limits. In order to address the above concerns, monitoring will include technical evaluation of environmental and social risks and uncertainties. Broadly, effects monitoring has the following objectives:

- To verify that the impacts of the proposed project are within acceptable limits, thus establishing credibility (public assurance);
- To immediately warn the Project proponents (and the regulatory agencies, if appropriate) of unanticipated adverse impact or sudden changes in impact trends so that corrective actions can be undertaken, which may include modifications in the proposed activities, or the inclusion of modified or additional mitigation measures;
- To provide information to plan and control the timing, location, and level of certain project activities so that the effects are minimized; and
- To facilitate research and development by documenting the effects of the proposed project that can be used to validate impact-prediction techniques and provide a basis for more accurate predictions of future projects.

Monitoring and evaluation methodologies will be developed during the detailed design phase of the Project when the specific information on field activities will be known. The effects monitoring will be comprised of the following as needed:

- Attitude and Community Perception;
- Transportation Systems;
- Soil Erosion and Drainage;
- Land Contamination;
- Water Quality;
- Air Quality;
- Noise Level;
- Fauna & Flora;
- Wastewater;
- Archaeological Resources and Cultural Heritage;
- Public Health and Safety; and,
- Occupational Health and Safety.

Table 8-6 provides a framework monitoring plan that may be used by the APPC Project & Technical Manager and ESMU in developing their EMP. This framework is a guideline that should be used to assist in creating separate construction and operation phase monitoring plans throughout the life of the Project. The plans should be used in conjunction with other inspection checklists and reporting forms that will be required for monitoring different contractors during different activity stages and phases of work. A consolidated and comprehensive operation phase monitoring plan should be developed as part of the EMP based on site specific conditions and operational aspects identified following the construction phase.

Table 8- 6 Framework Monitoring Plan

Monitoring parameter	Monitoring Locations	Monitoring Objectives	Methodology/ Resource Requirement	Frequency	Role	Documentation
Attitude and Community Perception	All communities affected by power plant construction activities.	To ensure that grievances are resolved and do not escalate into conflict.	Biweekly review of grievance register to identify outstanding issues not resolved. Informal and formal discussions with local government to identify disturbances/ grievances in the affected communities as a result of project activities.	Biweekly review during preconstruction, extending into the construction stage as required.	APPC and ESMU	Complete records and reports of findings
Transportation	Secondary highway, primary access road and ROW around the NFPP.	To document disturbances to local villagers due to transportation if they occur. To avoid traffic accidents. To mitigate nuisance of increased traffic due to increased noise level.	Visual observation of construction areas and surrounding road networks with particular attention to road areas in need of repair or where resurfacing has recently occurred. Particular attention to road segments in proximity to any sensitive receptors or human use areas.	Biweekly during construction extending to quarterly during initial operational phase	APPC and ESMU	Record all of accidents, noise level, and problems regarding transportation.
Soil Erosion and Drainage	Construction site disturbance areas, temporary lay down areas, waste staging areas, loading zones and site perimeter.	To assess the effectiveness of environmental protection measures aimed to minimize erosion, maximize sediment retention and minimize suspended solid loads off-site.	Erosion effects will be monitored by visual observation of landforms, stormwater turbidity and photographic documentation; Identification of areas of potential soil instability, soil erosion, and standing water.	Weekly throughout construction activities involving land disturbance, grading, landscaping or other land surface impacts; quarterly during operation phase	APPC and ESMU	Complete record Record of visual observation/ photographs

Land Contamination	Visual soil contamination monitoring should occur at all areas near fuel and chemical storage areas and maintenance activities.	To assess the effectiveness of environmental protection measures aimed to prevent pollution and protect environmental resources and community health and safety	Visual observations should be undertaken to monitor for instances of soil contamination due to spillages etc. In the event of a major spill, nearby community wells should be monitored for contamination. Verification of disposal practices through field visits and inspections.	Visual observations of soil contamination should be ongoing, on a weekly basis during construction and monthly during operation phase.	APPC and ESMU	Reports, photographs and records of any sampling and analysis
Water Quality	At wells and surface water bodies near construction site and labor campsite. Selected local wells in nearby communities. Selected locations at nearby surface water bodies.	Turbidity, pH, DO, TSS, Total Dissolved Solids, oil & grease, total coliform, heavy metals	Laboratory analysis/sampling bottles	Pre-construction baseline, followed by monthly tests during construction and biyearly during operations	APPC and ESMU	Record of sampling location and analysis, corrective actions required
Air Quality	• Upwind area • Within construction area • Downwind direction at site perimeter • Adjacent to nearest residential areas	To measure concentrations of dust and gaseous emissions at selected locations surrounding the project area, so that the results can be assessed in relation to air quality standards	Site inspection Air quality sampling parameters will include hourly and 24-hour readings of total suspended particulates (TSP) and particulate matter less than 10µm (PM10) for gravimetric determination. NOx and CO during operation phase	Determined by construction activity (weekly to monthly depending on current activities). Monthly extending to biyearly during operation.	APPC and ESMU	Record of visual observations, analytic results and photographs
Noise Level	Identified locations within the	To ensure that noise levels produced by operation of machinery	Site inspection The measurement of noise levels will be conducted using	Monthly during construction extending	APPC and ESMU	Complete record of noise

	construction area based on activities and nearby noise generating sources	and equipment do not exceed standards and to ensure that adopted air pollution and noise controls and management are effective.	an integrated sound meter. Since operation will be continuous over 24 hours, representative measurements will be made during all working shifts on the day of sampling. The grievance register will be monitored for reports by local residents for vibration causing human irritation or damage to property.	to quarterly during operation.		measurements with documentation of sample locations
Fauna & Flora	Construction area, at site perimeter and in immediately adjacent land areas.	• To document terrestrial flora and fauna prior to land clearing. • To monitor the extent of land clearing and of rehabilitated areas following completion of land preparation activities. • To document rehabilitation success.	Site surveys and photographic records of land clearance, and subsequent rehabilitation. Rehabilitation progress will be recorded by measuring stem density and projected foliage cover.	Daily, Weekly or Monthly depending on construction activities. During operation phase extending to quarterly. Vegetation monitoring on rehabilitated sites will be carried out at six-monthly intervals, over two years after planting of vegetation.	APPC and ESMU	Complete records and reports of findings
Wastewater	All generation areas, conveyance systems and holding/storage infrastructure used for wastewater from construction, operation and sanitary sources.	Identify whether wastewater management practices are protective of the environment and human health and take corrective actions if needed.	Site inspection Soil and water testing if needed Verification of waste disposal practices.	During construction weekly and extending to monthly during operation phase.	APPC and ESMU	Record of visual Inspection, photographs and documentation of sample analysis

Archaeological Resources and Cultural Heritage	Construction Site	Ensure that chance find policy is implemented and effective	Visual Inspections and interviews with staff	Weekly or Monthly based on construction activities occurring. Immediately after and continuously following a chance find.	APPC and ESMU	Record of visual Inspections and interviews and photographs
Public Health and Safety	Site and surrounding area including nearby villages	To support government and local communities to prevent and to combat diseases. To ensure that the opportunity for the spread of disease between the non-local workforce and local residents is kept to a minimum. Avoid any deterioration in public health and environmental sanitation as a result of the project. To determine whether the presence of the construction workforce is negatively impacting the provision of local health services. To determine whether the treatment of ailments as a direct result of construction activities is placing pressure on local health services.	Records of accidents and safety hazard incidents. Medical surveillance of workforce. Collect and analyze relevant primary and secondary data from the company medical clinic and public medical centers. Quarterly consultation with local health service providers. Consultation with local government to determine sanitation as part of community development needs assessment.	Monthly during construction extending to quarterly during operation phase.	APPC and ESMU	Complete records and reports of findings

Occupational Health and Safety	Project site	To monitor the effectiveness of Contractor/Operator Health and Safety Plan implementation.	Conduct complete safety and health inspections including review of management practices, labor practices, equipment and machinery, personal protective equipment (PPE) use and enforcement, safety incidents and policies. Conduct interviews with managers and staff.	Monitoring will commence at the start of the preconstruction stage and continue through construction and operation stages weekly. Operation phase monitoring weekly during startup phase and extending to quarterly following first year.	APPC and ESMU	Complete records and reports of findings.
Social Impacts	Affected communities	To monitor the positive and negative impacts on local businesses, road infrastructure, local health care facilities, and communities at large.	Conduct correspondence with community outreach groups and request input on positive/negative impacts to local businesses, road infrastructure, local health care facilities and the communities at large. Results of correspondence will be recorded.	Correspondence will be initiated by the ESMP on a quarterly basis throughout the construction stages of work and extending to bi-yearly during operations phase.	APPC and ESMU	Complete records and reports of findings and records/documentation of the necessary action plans conducted in response to any negative impacts identified.

9 STAKEHOLDER ENGAGEMENT

9.1 Introduction

This section presents the Stakeholder Engagement Plan (SEP) for the Mazar IPP. Participation is a process, through which stakeholders influence and share control over development initiatives as well as the decisions and the resources that affect them. The Mazar IPP Project is not expected to have potentially significant adverse impacts on any Affected Communities. This is primarily due to the fact that the nearest villages are approximately 1 km distance from the site and that the Project site is separated from the villages by the larger NFPP industrial complex located immediately north of the Project site. In effect, the NFPP blocks the Project site from visual sight of nearby communities as well as buffering any direct environmental impacts such as noise and dust.

However, regardless of the lack of direct impacts on Affected Communities, the APPC has already initiated informed consultation and participation with the nearest villages, and will establish a grievance mechanism for these nearby communities as one part of the ongoing external communications program. As described in Section 8, the APPC will nominate a Project Outreach Coordinator to undertake the SEP and GM portions of the ESMS, and the ESMU will conduct monitoring and review to ensure that it is undertaken in a meaningful and transparent manner.

The pre-project stakeholder engagement and consultation was initiated by the ESIA team in order establish communications with stakeholders as well as the greater community and social network that surrounds the proposed Project. This stakeholder outreach and involvement will increase the probability of successful implementation of the Project and provide any potentially Affected Communities with a clear and achievable means of voicing concerns and grievances throughout the life of the project. The objectives of the stakeholder engagement include the following:

- Provide a preliminary identification and mapping of key stakeholders of the project, including vulnerable groups (if any), to be updated as the Project evolves.

- Provide a practical framework for the dialogue with stakeholders through the life of the aforementioned Project that is technically and culturally adapted to the local context.
- Ensure that the SEP is underpinned with sufficient resources, supportive institutional structure and adequate processes.

The SEP activities conducted to date on behalf of the Project Proponent were conducted between March and July 2018. The dialogue approach detailed in this SEP has been prepared in compliance with national legislation promulgated by the Afghanistan NEPA and country norms, as well as, IFC PS 1. The SEP is a "living" document that will be updated as the project evolves and the stakeholder landscape is further understood. The APPC Project Outreach Coordinator will have the primary responsibility for enacting and managing the SEP.

The Project description as well as the social context and characteristics of the Affected Communities are detailed in Sections 3 and 4 of the ESIA. This information and context has been used in, 1) providing best available Project information to stakeholders, and, 2) identifying and mapping the social, gender and potentially vulnerable groups that have been incorporated into the SEP.

9.2 Stakeholder Groups

For the purposes of this SEP, stakeholders are defined as:

- Parties which are or can be influenced by the Project (positively and/or negatively).
- Parties showing their interest in the Project.
- Parties which are able to influence the Project.
- Explicit inclusion of women representatives and women's groups

The list of stakeholders and the plan of engagement with various groups will be issued and revised on a regular basis to ensure that the Project Proponent is aware of those who are interested and/or concerned with the Project and, consequently, should be involved in the engagement process. In an effort to ensure inclusion of gender equality and women's participation in the project, specific women's groups and representatives were disaggregated in the SEP for decision making input and input into the grievance redress mechanism. While preparing this SEP, the main groups of stakeholders that were identified are presented in Table 9-1. Due to the nature and scale of the Project and the stakeholder groups identified, a ranking system indicating the degree of interest in and influence over the Project was not deemed useful and all stakeholders were treated as highly interested and influential. Because public notices were posted prior to conducting community focus groups and representatives/leaders of each surrounding community were present at the focus group meetings, no quantitative analysis of sample size and selection was conducted. Additionally, the local officials of each relevant ministry/agency were contacted.

Table 9- 1 Stakeholder Groups

Stakeholder Group	Stakeholders	Impact/Experience
Local Population (Potentially Direct Stakeholders)	Residents of the surrounding villages of Barakha, Posht-e Bagh, Masjed Jamee area of Tohkta, Sahee Rahaeshi area of Kod-e Barq Village	The local residents of the communities nearest to the site have the greatest interest in the Project and are likely to be the most indirectly impacted by the positive and potential negative impacts of the Project.
Women's Groups (Potentially Direct Stakeholders)	Female residents of the Barakha Village comprising a separate focus group consultation	Women will be impacted indirectly by the outcome of the Mazar IPP and are a critical part of the SEP in achieving representative public engagement
Employees of the NFPP/Kod-e Barq (Potentially Direct and Indirect Stakeholders based on location)	Employees of the NFPP	Represent a significant group of local skilled and unskilled laborers who work at the NFPP; outcome of the Mazar IPP may have impact on new employment opportunities
Non-Government Organizations (Indirect Stakeholders)	Danish Committee for Aid to Afghan Refugees (DACAAR) and Bakhtar Development Network (BDN)	Prominent NGOs that are well informed of social and environmental conditions and act as public advocates regarding sustainable development are key stakeholders for knowledge transfer
Local Government Officials (Indirect Stakeholders)	• Dep. of Rural Rehabilitation and Development • Dep. of Disaster Management and Relief • Dep. of Information and Culture • Dep. of Agriculture, Irrigation and Livestock	Officials have a key role in local authorizations during all project phases (design, construction, operation) and act as public representatives and liaisons

	• National Environmental Protection Agency	

9.3 SEP Schedule

Stakeholder engagement will be carried out throughout the Project in stages at key phases in order to disseminate new information on Project details and update stakeholders of timelines and upcoming activities. This initial outreach conducted during preparation of this ESIA is considered Pre-Project/Preliminary and the planned subsequent stages for outreach to all of the identified stakeholder groups are as follows:

- Stage 1: Pre-Project/Preliminary
- Stage 2: Project Approval/Pre-Construction
- Stage 3: Construction Phase
- Stage 4: Pre-Start Up Operation
- Stage 5: Operation Phase

The exact dates for external communications prior to each new phase of the Project have not been determined as no project timeline exists. Therefore the SEP schedule is considered a SEP Framework even though this SEP Plan has been initiated.

The remainder of this section presents the details of the activities and dialogue documented during Stage 1: Pre-Project/Preliminary and establishes the framework of stakeholders and meeting locations for the implementation of the ongoing SEP. The APPC Project Outreach Coordinator will, as a primary duty, enact and document each subsequent stage to explain the rationale and timing for the engagement, the information disseminated, the record of dialogue and/or grievances and resolution/response actions provided.

9.4 Pre-Project/Preliminary Stakeholder Engagement

The following Table 9-2 provides a record of the outreach conducted with the local population, specifically the communities immediately surrounding the site to the northwest, north and northeast in closest proximity to the Project site. The location of these villages in relation to the site is depicted in Figure 4-23. Public notices were posted prior to conducting the meetings and arrangements were made with local leaders (i.e. Imams, school administrators and teachers) in advance in order to maximize attendance and interest. The community consultation meetings were designed specifically to provide project information to the public and solicit feedback. These sessions were informal to encourage a friendly social environment in which participants were comfortable in raising questions, expressing their opinion or opposition, and voicing concerns about the project. The lists of attendees, contact information and photographs of meetings are provided in Annex 9.

Table 9- 2 Outreach with Local Population

Date/Time	Event/Location	Main Points/ Public Comments	Responses/Suggestions
March 26, 2018 14:00-16:00 PM	Community Consultation Meeting: Barakha Village	Concern that all the electricity generated at the proposed plant would be transmitted to the national grid and used up in other parts of Afghanistan without providing adequately for the host community.	The electricity generated by the power plant in Dehdadi District will be evacuated to the National Grid and distributed by the transmission company of Afghanistan. Decisions regarding the distribution of electricity produced are with the Government of Afghanistan/DABS and not within the control of the project.
July 21, 2018 14:00-16:00 PM	Community Consultation Meeting: Posht-e Bagh Village	The power plant will create a lot of job opportunities and many of the people especially young people are jobless in these areas.	The project will utilize appropriately skilled local labor where possible and offer training for some positions. Local leaders will be consulted on screening and selection process.
July 21, 2018 14:00-15:30 PM	Community Consultation Meeting: (Gender Specific) Women of Posht-e Bagh Village	Job opportunities for women should be considered in each phase of the project. Specific empowerment programs should be developed for the benefit of women who are resident in the communities.	The ESIA process has considered gender issues and involving women's groups was part of this. The community development activities will be appropriately designed to reflect the findings of the assessment in this respect. The types of support discussed here will be considered as part of future consultations and to reach agreement on appropriate

			community development activities.
July 22, 2018 08:00-09:30 AM	Community Consultation Meeting: Masjed Jamee of Tohkta Village	During operation stage, the Mazar IPP, Jade Glass Factory, and NFPP together will be affecting the households, crops, agriculture.	A mitigation plan for all identified negative impacts from the Mazar IPP is being generated and will be put in place. The mitigation measures will be made available as public information and community input on these measures is part of the SEP.
July 22, 2018 10:00-12:00 AM	Community Consultation Meeting: (Men and Women) Sahaee Rahaeshi Kod-e Barq Village	Will the gas wells be able to produce enough for running the Mazar IPP or will NFPP production be impacted.	For long-term gas supply to the Mazar IPP, the MoMP is taking measures to ensure that enough gas will be available for all uses.
July 25, 2018 10:30-12:00 AM	Community Consultation Meeting: Barakha Village (2nd Consultation)	During construction stage, all of the households in Barkha village will be affect due to the air pollution, noise, and waste. Also concerns that there could be accidents like gas and electric leakages and fires at the plant considering the extensive use of natural gas and the generation of electricity.	Mitigation measure for air pollution, noise, and waste have been proposed and will be available for public comment. For this project, an ESMP will put in place to prevent pollution impacts during the construction and operation phases. Untreated waste will not be discharged to the environment. There will also be an emergency response plan in place to contain and rapidly respond to such events. The pipeline and electrical line projects are part of a separate ESIA process.

The following Table 9-3 provides detail of the NGOs and local government ministries/agencies that were part of the Pre-Project/Preliminary SEP activities. Meetings with institutional stakeholders including government departments were organized to discuss project interventions and their potential impacts on the local communities and environment. In these meetings, stakeholders were informed about the available details of the Project and location. Institutional stakeholders showed their concerns and gave suggestions/recommendations for the implementation of the project. A summary of the salient topics discussed are listed below:

- Government should fulfill the regulatory requirements of conducting ESIA of proposed project;
- Project shall be done with high quality work and materials;
- Professional company shall be awarded for accomplishing the project;
- Possible damage to flora and fauna particularly at proposed site for power house should be addressed;
- Construction related issues like excavated material, soil erosion and hazards for local communities and labor force should be appropriately addressed during the construction activities;
- Safe transportation of construction material;
- Health and safety measures for labor force; and,
- Rights of employment in Mazar IPP Project for local community;

The record of NGO meetings including participants, contact information and photographs of the events are provided in Annex 9.

Table 9- 3 Outreach with NGOs and Government Agencies

Date	Event/Organization	Main Points/ Comments	Information Provided/ Responses
July 24, 2018	NGO Consultation Meeting: DACAAR Office	Concern that there will be increased social tension in the community due to the anticipated loss of livelihood.	It is anticipated that during the construction and operation phases, positive impacts will be gained by the local community through employment opportunities at the proposed plant. Employment prospects will exist for skilled and unskilled labor. Where possible, appropriately qualified personnel will be drawn from the local community in line with Mazar IPP's employment policies which will meet the requirements of Afghanistan legislation and IFC PS2. Local sources of labor should be utilized where possible.

			There also will be a Project Outreach Coordinator employed to, amongst other things, engage with local communities regarding their needs and opportunities the Project may offer.
July 25, 2018	NGO Consultant Meeting: Bakhtar Development Network (BDN)	All potentially negative long-term effects, especially arising from technical operations of the power plant should be clearly identified.	A mitigation plan for all identified negative impacts will be put in place and made available for comment and input.
March 29, 2018	Government Consultation: Department of Rural Rehabilitation and Development,	No comments	- The potential impacts of Project. - Understanding on the road network in and around the project Site.
March 30, 2018	Government Consultation: Department of Disaster Management and Relief, Rahmatulla Zahid Head of Department	No comments	General discussion on natural disaster repercussions of project and generation of ERP with input from the Department.
April 03, 2018	Government Consultation: Department of Information and Culture, Saleh Mohammad Head of Department	May be historical place around the project site that could be impacted.	Chance find procedure will be in place and implemented. If continuation of the work would endanger a finding, project work shall be suspended until a solution for preservation of the artifacts is agreed upon. The Law on the Protection of Historical and Cultural Properties does not allow any actives which endanger Registered Archaeological Place or building, and this Law is stated in Article 7, 11, 16.

April 03, 2018	NEPA, Ghulam Nabi, Director of NEPA	Protect the area around the project site to minimize impacts to migratory animals and birds and prevent pollution of surface and groundwater. Previous studies exist for environmental and social aspects of project area.	Continuous consultation with NEPA stakeholders is needed throughout Project implementation. The power plant should be built in line with the highest safety standards and pollution control technology in order to meet IFC air quality guidelines.
April 04, 2018	Department of Agriculture, Irrigation & Livestock, Hamayon Hamkar Manager of Agricultural Services	Provided input on broad overview of the agricultural and livestock sector in Dehdadi and information on the crops grown in the area and agricultural practices. Question whether any direct impact on agriculture due to the establishment of the power plant.	Agriculture is the primary mainstay of the district with almost 80% households involved. Main crops include rice, maize, and vegetables. Vegetables are also grown in significant quantity and used for export to other parts of Mazar-e Sharif. The agricultural practices in the region is a mix of both cultivating one's own land as well as sharecropping. Impacts from the project related activities are envisaged to be low on the neighboring area. DAIL's role in collection of secondary data on grazing reserves as well as current and future land use planning in relation to agriculture.

9.5 Grievance Mechanism

The aim of the Grievance Redress Mechanism (GRM) is to receive grievances and ensure adequate response to all complaints and appeals by potential direct and indirect employees as well as stakeholders including the local population affected by the Project. The GRM will consist of two separate tracks, the Employee (direct and indirect) GRM and the Public GRM.

As explained in the ESMP and Contractor Management Plans, the EPC and O&M Contractors will be responsible for generating and instituting Employee Grievance Redress Mechanisms for their employees and subcontractors. These GRM will be explicitly outlined in their individual HR Policies that will be prior-approved by the APPC and ESMU. The Employee GRM will allow all employees the ability to voice concerns over working and labor conditions, health and safety concerns, on-site facilities and services and other issues of concern.

The functional procedures of the Employee GRM will be posted on-site in the local languages and disseminated verbally at health and safety tailboard meetings on an ongoing basis throughout the Project. The APPC and ESMU will periodically monitor the effectiveness of the Contractor GRM through interviews with employees and third parties. Mismanagement of the GRM by Contractors may lead to stop orders, corrective actions or cancelation/delay of payments. To a great extent, there is overlap in the function of the Employee GRM with the environmental and social mitigation and monitoring that will be implemented in accordance with the ESMP, since performance regarding working and labor conditions, health and safety, on-site facilities, etc. will be continually inspected and monitored by the APPC and ESMU.

A separate community GRM will be implemented by the APPC Project Outreach Coordinator, with oversight conducted by the ESMU. This GRM will be established at the Project level by the Project Owner, Ghazanfar Group, Afghan Power Plant Company in order to try to resolve quickly any concerns or grievances related to project development and implementation.

Based on customary socio-political practices, individual grievances are commonly channeled through existing local-level structures consisting of Community Development Councils (CDCs), Shuras and/or village leaders. The significance and authority of these agencies in representing their respective communities/villages will be honored for matters of engagement in the GRM.

The Public GRM will be institutionalized through public notices and outreach to the affected community contact representatives that were identified in the Pre-Project/Preliminary Stakeholder Outreach Community Consultation Meetings. The following individuals (Table 9-4) were informed of project details at these meetings and have agreed to assist the APPC Project Outreach Coordinator in advertising and educating their respective community/village/group on the GRM and its functions.

Table 9- 4 Community Outreach Partners

Barakha Village			
Position	**Name**	**Father's Name**	**Phone Number**
President	Barialai Khan	Abdul Qudos	0792881418
Vice president	Shamuddin	Rahmatulla	0781637380
Members	Mohammad Areif	Mohammad Khan	0797327572
	Khoshdil	Mohammad Khan	0795797743
	Qari Mohammad Zabit	Ewaz Mohammad	0785897929

Posht-I Bagh Village (Men's Group)			
Position	**Name**	**Father's Name**	**Phone Number**
President	Din Mohammad	Haji Mirdad	0782945923
Vice president	Ahmad Tamim	Mohammadulla	0700515609
Members	Abdul Jabar	Mohamad Osman	0700521159
	Haji Hakim	Karim Bay	0789614690
	Habibullah	Shamir Dan qil	0795927481
	Najibullah	Haji Ramazan	0799359550
		Haji Abdul Hakim	0790053541

Posht-I Bagh Village (Women's Group)			
Position	**Name**	**Father's Name**	**Phone Number**
President	Rana	Abdul satar	0798400998
Vice president	Najila	Karim Khan	
Members	Sediqe	Seyed Karim Aqa	
	Shafiqa	Mohammad Yusef	
	Hamida	Seyed Yunis	

Sahaee Rahaeshi, Kod-e Barq Village (Women's Group)			
Position	**Name**	**Father's Name**	**Phone Number**
President	Qutay	Mohammad Nader	0799104565
Vice president	Marina	Abdul Majid	0728544832
Members	Sharifa	Mohammad Ayub	0796210195
	Mina	Hayatullah	0773700507

The procedures that will be established for the Public GRM is as follows:

Grievance Redress Committee:

The Mazar IPP Grievance Redress Committee (GRC) will consist of at least one company official of the Afghan Power Plant Company, one government representative and one NGO representative. The government and NGO representatives will be selected from qualified and willing candidates that are active and engaged at the local/regional level. At all times, at least one of the three representatives will be a female. As needed, each entity or organization will nominate an alternate representative to be active when the primary representative is unavailable.

Public Outreach and Grievance Process:

All local community members or other affected individuals (AIs) have a right to raise formal complaint to the Grievance Redress Committee, either in writing or verbally (according to the Afghan Central Statistics Organization 48% of the population of Dehdadi District aged >10 are illiterate). In some cases it is expected that complaints will be channeled through either local CDCs, Shuras or the community outreach partners documented in Table 9-4. The AI (or his/her representative) may submit a complaint in a number of ways, that will be publicly advertised and will consist of a phone number, email address and a physical address for a drop box or delivery. Alternatively, complaints may be raised during stakeholder engagement meetings, outreach sessions, or directly to APPC officials or representatives after which they will be documented for record.

The GRM procedures to be followed, as well as, the phone, email and physical address for submitting formal grievances will be translated and published in Pashto and Dari so that they are easily accessible to all stakeholders and made available both on-site and through community outreach partners via the APPC Project Outreach Coordinator. Information on the steps to be followed in handling grievances will be incorporated into the ongoing stakeholder engagement process of providing local communities with information about the Project at each stage as follows (exact dates to be determined):

- Stage 1: Pre-Project/Preliminary (Completed)
- Stage 2: Project Approval/Pre-Construction
- Stage 3: Construction Phase

- Stage 4: Pre-Start Up Operation
- Stage 5: Operation Phase

Review and Resolution of Grievances:

The GRC will meet to try and resolve the matter at the individual or community level and make a response of acknowledgement within 7-10 working days from receipt of complaint. Mitigation and/or rectification will be accomplished within no later than 20 days of the complaint. If an extension is required to conduct mitigation and/or rectification due to the nature or scale of the issue, a response from the GRC will be issued to the AI or community with explanation of the activities that will be conducted in response to the complaint and an expected time frame for completion.

Information Management:

All submitted complaints and grievances will be added to a database/project file that will be updated and kept current by the APPC Project Outreach Coordinator. The status of grievances submitted and grievance redress will be reported to the APPC CEO through the monthly status reports. The ongoing record of the GRM will include the following information:

- Issue and date received
- Contact details and address of AI and his/her representative if applicable
- GRC response date and record of mitigation/rectification dates and actions
- Feedback (Acceptance/Non-acceptance) response from the AI
- Closing date of the issue

Finally, the ESMU will conduct a secondary layer of monitoring over the GRM. This will ensure that the APPC is successful and transparent in its communications and redress with the affected communities and will provide the APPC CEO with advance notice of any underlying community dissent prior to fomenting cause for concern.

PART III

ANNEXES

Table of Contents

Annex 1. APPC Human Resources Policy

../../10OCT files/Ghazanfar Group Human Resources Manual- Final.pdf

Annex 2. APPC Security Management Plan

Confidential – Included as separate deliverable

Annex 3. APPC Environmental & Social Management Policy

A.P.P

AFGHAN POWER PLANT COMPANY

Add: Baihaqi Street Burj Ghazanfar, Mazar-E-Sharif, Afghanistan
Phone: +93 799 505 505

شرکت افغان پاور پلنت

Policy on Environmental and Social Management

The purpose of this Environmental and Social Management Policy (the E&SM Policy) is to convey the corporate commitment to sustainable development, corporate social responsibility and risk management. The E&SM Policy is the cornerstone of the Environmental and Social Management System (ESMS), which includes not only the written policy and procedures but also the commitment to retain employees dedicated to following these procedures and to undertake continual improvement of the management system.

Management Statement to all Employees of our Afghan Power Plant Company:

Our vision for the Afghan Power Plant Company is to become one of the most respected and admired companies in Afghanistan. We aspire to conduct ourselves in an ethical and responsible manner. Corporate social responsibility, which spans environmental, human rights, labor and social issues, is a growing concern to investors, consumers and to all of us as people. To integrate corporate social responsibility into our day-to-day business activities, we are developing and implementing an environmental and social management system (ESMS). A management system involves trained, committed employees routinely following procedures and continually improving. I ask for your full cooperation in this important initiative. We believe that corporate social responsibility must be a foundation of our long-term growth and profitability. As we strive to successfully implement our ESMS, we will train and involve you throughout the process.

Signature of CEO: MMehta

Print Name: Mr. Mahender Mehta – CEO Afghan Power Plant Company

Date: 23rd October, 2018

A.P.P
AFGHAN POWER PLANT COMPANY
Add: Baihaqi Street Burj Ghazanfar, Mazar-E-Sharif, Afghanistan
Phone: +93 799 505 505
شرکت افغان پاور پلنت

Policy Statement

The management of the Afghan Power Plant Company are committed to conducting business activities in an ethical and responsible manner. Furthermore, it is our responsibility to comply with International Performance Standards, EHS Guidelines, ESIA/ESMP, local laws and regulations, and permits and standards. We commit to ensuring that any contractor providing services of any kind duly follows these requirements throughout the duration of the contract, including any activity or services performed by subcontractors or third parties undertaking a contract from the contractor.

The Afghan Power Plant Company believes that avoidance, minimization and management of environmental, social and health and safety risks and impacts is not only sound business practice, but when correctly implemented, can reduce waste, improve profitability and generate good will and positive benefits in the communities where we operate.

The Afghan Power Plant Company is committed to the following practices and goals:

Good industrial practice and resource efficiency strategies to minimize waste and pollution resulting from its business activities. When combined with continuous improvement programs, this approach can also result in more efficient production and increased profitability. The Afghan Power Plant Company requires its contractors and subcontractors to follow industry sector guidelines as benchmarks for good industry practice and to design, implement and operate their activities accordingly.

Protection, conservation, management and sustainable use of biodiversity, natural resources and ecosystem services. The Afghan Power Plant Company seeks to ensure that its operations include measures to safeguard critical habitats and to protect, and where feasible, enhance natural habitats, as well as the biodiversity and corresponding ecosystem services they support.

Social safeguards met through robust public consultation, outreach and communication to affected communities, implementation of grievance redress mechanisms, good labor relations and practices, including a worker grievance redress mechanism, guided by the core International Labor Organization (ILO) Conventions and other ILO standards. The Afghan Power Plant Company is also fully committed to maintaining good working conditions and health and safety practices and standards in accordance with the Afghan Labor Law and IFC PS 2 (Labor and Working Conditions).

Specific codes of conduct for employees and contractors included in or alongside the HR policy to address child labor, forced labor, nondiscrimination and equal opportunity, migrant workers, workers' organizations and nonemployee workers. The Afghan Power Plant Company is fully committed to gender equality, including the avoidance of gender based exclusion, sexual exploitation and assault (SEA) and gender based violence (GBV) in the workplace and communities in which we conduct business.

Participation and inclusion of persons with disabilities if meeting job requirements, including access to the physical environment, equality of opportunity in employment for persons with disabilities, and adherence to the principles of the UN Convention on the Rights of Persons with Disabilities subject to compliance of job description.

Preservation of Cultural heritage, natural habitats and cultural sites. The Afghan Power Plant Company believes in fair compensation and livelihood restoration of any persons or groups physically displaced or restricted from their household, community or livelihood in accordance with international laws (Land Acquisition and Involuntary Resettlement).
Through its environmental and social management system (ESMS) the Afghan Power Plant Company is responsible for implementing this policy and assuring that all business activities undertaken by the company are in compliance with it. In order to achieve these goals the Afghan Power Plant Company will retain E&S personnel required to be on staff and on-site—including those responsible for HR; worker health and safety; worker grievances; environmental management; community health; safety and security; worker accommodation; site security; and emergency response.

Staffing practices will include induction and training programs for E&S and other personnel, including training on applicable HR policy provisions, grievance mechanisms, health and safety, code of conduct, materials management, and environmental protection. In addition, monitoring will be conducted with an eye on continual improvement and adaptive management. Our Management will review available information, records, and documentation related to the environmental and social risks and impacts in order to identify lessons learned and to continually improve our environmental and social performance.

Signature of CEO: Mehta

Print Name: Mr. Mahender Mehta – CEO Afghan Power Plant Company

Date: 23rd October, 2018

Annex 4. Waste Management Plan - Guide

The EPC and O&M Contractors will be required to generate independent Waste Management Plans for the project that will be reviewed, commented upon and ultimately approved by the ACCP Project & Technical Manager prior to commencing work at the site. The purpose of this Management Plan Guide is to provide a broad overview of the risks presented by the generation and handling of construction spoils and waste during construction and operation. The Contractor Waste Management Plans will require additional detail and specific mitigation measures to allow for the environmentally sound management of all waste streams expected to be encountered or generated during the Contractor's specific work activities.

Particular risks to be avoided and managed during construction include the following.

- Pollution of the ground and groundwater if hazardous liquids such as used oils and cement/ wet concrete are not properly stored and disposed.
- Increased pollution of groundwater and surface waters, windblown litter, smoke from fires and potential health impacts to nearby residents to the waste disposal sites due to increased amounts of waste deposited.
- Fugitive dust arising from the handling and storage of excavated spoil, concrete batching, rubble, and other inert construction wastes.

The responsibility for minimizing the impacts associated with construction spoil handling and waste management will rest primarily with the contractor(s) responsible for the construction and installation of equipment.

Construction Spoils and Dust Management

By far the largest quantity of waste arising during construction will be spoil generated from the excavation of the terraces to create level platforms for the installation of the major items of plant and equipment. The spoil which is excavated in creating the platforms will, wherever possible, be re-profiled around the site or re-used for landscaping. The surplus of excavated material will be disposed offsite.

The objective of the Construction Spoils and Dust Management Plan will be that as little spoil as possible should be disposed off site. The spoil which is excavated in creating the platforms will, wherever feasible, be re-profiled around the site or re-used for landscaping.

Waste Management

During construction and operation, the overall objective is to minimize the impacts of waste generated through the following:

- minimize the amount of waste that is generated;
- maximize the amount of waste that is recovered for recycling - including segregation of recyclable wastes at source;
- minimize the amount of waste that is deposited at landfill;
- ensure any hazardous wastes (e.g. used oils, lead-acid batteries) are securely stored and transferred to appropriate facilities;
- avoid dust impacts from handling of construction wastes;
- ensure all wastes are properly contained, labelled and disposed of in accordance with local regulations; and
- waste is disposed of in accordance with the waste management hierarchy.

The internationally recognized and accepted hierarchy of waste management is illustrated in Figure Annex 4-1.

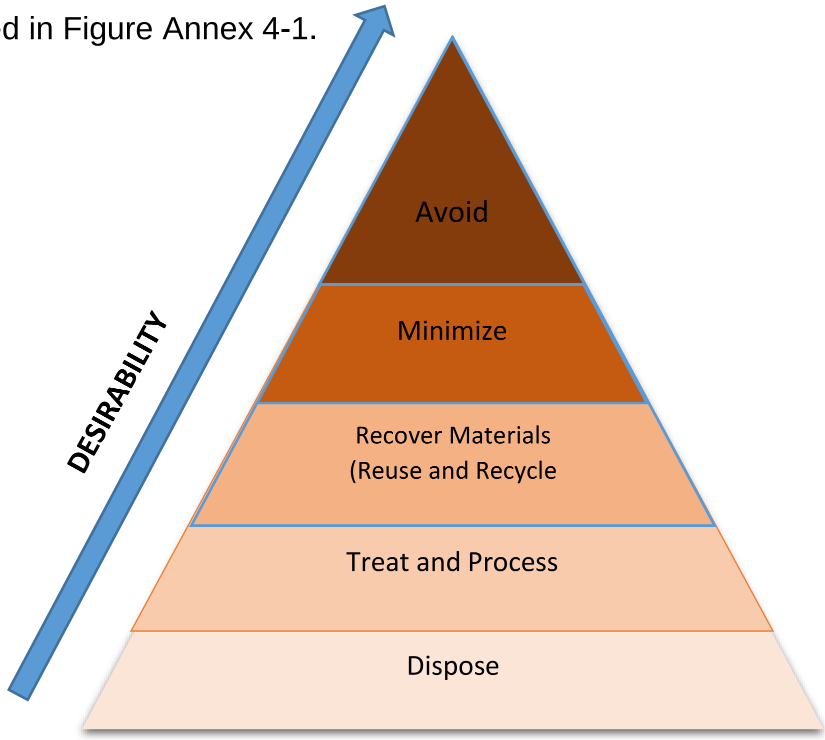


Figure Annex 4-1 Waste Management Hierarchy

Content

The contractor(s) will incorporate into the construction program the following "good site practices" which will reduce the risk of impacts arising from waste management activities. The contractor(s) will produce a waste management plan that will cover the following key aspects:

- develop inventory and schedule of likely wastes;
- assessment of local waste management facilities;
- waste minimization principles;
- maximize reuse /recycle opportunities;
- waste segregation (liquid and solid/reusable and recyclable);
- waste collection, storage and transfer;
- specific disposal procedures for all waste steams identified including waste transfer notes if moved to an offsite licensed facility;
- auditing and reporting procedures; and
- closure process which will include appropriate monitoring and recording.

Table Annex 4-1. Construction Spoil and Waste Management Plan

#	Issue	Mitigating/Monitoring Activity	Responsibility	Timing
1	Construction Spoil – Handling and Storage	• Where possible align windrows with the prevailing wind to minimize surface area exposed to wind erosion. • Keep stockpiles to a minimum practicable height and use gentle slopes. • Minimize the storage time of stockpiles. • Minimize the height and fall of materials during handling.	Contractor	Implemented during construction.
2	Construction Spoil – Transport	• Ensure that all dust generating materials transported to and from the construction works are covered by sheeting. • Clean wheels of vehicles leaving the work sites so that dirt and mud is not spread on surrounding roads. • Ensure that exhausts do not discharge directly at the ground	Contractor	Implemented during construction.
3	Dust prevention – Haul Routes	• Locate haul routes away from sensitive sites if possible. • Pave heavily used areas, or use geotextiles e.g. around batching plant or haul routes. Sweep these regularly. • Pave access roads to the construction site. • Reduce the width of haul roads (while still allowing two-way traffic) to minimize surface area from which dust may be produced. • Sweep paved access roads (while still allowing two-way traffic) and public roads when necessary.	Contractor	Implemented during construction.

		• Limit vehicles speeds – the slower the vehicles the less dust generated.		
4	Dust prevention – Concrete batching and pouring	• Mix large quantities of concrete or bentonite slurries in enclosed/shielded areas. • Before concrete pours, vacuum dirt out of formwork rather than blowing it out. • Keep large concrete pours clean after they have gone off. They can generate large quantities of dust.	Contractor	Implemented during construction.
5	Dust prevention – cutting/grinding/ grouting /packing	• Minimize cutting and grinding on site. • On cutters and saws, use equipment and techniques such as dust extraction to minimize dust. Consider a wet cutting saw or use vacuum extraction	Contractor	Implemented during construction.
6	Hazardous Waste Management.	• Hazardous wastes, such as batteries and fluorescent lights, will be collected, stored safely and then transported to an appropriate facility. • Waste oil generated at the construction sites will be collected and stored on site in sealed drums before being transported to an approved disposal facility. • All storage areas for hazardous substances will be hard surfaced with a secondary containment system in place.	Contractor	Implemented during construction.
7	Solid Waste Management	For all construction works the following procedures will be applied to solid waste management:	Contractor	Implemented during construction.

		• All waste will be collected and segregated for reuse, recycling or disposal. • Waste will be disposed of at a licensed site by an authorized disposal contractor, where they are located within a reasonable distance of the site. • Records of all waste stored, disposed of and transported shall be kept. • Other wastes (e.g. chemicals, oils, etc.) will be segregated and stored for transport to recycling or disposal facilities. • The Project will require contractors to take reasonable measures to dispose/recycle/transport wastes in a manner consistent with law and good environmental practice.		
8	Segregation of Solid Wastes	• Solid wastes will be segregated at source. • The Project will separate recyclable waste where possible. • Recyclable solid waste (plastic PET bottles, tin cans, aluminum cans and cardboard) should be compacted where possible for storage prior to removal. • Waste shipment request forms will be completed and used for monitoring waste streams and volumes removed from the construction site.	Contractor	Implemented during construction.
9	Waste Transport	Waste will be securely transported from the point of arising to storage facilities and from there to treatment or disposal facilities	Contractor	Implemented during construction.

		so as to avoid spillages, windblown litter and other potential environmental problems by applying the following precautions: • The nature, composition and integrity of transport packaging and containers will be appropriate to the type and class of waste being transported. • Transport vehicles will be appropriate for the type, class and quantity of waste being transported in terms of its composition, load capacity, covering etc. • Loading and unloading procedures to avoid waste loss will be followed. • Employees will be trained in the correct procedure to address accidents and emergencies. • All transport vehicles will be equipped with suitable materials or equipment to contain, manage and remove accidental spillages. • Vehicles carrying hazardous wastes shall be labelled appropriately. If a hazardous waste is mixed with nonhazardous waste, the entire consignment will be regarded as hazardous. • A waste transfer note (WTN) system will be employed to provide evidence that all loads of hazardous waste have been taken to an approved treatment or disposal site.		

Annex 5. Health and Safety Plan - Guide

The EPC and O&M Contractors will be required to generate independent Health and Safety Plans for the project that will be reviewed, commented upon and ultimately approved by the ACCP Project & Technical Manager prior to commencing work at the site. The Contractor Health and Safety Plans will require additional detail and specific mitigation measures to allow for the management of Emergency Response, Spill Prevention, Control and Countermeasures, as well as, Traffic Management on and around the site. These Health and Safety Plans will be a critical requirement for each Contractor/Operator working on-site. The following guidelines[1] are designed to provide a sound, flexible framework for Project Contractors, Operators and the ACCP and ESMU in addressing and managing safety and health issues across diverse activities throughout the life of the project.

Regulatory Authority

The Afghanistan Ministry of Justice generated the Labor Law of Afghanistan that was adopted by GoIRA in February 2007. This law has been enacted by Presidential Decree No. 94, in accordance with Article 48 of the Constitution of Afghanistan to regulate and clarify the obligations, rights, privileges and social security of employees. Based on Chapter 10 of the Labor Law, employers are charged with providing continuous training to employees on work place safety and must provide medical service free of charge to employees injured on the job. Employers are also required to make provisions at no cost to the employee to ensure work place safety and health, as described in Article 112.1 and 2:

- Where the work carried out is under conditions harmful to health or under special temperature or refrigeration or where there is the likelihood of contamination of employees, special clothes and footwear, masks, eye glasses, gloves and other protective devices as well as preventive and curative foods will be put at the disposal of employees free of charge.
- The organization is responsible for supplying, maintenance, cleaning, sterilisation, drying and repair of special working clothes and other protective devices.

[1] These guidelines draw from the framework provided in the U.S. OSHA Safety and Health Program Management Guidelines

In addition, the IFC Performance Standard 2, Occupational Safety and Health standards require the application of good international industry practice (GIIP) to assess risk and potential hazards to workers, provide preventative and protective measures, training, monitoring and reporting, emergency preparedness and response procedures.

Management is a crucial element of good OHS practices. Management provides the leadership, vision, and resources needed to implement an effective safety and health program. Management leadership means that the leaders within contracting and operations firms, as well as, ACCP and ESMU managers will drive the OHS Program from the top down, ensuring that adequate time and attention is given to proper health and safety activities. The Project Owner, Ghazanfar Group, Afghan Power Plant Company has started this effort by generating a corporate Health and Safety Policy Statement that is provided below.

غضنفر گروپ
GHAZANFAR GROUP

Health and Safety Policy Statement

The Management of the Ghazanfar Group and the Afghan Power Plant Company is committed to the health and safety of its employees and for all who are involved in our projects. Protection of employees from injury or occupational disease is a major continuing objective. We are committed to Kaizen activities toward an accident-free workplace through effective administration, education and training.

Our philosophy is that the well-being of our company and clients is dependent on the health and safety or our workforce. The Management, Directors and Officers of this corporation promise that every precaution, reasonable in all circumstances, will be taken for the protection of all workers. No job is to be regarded so urgent that time cannot be taken to do it in a safe manner. The welfare of the individual is our greatest concern.

Supervisors will be responsible for the health and safety of workers of respective departments. Supervisors are also responsible to ensure that machinery and equipment required for use by each worker are safe and that each worker works in compliance with established safe work practices and procedures for each piece of equipment. Workers must receive adequate training in their specific work tasks to protect their health and safety. We strive for preventive maintenance rather than breakdown maintenance

We recognize that a safe work environment can be established and sustained only through a united effort by all employees and subcontractors and that the assistance of each person is required. Your attitude and cooperation in promoting accident prevention will assist in achieving our goal: "no one gets hurt", and make our company the best place to work, one where employees share in corporate growth and success.

I, Mr. Ismail Ghazanfar, Chief Executive Officer (CEO) of the Ghazanfar Group give my personal promise to ensure a safe workplace for all parties. I realize that all workers have the right to work in a safe and healthy work environment.

Signature of CEO: ________

Print Name: Mr. Ismail Ghazanfar

Date: July 21, 2018

Senior Management Representative: Mehta
Print Name: Mahender Mehta - CEO - Afghan Power Plant
Date: July 21, 2018

Tel: +93 (0) 502040745
Fax: +93 (0) 502003426
P.O.Box: 26-27
Jada Baihaqi, Burj Ghazanfar
Mazar-e-sharif, Afghanistan
E-mail: info@ghazanfargroup.com
web: www.ghazanfargroup.com

Action items that should be taken by the managers of contracting and operating firms as they design and generate their Health and Safety Plans and programs include:

- Communicate your commitment to the health and safety program
- Define your program's goals and expectations
- Allocate the necessary resources
- Expect employee performance
- Encourage workers to report safety and health concerns and issues
- Give workers access to the health and safety information they need to stay safe

Hazard Identification and Assessment

Assessing hazards in order to fix them is a core element of any effective safety and health program. Failure to identify or recognize hazards is frequently one of the "root causes" of workplace injuries, illnesses, and incidents. In order to identify and document effective mitigation measures, the IFC General Environmental, Health, and Safety General Guidelines[2] should be consulted and referenced by Contractors and Operators in their Health and Safety Plans.

Hazard identification and assessment means that you:

- Collect and review information about the hazards likely to be present in the workplace;
- Periodically inspect the workplace to identify new or recurring hazards;
- Investigate injuries, illnesses, incidents, and close calls/near misses to identify the under- lying hazards;
- Identify and address any trends in injuries, illnesses, and hazard reports;
- Consider hazards associated with emergency or non-routine situations; and,
- Determine the severity and likelihood of incidents that could result from each hazard identified and use this information to prioritize corrective actions. Note, however, that employers have an ongoing obligation to control serious, recognized hazards.

[2] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

Hazard Prevention and Control

Your Health and Safety Plan should describe the steps you will take to prevent and control the hazards you have identified. An effective plan will address serious hazards first. Interim controls may be necessary, but the overall goal is to ensure effective long-term hazard control. Track your progress towards completing your control plan and periodically verify that controls remain effective. Hazard prevention also incorporates non-routine operations, emergencies and accidents. In order to account for such scenarios the following steps are useful:

- Develop procedures to control hazards that may arise during non-routine operations;
- Develop or modify plans to control hazards that may arise in emergency situations;
- Procure any equipment needed to control emergency-related hazards;
- Determine in advance (and train) staff who will be responsible for implementing the emergency plan; and,
- Conduct emergency drills to ensure that procedures and equipment provide adequate protection during emergency situations.

Education and Training

Education and training means that employers, managers, supervisors, and workers have the knowledge and skills needed to work safely and avoid creating hazards that could place themselves or others at risk. This can include specialized training for individuals taking part in or overseeing special tasks that carry unique hazards. Two of the most important parts of training are that workers are instructed on their specific roles within the safety and health program and on how they should carry out those responsibilities. Following training, it is important to provide opportunities for workers to ask questions and offer feedback to ensure that the information is well understood and clear.

Training should be both regular and ongoing. Daily health and safety briefings should start the day by explaining activities planned and the health and safety issues that need to be managed per task. Ongoing refresher training for specific tasks can occur weekly, monthly or quarterly to make sure that specialized tasks are covered for specialized employees. Additional training should be provided as necessary when a worker is assigned a new task or given a new assignment.

Program Evaluation and Improvement

Periodically step back and evaluate what works and what does not, and whether you are on track to achieve your program goals. Evaluate the program initially to verify that it has been implemented as intended and on a regular basis once it is established. Whenever you identify opportunities to improve the program, make adjustments, and monitor how well it performs as a result. Share the results of your monitoring and evaluation within the workplace to help drive further improvement. Program evaluation and improvement means that you:

- Establish, report, and track metrics that indicate whether the program is effective; and,
- Evaluate the overall program, initially and periodically, to identify deficiencies and opportunities for improvement.

Coordination on Multi-Employer Worksites

During the Project, it will be typical for workers of more than one employer to work alongside or interact with each other. Typically, some workers are employed by a host employer (which may be an owner or general contractor) and others by a contractor or subcontractor. In these settings, employers must establish mechanisms to coordinate their efforts and communicate information to ensure that all workers on site and their representatives can participate in efforts to prevent and control injuries and illnesses, and that workers are afforded equal protection against hazards.

In a multi-employer work environment, the host employer and the contractor or subcontractor commit to a program that will provide the same level of safety and health protection to temporary and contract workers as to permanent workers. Before the start of any on-site work, the contractor, subcontractor and independent contractor should establish their respective safety and health responsibilities and obligations, as well as procedures for coordinating these responsibilities and communicating safety and health information.

Special Risks Assessment

The construction, operation and maintenance of a gas-fired power plant will present special risks that are not normally associated with other types of construction or facility management. These special risks must be identified early so that they can be incorporated into the activity hazard analyses and health and safety plans generated to manage OHS. The IFC Environmental, Health, and Safety Guidelines for Thermal Power Plants describes special hazards and measures to control those risks.

Non-Ionizing Radiation

Combustion facility workers may have a higher exposure to electric and magnetic fields (EMF) than the general public due to working in proximity to electric power generators, equipment, and connecting high-voltage transmission lines. Occupational EMF exposure should be prevented or minimized through the preparation and implementation of an EMF safety program including the following components:

- Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities;

- Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers;

- Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE). Personal exposure monitoring equipment should be set to warn of exposure levels that are below occupational exposure reference levels (e.g., 50 percent). Action plans to address occupational exposure may include limiting exposure time through work rotation, increasing the distance between the source and the worker, when feasible, or the use of shielding materials.

Heat

Occupational heat exposure should be prevented or minimized through the preparation and implementation of a heat safety program including the following components:

- Regular inspection and maintenance of pressure vessels and piping;
- Provision of adequate ventilation in work areas to reduce heat and humidity;
- Reducing the time required for work in elevated temperature environments and ensuring access to drinking water;
- Shielding surfaces where workers come in close contact with hot equipment, including generating equipment, pipes, etc.; and,
- Use of warning signs near high temperature surfaces and personal protective equipment (PPE) as appropriate, including insulated gloves and shoes.

Noise

Noise sources in combustion facilities include engines; fans and ductwork; pumps; compressors; condensers; precipitators, including rappers and plate vibrators; piping and valves; motors; transformers; circuit breakers; and cooling towers. Recommendations to prevent, minimize, and control occupational noise exposures in thermal power plants include:

- Provision of sound-insulated control rooms with noise levels below 60 dBA;
- Design of generators to meet applicable occupational noise levels; and,
- Identification and mark-out of high noise areas and requirements that personal noise protecting gear is used all the time when working in such high noise areas (typically areas with noise levels >85 dBA).

Confined Spaces

A confined space is defined as a wholly or partially enclosed space not designed or intended for human occupancy and in which a hazardous atmosphere could develop as a result of the contents, location or construction of the confined space or due to work done in or around the confined space. A “permit-required” confined space is one that also contains physical or atmospheric hazards that could trap or engulf the person.

Confined spaces can occur in enclosed or open structures or locations. Serious injury or fatality can result from inadequate preparation to enter a confined space or in attempting a rescue from a confined space. Recommended management approaches include:

- Engineering measures should be implemented to eliminate, to the degree feasible, the existence and adverse character of confined spaces.

- Permit-required confined spaces should be provided with permanent safety measures for venting, monitoring, and rescue operations, to the extent possible. The area adjoining an access to a confined space should provide ample room for emergency and rescue operations.
- Access hatches should accommodate 90% of the worker population with adjustments for tools and protective clothing. The most current ISO and EN standards should be consulted for design specifications.

Prior to entry into a permit-required confined space:

- Process or feed lines into the space should be disconnected or drained, and blanked and locked-out.
- Mechanical equipment in the space should be disconnected, de-energized, locked-out, and braced, as appropriate.
- The atmosphere within the confined space should be tested to assure the oxygen content is between 19.5 percent and 23 percent, and that the presence of any flammable gas or vapor does not exceed 25 percent of its respective Lower Explosive Limit (LEL).
- If the atmospheric conditions are not met, the confined space should be ventilated until the target safe atmosphere is achieved, or entry is only to be undertaken with appropriate and additional PPE.

In addition:

- Safety precautions should include Self Contained Breathing Apparatus (SCBA), life lines, and safety watch workers stationed outside the confined space, with rescue and first aid equipment readily available.
- Before workers are required to enter a permit-required confined space, adequate and appropriate training in confined space hazard control, atmospheric testing, use of the necessary PPE, as well as the serviceability and integrity of the PPE should be verified. Further, adequate and appropriate rescue and / or recovery plans and equipment should be in place before the worker enters the confined space.

Electrical Hazards

Energized equipment and power lines can pose electrical hazards for workers at thermal power plants. Recommended measures to prevent, minimize, and control electrical hazards at thermal power plants include:

- Consider installation of hazard warning lights inside electrical equipment enclosures to warn of inadvertent energization;

- Use of voltage sensors prior to and during workers' entrance into enclosures containing electrical components;
- Deactivation and proper grounding of live power equipment and distribution lines according to applicable legislation and guidelines whenever possible before work is performed on or proximal to them; and,
- Provision of specialized electrical safety training to those workers working with or around exposed components of electric circuits. This training should include, but not be limited to, training in basic electrical theory, proper safe work procedures, hazard awareness and identification, proper use of PPE, proper lockout/tagout procedures, first aid including CPR, and proper rescue procedures. Provisions should be made for periodic retraining as necessary.

Fire and Explosion Hazards

Thermal power plants store, transfer, and use large quantities of fuels; therefore, careful handling is necessary to mitigate fire and explosion risks. Fire and explosion prevention management guidance is provided in Section 2.1 and 2.4 of the General EHS Guidelines. Recommended measures to prevent, minimize, and control physical hazards at thermal power plants include:

- Use of automated combustion and safety controls;
- Proper maintenance of engine safety controls;
- Implementation of startup and shutdown procedures;
- Regular cleaning of the facility to prevent accumulation of dust (e.g., on floors, ledges, beams, and equipment); and,
- Use of automated systems such as temperature gauges or carbon monoxide sensors to survey fuel storage areas to detect fires caused by self-ignition and to identify risk points.

Plan Template

Each guideline below in Table 2 describes one element of the program followed by several action items. Each action item lists examples of steps that employers and workers can take to establish, implement, maintain, and improve their safety and health programs. While the action items are specific, they are not prescriptive. There may be several ways to implement each core element and action item. Your safety and health program can and should evolve. Experimentation, evaluation, and program changes are all part of the process.

Table Annex 5- 2. Health and Safety Management Plan Guide.

#	Issue	Mitigating/Monitoring Activity	Responsibility	Timing
1	EHS Management	Occupational health and safety during construction will be managed under an EHS Management System. This involves the following: ▪ compliance with international standards for good construction practices; ▪ adherence to international guidance and codes of practice on EHS management during construction; ▪ management, supervision, monitoring and record-keeping as set out in the project's EHS Management System and associated Contractor's Construction Environmental Control Plan; ▪ implementation of EHS procedures as a condition of contract with the Contractor and its sub-contractors; ▪ clear definition of EHS roles and responsibilities of the companies involved in construction, and their individual staff (including the nomination of EHS supervisors); ▪ pre-construction assessment of the EHS risks and hazards associated with construction, including consideration of local cultural attitudes, education level of workforce and local work practices;	Contractor	Developed during Project planning, implemented during construction.

		▪ provision of appropriate training on EHS issues for all construction workers, including initial induction and regular refresher training, taking into account local cultural issues; ▪ provision of health and safety information; ▪ regular inspection, review and recording of EHS performance; and ▪ maintenance of a high standard of housekeeping at all times.		
2	Supervision	It is a requirement of the Contractor that HSE responsibilities and accountabilities are defined in individual job descriptions at all levels of the organization.	Contractor	Developed during Project planning, implemented during construction.
3	Supervision	HSE Manager will be responsible for assisting their Team Leaders in implementation of the HSE management system and in auditing and remedial actions. Each employee and contractor will be required to be individually responsible for taking reasonable care of the environment, their own health and safety and that of others.	Contractor	During construction.
4	Supervision	Contractors will be selected on the basis that they are competent to perform the work and that their HSE management systems are compatible with International best practice. The Contractor and suppliers will be assessed during the contract	Client	During procurement.

		evaluation process to demonstrate that these requirements are met.		
5	Personnel	A system will be established for selection and placement of qualified personnel to meet specific job requirements. Recruitment policies and procedures will include consideration of personal competencies and capabilities required to carry out the HSE functions of the job through the following deliverables: ▪ individual Roles and Responsibilities Statements will be required from HSE contractor to define the HSE scope and required competencies of each position including accountabilities, main HSE tasks and hazards and relevant site specific HSE requirements; ▪ Routine and Annual Appraisals will need to take into account applicable standards, the nature of operations and local circumstances to determine level of competence required for each position in terms of HSE related knowledge, experience and requirements; and ▪ HSE training needs should be identified for all employees at all levels.	Contractor	Developed during Project planning, implemented during construction.
6	Staffing	The Contractor will ensure that recruiting plan provides sufficient numbers of competent staff for the facility.	Contractor	Developed during Project planning, implemented during construction.

7	Training	The Contractor will develop a training program. Recruits will be trained and continuously monitored against agreed standards. This will be a key strategy in enhancing safety and environmental protection.	Contractor	Developed during Project planning, implemented during construction.
8	Competence	Key considerations of the Contractor in assessing competence will be based around safety and environmental factors including workplace risk assessment and hazard identification training, permit to work process, exposure to hazardous substances and chemicals, spill and accident reporting and waste management procedures.	Contractor	Developed during Project planning, implemented during construction.
9	Training	The Contractor will educate and train employees to conduct their activities in a safe and responsible manner.	Contractor	Developed during Project planning, implemented during construction.
10	H&S awareness	The Contractor will promote the Health and Safety awareness of employees, suppliers and contractors.	Contractor	Developed during Project planning, implemented during construction.
11	Workers risk	Workers will be subject to a risk assessment and then health monitoring if appropriate.	Contractor	Developed during Project planning, implemented during construction.
12	Emergency	First aid will be provided on site. Employees should have access to fully equipped medical facilities, access to a doctor and	Contractor	Developed during Project planning, implemented during construction.

		paramedics if necessary. Emergency response plans will be in place for large scale events.		
13	Accident Frequency and Severity	Procedures will be implemented for the investigation and reporting of accidents and incidents in accordance with the HSE standards. Records will be maintained and reported on a periodic basis. Appropriate action will be taken to minimize recurrence of such events.	Contractor	Developed during Project planning, implemented during construction.
14	Accident investigation	Each accident or incident will be investigated, classified to determine the potential effect and appropriate remedial actions established. Implementation of remedial actions will be monitored.	Contractor	During construction.
15	Accident record	Accidents and incidents will be classified according to their severity and frequency of occurrence. Records will be kept of all accidents and incidents as well as all reported near misses.	Contractor	During construction.
16	Road Related Accidents.	Hazards to personnel associated with vehicle transportation, both on- and off-road, may present a risk to safety. Accordingly, the Contractor shall be expected to develop and implement management systems and procedures that will provide the highest level of control over these hazards.	Contractor	
17	HSE management of temporary work sites	Design and layout of all work sites will be reviewed from HSE perspective.	Contractor	Transport hazards

	Transport hazards	▪ Suitable infrastructure for transporting personnel, materials and equipment will be provided. ▪ Assessment will be made of the transport risks associated with the delivery of materials and transport of staff.	Contractor	Developed during Project planning, implemented during construction.
18	Environmental conditions e.g. extreme temperatures, inside and outside buildings	Exposure of the workforce to extreme climatic conditions shall be managed through the following: ▪ Providing advice. ▪ Monitoring of personnel. ▪ Provision of potable water. ▪ Suitable clothing. ▪ Sun screen if required.	Contractor	Developed during Project planning, implemented during construction.
19	Noise	Exposure of the workforce to sources of noise shall be managed through the following: ▪ Selection of equipment. ▪ Maintenance of equipment. ▪ Training for personnel.	Contractor	Developed during Project planning, implemented during construction.
20	Vibration	Exposure of the workforce to sources of vibration shall be managed through the following: ▪ Selection of equipment. ▪ Maintenance of equipment. ▪ PPE. ▪ Training for personnel.	Contractor	Developed during Project planning, implemented during construction.

21	Injury from materials and equipment	Injury of the workforce from handling materials and equipment shall be prevented through the following: ▪ Suitable equipment which is tested and maintained. ▪ Work Plans. ▪ PPE.	Contractor	Developed during Project planning, implemented during construction.
22	Slips, trips, falls	Injury of the workforce from accidental slips, trips and falls shall be prevented through the following: ▪ Proper site set up. ▪ Housekeeping. ▪ PPE. ▪ Site walk rounds.	Contractor	Developed during Project planning, implemented during construction.
23	Flora and fauna	Injury of the workforce from exposure to hazardous flora and fauna shall be prevented through the following: ▪ Identification of flora and fauna that could pose a hazard to personnel. ▪ Advice to personnel. ▪ PPE if required.	Contractor	Developed during Project planning, implemented during construction.
24	Diseases	Injury of the workforce from communicable and non-communicable diseases shall be prevented through the following: ▪ Identification of diseases that could pose a hazard to personnel. ▪ Advice to personnel.	Contractor	Developed during Project planning, implemented during construction.

25	Stress associated with working environment	Stress within the workforce shall be managed through the following: ▪ Advice to personnel. ▪ Support. ▪ Monitoring.	Contractor	Developed during Project planning, implemented during construction.
26	Injury or illness	▪ First aid and medical facilities – appropriate to likely hazards and other facilities available. ▪ Emergency Response Plan.	Contractor	Developed during Project planning, implemented during construction.

In addition to general guidelines, each Contractor Health and Safety Plan will also require the inclusion of traffic management. The purpose of the following guidance is to ensure that construction and operation components and activities do not adversely affect road users and other sensitive receptors. This Traffic Control Management Plan (TCMP) guide therefore identifies the potential impacts and appropriate measures to mitigate them.

Prior to the commencement of construction, the contractor(s) shall use the TCMP as the basis for undertaking a detailed Traffic Assessment (TA) and preparing a detailed TCMP; this will identify specific measures to mitigate any predicted impacts. The contractor's (or contractors') TCMP shall include detailed procedures that demonstrate how the impacts of traffic on communities have been taken into consideration. The contractor(s) shall develop and submit:

- procedures within 30 days of the start of the construction phase; and
- detailed project-specific procedures that specify how the requirements of their TCMP will be implemented to the satisfaction of the appropriate traffic authorities.

The contractor(s) shall regularly update their TCMP as the construction method is developed and vehicle movement and timing requirements are identified in detail. The contractor(s) shall consult with the relevant government agencies to identify where Project plans can complement existing road development plans at the district and provincial level. The contractor(s) will also consult with the leaders of any communities that will suffer a significant increase in traffic in order to identify alternative routes where possible, or appropriate mitigation measures.

The contractor(s) will:

- identify those responsible for carrying out and managing the procedures;
- reference the procedures and activities the contractor(s) will develop and implement;
- identify work to be undertaken on the roads prior to construction activities to upgrade or stabilize the roads if necessary;
- identify the routes that will be used with the estimated numbers of traffic movements, speeds and times of travel;

- justify where a route has to pass through residential areas and the measures that will be used to ensure the safety of the community and minimize the nuisance impact of traffic movements;
- identify how existing road development plans have been taken into account in the identification of routes and road restoration measures;
- identify the program of road restoration measures that are likely to be required post construction;
- address how the Contractor(s) can reduce the exposure of vehicle drivers, their passengers and other road users from the hazards of road-related accidents;
- identify (and adopt to the maximum extent feasible) all reasonably practicable alternatives to road transportation in order to reduce the number of trucks on the roads; and
- provide details of audits and reviews of the components of the project transport system.

Table Annex 5- 3. Traffic Control Management Plan.

Issue	Mitigating/Monitoring Activity
Access to construction areas	The following environmental aspects shall be considered in finalizing the location of the access road that will be constructed specifically for the Scheme: • environmentally sensitive areas; and • pedestrians. Other measures for mitigating the impact of access roads are as follows: • Access will be via specified routes, which will be agreed with the relevant authorities. • Existing, upgradeable roads will be used where practicable, to avoid the need to construct new roads. • Access roads to previously inaccessible sensitive areas will be avoided. • If the Contractor requires additional routes, a specific proposal will be submitted to the relevant authorities, if required, for consideration and approval.

	• Suitable measures will be implemented to avoid damage to public roads and any damage will be repaired to an equal or better standard in a timely manner. • The Contractor will remove all temporary roads or road enlargements, except where local communities or landowners request that a new road be left in place. • Temporary access roads will be kept free from deposits to prevent silt, or other materials from entering drains or watercourses. Access routes to be used by construction traffic will be properly signposted. This shall be sufficient to prevent vehicles from leaving the designated routes and ensure that the appropriate speed limits are enforced particularly through residential areas. • Access and site roads will be maintained in good condition. • Temporary roads will be removed when no longer needed and will be reinstated. All damage to existing roads will also be reinstated. • Any additional routes will be selected to avoid ecologically sensitive areas, and to minimize erosion. • The Contractor will liaise with the appropriate regulatory authorities to gain approval to use, and regularly inspect, the road infrastructure.
Routing of construction traffic	• Relevant authorities will be consulted to agree on specific routes for use by construction traffic to avoid any sensitive residential areas and unsuitable parts of the road network. • Precautions will be taken by the Contractor to avoid damage to the public highways used by vehicles or other items of equipment. Timber mats, tyres or steel plates will be laid as necessary, in particular under tracked equipment. Any road damage will be repaired. • Advance warning will be given of any proposed road diversions and closures. • The Contractor should consider whether to use buses to transport workers to the construction site.

	• The Contractor will comply with all statutory vehicle limits (width, height, loading, gross weight) and any other statutory requirement.
Temporary traffic control and management	• Traffic flows will be timed, wherever practicable, to avoid periods of heavy traffic flow along main roads. • In addition, the Contractor will not commence any work that affects the public highway until all agreed traffic safety and management measures essential for the works are accepted and agreed with the relevant authorities. • In terms of traffic control, vehicles will be prohibited from reversing unattended into the construction site. Vehicles and plant shall enter and exit the site in a forward direction, as far as possible. In addition, the Contractor will ensure that all heavy goods vehicles are equipped with audible reversing alarms. • Clear signs, flagmen and signals will be set up where necessary. Where temporary traffic signals are required, the details and locations of the signs shall be discussed with the relevant authorities. The signs will be fixed safely and securely to ensure that they do not become detached or dislocated, and will be visible and comprehensible by all. The Contractor will also carry out maintenance checks to clean and rescuer signs if necessary. • Appropriate supervision will be provided by the Contractor to control the flow of traffic when machinery needs to cross roads. • Liaison with the police and other authorities will occur prior to the movement of any abnormal loads. In particular, liaison with the relevant Highway Authority will occur prior to transportation on major highways and motorways. • Access to commercial and residential properties shall be maintained and speed limits will be established and enforced over all construction traffic routes. • Where roads used by children to reach schools are used by construction traffic, road safety education will be provided at schools. Vehicle traffic will be prohibited during hours that children are travelling to and from school.

	• Ambulances and fire services will be consulted regarding road diversions. Road diversions will not increase the response time of these services to local communities. • Access to residential and commercial properties will be maintained. • If road closures are required, diversions will be planned and communicated to the authorities (including emergency services and public transport providers) and affected communities in advance (via the pre-construction community meeting) and will be properly signposted. Crossing for pedestrians and animals will be provided to avoid the need for a diversion. No diversion will be permitted that prevents a public transport service from continuing or requires a diversion of more than 1km for vehicles or a diversion of more than 500m for pedestrians or livestock. Notification periods for road closures are as follows: o two weeks minimum notice on closure of up to 28 days; o one month minimum notice on closure of 28 days to three months; o three months notice for closure over three months or for permanent closure. • Education on traffic safety will be provided by the Community Liaison Officer(s) (CLOs) to communities not normally subjected to major infrastructure construction. • Fuel use will be minimized during the transportation of construction materials and personnel. A fuel use assessment will be undertaken, in conjunction with safety assessments, at the outset of the construction program. • A 30 km/h speed limit shall be enforced on the access road. The speed limit shall be 50 km/h in the towns and villages. The speed limit on the motorways and highways shall be 90 km/hr. • A 30km/h speed limit shall be established and enforced over all roads on site.
Parking facilities	• Signposted, parking facilities shall be provided at accessible locations on the road network. • The Contractors will ensure that part of the Construction Site is set aside for the parking of emergency service vehicles. The

	Contractor is expected to make provision for a dedicated parking area on the construction base for the private vehicles of construction personnel.

Maintaining Highways	• The Contractor is expected to keep highways free from mud and dust and to ensure that no vehicle or other items of equipment leaving the construction base or working width, deposit soil, debris or rock on public highways or public right of ways.
	• Measures will be implemented to ensure that the transport of mud and dust from the site onto public highways and roads is limited. Such measures may include:
	  o paving the access road; and
	  o the use of hard core surfaces on access roads.
	• the provision of an easily cleaned hardstanding area within the construction site for vehicles entering, parking and leaving.
	• the appointment of site personnel to clean the construction hardstanding area and to remove any mud or debris deposited on the public highways;
	• the provision to clean hardstanding areas and to clean any mud or debris deposited by work vehicles on roads or footways in the vicinity of the construction site;
	• fully sheeting all works vehicles carrying potentially dusty material or likely to deposit loose materials on the public highway during transit;
	• the Contractor shall clean and maintain temporary and permanent roads, and shall remove mud and debris from public roads.

Road Related Accidents	Hazards to personnel associated with vehicle transportation, both on- and off-road, will present one of the most significant risk exposures of the Project. Accordingly, the Contractor shall be expected to develop and implement management systems and procedures that will provide the highest level of control over these hazards. Accordingly, the Contractor's procedures shall specifically cover arrangements for the following important aspects: • the source of and number of qualified drivers required; • training and approval requirements for drivers;

	• hours of driving and rest periods; • security arrangements for drivers, vehicles and loads; • arrangements for driver communication with control points and vehicle equipment; • language/communication issues; • the source of suitable vehicles (e.g. quality and specification); • the number of vehicles required; • the program for preventative vehicle maintenance; • vehicle routes, route planning and alternative routes; • overall vehicle movements; • procedures for the emergency recovery of vehicles; • an appraisal of the social impact of vehicles in the local community; • procedures for spot checks and audits of the transport system and for reporting problems. • pre-use vehicle inspections shall be completed and recorded on the approved form; • all drivers shall be trained and evaluated in defensive and off-road vehicle operation.
Vehicle Standards and Maintenance	The Contractor shall comply with all other aspects of the Construction Health and Safety Management Plan, which include requirements for vehicle standards and maintenance. The contractor shall also ensure that: • All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local people. • New vehicles: vehicles/equipment purchased 'as new' after contract award shall comply with the appropriate emission standards in force on the purchase date. • Older vehicles: vehicles/equipment not purchased 'as new' after contract award shall be maintained so that noise and emissions levels are no greater than when the vehicle/ equipment was new. The contractor shall produce method statements, as part of their TCMP, to cover routine maintenance and to minimize equipment emissions. Routine maintenance shall be to a high standard to ensure that vehicles are safe and that emissions and noise are

	minimized. Method statements shall require regular maintenance of diesel engines to ensure that emissions are minimized, for example, by cleaning fuel injectors.

In addition to traffic management, the Contractor H&SPs will be required to explicitly contain guidelines and directives on Emergency Response and Spill Prevention, Control and Countermeasure actions. The following guidance provides general considerations about these risks and their management, however, the Contractor H&SP will require additional detail and direction based on their specific activities and the types of risks expected to be encountered.

Risk assessments will take into account environmental as well as health and safety hazards and will include area and task based assessments. They will be performed by trained staff and each hazard will be considered in the context of its effect upon the activities with regard to:

- materials/substances;
- equipment;
- the workplace;
- people;
- procedures; and
- the environment.

This risk assessment approach will consider the hazard, harm, potential severity, probability of occurrence, risk rating, control measures and residual risk. These assessments will also detail action dates and be reviewed on a regular basis. Table 4 presents the Accidents Risk Assessment Management Plan.

Table Annex 5- 4. Risk Assessments from Spills, Leaks and Emergency Situations

Risk			Managing the Risk	Assessing the Risk		
Hazard	Receptor	Pathway		Probability of Exposure	Consequence	What is the overall risk
Fuel Handling						
Spillage of diesel	• Soil • Air • Groundwater	Storage tank leak or transfer spill	• Training of staff; • Impervious surfaces; • Routine operator checks; and • Clean up response team.	Unlikely	Ground contamination	Not significant
Air Pollution Control						
Flue gas leak	• Air	Overpressure, material defect, corrosion/erosion	• Design and fabrication standards; • Inspection and maintenance program; • Controls and alarms for pressure; • Continuous emission monitors; and • Prompt shutdown of equipment.	Very unlikely	Release of toxic combustion products to plant enclosures and potentially to atmosphere or via stack	Not significant
Leak/ spill of water treatment chemicals	• Groundwater	Storage container leak or transfer spill	• Training in unloading practices • Design standards • Impervious surfaces	Very unlikely	Potential for contamination of groundwater	Not significant
Power Generation System						
Leak of ion exchange regeneration	• Air • Soil • Groundwater	Storage container leak or transfer spill	• Bunded storage vessels; • Routine inspection and maintenance program;	Very unlikely	Potential contamination of soil, groundwater and	Not significant

chemicals (NaOH, HCl)	• Surface Water		• Minimum of flanged connections; • Tanks fitted with high level alarms; • Design standards; • Impervious operational areas indoors; • Localized catchment volume; • Training in unloading practices; • Size of deliveries to reduce number of deliveries/unloading operations.		surface water, and release of HCl fumes	
Vibration from out of balance rotating machinery or mechanical failure	Installation	Transmitted vibration	• Alarm and shutdown systems; • Anti-vibration mountings; • Routine operator checks.	Very unlikely	Transmitted vibration	Not significant
Turbine equipment failure	Equipment	Material defects, corrosion/ erosion, fabrication defect or vibration	• Specification of equipment; • Implementation of correct codes of practice; • Inspection and maintenance program; • Vibration sensors, isolation valves, emergency shutdown valves • Fire detection and fire protection systems	Unlikely	Disintegration of the turbine, causing further adverse consequences through damage elsewhere in the power plant	Slight - Moderate

			• Equipment within concrete structure • Emergency Plan			
Fire from ignition of lube oil leak	Air	Oil leak plus ignition source	• Use of fire-proof lube oil • Oil collector installed • Minimum of flanged connections • Design standards • Routine operator checks • Fire detection and fire protection systems • Response procedure	Very unlikely	Smoke, toxic combustion products	Slight - Moderate
Leak of lube oil/ seal oil from steam turbine equipment	Soil Groundwater Surface Water	Equipment fracture or vibration	• Minimum of flanged connections • Design standards • Routine operator checks • Routine inspection and maintenance Program. • Impervious surfaces indoors • Effluent drains isolate the area	Unlikely	Potential fire and groundwater contamination	Not significant

Steam leak to plant building/ atmosphere	Noise Visual	Faulty boiler tubes and connections	• Statutory design, fabrication and inspection • standards for steam systems • Minimum of flanged connections • Controls and alarms for pressure • Routine operator checks	Unlikely	Noise and visible plume at leak	Not significant
			Furnace/Boiler			
Fire from ignition of gas leak	Air Plant	Ignition of gas leak	• Bunded storage tanks • Minimum of flanged connections • Design standards • Impervious operational areas • Routine operator checks • Limited sources of ignition • Firefighting systems • Response procedure	Very unlikely	Smoke, toxic combustion products released to plant building, potentially to atmosphere; potential of consequential events	Slight - Moderate
Leak of diesel for starter burner	Soil Groundwater Surface Water	Spill during delivery; leak due to faulty storage tank, burners or pipework connections	• Secondary containment for delivery and storage • Routine inspection and maintenance program • Minimum of flanged connections • Design standards • Impervious surfaces indoors	Very unlikely	Potential soil, groundwater and surface water contamination	Not significant

			• Discharge point for attenuation ponds will be Kept locked shut.			
Pressure surge/explosion in combustion system	Air Plant	Delayed ignition of support fuel; presence of flammable material; gas explosion	• Combustion control system with interlocks. • Boiler design standard • Operator training. • Crane operator observation of gas bottles and back loading of rejected feedstock	Very unlikely	Flue gas emissions above limits and/or release of flue gases from plant if structure damaged	Slight - Moderate
Back flow of combustion gases up feed chute	Air	Waste ignition in chute	• suction created by ID fan or suction effect of • stack if ID fan stopped • “plug” of waste in chute acting as seal • level detection/alarm in chute • extraction of tipping hall atmosphere by combustion fan	Very unlikely	Combustion products released to tipping hall and potentially into atmosphere	Not significant
Miscellaneous						
Leak of fuel oil/diesel for vehicle refueling	Soil Groundwater Surface Water	Spill during delivery or refueling, or leaks	• Secondary containment for delivery and storage • Routine inspection and maintenance Program.	Very unlikely	Potential soil, groundwater and surface water contamination	Not significant

			• Storage Tank fitted with high level and leak alarms • Minimum of flanged connections • Design standards • Impervious surfaces outdoors • Oil water interceptors on drainage system			
Fire in stores containing flammable materials such as paints and solvent	Air Soil Surface water Ground water	Emission of toxic combustion products	• Fire precautions • Notices and training regarding fire hazards • Training regarding fire hazards • Fire hose nearby • Only store relatively small amounts of materials • Enforce no smoking rules • Permit-to-work system • Have a fire detection system and an emergency plan.	Very unlikely	Major fire with emission of toxic combustion products and subsequent contamination of air, soil, surface water or groundwater; also potential for release of contaminated firewater	Not significant
Spillage of raw materials	Soil Surface water Ground water	Leakage from containers in storage or spillage during use	• Store only small quantities of materials • Bunded area for tanks • Designated storage areas	Unlikely	Contamination of soil, surface water/groundwater	Not significant

			• Storage in accordance with requirements of the control of hazardous substances • Use of spill kits			
Equipment/part item fire	Air	Faulty electric motor, cabling	• Design and fabrication standards • Inspection and maintenance program. • Routine operator inspection • Fire detection systems and fire hoses • Response procedure	Very unlikely	Smoke, combusted products potentially released into the atmosphere	Not significant
Firewater contamination	Air Surface Water Ground Water	Ineffective firewater containment	• Containment within plant area with • impervious surfaces • Containment in bunker • Drainage arrangements to waste water tank.	Very unlikely	Potential contamination of controlled water by run off through uncontaminated surface water system; potential for contamination of groundwater	Not significant

Annex 6. Green Tech ESIA Team

Environmental and Social Impact Assessment Team Credentials and CVs

Ethan Myer Curriculum Vitae

236 E. Grant Street
Lancaster, PA 17602 USA
ethanmyer@yahoo.com

OVERVIEW

Ethan Myer is an environmental manager with over 15 years of experience in the fields of environmental impact assessment, remedial action oversight, and regulatory compliance. Professional specializations include management of environmental and social risk for international development programs; implementation of environmental and social impact assessment processes; technical investigation including soil, air and groundwater testing; and, multisectoral data and policy research in support of development interventions. While managing multicultural staff on development programs in South Asia, Africa and the Caribbean he is concurrently contracted on US-based assignments. He has implemented a wide range of environmental management systems and has gained a synergistic understanding of local, state, national and international regulatory policies. Mr. Myer possesses strong interpersonal and communication skills and has a proven ability to work and succeed in complex foreign environments. He holds a Bachelor of Science degree in Biology from Wake Forest University in North Carolina and a Master of Science degree in Environmental Sciences & Policy from Johns Hopkins University in Maryland.

INTERNATIONAL CONSULTANCIES

International Executive Service Corps (IESC), Washington DC

Feed the Future Tanzania Enabling Growth Through Investment and Enterprise (ENGINE)
http://vegaalliance.org/our-programs/tanzania-enabling-growth-through-investment-and-enterprise/
Dar es Salaam, Mbeya, Morogoro, Iringa and Zanzibar, Tanzania (11/18/16 – present)

Acting Environmental Compliance Adviser for the Tanzania ENGINE project's US Development Credit Authority loan guarantee agreements with four Tanzanian national banks. Reviewed existing environmental and social policies of the banks and incorporated ENGINE environmental policy measures into a new framework to govern the DCA loan guarantee agreement. Conducted training with the bank's management and loan officer representatives. *Focus on environmental management for agricultural policy transformation and initiation of lending program with financial intermediaries.*

Roots of Peace, San Rafael, California

Commercial Horticulture and Agricultural Marketing Program (CHAMP)
http://www.champ.af/
Kabul, Afghanistan (01/17/18 – present)

Acting Environmental Specialist on the Afghanistan CHAMP program supporting supply chain, marketing, and export promotion of Afghan produce to international markets through freight and logistics facilitation, packing house and cold storage infrastructure, and expanding the manufacture of domestic packaging. Counterparts include the Ministry of Agriculture, Irrigation and Livestock as well as private sector agribusinesses receiving grants through program funding. Implementation of the environmental management plan entails integration of the Global Food Safety Initiative, improving environmental management capabilities of partner institutions and the generation of environmental review reports submitted to the Mission Environmental Office for clearance of grant-based private enterprise activities. *Focus on food safety systems, water conservation and energy efficiency, cleaner production and pollution prevention, and safe use of packing house and commodity storage pesticides.*

RTI International (RTI), Research Triangle Park, North Carolina

Somalia Growth, Enterprise, Employment and Livelihood (GEEL) Program
https://www.usaid.gov/somalia/economic-growth-and-trade
Somalia, Puntland and Somaliland (04/29/16 – present)

Acting Environmental Adviser for the GEEL program supporting Somalia's private sector expansion in agriculture, fish, and non-pastoral livestock products while growing the capacities of the government at the federal, regional, and local levels. Collaborate with the USAID East Africa Regional Environmental Adviser on maintenance of the environmental management system; lead research and review in support of hydrogeologic assessments and land use decisions; and, direct a field team of local national staff on mitigation and monitoring of grants and small-scale infrastructure projects. Concentration in years 0-2 on agricultural enterprises in the banana and sesame value chains, livestock management, sustainable fisheries and innovative alternative energy solutions in cold chain management. *Focus on sustainable fisheries systems, water conservation and irrigation efficiency, renewable energy applications and community-based natural resource management.*

International Executive Service Corps (IESC), Washington DC
Mali Finance for Food Security and Women Entrepreneurs (FFSWE)
Bamako, Mali (02/22/16 – 12/31/16)
Environmental Compliance Consultant for USAID's Mali FFSWE project. Developed an environmental management system for the Development Credit Authority (DCA) program to enable partner financial institutions to assess the environmental impacts of potential lending opportunities and undertake necessary due diligence actions under Malian law and US government regulations. Scope of work included review and assessment of lending institution environmental policies and the Republic of Mali National Directorate of Sanitation and Pollution and Nuisance Control (DNACPN) EIA law. *Focus on environmental management systems for lending institutions and micro, small and medium enterprise development.*

Management and Engineering Technologies International, Inc. (METI), El Paso, Texas
Cap Haitien Port Project
Cap Haitien, Haiti (02/10/16 – 08/10/16)
Haiti Environmental Compliance Consultant for the USAID funded Cap Haitien Port Project under a METI contract through the US Forest Service, International Programs to identify environmental risks and determine mitigation measures associated with redevelopment of Haiti's northern shipping port. Tasks included port inspection, review and assessment of the US Army Corps of Engineers draft Environmental Assessment and generation of the project environmental mitigation and monitoring plan. *Focus on environmental and social impact assessment, coastal resource management, climate change adaptation and port infrastructure development.*

AECOM International Development, Arlington, Virginia
Strengthening Watershed and Irrigation Management (SWIM)
Kabul, Afghanistan (05/05/17 – 06/22/17)
Principal Environmental Consultant for USAID's irrigation rehabilitation and watershed restoration project in the North, South and West regions of Afghanistan. Performed a leadership role in developing the Scoping Statement report in the Programmatic Environmental Assessment process. Conducted consultation with director level government counterparts at the Ministry of Agriculture, Irrigation and Livestock; Ministry of Energy and Water; and National Environmental Protection Agency, as well as being the key liaison with the USAID Mission Environmental Officer throughout the EA process. In-country work included gathering and compiling geographic information, directing the field team on primary stakeholder consultations in rural Afghan provinces and environmental data gathering on project activities leading to the final assessment of issues, potential impacts and their significance. *Focus on Scoping Statement for Environmental Assessment, government stakeholder outreach, primary stakeholder consultation, irrigation infrastructure rehabilitation, watershed restoration.*

International Executive Service Corps (IESC), Washington DC
Assistance in Building Afghanistan by Developing Enterprises (ABADE)
Kabul, Mazari Sharif and Hirat, Afghanistan
Initial Consultancy (02/22/13 – 11/03/15), Second Consultancy (11/04/15 – 04/15/17)
Environmental Compliance Officer for the USAID ABADE economic development program supporting over 200 public-private alliances aimed at generating growth of Afghan enterprises and marketability of Afghan products. Role included generation and maintenance of the environmental management system, conducting environmental impact and activity hazard analyses of individual subprojects across multisectoral industries and value chains, and training/mentoring Afghan environmental and engineering

staff. *Focus on cleaner production, pollution prevention, waste management, capacity development, technical assistance for industrial enterprises and natural resource management.*

AECOM International Development, Arlington, Virginia
Haiti Health Infrastructure Program (HHIP)
Port-au-Prince, Haiti (6/18/15 – 09/30/17)
Environmental Specialist for USAID's post-earthquake health infrastructure redevelopment program providing leadership and support services to the Haitian Ministry of Health. Generated 22CFR§216 compliant environmental management plans for the program's major infrastructure redevelopment activities focused on hospitals and clinics throughout the country. Role involved integrating environmental performance and compliance into architectural planning and design, and directing the environmental, health and safety policies during construction management oversight. *Focus on natural disaster management, infrastructure development, construction site health and safety and bio-hazardous and medical waste management.*

International Executive Service Corps (IESC), Washington DC
Liberia Investing for Business Expansion (IBEX)
Monrovia, Liberia (06/14/14 – 06/27/14)
Consultant to the USAID Liberia/IBEX program. Generated and delivered an environmental impact assessment training seminar consisting of lectures, case-studies and syndicate sessions for partner financial institutions. Delivered a live on-air radio interview promoting the DCA environmental management program on UNMIL Radio reaching approximately 75% of Liberian territories and 80% of the population of nearly 4.5 million people. Worked collaboratively with a team of risk assessment staff and IBEX project managers to develop a functional environmental screening tool to apply to business loan applicants using USAID Environmental Procedures 22CFR§216 and applicable loan guarantee agreements. *Focus on environmental management systems for lending institutions, public media outreach, environmental training and seminar development.*

Development Alternatives, Incorporated (DAI), Bethesda, Maryland
Stability in Key Areas – North (SIKA-N)
Mazari Sharif, Afghanistan (11/7/12 – 11/30/13)
Environmental Specialist providing environmental management services to the USAID funded SIKA stabilization project in northern Afghanistan. Developed the environmental management plan governing the northern working region and environmental training materials used to direct local national staff. Mentored Afghan project engineers and provided environmental oversight for infrastructure and service delivery components of the project work plan. *Focus on environmental management of small-scale infrastructure development and water, sanitation and hygiene services in active conflict zones.*

Development Alternatives, Incorporated (DAI), Bethesda, Maryland
Regional Afghan Municipalities Program for Urban Populations (RAMP UP)
Kabul, Hirat and Mazari Sharif, Afghanistan (06/28/11 – 10/02/11)
As Environmental Specialist developed the environmental management program and provided oversight of compliance activities for the USAID RAMP UP Regional Command East, West and North projects. Generated the framework environmental management plan covering municipal water supply, infrastructure, road construction, municipal solid waste, sanitation and latrines. Responsible for developing manuals, training and guidance documents and mentoring national-staff engineers in each region. Assigned as a program interface with counterpart Afghan ministries and agencies and worked closely with the USAID Mission Environmental Office in providing synthesis of the cross-regional program with regard to environmental compliance. *Focus on municipal solid waste management (collection, transfer, recycling and disposal); landfill assessment, design and construction; and, water resource management.*

Development Alternatives, Incorporated (DAI), Bethesda, Maryland
Afghanistan Small and Medium Enterprise Development (ASMED)
Kabul, Hirat, Mazari Sharif, Jalalabad and Kandahar, Afghanistan
(12/28/09-6/28/10 and 01/30/11 – 07/31/11)
As Environmental Specialist provided environmental compliance management services to the USAID ASMED project with a focus on field inspections, project assessments, and compliance reporting to satisfy 22CFR§216. Conducted project environmental screening, mitigation and monitoring activities for steel,

textile, agribusiness, mining, and recycling sector enterprises throughout Afghanistan. Coordinated compliance activities with national-staff counterparts and local environmental service providers across five project regions. Developed and delivered a 5-day classroom and field based environmental management training program for national field staff, engineers and program beneficiaries. *Focus on industrial waste management, capacity development and environmental technical assistance.*

Development Alternatives, Incorporated (DAI), Bethesda, Maryland
Local Governance and Community Development (LGCD)
Kabul, Afghanistan
(07/14/10 – 04/16/11)
As Environmental Specialist, performed a compliance audit to satisfy the USAID Mission Environmental Office of the USAID LGCD project portfolio that included review of 2000+ stabilization subprojects across five regions in Afghanistan. Conducted file reviews and data gathering activities in the process of preparing project closedown documentation and follow-on reporting requirements. Generated expanded mitigation plans for special infrastructure subprojects including a large-scale road rehabilitation project in Farah Province and radio/TV transmission tower project in several southeast provinces of Afghanistan. Acted as liaison between LGCD senior management, USAID COTR and USAID Mission Environmental Officer. *Focus on environmental audit and assessment of environmental management system.*

EDUCATION
Wake Forest University, Winston-Salem, North Carolina
Bachelor of Science Degree: Biology, May 1997
Johns Hopkins University, Baltimore, Maryland
Master of Science Degree: Environmental Sciences & Policy, December 2017

CERTIFICATIONS
United States Agency for International Development
Environmentally Sound Design and Management – Bangkok, Thailand, 2015
United States Department of Labor – Occupational Safety and Health Administration
Health and Safety Training to satisfy OSHA 29 CFR 1910.120(e)
Supervisor Training/Hazard Communication to satisfy OSHA 29 CFR 1919.1200
DOT Hazardous Materials Transportation to satisfy OSHA 49 CFR 172.704
Colorado Department of Public Health and Environment WWFOCB
Colorado Class C Wastewater Treatment Plant Operator’s Certificate - 1998

ADVANCED ACADEMIC COURSEWORK
Johns Hopkins University
Environmental Impact Assessment and Decision Methods, 2017
Management for Environmental Results with Performance-based Measurement, 2016
Drinking Water, Sanitation and Health, 2016
Hydrology and Water Resources, 2016
Strategies in Watershed Management, 2015
Field Course in Nepal; Climate Change on the Frontlines, 2015
Principles and Methods of Ecology, 2015
Geologic Foundations of Environmental Science, 2014
Environmental Policymaking and Policy Analysis, 2014
Rutgers University
Wetland Delineator Program, 2004

Curriculum Vita (CV)

Personal Information

Name and Last Name:	Sayed Asghar Mosavi
Nationality:	Afghan
Date of Birth:	1981
Email:	mosavi2007@gmail.com
Years of Experience :	14

Education

1999-2004:	B.Sc in Environmental Engineering from University of Tehran, Iran.

Key Qualifications & Additional Trainings

Membership of Afghan Engineering Association (AEA)

Membership of Afghanistan Builders Associations (ABA)

Design and supervision of any water/wastewater treatment plants.

Water /wastewater quality testing and analyzing.

Water distribution system modeling.

water storage tanks sizing

Supervisor and Project management in Environmental projects.

Supervisor & Analysis and Design Environmental studies

Disinfection system design and supervision

Sewerage system design

Auto Cad

Architect

EPA NET (software for water modeling)

Water CAD (software for water modeling)

Languages

English:	Excellent
Dari :	Mother Tongue
Pashto :	Basic Level

Employment background

Year	Company/Organization	Position
2008 – Present:	Green Tech Construction & Engineering Co.	Project Manager
2005-2088:	Omran Holding Group Company	Sanitation department manager

Experiences

Year	Project Name & Summary:
2018	**Copper Mining Exploration of Balkhab** **Project Summary:** This project is located in Balkha District, Sar-I Pul Province, Afghanistan. The objective of this project is development of ESIA report for exploration of Balkhab Copper. This ESIA includes study of existing environmental conditions in order to provide the environmental and socio-economic baseline, review of Afghan and IPC requirements, analysis of alternatives, determination of potential impacts, conduct the first public consultation, develop and environmental and social management

plan, develop a stand-alone stakeholder engagement plan, risk assessment plan, security management plan, hazardous materials management and safety, establishment GRC, and HSE. The methodology for preparing the Environmental and Social Impact Assessment is accordance to Environmental Regulations and Standards of Afghanistan and IFC Performance Standards.

2018 **Gold Mining Exploration of Badakhshan**

Project Summary:

This project is located in Balkha District, Sar-I Pul Province, Afghanistan. The objective of this project is development of ESIA report for exploration of Badakhshan Gold. This ESIA includes study of existing environmental conditions in order to provide the environmental and socio-economic baseline, review of Afghan and IPC requirements, analysis of alternatives, determination of potential impacts, conduct the first public consultation, develop and environmental and social management plan, develop a stand-alone stakeholder engagement plan, risk assessment plan, security management plan, hazardous materials management and safety, establishment GRC, and HSE. The methodology for preparing the Environmental and Social Impact Assessment is accordance to Environmental Regulations and Standards of Afghanistan and IFC Performance Standards.

2018 **Bayat IPP Power Plant (42 MW)**

Project Summary:

The Bayat IPP power plant is located Bayat Power 1 is located near the gas fields Yatimtaq or Jarquduk in Sheberghan, Jawzjan Province, Afghanistan. The objective of this project is development of ESIA report for Bayat IPP 40MW gas-to-power plant. This ESIA includes study of existing environmental conditions in order to provide the environmental and socio-economic baseline, review of Afghan and OPIC requirements, analysis of alternatives, determination of potential impacts, conduct the first public consultation, develop and environmental and social management plan, develop a stand-alone stakeholder engagement plan, traffic control management plan, risk assessment plan, security management plan, hazardous materials management and safety, establishment GRC, HSE, Noise Modeling, Air Modeling. The methodology for preparing the Environmental and Social Impact Assessment is accordance to Environmental Regulations and Standards of Afghanistan and OPIC Performance Standards.

2018 **15MW ON-GRID POWER PROJECT KANDAHAR, AFGHANISTAN (Contractor Zularistan Ltd)**

Project Summary:

The objective of this project is development of ESIA report for 15MW ON-GRID POWER PROJECT KANDAHAR, AFGHANISTAN. This ESIA includes study of existing environmental conditions in order to provide the environmental and socio-economic baseline, review of Afghan and World Bank (WB) requirements, determination of potential impacts and mitigation measures, conduct the first public consultation, develop and Environmental and Social Management Plan (ESMP) and Monitoring Plan (MP), develop a stand-alone stakeholder engagement plan, establishment GRC, and HSE. The methodology for preparing the Environmental and Social Impact Assessment is according to Afghanistan Regulation on Evaluation of Environmental and Social Impacts (Official Gazette No. 1276, dated: 9th December, 2017) and World Bank Safeguard.

2018 **15MW ON-GRID POWER PROJECT KANDAHAR, AFGHANISTAN (Contractor 77 Construction)**

Project Summary:

The objective of this project is development of ESIA report for 15MW ON-GRID POWER PROJECT KANDAHAR, AFGHANISTAN. This ESIA includes study of existing environmental conditions in order to provide the environmental and socio-economic baseline, review of Afghan and World Bank (WB) requirements, determination of potential impacts and mitigation measures, conduct the first public consultation, develop and Environmental and Social Management Plan (ESMP) and Monitoring Plan (MP), develop a stand-alone stakeholder engagement plan, establishment GRC, and HSE. The methodology for preparing the Environmental and Social Impact Assessment is according to Afghanistan Regulation on Evaluation of Environmental and Social Impacts (Official Gazette No. 1276, dated: 9th December, 2017) and World Bank Safeguard.

2017-2018 **Environmental and Social Survey and Management Plan of Jaghato to Nawor Road (80 Km), Ghazni, Afghanistan**

Project Summary:

Public announcement, dissemination of project information and consultation process according to Community Consultation Manual.
Environmental and Social Assessment through screening checklist.
Conduct Community Consultation Meetings.
Establish Grievance Redress Committee.
Transect Walk and Outputs of Transect Walk.
Alignment Details for Disclosure.
Develop Stripe Map/Plan that illustrate and show Project Affected persons (PAPs)
Verification of Ownership of Land/Assets.
Abbreviated Resettlement Action plan.
Safety and Health Plan.
Develop a site specific Environmental and Social Management Plan (ESMP).
Monitoring plan for mitigation measures.

Consider gender mainstreaming and consultation during project survey, design and construction supervision.
Ensure that community representatives are mobilized in the establishment of Grievance Redress or Social Inclusion Committees (SIC) and security Shuras.
Ensure that all relevant socio-economic data on target communities is collected and consolidated

2017 **Environmental and Social Impact Assessment of Maihan Industrial Park, Guzara District, Herat Province, Afghanistan**
Client: Private Sector
Project Summary:
The objective of this project is Environmental Studies including development of ESIA report for Maihand Industrial Park, which located in Guzara District of Herat Province. This environmental assessment study includes study the existing environmental and social conditions, potential impacts and mitigation measures, environment and social management plan, monitoring plan, and HSE plan.

2017 **ESIA Kajaki Dam Phase II - Helmand – Afghanistan**
Client: World Bank & Ministry of Energy & Water- 77 US Corp JV as prime contract
The objective of this project is Environmental Studies including development of ESIA report for the Kajaki Dam Phase II project. This environmental assessment study includes study the existing environmental conditions in order to establish the present physical, biological and socio-economic scenario and also to predict future impacts owing to construction, operation and maintenance of the project. The study should be done according to the IFC standards given along with the RFP of the project and the work plan provided in part C of this contract.

2016-2017 **Environmental Social Safeguard of Cement Factory Concrete Deck Girder Bridge over the Harirod River on Herat Bypass Road**
Contractor: Pamir Geo Technic Services , Green Tech JV
Client: UN Office for Project Services(UNOPS)
Project Summary:
Public announcement, dissemination of project information and consultation process according to Community Consultation Manual.
Environmental and Social Assessment through screening checklist.
Conduct Community Consultation Meetings.
Establish Grievance Redress Committee.
Transect Walk and Outputs of Transect Walk.
Alignment Details for Disclosure.
Develop Stripe Map/Plan that illustrate and show Project Affected persons (PAPs)
Verification of Ownership of Land/Assets.
Abbreviated Resettlement Action plan.
Safety and Health Plan.
Develop a site specific Environmental and Social Management Plan (ESMP).
Monitoring plan for mitigation measures.
Consider gender mainstreaming and consultation during project survey, design and construction supervision.
Ensure that community representatives are mobilized in the establishment of Grievance Redress or Social Inclusion Committees (SIC) and security Shuras.
Ensure that all relevant socio-economic data on target communities is collected and consolidated

2015-2016 **Feasibility Study, Procurement and Institutional Development Support for the Northern Afghanistan Railway Study Phase 1&2**
Contractor: Afghanistan Railway Authority (AFRA) & CANARAIL
Client: Asian Development Bank (ADB)
Project Summary:
Green Tech Company was assigned to prepare the feasibility study for Phase 1&2 railway which is currently under way. As part of the feasibility study of Phase 1&2 of the project a programme of social investigation related field survey and data collection is required.
Also Flora and Fauna study including studies about on Birds migration and habitat is done in this project. The document provided base on the Terms of Reference (TOR) for this Social Safeguard Planning Sub-consultancy Works.
The total length of the railway in Phase 1&2 including mainline Kholm to Aqina and Amu Darya Oil and Gas Block links to this mainline is about 620km.

2015 **SOCIAL and ENVIRONMENTAL ASSESSMENT**
NATEJA(Non-formal Approach to Training, Education and Jobs in Afghanistan)
Contractor : Green Tech , ACE India JV
Client: World Bank & Ministry of labour, Social Affairs, Martyrs and Disabled
Project Summary:
The NATEJA project focused on increasing access to non-formal technical and vocational training for the unskilled and semi-skilled, young, illiterate, Afghan women and men. This will be achieved by providing them with market relevant practical skills to improve their potential for employment and Higher earnings, and building their basic literacy and numeracy skills. The project will also improve labor market outcomes by enhancing the quality of training delivery through performance-linked

financial incentives, and will use non-formal training providers and employers to train the unskilled and illiterate individuals. The project will also contribute to creating business opportunities for Training Providers and bazaar shop owners while promoting wage employment and self-employment for an important segment of the Afghan population.

2015 **Granite Project, Sherbatu, Environmental Studies, Bamyan, Afghanistan**
Client: CENTAR AMERICAN
Project Summary:
Baseline environmental studies
Reviewing legal documents
Impact Assessment
Mitigation and remediation plan
EMP and Monitoring plan
Data collection, raising awareness by (conducting focus group discussion, personal interview, field observation)
Desk tasks

2014 **Afghan Tajik- Mazar-e- Sharif Block**
Baseline environmental assessment (BEA) & social impact assessment (SIA) and environmental impact assessment (EIA), Northern area, Afghanistan
Client: Ministry of Mine and Petroleum Afghanistan
Contractor: Turkish Petroleum and Dragon Oil and Gazanfar Group Consortium
Project Summary:
Contractor acquire approximately 1200 km of 2D seismic data and to drill total of 2 wells in the northern Afghanistan as part of Client oil and gas exploration program commitment with terms of the concession agreement. Before commencement of Seismic Data Acquisition Baseline Environmental Assessment along with the Social Impact Assessment studies will be carried out and before commencement of Drilling Activity Environmental Impact Assessment shall be carried out according to article 13 of Environment Law of Afghanistan, for the area of Mazar-I Sharif.

2012-2014 **Feasibility Study, Procurement and Institutional Development Support for the Northern Afghanistan Railway Study.**
Project Summary:
Green Tech Company was assigned to prepare the feasibility study for Phase 1&2 railway which is currently under way. As part of the feasibility study of Phase 1&2 of the project a programme of social investigation related field survey and data collection is required.
Also Flora and Fauna study including studies about on Birds migration and habitat is done in this project. The document provided base on the Terms of Reference (TOR) for this Social Safeguard Planning Sub-consultancy Works.
The total length of the railway in Phase 1&2 including mainline Kholm to Aqina and Amu Darya Oil and Gas Block links to this mainline is about 620km.

2014 **Water Supply and Irrigation Storage Dam, Technical feasibility study and deign of Qadis Khordak Storage Dam Project, Qadis District, Badghis Province**
Project Summary:
Technical feasibility study and deign of Qadis Khordak Storage Dam Project, Qadis Khordak Water Storage Dam site which is located in Qadis Khordak that is one of the seven districts of Badghis Province, 62 km from provincial capital, Qala I Now this feasibility study done by Green Tech according to TOR and data collected and awareness increased among people through conducting focus group discussion, personal interview, field observation.
The assignment provided and assigned by Ministry of Rural Rehabilitation Development in May 2015.

2014 TFBSO GHAZNI Lithium, Environmental Studies Dashte Nawur Afghanistan

2013 Detailed environmental assessment for the exploration and evaluation work Program for the Badakhshan SRK licence blocks- Gold mine

2013 BEA and EIA of Amu Darya Basin includ (BES- Bazarkhami Block, EIA- Bazarkhami Block, BEA-Kashkari Block, EIA- Kashkari Block, BEA- Zamarudsay Block, EIA- Zamarudsay Block, Angot-Screening Report, Aq Darya- Screening Report, Kashkari- Screening Report.

2012 Rapid EIA (Environmental Impact Assessment

2012 Environmental Studies of Dorjeoil Oil Refinery, 2012

Curriculum Vita (CV)

Personal Information

Name	Abdul Hussain
Last Name	Haydari
Nationality	Afghan
Date of Birth	1992
Email	Haydari.1389@gmail.com h.haidari@greentech.af
Years of Experience	7

Education

2011-2014: Environmental Engineering, Avicenna University, Kabul, Afghanistan.

2008-2010: General Studding, Shamsul Arifeen High School, Ghazni, Afghanistan.

Other Courses

Global Warming: ***The Science and Modeling of Climate Change*** (On-line Course) from Chicago University, United States, America, from June 25, 2018.

Certificate of Training ***the World Bank Environmental and Social Framework***, from World Bank, Kabul, from July 9-10, 2018.

Certificate of ***Training Course on Decentralized Wastewater Treatment System (DEWATS)*** from BORDA Company, Kabul, from 14th March 2016 to 23th March 2016.

Diploma of 12-mounth English for Academic Purposes Courses and TOFLE iBT preparation Courses from TOEFL House institute, Kabul, Afghanistan.

Languages

English:	Excellent
Dari:	Mother Tongue
Pashto:	Excellent
Deutsch:	Basic level

Employment background

Year	Company/Organization	Position
2013 - Present	Green Tech Construction & Engineering Co.	Environmental and social Expert
2016	Truthland Engineering Company.	Environmental Expert
2015	BORDA Company.	Sanitation and Social Surveyor
2015	Local Industry and Construction Institute, department of environmental engineering	Instructor

Computer Skills

Microsoft Office (Word, Excel, Access, and PowerPoint);

Adobe (Photoshop, Primer, Audition, and Flush);

Arc GIS;

Microsoft Project;

WindRose PRO3;

AutoCAD;

ROSA727;

EPANET.

Other Skills

Familiar with the afghan national environmental protection agency (NEPA) standards and compliance requirements for similar projects.

Familiar with World Bank Group/IFC (WBG) Environmental, Health and Safety (EHS) Guidelines: standards and compliance requirements for similar projects.

Familiar with ADB Safeguard Policy

Familiar with ESIA, EIA, IEE, and Screening Reports.

Familiar with function of Vibration, Sound/Noise, and Air Devices.

Familiar with water and wastewater sampling, testing and analyzing.

Familiar with Writing Proposal For ESIA;

Familiar with Preparing TOR for ESIA

Experiences

Green Tech Construction & Engineering Company

Environmental and Social Impact Assessment of Exploration of Copper Mining, Balkha District, Sar-I Pul Province, 2018.

Environmental and Social Impact Assessment of Exploration of Gold Mining, Raghistan District, Badakhshan Province, 2018.

Environmental and Social Impact Assessment of Bayat IPP (42 MW Gas to Power Plant, Sheberghan City, Jawzjan Province, 2018.

Environmental and Social Impact Assessment of Mazar IPP (50 MW Gas to Power Plant, Dehdadi District, Balkh Province, 2018.

Environmental and Social Survey and Management Plan of Jaghato to Nawor Road (88 Km), Ghazni, Afghanistan, 2017-2018.

Environmental and Social Impact Assessment of Maihan Industrial Park, Guzara District, Herat Province, Afghanistan, 2017.

Environmental and Social Impact Assessment of Kajaki Dam, Phase II, Kajaki District, Helmand Province, Afghanistan, 2017.

Environmental Survey of Northern Afghanistan Railway Study Herat – Torghundi Railway, 2016.

Environmental Social Safeguard of Cement Factory Concrete Deck Girder Bridge (300 m) over the Harirod River on Herat Bypass Road, 2016.

Feasibility Study, Procurement and Institutional Development Support for the Northern Afghanistan Railway Study, 2016.

Environmental Studies of Ghazanfar Oil Refinery, Hairaton, Balkh Province, 2015.

Granite Project, Sherbatu, Environmental Studies, Bamyan, Afghanistan, 2015.

Water Supply and Irrigation Storage Dam, Technical feasibility study and deign of Qadis Khordak Storage Dam Project, Qadis District, Badghis Province, 2014.

Shibirghan-Gas Wells Environmental Studies, 2014.

Afghan Tajik Mazar-e-Sharif & Sandoqli Blocks BEA, SIA, and EIA, 2014.

TFBSO GHAZNI Lithium, Environmental Studies Dashte Nawur Afghanistan, 2014.

Detailed environmental assessment for the exploration and evaluation work Program for the Badakhshan SRK licence blocks- Gold mine, 2013.

BEA and EIA of Amu Darya Basin includ (BES- Bazarkhami Block, EIA- Bazarkhami Block, BEA- Kashkari Block, EIA- Kashkari Block, BEA- Zamarudsay Block, EIA- Zamarudsay Block, Angot- Screening Report, Aq Darya- Screening Report, Kashkari- Screening Report, 2013.

Rapid EIA (Environmental Impact Assessment), 2012.

Environmental Studies of Dorjeoil Oil Refinery, 2012.

Responsibilities:

Identifying the environmental impacts of projects.

Analyzing the environmental impacts of projects.

Preparing of environmental and social management plan.

preparing the environmental and social monitoring plan.

Preparing the HSE plan.

Estimate the cost of environmental and social management plan.

Preparing Environmental Code of Practice

Identifying the significant impacts of project by suing checklist, matrix, and etc.

Coordinating environmental staff to lead the project from the first step to final stage.

Review and appraise the environmental risks and impacts.

Reporting on land acquisition and resettlement action plan.

Doing grievance procedures.

Conducting field surveys: collecting data to establish a baseline condition for levels of pollution or contamination for a site or area of consideration.

Carrying out desk-based research to review previous investigations of site and possibly undertaking fieldwork to identify previous activities on the site and any contamination.

Define steps required to assist clients improve their performance.

Review and finalization of Projects safeguards documents/studies.

Preparing monitoring and supervision plan for safeguards staffs.

Provide training on E&S issues to investment staff and other Specialists.

Contribute to corporate knowledge base by analyzing and disseminating lessons learned and best practice from specific IFC investments;

Prepare involuntary resettlement categorization checklist;

Report writing: completion of detailed scientific reporting.

Assess the local needs and propose relevant recommendations in the specific context of Afghanistan.

Truthland Engineering Company

Environmental and Social Impact Assessment of Chak-e Wardak Irrigation and Hydro Power Dam, 2016.

Responsibilities:

Identifying the environmental impacts of projects.

Analyzing the environmental impacts of projects.

Preparing of environmental and social management plan.

preparing the environmental and social monitoring plan.

Preparing the HSE plan.

BORDA-Afghanistan

Sanitation and Social Survey of the following site:

Deh Afghanan, Deh Ghochak, District 2, Kabul (Gozar).

Masjid-e Itifaq, District 13, Kabul (Gozar).

Responsibilities:

Fill out the survey form;

Managed the survey team;

Checked the data;

Held up the focus group discussion meeting.

Analyzed the result of both site by using Open Data Kit (ODK) Aggregate.

Local Industry and Construction Institute, department of environmental engineering

Instructor, 2015.

Responsibilities:

Taught the following Subjects:

Hydrology;

Fluid Mechanics;

Hydraulics;

Water and Wastewater Laboratory;

Environmental and Social Impact Assessment (ESIA);

Municipal Solid Waste Management;

Advisor of two students for their monograph.

Curriculum Vita (CV)

Personal Information

Name:	Zeyanab
Last Name:	Ahmadi
Nationality:	Afghan
Date of Birth:	1992
Email:	zeynab.ahmadi@greentech.af
Years of Experience:	4
Purposed Position:	Social Expert

Education

2011-2014:	Bachelor of Social Studies, Avicenna University, Kabul, Afghanistan.
2010:	Neswane Jebreil high school, Herat, Afghanistan

Other Courses

Certificate of Training ***the World Bank Environmental and Social Framework***, from World Bank, Kabul, from July 9-10, 2018.

Languages

English:	Excellent
Dari :	Native
Pashto :	Good

Employment background

Year	Company/Organization	Position
2015 – Present:	Green Tech Construction & Engineering Co.	Social & Gender Specialist

Computer Skills

Microsoft Office (Word, Excel, Access, and PowerPoint);

Adobe Photoshop

Google Earth

Projects

Green Tech Construction & Engineering Company

Environmental and Social Impact Assessment of Exploration of Copper Mining, Balkha District, Sar-I Pul Province, 2018.

Environmental and Social Impact Assessment of Exploration of Gold Mining, Raghistan District, Badakhshan Province, 2018.

Environmental and Social Impact Assessment of Bayat IPP (42 MW Gas to Power Plant, Sheberghan City, Jawzjan Province, 2018.

Environmental and Social Impact Assessment of Mazar IPP (50 MW Gas to Power Plant, Dehdadi District, Balkh Province, 2018.

Environmental and Social Survey and Management Plan of Jaghato to Nawor Road (88 Km), Ghazni, Afghanistan, 2017-2018.

Environmental and Social Impact Assessment of Maihan Industrial Park, Guzara District, Herat Province, Afghanistan, 2017.

Environmental and Social Impact Assessment of Kajaki Dam, Phase II, Kajaki District, Helmand Province, Afghanistan, 2017.

Environmental Survey of Northern Afghanistan Railway Study Herat – Torghundi Railway, 2016.

Environmental Social Safeguard of Cement Factory Concrete Deck Girder Bridge (300 m) over the Harirod River on Herat Bypass Road, 2016.

Feasibility Study, Procurement and Institutional Development Support for the Northern Afghanistan Railway Study, 2016.

Environmental Studies of Ghazanfar Oil Refinery, Hairaton, Balkh Province, 2015.

Responsibilities

Gender

Dissemination of information to women/ PAPs as proposed in the ESIA and RAP and other documents.

Oversee the environment and social issues considering gender perspective along the projects corridor.

Coordinate with provincial environmental and social management officer for ensuring women participation in the implementation of the ESM provisions especially social development issues during ESMP and RAP implementation.

Preparing women consultation guideline and procedures in order to integrate gender consideration into project plan design and implementation.

Carry out assessment of women affected by the project; assess vulnerability and entitlement issues and coordination of RAP implementation.

Facilitate women's participation in the implementation of PRA-based community mobilization as per the standard procedures for the selection of labor for community-based projects.

Monitoring the implementation of gender-specific labor-based works to ensure the smooth implementation of activities.

Identify gender and women inclusion training needs of the key counterparts and support the ESMU in the development and delivery of identified trainings.

Support the provincial ESM Officers in gathering data for community profiles and on the program's impact on improving rural access for women and children.

Provide input related to gender issues and mainstreaming within project activities into any ad hoc progress reports, briefs, periodical reports and statistical data as required by the project management.

Try to involve women in projects and make recommendations to the ESMU/PMT on appropriate measures to be taken.

Support and facilitate the provincial ESM Officers in implementing completion audits of upon completion of the projects. Facilitate women's participation in completion audits.

Monitoring the women's participation in the implementation of projects to ensure compliance with the terms agreed within community consultation and participation.

Support provincial ESM Officers to monitor the implementation and progress towards achieving the project gender focused targets.

Provide input on gender-specific activities into ESM monthly reports considering gender disaggregate-data on project progress highlighting relevant implementation challenges and measures to address such challenges as they arise and ensure timely reporting.

Management of events and publications on gender issues.

Establish GRC (Grievance Redress Committee) for women in each segment of project.

Social

Development of tools, checklists and guidelines to improve efficiencies of project processing and enable improved client management of social issues.

Train social staff.

Coordinating social staff to lead the project from the first step to final stage.

Review and appraise the social risks and impacts.

Preparing of resettlement categorization checklist.

Reporting on land acquisition and resettlement action plan.

Doing grievance procedures.

Monitoring on resettlement-related information and ensure that those are well considered and included in the program communication plan.

Conducting field surveys: collecting data to establish a baseline condition for levels of pollution or contamination for a site or area of consideration.

Carrying out desk-based research to review previous investigations of site and possibly undertaking field work to identify previous activities on the site and any contamination.

Define steps required to assist clients improve their performance.

Work with client companies and mobilize technical and financial support to address environmental and/or social aspects of clients' operations.

Review and finalization of Projects safeguards documents/studies.

Develop standard operating procedures and flowcharts.

Preparing monitoring and supervision plan for safeguards staffs.

Provide training on E&S issues to investment staff and other Specialists.

Contribute to corporate knowledge base by analyzing and disseminating lessons learned and best practice from specific IFC investments

Prepare involuntary resettlement categorization checklist

Ensure that resettlement-related information are well considered and included in the program communication plan

Assess the capacity of EA to screen impacts, prepare and implement resettlement plans, and Recommend appropriate capacity development activities to develop or enhance safeguards knowledge and skills of EA

Data interpretation including detailed assessment of data, using software modelling packages.

Development of conceptual models involving identification and consideration of the potential contaminant sources, critical pathways and receptors that could potentially have an adverse impact on the immediate and wider environment.

Report writing: completion of detailed scientific reporting.

Dialogue with regulators and sub-contractors e.g. analytical laboratories.

Assess the local needs and propose relevant recommendations in the specific context of Afghanistan.

Curriculum Vita (CV)

Personal Information

Name:	Mahbeigom Fayyazi
Nationality:	Afghan
Date of Birth:	1988
Email:	marketing@greentech.af
Years of Experience:	8
Purposed Position:	Project Coordinator

Education

2016:	B.S. in Software Engineering, University of Islamic Azad University of Najafabad, Iran

Languages

English:	Excellent
Dari :	Mother Tongue
Pashto :	Good

Employment background

Year	Company/Organization	Position
2017 – Present	Green Tech Construction & Engineering Co.	Project Coordinator
April 2018 – for one week	Sandra Calligaro, ACF	Translator and interpreter
2016 – 2017	AFGHANISTAN RESEARCH AND SOCIAL CHANGE ORG (ARSCO	IT Officer
2015-2016	PARSI GROUP	Social Media Activist (Telegram, Instagram)
2014	JOOYESHGAR COMPANY	Web Developer
2013-2014	SOMAYEH Technical University	Senior IT Assistant
2011	Taheri Mobile	Manager

Skills/Qualifications

Proficiency in written and spoken English. TOEFL Score: 80

Computer literate in Microsoft Word, Excel, PowerPoint, Outlook, e-mail & social media

Demonstrated experience in leadership through active role/presidency in university and organization

Team working skills through experience on Internship Course

Research & Analytical Skills through my bachelor's final project "A review of studies in breast cancer detection by image processing"

Experience

Green Tech Construction & Engineering Company

Environmental and Social Impact Assessment of Exploration of Copper Mining, Balkha District, Sar-I Pul Province, 2018.

Environmental and Social Impact Assessment of Exploration of Gold Mining, Raghistan District, Badakhshan Province, 2018.

Environmental and Social Impact Assessment of Bayat IPP (42 MW Gas to Power Plant, Sheberghan City, Jawzjan Province, 2018.

Environmental and Social Impact Assessment of Mazar IPP (50 MW Gas to Power Plant, Dehdadi District, Balkh Province, 2018.

Environmental and Social Survey and Management Plan of Jaghato to Nawor Road (88 Km), Ghazni, Afghanistan, 2017-2018.

Environmental and Social Impact Assessment of Maihan Industrial Park, Guzara District, Herat Province, Afghanistan, 2017.

ESIA Project Coordinator and Marketing Officer

Help create customer research databases

Analyze research to target the best audience and maximize reach

Meet and coordinate with marketing director on a regular basis

Collaborate with other marketing team members

Research and analyses market trends, competitor offerings, demographics, and other information that affects marketing strategies

Works with other company officers to establish budgets and marketing objectives

Write, edit and proofread marketing material for use in different channels

Oversee and update the website(s)

Coordinate with outside agencies, for example designers, to produce marketing material such as stationery and web pages

Maintain and develop the organization's database

Aim to maximize number of customers

Sandra Calligaro, ACF

Translator and interpreter for interviewing women in Ghor province about violence against women

Communicate with women and help them feel comfort with our team.

Help my supervisor to choose cases for interview.

Interpret interviewer for my supervisor, and make sure she got it.

Translate Dari voices to English writing.

AFGHANISTAN RESEARCH AND SOCIAL CHANGE ORG (ARSCO)

IT Officer

Set up workstations with computers and necessary peripheral devices (routers, printers.)

Install and configure appropriate software and functions according to specifications.

Provides assistance in the use of personal computer hardware, software, and specialized mainframe technology.

Installs software and installs and repairs hardware and peripherals;

Sets up and configures desktop computers, peripherals and accounts assigning security level;

Troubleshoot systems and network problems, diagnosing and solving hardware or software faults.

Setup new user's accounts and profiles and deal with password issues.

Assist in maintaining Internet service, firewalls, and telephone systems.

Maintain records/logs of repairs and fixes and maintenance schedule.

PARSI GROUP

Social Media Activist (Telegram, Instagram)

Communicate with buyers and present the company's product.

Browsing web and find new products.

Maintained contacts information and organized and updated more than 1670 records in Excel databases files in the first month.

Registering purchase orders in the Access database.

Prepared reports monthly, quarterly or whenever required.

Able to query data and generate required report.

JOOYESHGAR COMPANY

Web Developer

Working as a part of team, joined in sessions, expressed my ideas and problem-solving.

Providing maintenance and support for customer's applications.

Working with MySQL and SQL databases and HTLM, CSS, Bootstrap, PHP.

SOMAYEH Technical University

Senior IT Assistant

Testing computers to see if they are working well and troubleshooting routine problems.

Installing various applications and programs for end users.

Setting up and configures desktop computers and

The ability to handle computer hardware and software

Taheri Mobile

Manager

Leading 4 employees

Monitoring team performance and report and training new employees using the data entry software

Developing and maintaining an internal client filing system

Annex 7. Noise Modeling

Introduction

A new power plant is going to be built in Mazar-i-Sharif, Afghanistan. Since all industrial units produce different environmental pollutions and causes damage to human, animal and plant ecosystems, the air pollution caused by the new power plant is discussed in this study. This power plant is located 16.5 km from the Mazar-i-Sharif and ends with a distance of 350 meters from the north to an industrial town. The area has almost no residencies, and only a 950-meter-long river is located on the west part of the region. Also, in the southwestern part of this site, a mountain area with a 5 km length range is located with no residential property. So, the location of the power plant is quite rural and shown in Figure Annex 7-1.

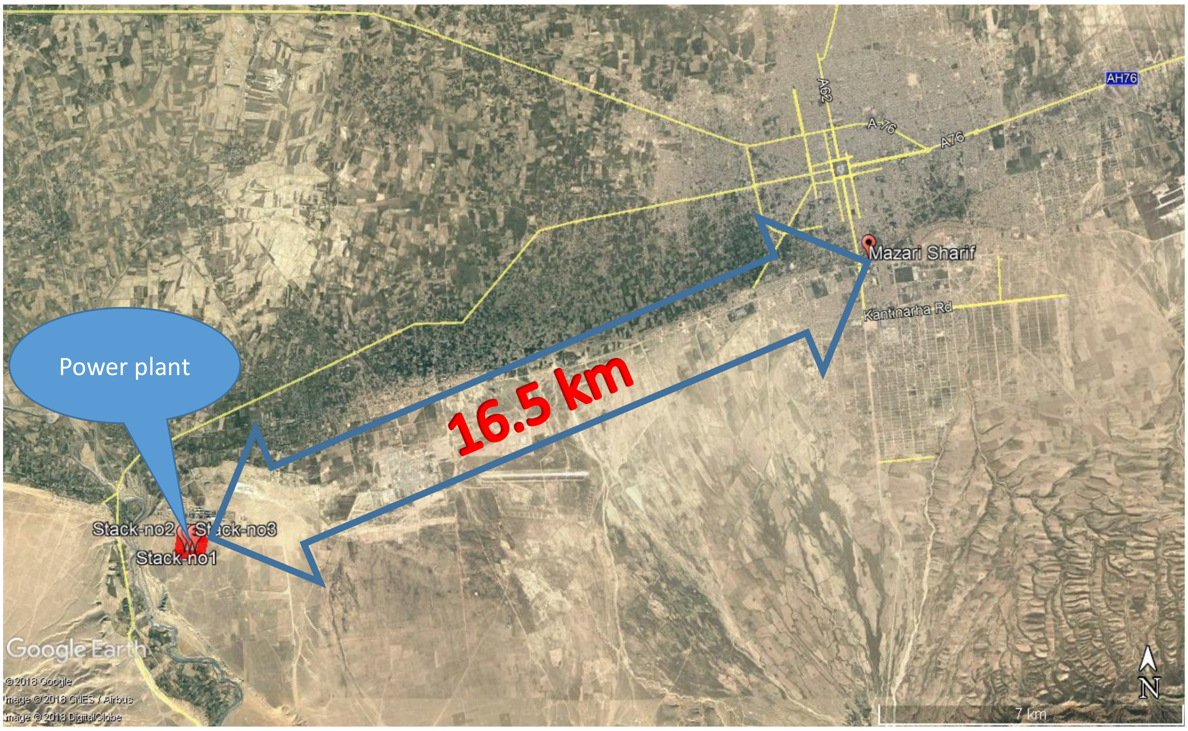


Figure Annex 7-1. The location of new power plant.

The plant equipped with three stacks that release CO and NOx pollutants. The stacks coordination in the UTM coordinate system is shown in Table Annex 7-1.

Table Annex 7-4- Stacks geographical coordination.

	latitude	longitude	Base Elevation (m)
Stack-1	36.629823°	66.942233°	437.72
Stack-2	36.629752°	66.943342°	438.9
Stack-3	36.629681°	66.944629°	440.77

The released gas of stacks, due to the difference in pressure between the fluid and the ambient air, produces sounds with a specific frequency. The sound intensity level, especially if exceed from the level of the average standard, needs proper procedures to reduce the intensity level. So, the sound level is calculated and then compared to the existing regulatory thresholds. The first step in determining the sound level is defining the type of stack. In general, in the sound tracking produced by flares and stacks, their classes are classified into two kinds of the ground stack (with less than 20 meters height and a relatively large vent) and the high stack (with more than 20 meters height). The simplistic equation for estimation the produced sound is same as follows:

The ground stack:

$$L_{WA} = 100 + 15 \times \log\left(\frac{Q}{Q_0}\right) \quad (1)$$

The high stack:

$$L_{WA} = 112 + 17 \times \log\left(\frac{Q}{Q_0}\right) \quad (2)$$

In the equations, L_{wA} is the sound intensity level in dB, Q is the mass flow rate of the stack, and Q_0 is the reference mass flow rate based on the type of vent.[3] There are also various techniques and methods for calculating this matter. The Flaresim software is one of the tools that can be used o order to solving flares/stacks environmental design.[4] This software will be used in this study too.

The Sound Calculation

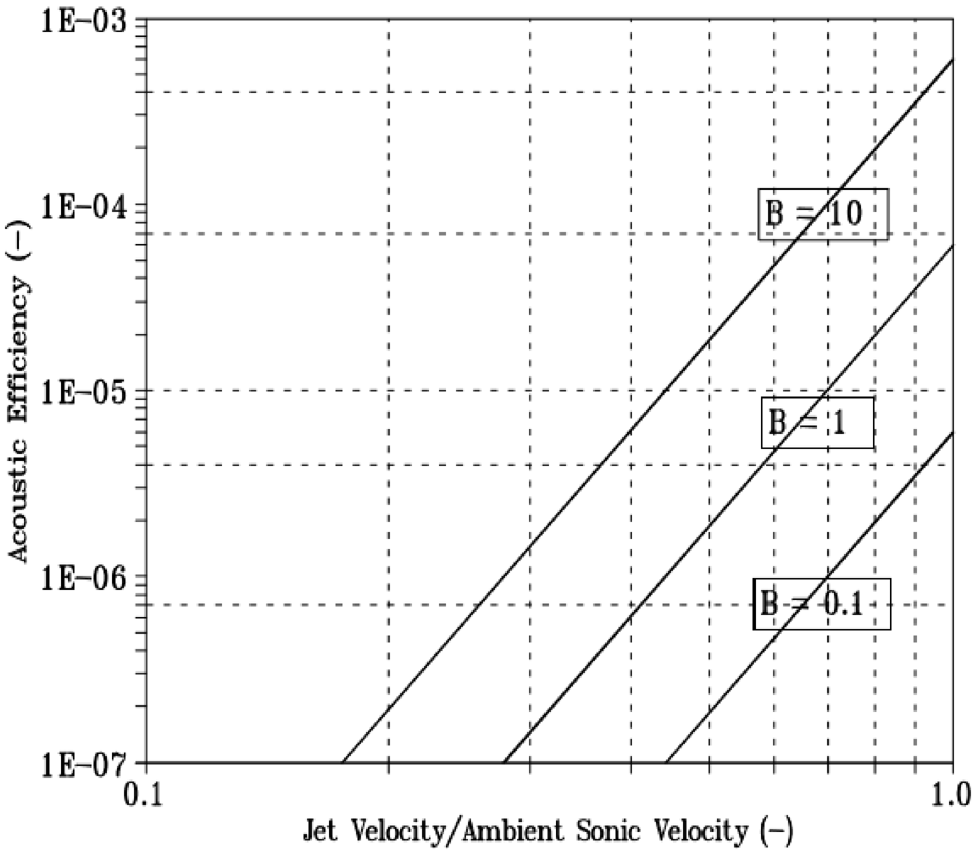
The Flaresim is an advanced software for flame simulation and design that developed by Hampshire, UK. This program can simulate the thermal radiation, noise generated by the flare system in industries, refineries, and factories, and the temperature of exposed surfaces. Also, users can implement flares based on radiation and sound for gas and liquid gas using a range of modeling algorithms by this software. The Flaresim is used to ease the design and simulation of vent system piping and flare systems at all stages of the design process. In this program, a stream diagram is used

[3] Manual Version 5.2. Copyright Flaresim Ltd, 201, http://www.softbits.co.uk

[۴] Hantschk, C. , Schorer E. Prediction of noise emission from industrial flares, Muller-BBM GmbH, Robert-Koch-Str. 11,82152 Planegg, Germany, www.acoustic08-paris.org to display the pipe network directly. Beside this chart, the supplementary tables contain all the necessary information and calculated results. This program is often used to model the flare's piping systems. This software can calculate the level of produced sound by (1) the burning of materials in flares and (2) gas emission in flares and stacks. In this project, the second mode is used because of the gas vent from the burner occurs without burning. The required equations for this mode are as follows:

$$PWA = \eta V \frac{\rho_j u_j^2}{2} \quad \text{...(3)}$$

$$B = \frac{\rho_j}{\rho_\infty} \times \left(\frac{T_j}{T_\infty} \right) \quad \text{...(4)}$$



$$SPL_i = SPL_{tot} - 10 \times \log \left[\left(1 + \left(\frac{f_i}{2f} \right)^2 \right) \left(1 + \left(\frac{f_{\max}}{2f} \right)^4 \right) \right] - 5.3 \quad \text{...(4)}$$

In these equations, the sound intensity level, the sound intensity pressure, the gas density, the temperature, the exhaust gas velocity, and the intermediate parameters are specified to determine the produced sound.

The height of the stacks is 30 m from the ground, and their outlet is 1.6 m. The gas flow rate is 26 m/s, and the gas output temperature is 365°C. Emission data of the **stacks is shown in Table Annex 7- 2.**

SOURCE			
ITEM	**parameter**	**format-units**	W18V50SG Genset
1	number of source	-	3xW18V50SG
2	source type	stack, boiler, flare	stack
3	location	Lat/Lon	Power plant
4	height	m	30
5	Stack inside diameter	m	1.6
6	Gas Exit Velocity	m/s	26
7	Gas Exit Temperature	C	365
8	Pollution name	-	CO, NO_x
9	Pollution type	gas/aerosol/PM	gases
10	Emission rate	gram/s	6.6(CO), 6.0 (NO_x)

The primary objective of this project is the environmental assessment of Mazar-i-Sharif power plant. Figure 2 shows the produced sound by the vent jet in a stack.

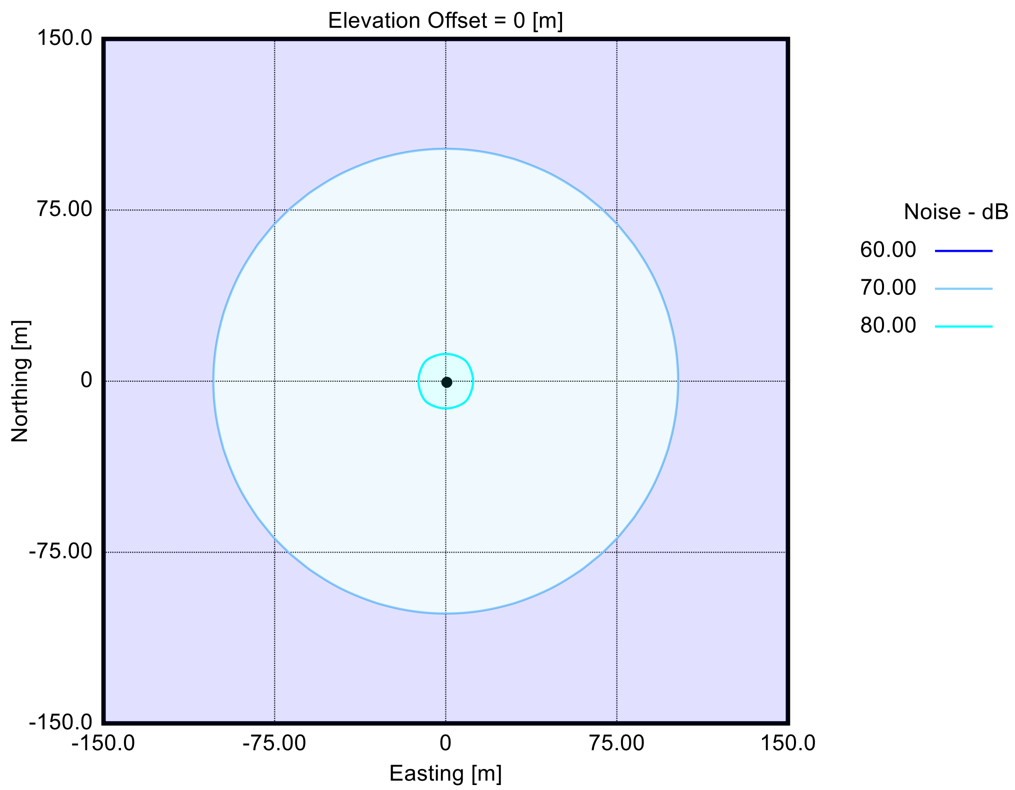


Figure Annex 7- 2- Sound level alignment on the ground

The ground maximum average level of the produced sound is 80 dB with 10 meters distance from the stack. The high maximum average level of produced sound, with 30 meters above the vent, is 90 dB with 8 meters distance from the stack. Moreover, the 80 dB sound leveling zone is located at a radius of 30 meters. Figure Annex 7-3 shows the sound level alignment at 30 meters.

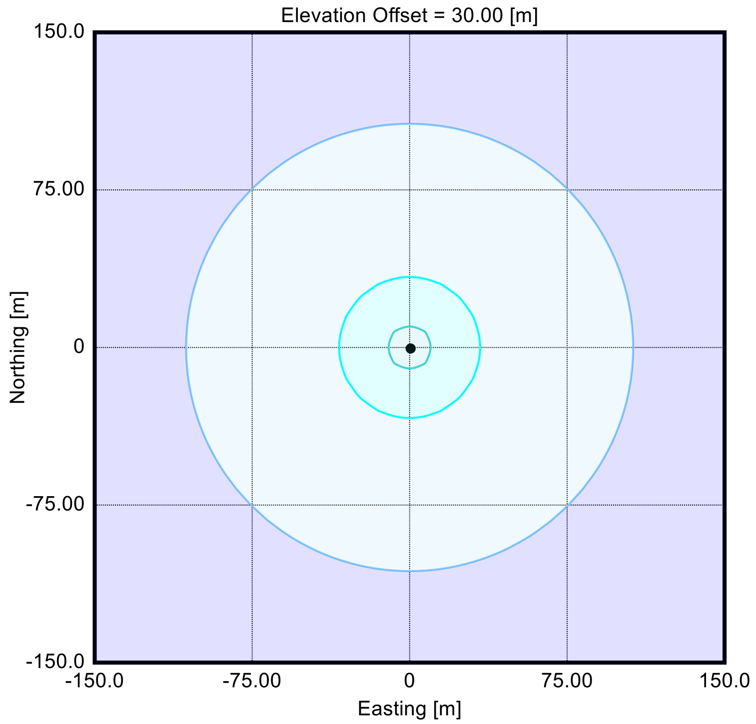


Figure Annex 7- 3- Sound level alignment at 30 meters.

Also, the sound intensity at various frequencies is shown in Figure Annex 7-4. The lower frequencies have the higher sound levels.

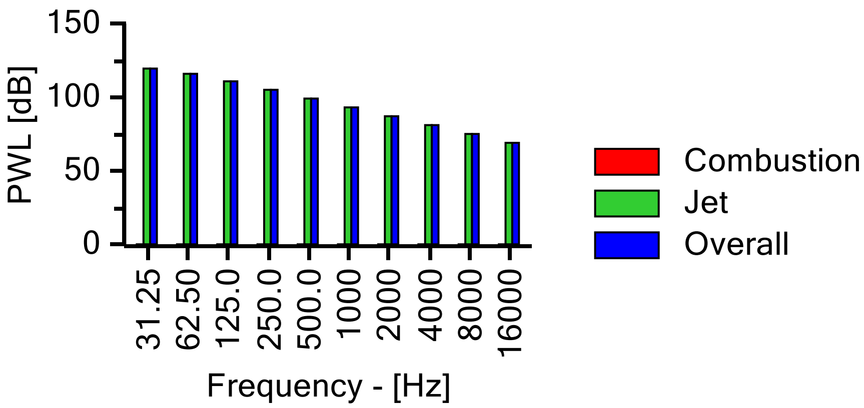


Figure Annex 7- 4- The sound intensity at various frequencies.

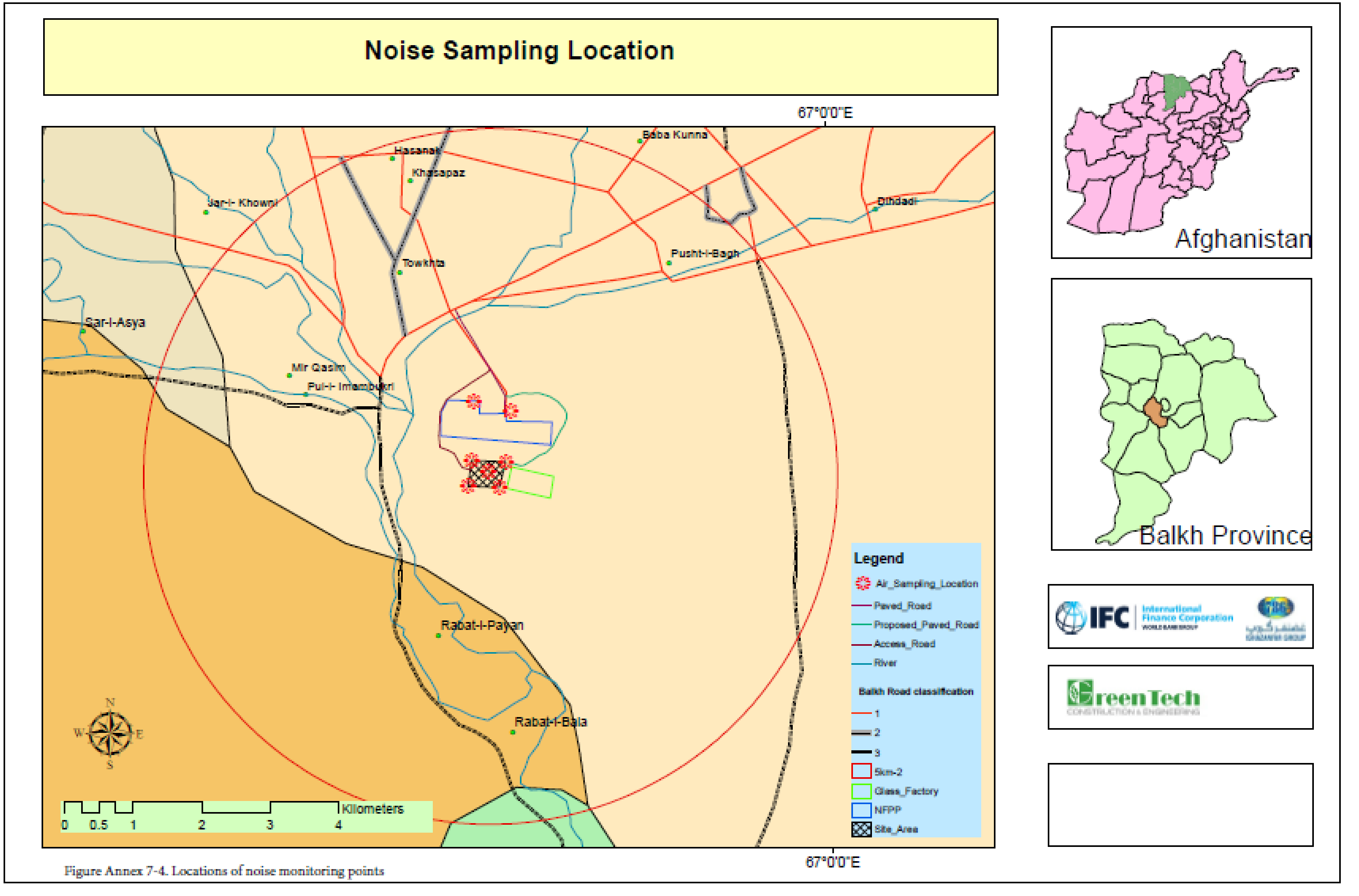


Figure Annex 7-4. Locations of noise monitoring points

Figure Annex 7- 5 The sound intensity at various frequencies.

Annex 8. Yatimtaq and Gerquduq Gas Samples

The Ghazanfar Group
Mazar IPP

2. Fuel Gas Analysis

SGS

Certificate of Quality No. 30-0077/17-AF
Page 1 of 1

CERTIFICATE OF QUALITY No. 30-0077/17-AF

Client: **Ghazanfar Group**
Sampled on: **15.03.2017**
Grade: **Natural Gas**
Received on: **04.04.2017**
Source: **Sample 1 ex Yatimtag field**
Sample 2 (cleaned) ex Hoji Gogirdek field

According to instructions received from Ghazanfar Group representatives, on the 15th of March 2017 two samples of Natural Gas were drawn by SGS inspector at Yamitag and Hoji Gogirdek fields, Afghanistan. On the 04 of April the samples were forwarded, without disclosing of its sources, to subcontracted accredited laboratory for analysis. The obtained results are as below, protocol dated 06.04.2017 issued by subcontract accredited laboratory.

PROPERTY	UNIT	RESULT	
		Sample 1	Sample 2
Carbon dioxide	Mole %	1.06	1.05
Methane	Mole %	95.55	96.39
Ethane	Mole %	0.74	0.71
Propane	Mole %	0.26	0.11
I-Butane	Mole %	0.30	0.03
N-Butane	Mole %	0.39	0.05
I-Pentane	Mole %	0.14	0.04
N-Pentane	Mole %	0.10	0.06
Hexane + Superior	Mole %	0.91	1.17
Nitrogen	Mole %	0.55	0.40
Density at 20 oC	kg/m^3	0.735	0.726
Relative Density		0.6109	0.6031
Wobbe Index (Superior)	Mj/m^3	50.76	50.65
Mean Molecular Weight		17.65	17.43
Superior Heat Value (Mol)	Kj/mol	935.85	927.89
Compressibility Factor		0.9976	0.9976

Precision parameters apply in the determination of above test results. Also refer to ASTM D3244-97, IP367 and Appendix E of IP Standard methods for Analyses and Testing for Utilization of test data to determine conformance with specifications. Tests performed in accordance with latest available issue of the relevant test method unless otherwise indicated

Signed and dated at
Hairaton, Afghanistan
11th April 2017

For SGS Afghanistan Ltd.

SGS Afghanistan Ltd. | Hairatan City Afghanistan, Mobile +93 793 239 787, +93 794 234 585, +998 97 333 9179 www.sgs.com
Member of the SGS Group (Société Générale de Surveillance)

8329P01/FICHT-20227939-v1 FICHTNER 2

Annex 9. Stakeholder Engagement Records

Community and NGO Consultation Meetings.

Focus Group Discussion #1
Attendance Sheet
Date: 03.26. 2018 Time: 2:00 PM-4:00 PM
Venue: Barakha village

#	Name	Job	Organization	Phone No.
1	Barialai Khan		NFPP	0792881418
2	Shamuddin		NFPP	0781637380
3	Mohammad Areif		NFPP	0797327572
4	Khoshdil		NFPP	0795797743
5	Qari Mohammad Zabit	Mulla	Baraka Mosque	0785897929
6	Nawed	Free Self-Employment		

Focus Group Discussion #2
Attendance Sheet
Date: July 21, 2018 Time: 2:00 PM-4:00 PM
Venue: Posht-e Bagh village (men)

#	Name	Job	Organization	Phone No.
1	Din Mohammad	Head of Teacher	School	799492423
2	Najebulla	Teacher	School	791419960
3	Moham Azim	Farmer		
4	Abdul Jabar	Free Self-Employment		793256937
5	Mohammad Tamin	Student	University	793012111
6	Haji Abdul Hakim	Farmer		
7	Habibulla	Employment	NFPP	777890017
8	Mohammad Hisam Din	Driver		789303708
9	Mohammad Alam	Farmer		
10	Mohammad Zulmai	Chairman	Transport	729903333
11	Ghulam Sakhi	Farmer		
12	Mohammad Qasim	Farmer		
13	Jan Mohammad	Soldier		
14	Abdul Star	Villager	Posht-e Bagh	789400998

Focus Group Discussion #3
Attendance Sheet
Date: 07.21. 18 Time: 2:00 PM-3:30 PM
Venue: Posht-e Bagh village (women)

#	Name	Job	Organization	Phone No.
1	Rana	House Wife		0798400998
2	Najebulla	House Wife		
3	Najela	House Wife		
4	Sidiqa	House Wif		
5	Shafiqa	House Wife		
6	Hamida	House Wife		

Focus Group Discussion #4
Attendance Sheet
Date: July 22, 2018.Time: 8:00 AM-10:00 AM
Venue: Masjed Jamee of Tohkta Village

#	Name	Job	Organization	Phone No.
1	Din Mohammad	Head of Teacher		799492423
2	Najebulla	Teacher		791419960
3	Moham Azim	Farmer		
4	Abdul Jabar	Free Self-Employment		793256937
5	Mohammad Tamin	Student	University	793012111
6	Haji Abdul Hakim	Farmer		
7	Habibulla	Employment	NFPP	777890017
8	Mohammad Hisam Din	Driver		789303708
9	Mohammad Alam	Farmer		
10	Mohammad Zulmai	Chear Man	Transport	729903333
11	Ghulam Sakhi	Farmer		
12	Mohammad Qasim	Farmer		
13	Jan Mohammad	Soldier		
14	Abdul Star	Villager	Tohkta	789400998

Focus Group Discussion #5
Attendance Sheet
Date: July 22, 2018. Time: 10:00 AM-12:00 AM
Venue: Sahaee Rahaeshi Kod-e Barq

#	Name	Job	Organization	Phone No.
1	Qutay Tayeb	Teacher		0799104565
2	Tamanna Hamidi	Teacher		0728544831
3	Zuhal Hashimi	Teacher		
4	Aesha	Cleaner		
5	Nahid	Teacher		
6	Shahnaz	Teacher		
7	Noshin	Teacher		
8	Roshan	Teacher		
9	Hafiz	Teacher		0700552213
10	Nafisa	Teacher		0797716519
11	Arezo	Teacher		
12	Razia	Student		0797273229
13	Bakhtavar	Teacher		0700509949
14	Shafiqa	Teacher		0797273229
15	Mozhdah	Teacher		0792020760
16	Sediqa	Teacher		0779742626
17	Tahmina	Teacher		
18	Marina	Teacher		0728544839
19	Sharifa	Teacher		0796910195
20	Mina	Teacher		0773700547
21	Beheshta	Teacher		0779742626
22	Sahar	Teacher		0793538454
23	Shahnaz	Teacher		
24	Khalida	Teacher		0797618496
25	Freshta	Teacher		
26	Najiba	Teacher		
27	Halima	Teacher		
28	Nafisa	Teacher		0705062966
29	Amena	Teacher		0795134739
30	Najiba	Teacher		
31	Fatema	Teacher		0799158488
32	Bi bi Hawa	Teacher		0795342421

Focus Group Discussion #5
Attendance Sheet
July 25, 2018.
Time: 10:30:00 AM-12:00 AM
Venue: Kod-e Barq

#	Name	Job	Organization	Phone No.
1	Amir Sha	Employment	NFPP	0730590431
2	Mohammad Iaqub	Employment	NFPP	0782672072
3	Saadat	Employment	NFPP	
4	Rokay	Employment	NFPP	0795811670
5	Khal Mohammd	Employment	NFPP	0798376900

Focus Group Discussion #5
Attendance Sheet
Date: 07.23. 18 Time: 02:00 PM-3:30 PM
Venue: DACAAR (NGO)

#	Name	Job	Organization	Phone No.
1	Mohammad Usof	Site Coordinator	DACAAR	0728313405
2	Samira	Supervisor	DACAAR	0793708034
3	Qais	Trainer	DACAAR	0729008818
4	Sayed Ali	Supervisor	DACAAR	0791810964

Focus Group Discussion #5
Attendance Sheet
Date: 07.23. 18 Time: 02:00 PM-3:30 PM
Venue: Bakhtar Development Network (BDN)

#	Name	Job	Organization	Phone No.
1	Dr Nizamuddin	Employment		0793085430
2	Dr Asad	Employment		0798640231
3	Dr Sabir	Employment		0799321159

Annex 10. ARAZI Land Lease Agreement and Operation License

Confidential – Included as separate deliverable

Annex 11. Air Modeling

Introduction

A new power plant is going to be built in Mazar-i-Sharif, Afghanistan. Since all industrial units produce different environmental pollutions and causes damage to human, animal and plant ecosystems, the air pollution caused by the new power plant is discussed in this study. This power plant is located 16.5 km from the Mazar-i-Sharif and ends with a distance of 350 meters from the north to an industrial town. The area has almost no residencies, and only a 950-meter-long river is located on the west part of the region. Also, in the southwestern part of this site, a mountain area with a 5 km length range is located with no residential property. So, the location of the power plant is quite rural and shown in Figure Annex 11-1.

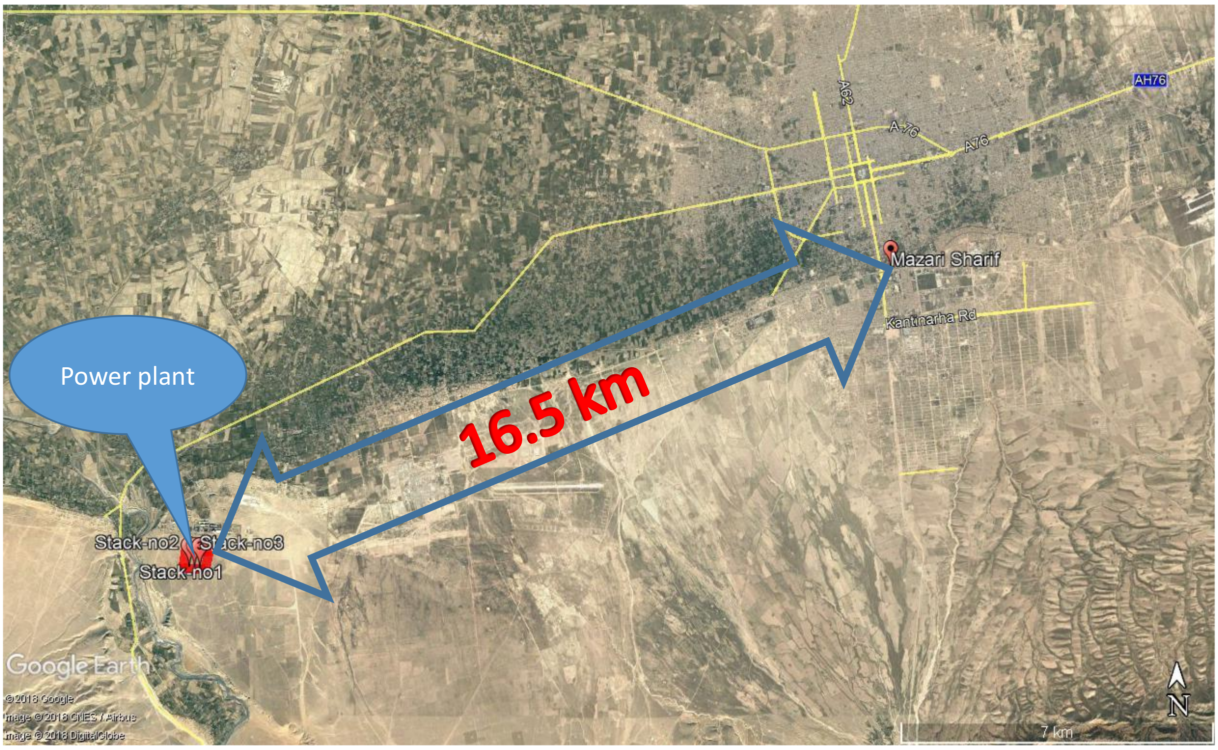


Figure Annex 11- 1 The location of new power plant.

The plant equipped with three stacks that release CO and NOx pollutants. These three stacks are located on the southern side of the power plant, and commonly one of them is in the standby mode to be used as needed. The issue that is considered in this part of the project is assessing the concentration of pollutants in the studied area under various meteorological conditions. The stacks coordination in the UTM coordinate system is shown in Table Annex 11-1.

Table Annex 11-**1**. Stacks geographical coordination.

	latitude	longitude	Base Elevation (m)
Stack-1	36.629823°	66.942233°	437.72
Stack-2	36.629752°	66.943342°	438.9
Stack-3	36.629681°	66.944629°	440.77

Figure Annex 11-2 shows the proposed location of the power plant and its stacks.

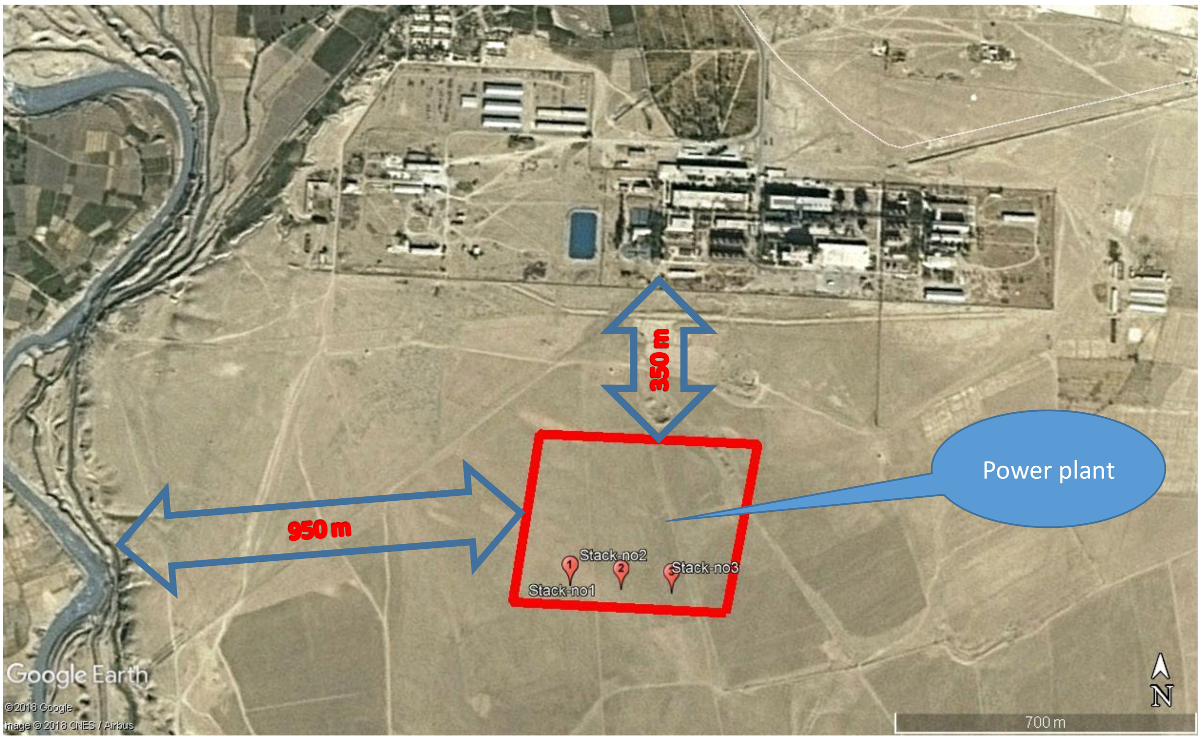


Figure Annex 11- 2 Location of the power plant and stacks.

The height of the stacks is 30 m from the ground, and their outlet is 1.6 m. The gas flow rate is 26 m/s, and the gas output temperature is 365°C. Emission data of the stacks is shown in Table Annex 11-2.

Table Annex 11-2. Stacks emission data.

ITEM	parameter	format-units	W18V50SG Genset
1	number of source	-	3xW18V50SG
2	source type	stack, boiler, flare	stack
3	location	Lat/Lon	Power plant
4	height	m	30
5	Stack inside diameter	m	1.6
6	Gas Exit Velocity	m/s	26
7	Gas Exit Temperature	C	365
8	Pollution name	-	CO, NO_x
9	Pollution type	gas/aerosol/PM	gases
10	Emission rate	gram/s	6.6(CO), 6.0 (NO_x)

In this project, which is aimed to the environmental assessment of the power plant, it is assumed that all the capacity of the power plant is used, and all three stacks are working in particular circumstances to work out the most critical outcome.

1. The power plant simulation

The AERMOD model has been using regarding the power plant's air pollution simulation. The model calculation is based on Gauss distribution equation in a steady state and employs two AERMAP and AERMET preprocessors, which analyses and sorts topographic and meteorological data respectively [1]. The studied domain in AERMOD is defined initially, and then the topographic processor analyses the effects of topographic situations of this domain. The meteorological processor sets the period of study, and after the definition of the emission sources, the model will be implemented.

1.1. Studied domain and topographic processing

For a better assessment of the pollutants' release the location of Mazar-i-Sharif, as a residential area, should be in the domain. In this regard, a radius with a 20 Km length from the power plant's center is considered. The studied domain, which is the pollution receptor grid, with a geographical center of 36.631161 and 66.943732, contains 80 cells with the size of 500 meters in both horizontal and vertical directions. In total, the concentrations and other parameters, such as topographic parameters, are calculated in 6400 grids. Figure Annex 11-3 shows the studied domain.

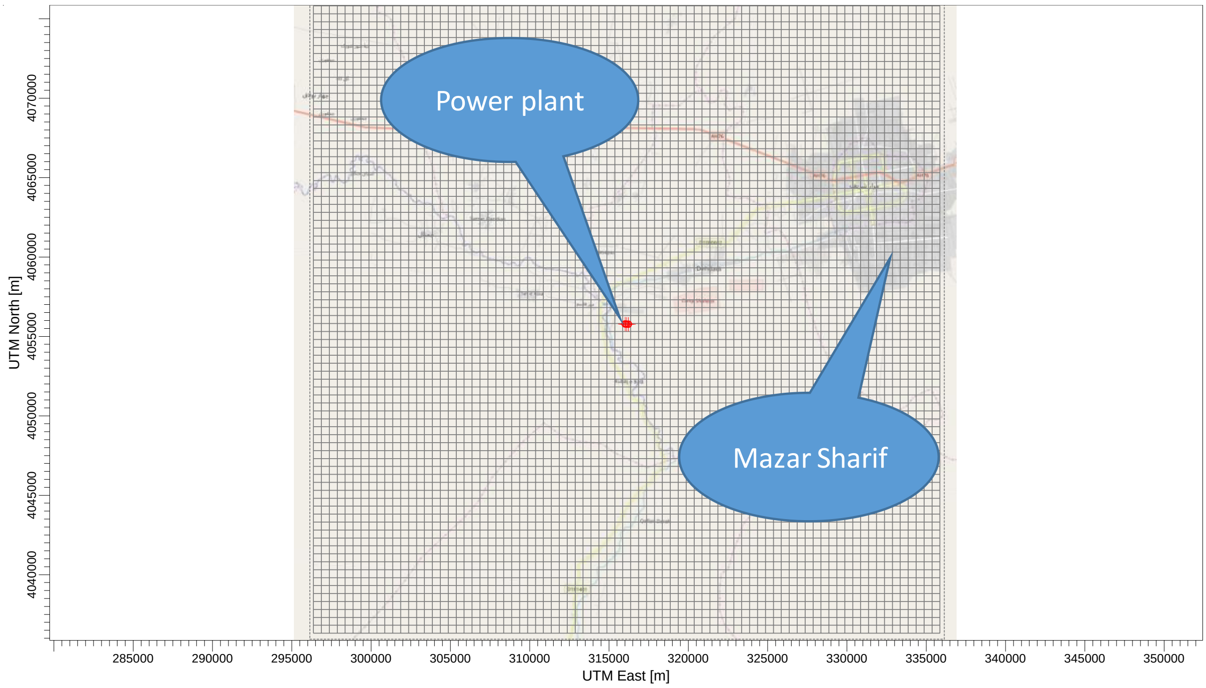


Figure Annex 11- 3 The studied domain.

Aimed at regional topography processing, data from the Global SRTM3 (90m), available in the USGS database, is used [2]. The AERMAP processor calculates the elevation of the sea level for all the receptor grids of the domain. Also, the model considers the geographical topographies' effects on the solution of the distribution equations. Figure Annex 11-4 shows the topography situations of the studied area.

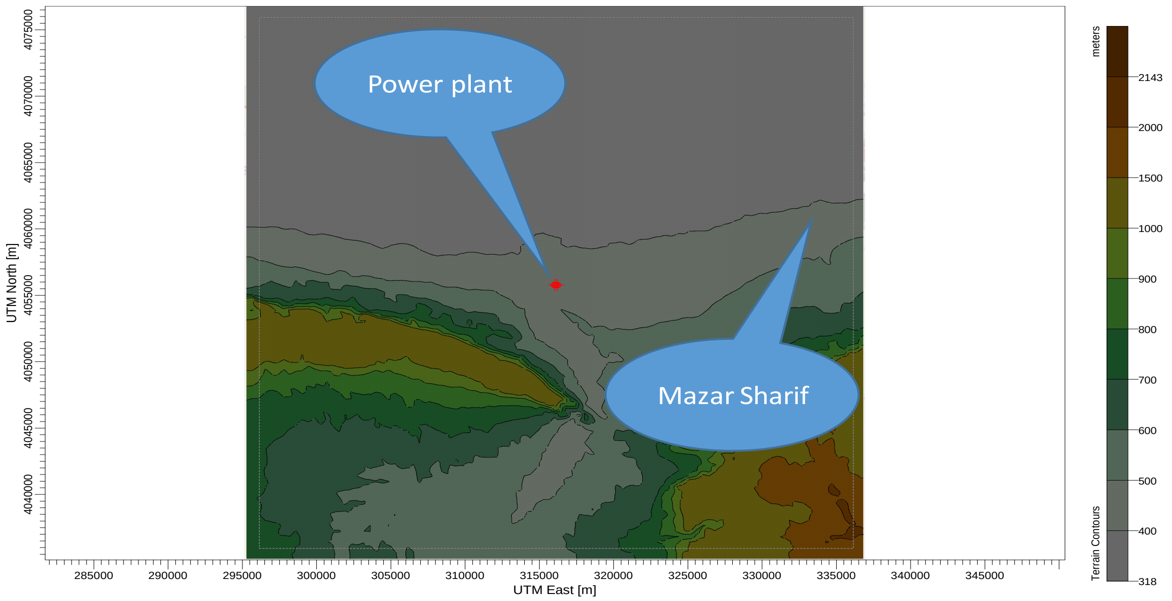


Figure Annex 11- 4 Domain's topographic situation

Two mountains are located in the south of the power plant, as shown in Figure 4. The highest elevation in comparison of the sea level is 2113 m and is related to the southeastern mountain. The height of the stacks from the sea level is estimated at 440 meters by the processor. The three-dimensional topographic map of the domain is shown in Figure Annex 11-5.

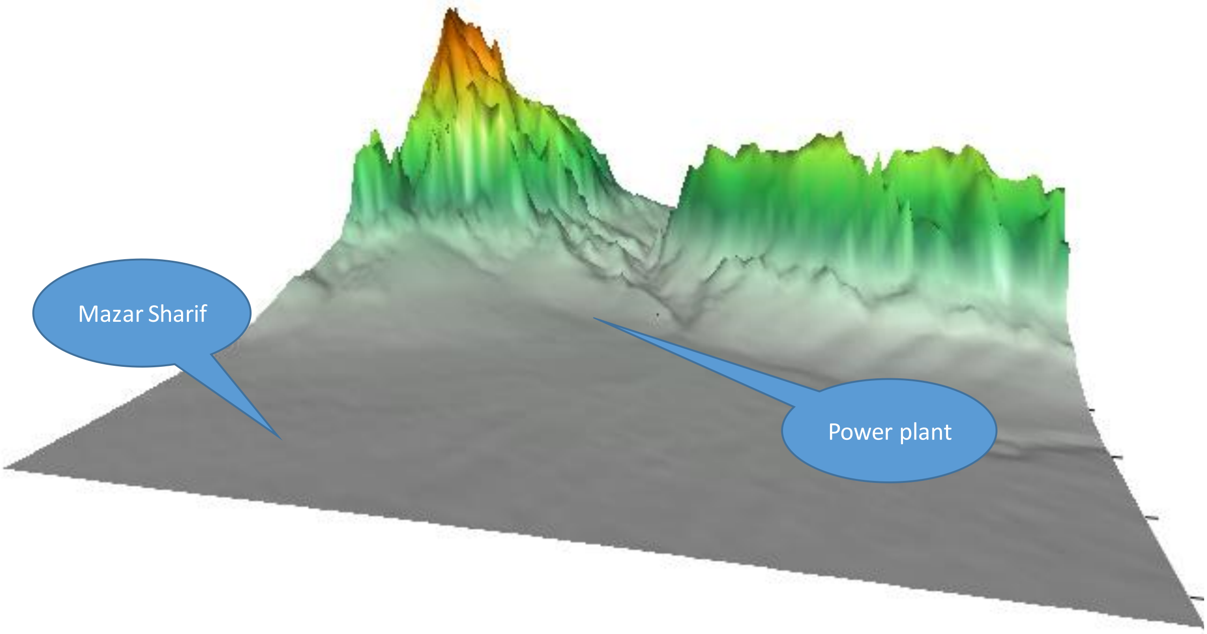


Figure Annex 11- 5 3D topographic view of the domain.

1.2. Run time and meteorological processing

For each runtime, meteorological processing is performed by the AERMET processor, and two sfc and pfl files, which contain low-atmospheric and high-atmospheric information respectively. Data recorded at the synoptic station of Mazar-i Sharif Airport is used as meteorological data. The airport is in the southeast of the city with a geographical coordinate of 36.70831 and 67.21198. The runtime range is determined according to the standard concentration of each pollutant in the ambient air [3].

The standard air quality for the air pollutants which provided by the US Environmental Protection Agency is presented in Table Annex 11-3.

Table Annex 11-3. The US-EPA ambient air standards.

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 μg/m^3 [1]	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb [2]	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm [3]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 μg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 μg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb [4]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

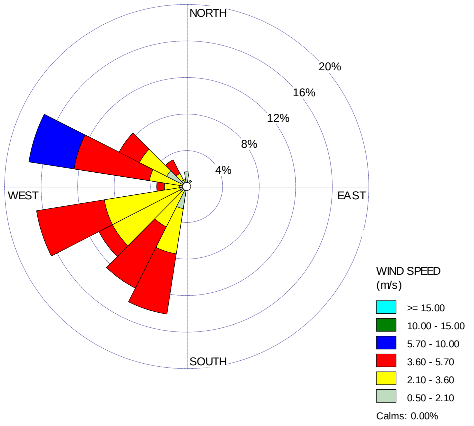
According to the standards provided by the EPA, one-hour and 8-hours investigations are required for CO pollutions. Also, for pollutants NOx, examination times are one-hour and one-year. Since the weather conditions vary in different seasons, it is necessary to select days that represent the whole year conditions.

In this regard, the middle days of each season are selected to run, which are shown in Table Annex 11-4.

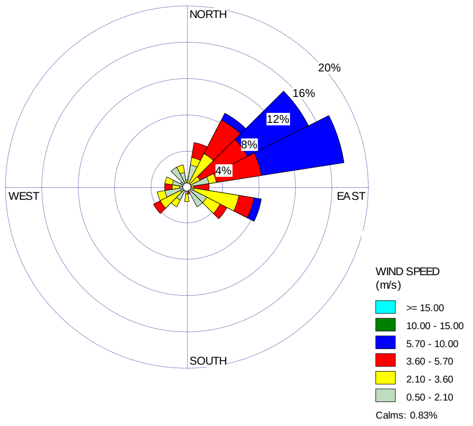
Table Annex 11- 4. Highlighted runtimes.

	START			END		
SEASON	year	month	day	year	month	day
SPRING	2017	5	4	2017	5	8
SUMMER	2017	8	4	2017	8	8
FALL	2017	11	4	2017	11	8
WINTER	2018	2	3	2018	2	7
ALL	2016	1	1	2018	8	1

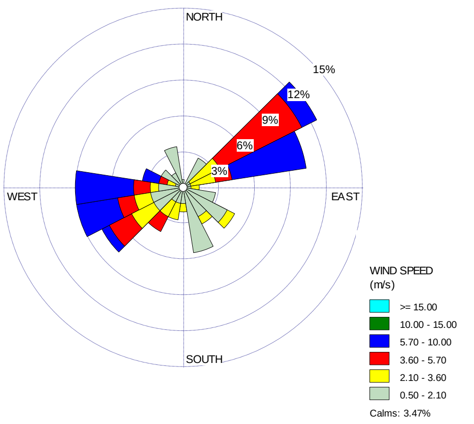
After the meteorological process, parameters such as temperature, dew point temperature, wind speed, wind direction, cloudiness, and relative humidity are regulated in a specified format to be used by the model. Figure Annex 11-6 shows the Rose-wind diagrams of the days using the output of the weather processor.



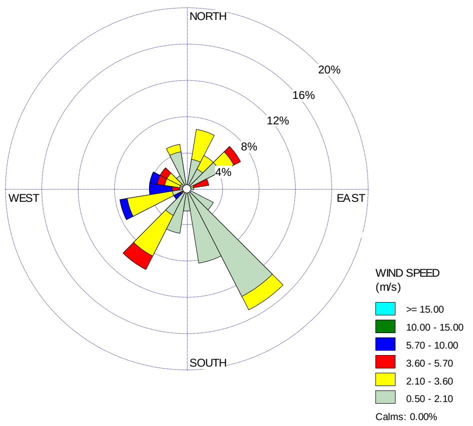
(a)



(b)



(c)



(d)

Figure Annex 11- 6 Rose-wind for runtimes, (a) spring, (b) summer, (c) autumn, and (d) winter.

2. Results and reviews

The stacks data with the introduced specifications were defined to the software for two different types of emissions, carbon monoxide and nitrogen dioxides. In this section, the output data of the model will be discussed for the studied runtime and domain. For CO, the model is executed on the highlighted days and the maximum one-hour and 8-hours concentrations are calculated. Also, for NOx, a periodic execution of the highlighted days and an annual performance over the past three years. The output concentration is compared with the standards.

2.1. Modeling results for CO

In the modeling of carbon monoxide distribution, the results of the spring, summer, autumn and winter will be discussed respectively. Figure Annex 11-7 shows the maximum distribution of CO in the studied five-days of the spring as an average of one-hour.

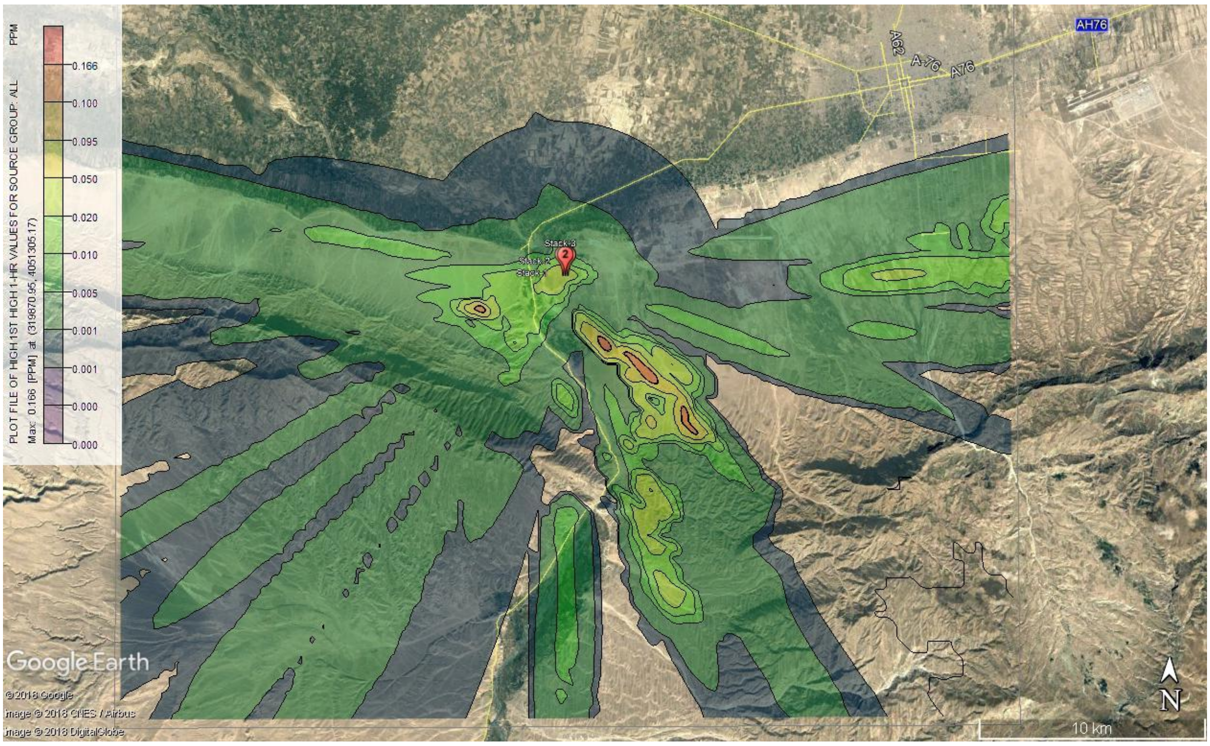


Figure Annex 11- 7 Maximum average of the one-hours CO concentration in the spring.

In this season the atmosphere has the instability condition most of the time, so, the distribution of pollutants occurs strongly in the atmosphere. The maximum average of one-hour concentration is 0.16ppm, at the lower part of the power plant' south-eastern area. This concentration is less than %1 of the standards amount, so it is not harmful. In Figure Annex 11-8, the highest average of CO 8-hours concentration is shown in the studied days.

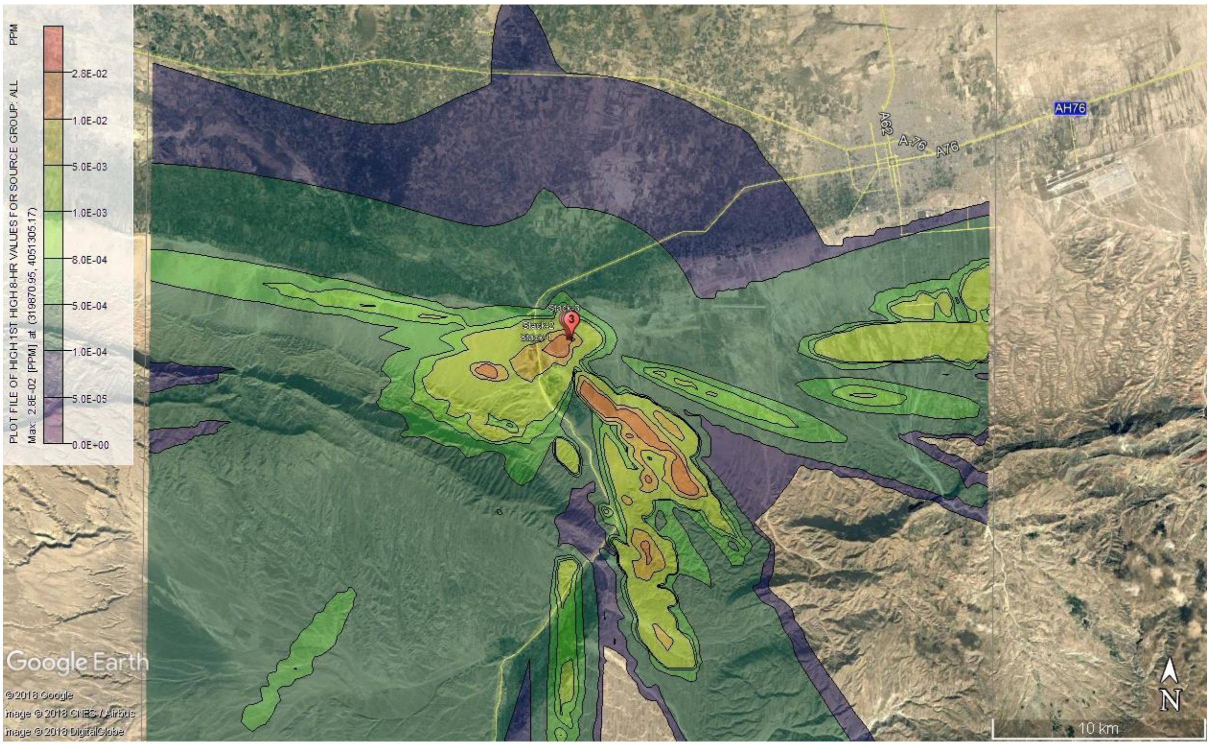


Figure Annex 11- 8 Maximum average of the 8-hours CO concentration in the spring.

Meanwhile, the mean 8-hours concentration is 0.027ppm, which is less than %0.5 of the standard amount.

In the summer, same as spring, the weather situation is unstable and causes to a strong pollutants' distribution. The pollutants concentration in the Mazar-i-Sharif town is rather small, and it quickly disappears due to its short lifespan. In Figure Annex 11-9, the highest average of the one-hourly concentration in the summer for this pollutant is shown.

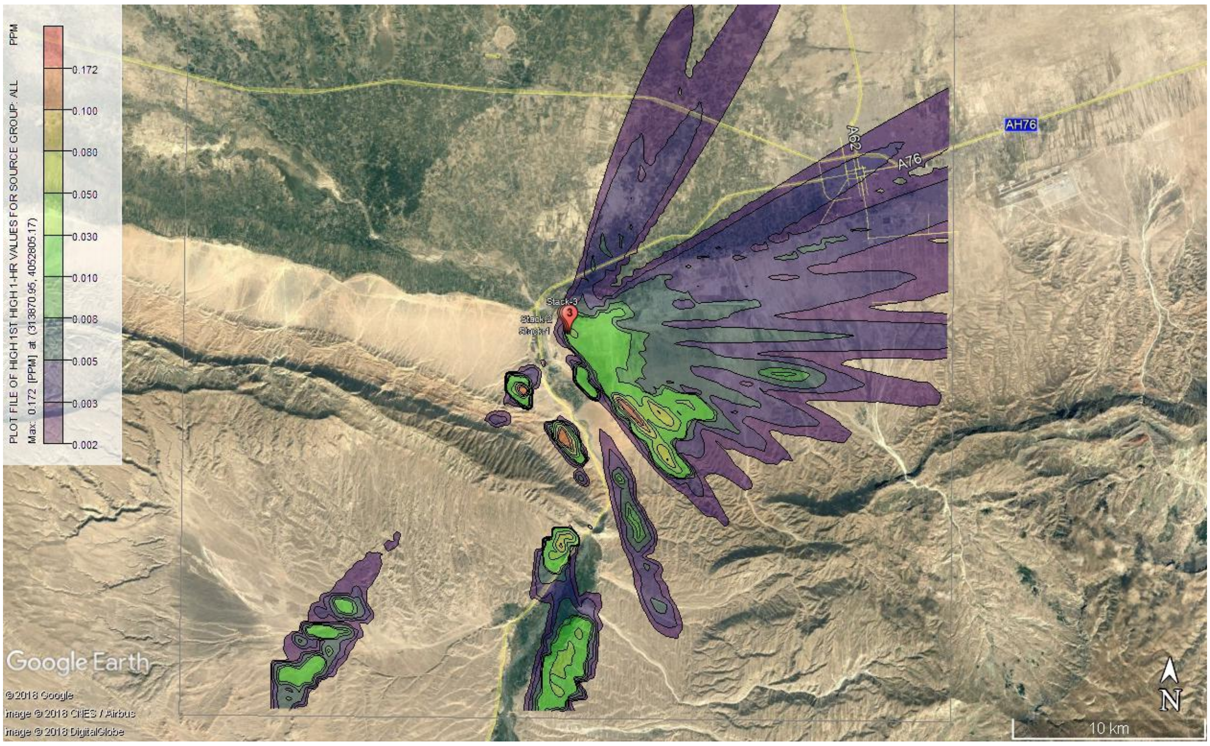


Figure Annex 11- 9 Maximum average of the one-hour concentration of CO in the summer.

The air condition is unstable in the most days of the summer, and the air mass containing pollutants is capable of climbing and spreading. The maximum CO concentration which occurred in the Earth level is 0.172 ppm in the southeast part of the power plant. Figure Annex 11-10 shows the maximum average of 8-hour CO concentration on summer days.

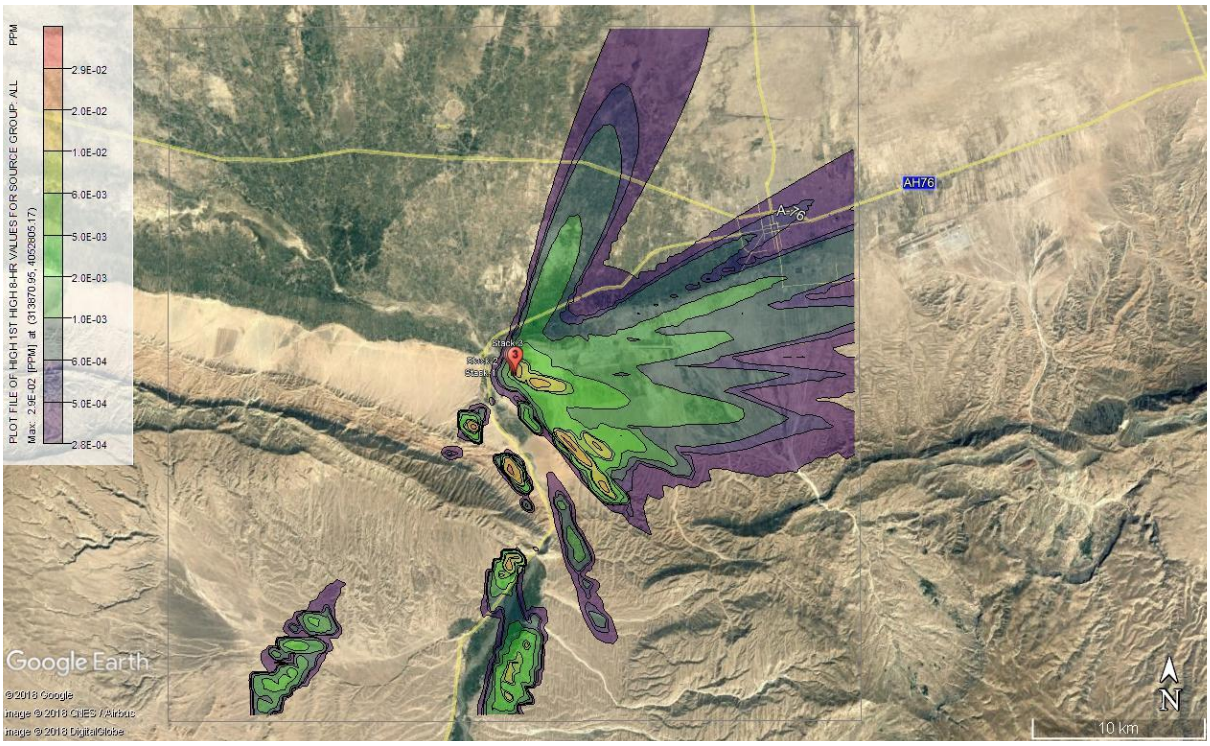


Figure Annex 11- 10 Maximum average of CO 8-hours concentration in summer.

According to the wind-rose of summer, it is clear that the city of Mazar-i-Sharif is at the downside of the wind direction, so the released pollutants of the power plant reached the town. The highest concentration is 0.028ppm, which is less than the standard level.

Figure Annex 11-11 shows the average one-hour CO concentration in the autumn. This pollutant has distributed over specific paths and has a maximum value of 0.183 ppm. The maximum level does not spread to the mountain location and occurs at a distance of 5 km of the stack.

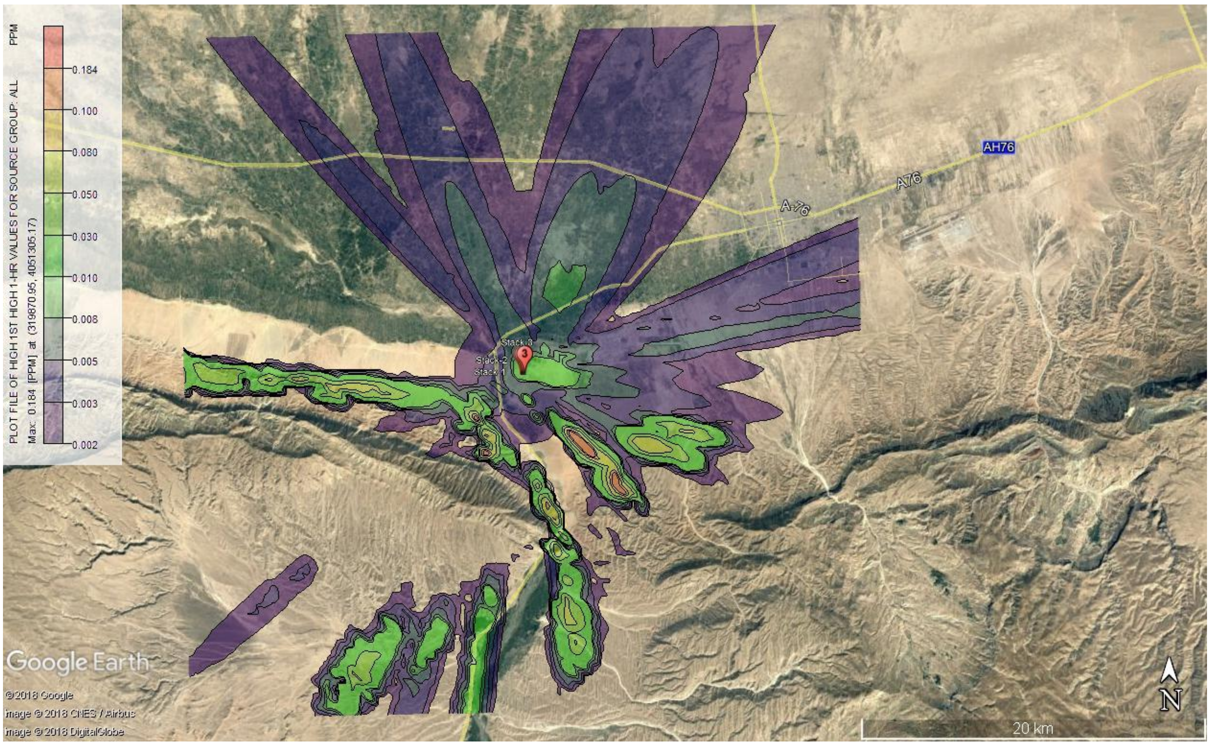


Figure Annex 11- 11 Maximum average of the one-hours CO concentration in the autumn.

The 8-hours CO concentration is shown in Figure Annex 11-12. The maximum concentration, in this case, is 0.0306 ppm, which is much less than the standard level and has occurred in the same place. According to Figure Annex 11-12, it is clear that a polluting plume is distributing from a distance between the two mountains.

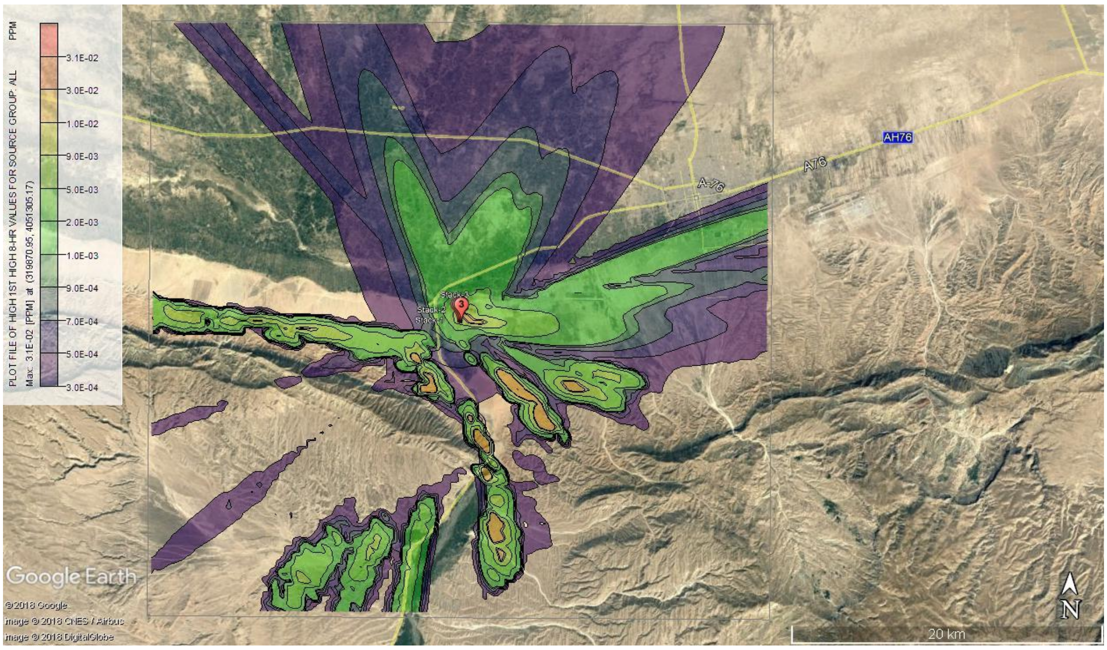


Figure Annex 11- 12 Maximum average of the 8-hours CO concentration in the autumn

In the winter the boundary layer level is usually lower than other seasons, so the pollutants are not allowed to climb. Figure Annex 11-13 shows the maximum average of the one-hour of the CO concentration in winter.

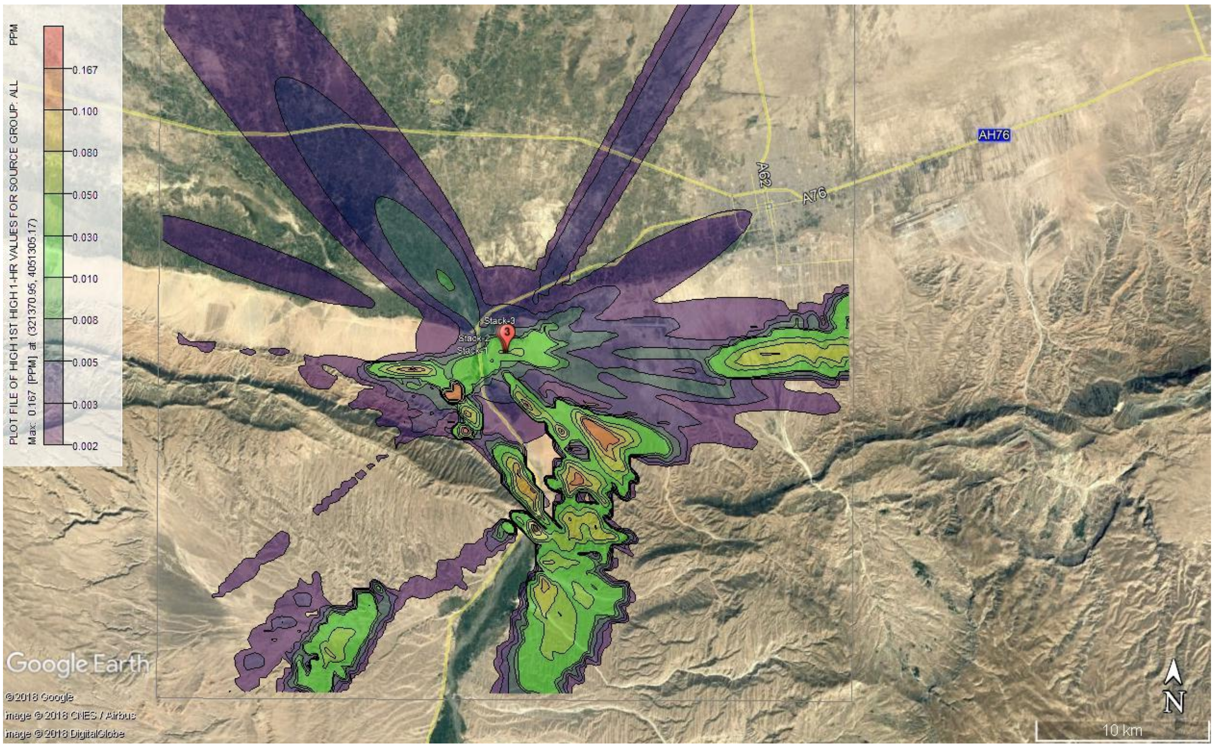


Figure Annex 11- 13 Maximum average of the one-hour CO concentration in the winter.

The highest concentration reached the earth level is almost 0.167 ppm, which occurs in the southeast mountain. Figure Annex 11-14 shows the average 8-hours CO concentration in winter.

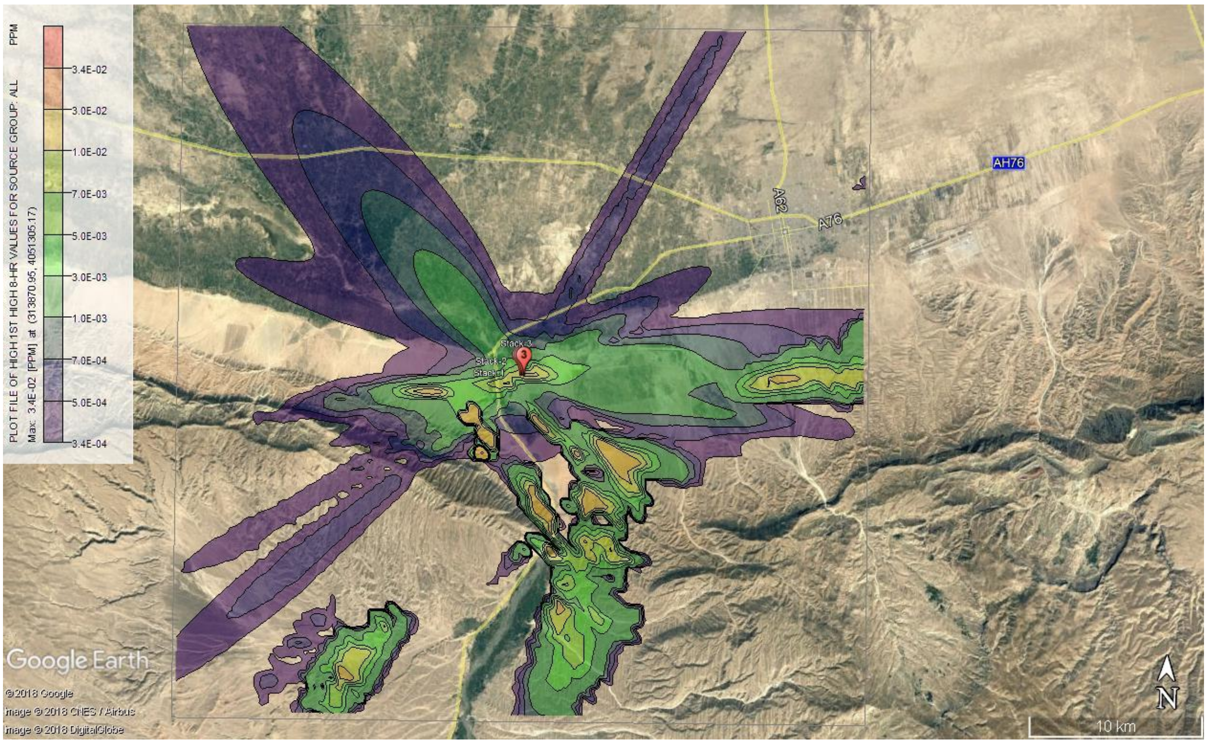


Figure Annex 11- 14 Maximum average of the 8-hours CO concentration in the winter.

The pollutant's concentration is passing through the space between the two mountains. As a result, the contamination level does not reach the city of Mazar-i-Sharif and the uplands. The highest concentration of this mode is 0.034 ppm and occurs in the area of the western mountain.

Furthermore, the entire studied runtime, from February 2016 to August 10, 2018, is conducted to determine the maximum average of the both one-hour and 8-hours CO concentrations. These results shown in Figure Annex 11-15 and Figure 16 respectively.

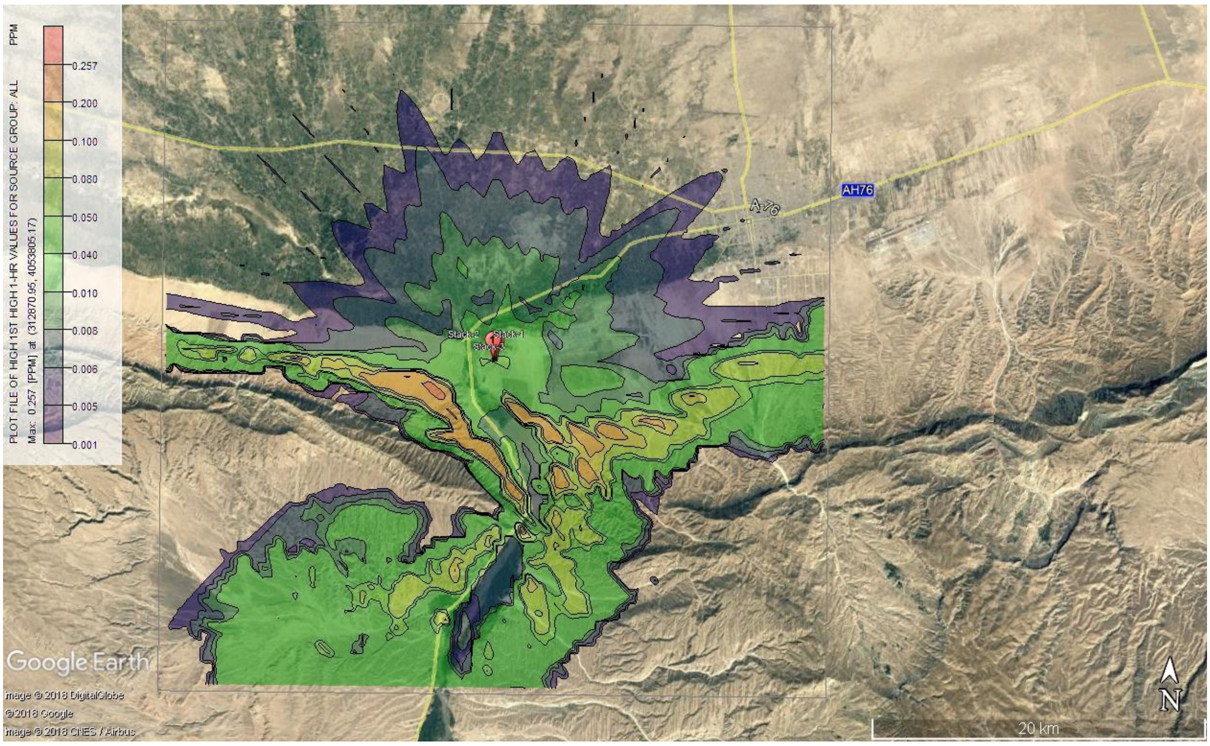


Figure Annex 11- 15 Maximum average of the one-hour CO concentration from 2016 to 2018.

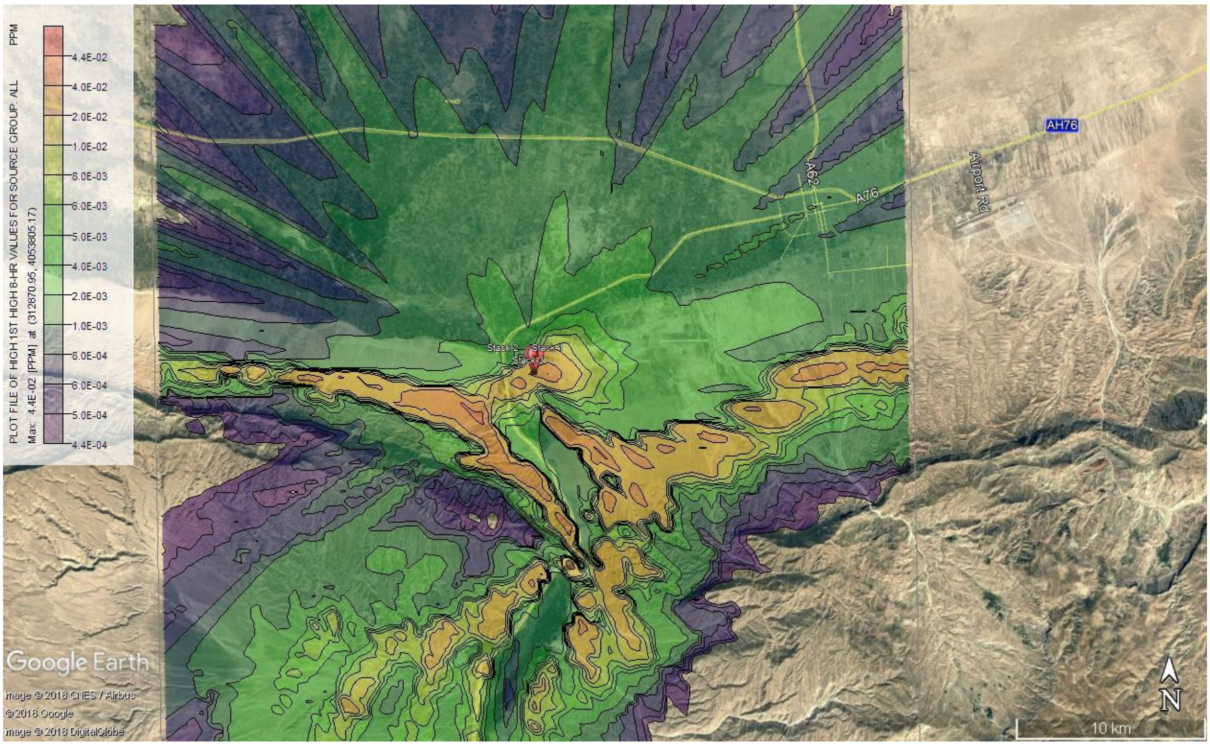


Figure Annex 11- 16 Maximum average of the 8-hours CO concentration from 2016 to 2018.

As Figure Annex 11-15 shows, the maximum concentration reached the ground level is 0.257 ppm, which occurs at the margin of the two mountains. The dominated wind is from north to south, so CO passes through the distance between two mountains. As a result, the concentration reached the city of Mazar-i-Sharif is very small. The concentration in the mountain, which has the highest concentration in the area, is much lower than the standard level. In Figure 16, same as Figure 15, the direction of the pollutant is to the south, so the maximum concentration occurs in the south of the power plant. It can be argued that the environment will be slightly affected by the CO released from the power plant.

2.2. Modeling results for NOx

In simulating the dispersion of nitrogen dioxide emissions, the results of the performances are also discussed from the spring. After that, the summer, autumn and winter results will be presented. This pollutant has an hourly and annual rate. Therefore, in the different seasons, the average hourly concentration is presented, and at the end, for the whole period examined, the annual average will be calculated. Figure Annex 11-17 shows the maximum NOx dispersion in the five-day period considered as a one-hour average.

Figure Annex 11- 17 Maximum average of one-hour NOx Concentration in the spring.

The maximum average hourly concentration is 92 ppb and occurred 5 Km below the southeast of the power plant. This concentration is almost near to the standard level but does not exceed it. The concentration in the close area of the power plant is about 60 ppb, and the concentration reached Mazar-i-Sharif is about 10 ppb.

In Figure Annex 11-18, the maximum average of the hourly concentration for this pollutant in the summer is shown.

Figure Annex 11- 18 Maximum average of one-hour NOx Concentration in the summer.

In the summer, the maximum average hourly rate is 95 ppb and occurs at 3.5 km southwest of the power plant. Despite the occurrence of the maximum concentration on the west side of the power plant, the wind direction is in such a way that it takes the pollutant to the east and the city of Mazar-i-Sharif. In this season, the concentration reached the city of Mazar-e-Sharif is about 10 ppb. This amount is %10 of the standard level and does not create a problem for citizens.

In the autumn, due to the stability of the weather conditions, the air mass does not move upwards, so the pollutants stay in the low level of atmosphere. The maximum average of the one-hour concentration in this season calculated with the amount of 102 ppb, which is 2 ppb more than the standard level. The location of this maximum concentration is on the west side of the river, the downside of the mountain. Due to atmospheric stability, the pollutant has not followed a specific direction and has progressed from different positions. The concentration reached the city of Mazar-i-Sharif and the industrial site which is located in the northern part the power plant is 3 ppb and 5 ppb respectively. Distribution of pollutants in the environment is similar to Figure Annex 11-19.

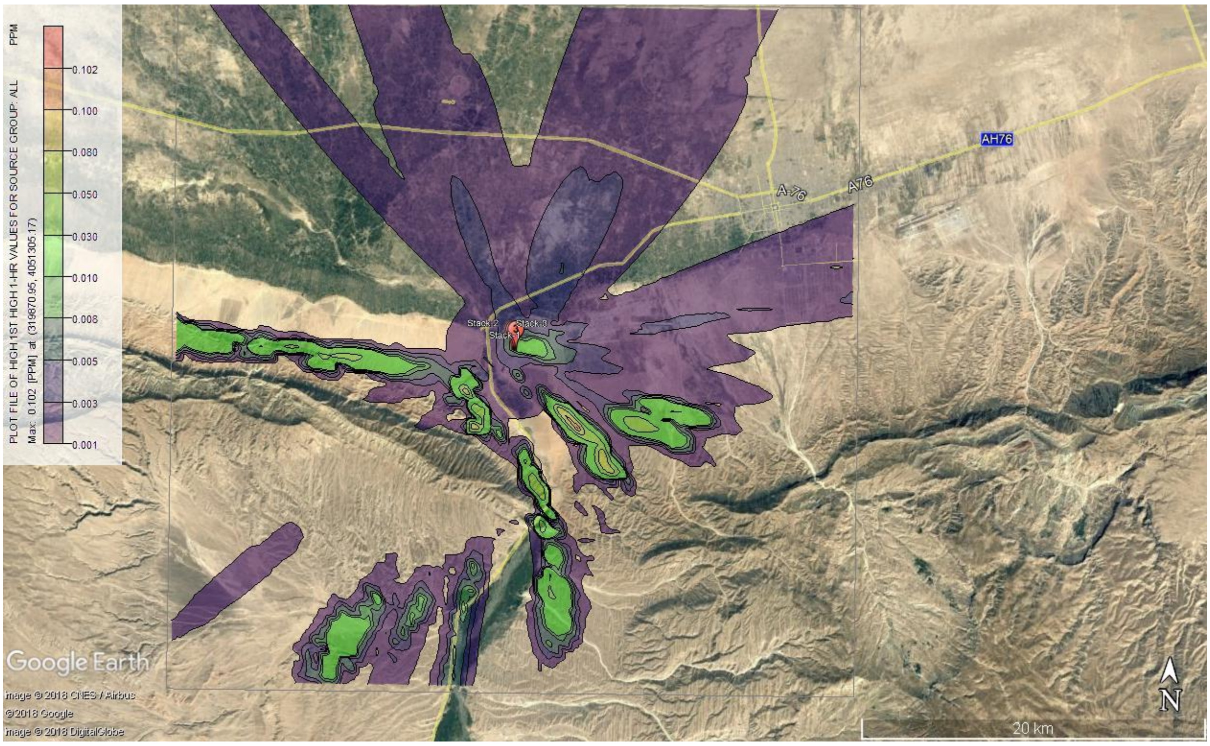


Figure Annex 11- 19 Maximum average of one-hour NOx Concentration in the autumn.

In the winter the boundary layer is usually lower, so pollutants are not allowed to climb. Figure Annex 11-20 shows the average of a one-hour NOx concentration distribution in winter.

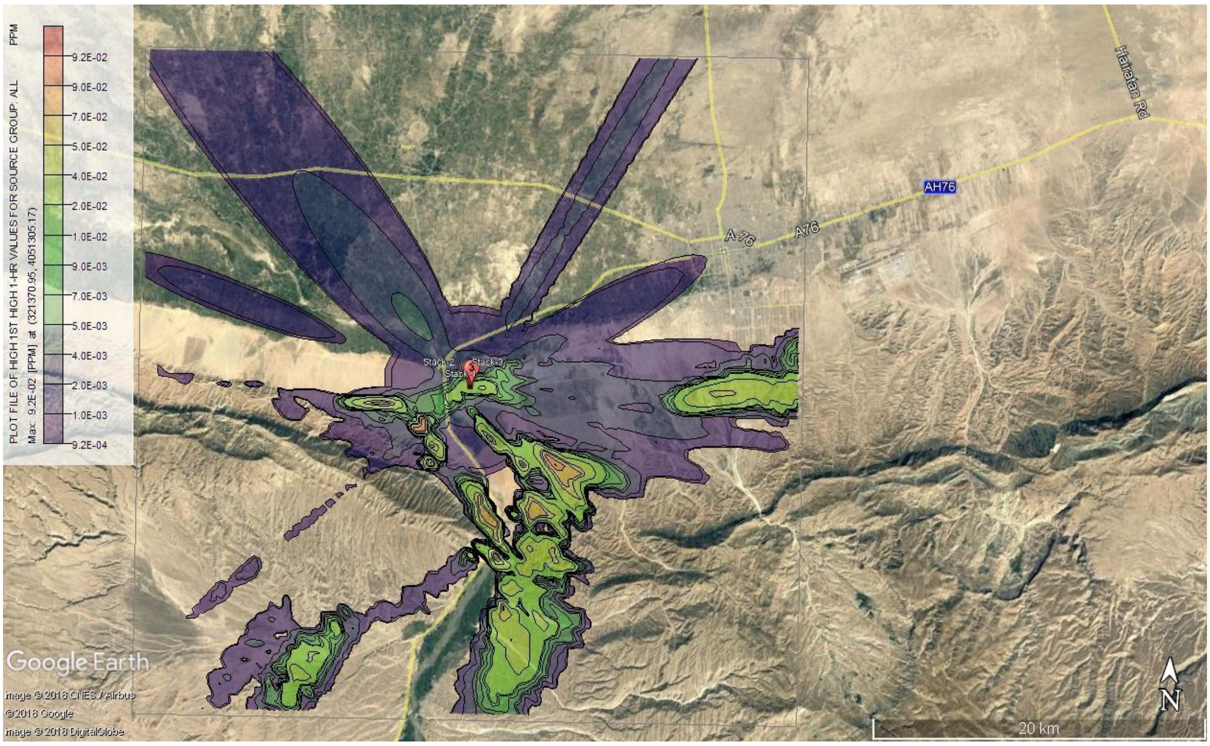


Figure Annex 11- 20 Maximum average of one-hour NOx Concentration in the winter.

In winter, the maximum concentration reached the earth level is about 92 ppb with a location of 6.6 Km in the southwest of the power plant. The distance between the two mountains and the river faces more pollution than other areas. Due to the specific atmospheric conditions, the concentration of NOx in the boundary of Mazar-i-Sharif reaches to 1 ppb. This amount of concentration is less than the standard level, so the level of air pollution is acceptable.

In the last run, the entire review period will be run from February 2016 to August 10, 2018, to indicate the maximum average of one-hour and one-year NOx concentration. Figure Annex 11-21 shows the maximum average of one-hour concentration throughout the entire survey period.

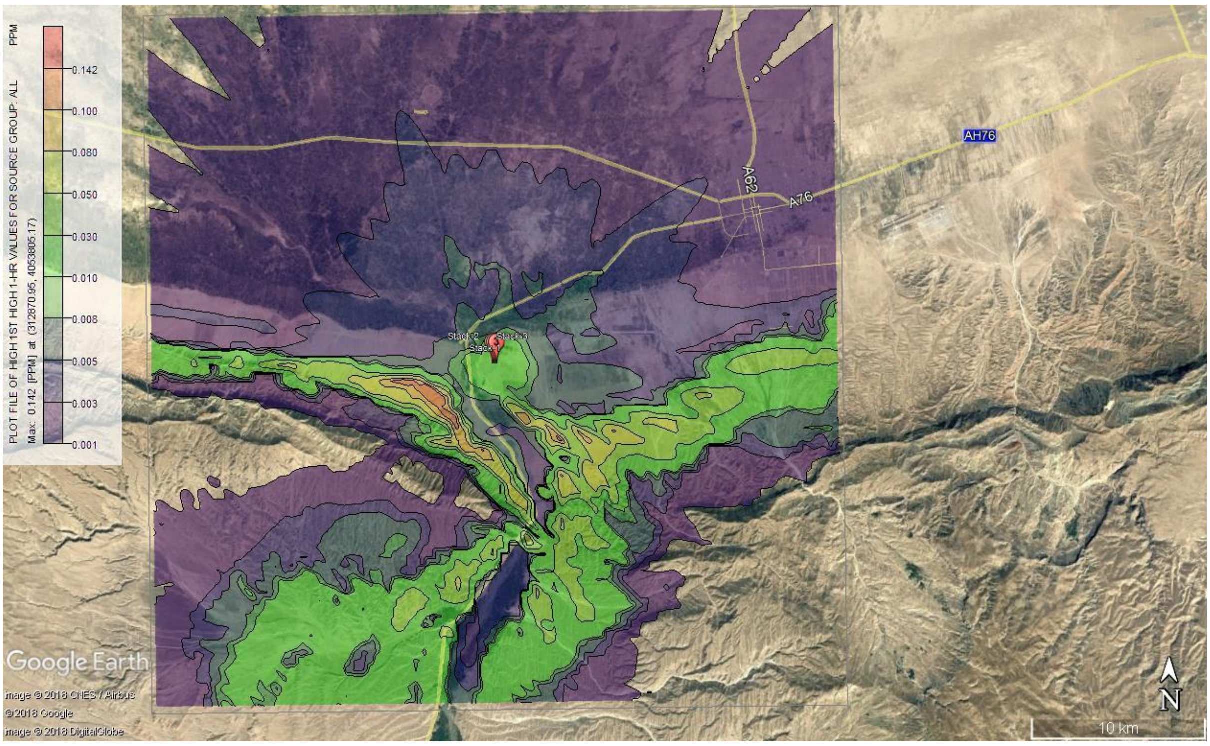


Figure Annex 11- 21 Maximum average of one-hour NOx Concentration from 2016 to 2018.

According to Figure Annex 11-21, the maximum concentration of NOx with the amount of 142 ppb, occurs in the southwest mountain at the 3.6 Km distance. This concentration is %40 higher than the standard level but occurs under certain meteorological conditions and on the downside of the mountains with no residencies. It is recommended to decrease the emission of NOx in certain weather conditions, especially temperature inversion.

The NOx concentration in the Mazar-i-Sharif is 5 ppb to 80 ppb, which is within the standard range. Since the direction of pollutant distribution is throughout the mountains, the amount of concentration in this area is higher than in other parts, and the most amount of NOx accumulate behind the mountains.

In the last step, Figure Annex 11-22 shows the average of one-year NOx concentration.

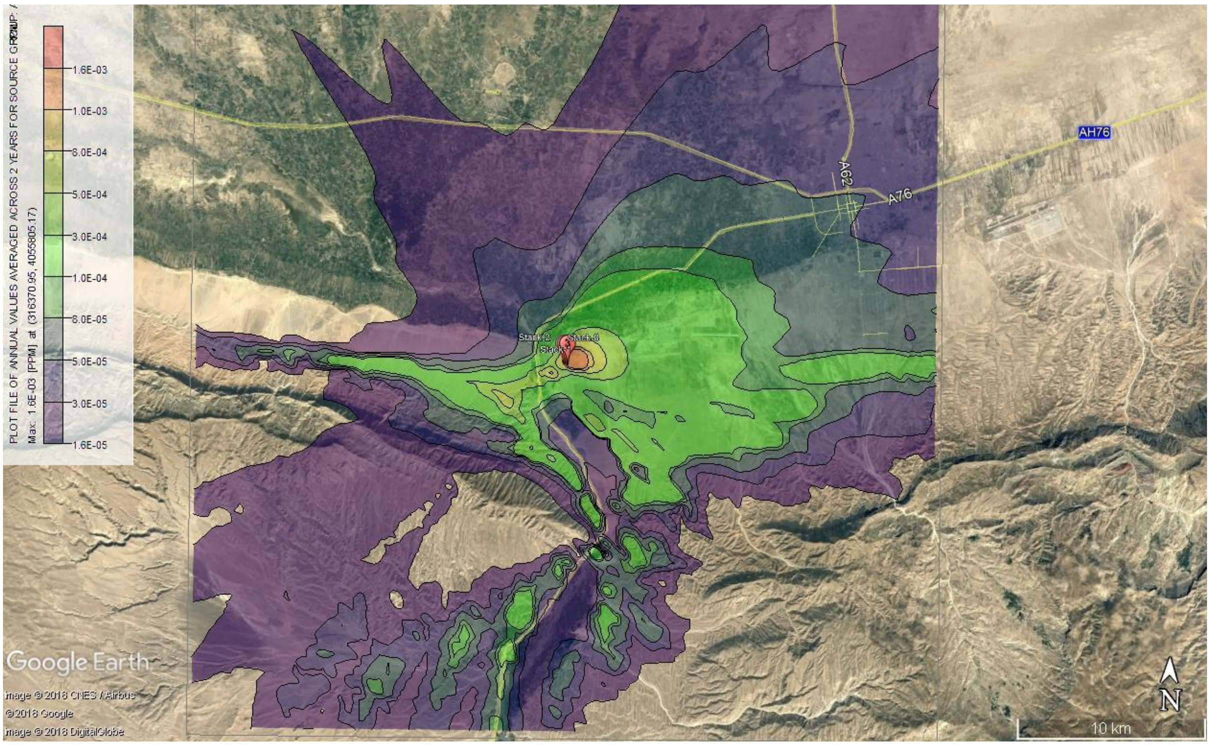


Figure Annex 11- 22 Maximum average of one-year NOx Concentration from 2016 to 2018.

The maximum average of annual NOx concentration is 1.6 ppb occurs in the area near to the power plant, which is lower than the annual standard level, so the concentration reached to different areas of this plant is less than standard level. Also, the annual concentration in Mazar-i-Sharif is less than 0.5 ppb.

3. Conclusion

In this project, air pollution modeling of the new power plant in Mazar-i-Sharif, 5 days per season from 2017 to 2018 were selected to study. The distribution and concentration of CO and NOx in the environment caused by the three stacks was simulated. The summary of the results of the modeling is shown in Table 5.

Table Annex 11-5. Summary of the modelling result.

	Max Concentration			
	CO (ppm)		NOx (ppb)	
Season	1Hr	8Hr	1Hr	Annual
Spring	0.166	0.027	92	-
Summer	0.172	0.028	95	-
Fall	0.183	0.0306	101	-
Winter	0.167	0.034	92	-
All period	0.257	0.044	142	1.6

As shown in Table 5, the concentration of carbon monoxide in all runtimes is much lower than standard, and there will be no issue regarding this pollutant. In the autumn, the maximum average of hourly nitrogen dioxide concentration is about 2 ppb higher than the standard, which is acceptable. But in the whole period of study, from 2016 to 2018, at a specific time, the concentration of NOx in the southwest mountain is 40% above the standard, and the number of emissions will be decreased by deactivating one of the stacks.

1. U.S. Environmental Protection Agency, Users guide for the AMS/EPA regulatory model – Aermod, EPA-454/B-03-001, September 2004 .
2. The United States Geological Survey, https://dds.cr.usgs.gov/srtm/version2_1/SRTM3/Eurasia.
3. United States Environmental Protection Agency (EPA) under authority of the Clean Air Act (42 U.S.C. 7401 et seq.)

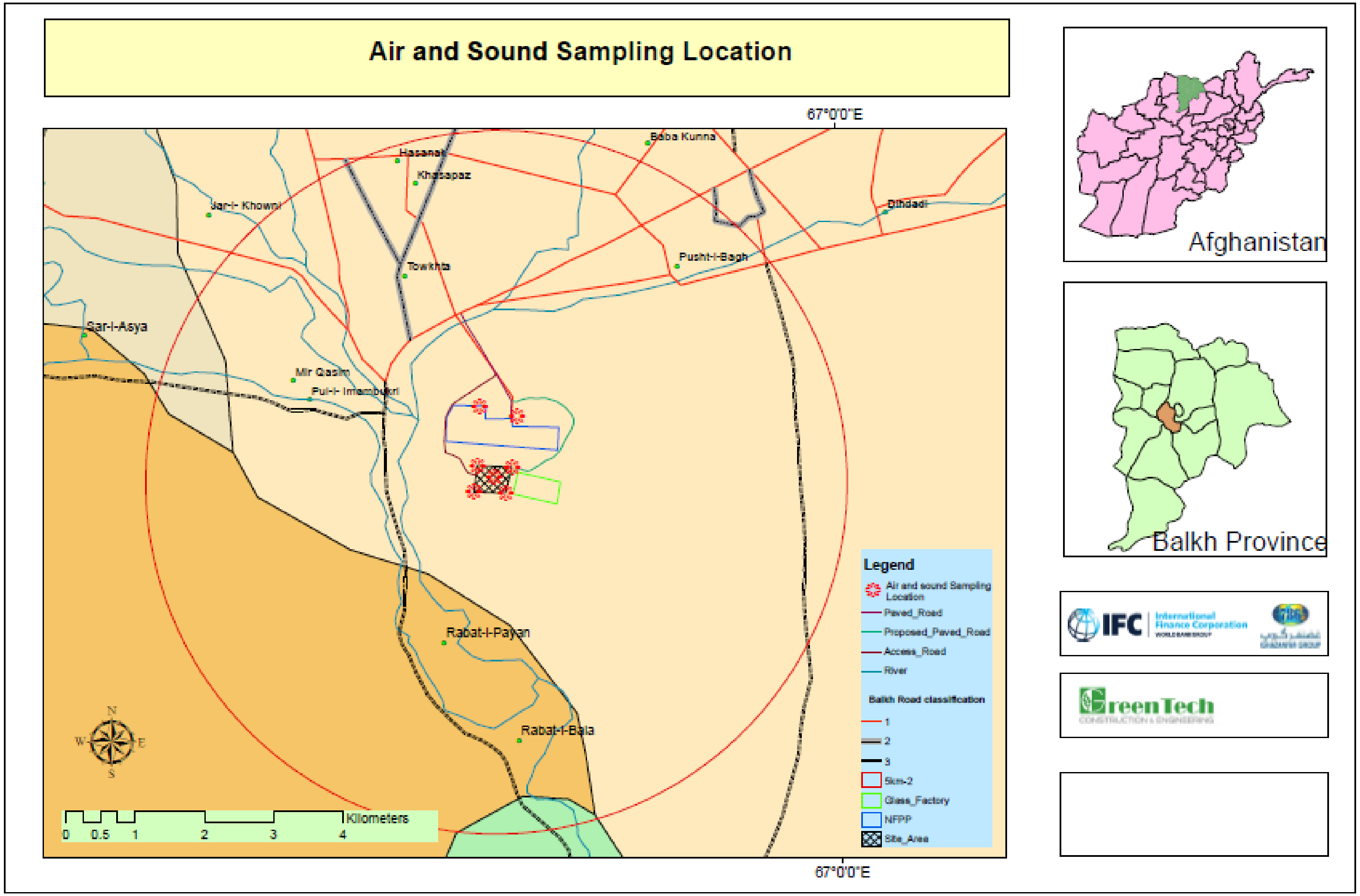


Figure Annex 11- 23 Air and sound sampling location

Annex 12. Community Development Plan

AFGHAN POWER PLANT COMPANY

COMMUNITY DEVELOPMENT PLAN

Date: October 27, 2018

INTRODUCTION

APPC parent company Ghazanfar Group has been active member by directing the efforts towards sustainable development of Afghanistan. The services being rendered include planning of humanitarian and development projects, designing feasibility studies, and management of community-based interventions for the development of target communities through best practices.

> **What is Community Development?**
> *Community Development is a process enabling communities to develop active, sustainable and supportive environments in which people live and work. Community Development as a philosophy is concerned with taking the journey from private concern (in the community) to public action (with the community). Through active participation and empowerment, Community Development encourages and supports the identification of barriers that prevent community members from participating in changing the issues that affect their lives.*

Our community development plan outlines a number of initiatives that will be rolled out during the construction of road in Mazar-E-Sharif regions to foster wellbeing and safety, social inclusion and social sustainability in those diverse communities. Our team of social welfare workers will work hard to achieve the community development objectives by improving community’s socio-economic status in a diverse range of areas from literacy education in villages to supporting the mother and child health in their homes.

Under the proposed road project, we will consider a multi-sectoral approach to Community Development and hence ensure that the services are offered through an extended range of sectors spanning infrastructure, health, education, and agriculture and capacity development. We will also ensure that women empowerment, as a key cross-cutting issue, is at the centre of Community Development.

Our team will work collaboratively with a diverse range of stakeholders including Engineer of MoPW to understand and represent the special needs of all the different groups within the target region. Working through this Community Development Plan will ensure our work with the community stakeholders will be focused and responsive to community needs and aspirations.

Proposed Projects:

Considering the significance of the community development, our project team will formulate the feasible projects for the sustainable development of the community. The development projects will further assist in the uplifting of the socio-economic status of beneficiaries.

Following is the list of the proposed long term feasible projects:

1. Access roads
2. School
3. Clinics
4. Small irrigation scheme
5. Clean drinking water supply
6. Off-grid energy alternatives (Solar Power)
7. Skills development for livelihood
    a) Welding & Steel works
    b) Tailoring works
    c) Masonry training
    d) Literacy education Male
    e) Literacy education Female
    f) Computer Classes
    g) English Classes

8. Maternal health promotion activities
    a) Maternal, new born & child health
    b) Pregnancy health caring
    c) Midwifery trainings
    d) Health hygiene education

9. Child health promotion activities
    a) Health education
    b) Food supply and nutrition
    c) Water & sanitation
    d) Maternal and child health
    e) Immunization
    f) Prevention & control of locally endemic diseases
    g) Treatment of common diseases & injuries
    h) Provision of essential drugs

10. Employment/training opportunities
    a) Carpentry training
    b) Backyard poultry trainings
    c) Horticulture management trainings

Described below is the brief information about each of the proposed project:

1. Access Roads:

For the increased involvement of the roadside communities, we will construct the rural access roads. Regarding the current situation in the Mazar-E-Sharif, the road infrastructure is alright but needs further improvements for which schools and other institutes like health centers are not well connected. It is further anticipated that the most of the roads in the road side villages are unpaved, graveled or even just earth roads. We understand that the rural access roads are the lifeline for people living along the main highways, and they provide intra-villages and near-village transport connecting the houses and farms to surrounding towns, cities, districts and eventually provinces. Our team will construct the road as per the approved quality specifications and assessed quantity measurements. The conventional road construction approach, whether asphalt or concrete, will be implemented.

2. Schools:

Schools are among the most important institutions for the overall development of the target communities although there are number of schools and educational institutes serving students of the Mazar-E-Sharif but the the figures are still lower than many other provinces. In Bamyan, there are 249 primary and secondary schools in this province catering for 77,150 students, and 1975 teachers are working in schools, and among them women 22%.(Source: CSO Afghanistan Statistical Year book 2006). In Samangan, there are 159 primary and secondary schools in the province catering for 59,915 students. Boys account for 68% of students and 83% of schools are boys' schools. There are 1,656 teachers working in schools in the Samangan province among them 21% are women. (Source: Environmental Plan Examination 44482-024-afg-iee-01) Under this component of our community development program, we will construct the new schools and/or rehabilitate the existing schools to assure that the education sector is upgraded for the target beneficiaries.

3. Clinics:

Health is yet another essential factor for the wellbeing and sustainable development of the target community. Provision of the health facilities such as dispensaries and health canters and making the facilities accessible to the public are among our major priorities. The community development largely, if not entirely, depends upon the provision of health facilities.

Health services in Bamyan appear to be as inaccessible as schools; and this is true of both dispensaries and health centers. The latter exists in-village for 5% of the population and 2% of the villages and the former in 3.8% of the population and 2.1% of the villages. More often than not, people seeking medical attention must travel more than 10 km to get it 70% for health centers and 72% for dispensaries. (Source: Environmental Plan Examination 44482-024-afg-iee-01).

4. Small Irrigation Scheme:

Irrigation development has been identified as an important tool to stimulate economic growth and rural development, and is considered as a cornerstone of food security and poverty reduction in Afghanistan. Under this portion of the project, our team will carry out engineering field surveys, design and construction of the small irrigation schemes in Mazar-E-Sharif and Samangan. The successful implementation of this project will enhance agriculture production to great intent. Provision of irrigation facilities for the mentioned areas will make large portion of the target land cultivable.

5. Clean Drinking Water Supply:

Inadequate sanitation and drinking unclean water promotes the spread of harmful diseases and ailments. As a basic need of the beneficiaries, we will assure that the portable, clean drinking water is made accessible to the communities surrounding the Mazar IPP. The projects about the Clean Water Supply and Sanitation will be implemented to enhance the life of the inhabitants, ultimately leading the target communities to the sustainable development.

6. Off-grid Energy Alternatives (Solar Power):

As the need of the hour, alternative energy sources are of highest significance for the population of the remote villages and districts. For this component, we will enhance the off-grid energy alternatives by creating the awareness among the target population. The main alternative we will emphasize is the Solar power to electrify the target areas. This is the only way that the rural population of Mazar-E-Sharif can move ahead towards attaining sustainable energy and enhancing social wellbeing.

7. Skills Development for Livelihood:

In the surrounding areas of the proposed road project, deprived education facilities and poor education quality at the school level pose persistent challenges as the youth eventually enter the market without required skills. Our project team will design the skills training programs with a prime objective to improve the quality, labour and market relevance, thus providing livelihood opportunities and improving the economic status of the target beneficiaries. Following are the major areas for which skills training program will be formulated:

a) Welding & Steel works
b) Tailoring works
c) Masonry training
d) Literacy education Male
e) Literacy education Female
f) Computer Classes
g) English Classes

8. Maternal Health Promotion Activities:

As an inevitable fact, the mortality rate for the new born and the mother are on high because of the lack of appropriate education and health facilities. By providing sufficient information, awareness and trainings, most maternal and new born deaths can be prevented. Following are main topics of concern which will be considered for the trainings:

a) Maternal, new born & child health
b) Pregnancy health caring
c) Midwifery trainings
d) Health hygiene education

9. Child Health Promotion Activities:

It is true and disappointing that child health promotion is given a low priority in almost all across Afghanistan. We are undoubtedly facing some problems in the country which need our serious attention towards the child health. As part of health segment of the project, a special focus will be set on the child health program. Listed below are major topics:

e) Health education
f) Food supply and nutrition
g) Water & sanitation
h) Maternal and child health
i) Immunization
j) Prevention & control of locally endemic diseases
k) Treatment of common diseases & injuries
l) Provision of essential drugs

10. Employment/Training Opportunities:

Skilled training for the youth and adults is vital for the uneducated and semieducated beneficiaries. The industrial skills taught can bring the added financial value to the families of the Yakawlang and Dar-i-Soof inhabitants. Following training categories will be provided to the selected youth and adults:

m) Carpentry training
n) Backyard poultry trainings
o) Horticulture management trainings

The Community Development Standard Model:

To achieve the aforementioned objectives for the community development, our project team will develop a standard model that can be applied for each of the projects. The Model has 5 components listed below:

a. ASSESSMENT

This will be the first and foremost step for assessing the environment and current status in the target areas; that is, who the people are who live there, how they live, whether there are any existing conflicts, and what resources will be need to build and support a community development program in this setting.

Tools to be used for assessment include:

- Stakeholder identification
- Social baseline study
- Social impact and opportunities assessment
- Competencies assessment

b. PLANNING

This will be followed to design development programs desired by all and therefore with an opportunity to become sustainable. Some plans may be internal to specific organizations, such as a NGO/CSO currently working in Mazar-E-Sharif. Other plans may be developed by coordinated efforts by MPW, MoPH, MoHE, and TVET.

Tools to be utilized for planning are:

- Strategic planning framework
- Community mapping
- Institutional analysis
- Problem census
- Opportunity ranking

c. RELATIONSHIPS

This step is significant for building and maintaining good relationships between all stakeholders, such as government, community members, company representatives, and local organizations. Relationships are the foundation of all cooperative activities and therefore essential for sound community development programs.

For building relationships, the important tools will be:

- Stakeholder analysis
- Consultation matrix
- Partnership assessment

d. PROGRAM MANAGEMENT

Program management will be implemented for supporting and implementing the plans developed with the planning tools. These management tools include means for ensuring that plans are realistically resourced and scheduled and that there are people taking responsibility for implementing them. Plans are just pieces of paper until they are put into motion. Program management will be accomplished by following tools:

- Conflict management
- Community action plans

e. MONITORING & EVALUATION

M&E will be incorporated for measuring progress toward program goals. Some evaluations may be internal to individual organizations, but ideally all participants will work together on some evaluation tools so that any modifications required to plans will be developed in a coordinated and cooperative manner.

Tools include:

- Logical framework
- Indicator development
- Goal attainment scaling