

PAKISTAN OILFIELDS LIMITED (POL)

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

3D SEISMIC DATA ACQUISITION OVER NOOR PROSPECT IN IKHLASE.L., DISTRICT ATTOCK

**PREPARED BY:
NATIONAL CLEANER PRODUCTION CENTER**

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Study for

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NOVEMBER 2024

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EXECUTIVE SUMMARY

- **Name of Project:** 3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., District Attock of Punjab
- **Name of Project Proponent:** Pakistan Oilfields Limited (POL)
- **Proponent Contact:** POL House, Morgah, Rawalpindi
- **Name of EIA Consultant:** National Cleaner Production Center (NCPC)

Pakistan Oilfields Limited (POL), a central oil and gas exploration and manufacturing company, wants to conduct 3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., District Attock in the Province of Punjab. This Environmental Impact Assessment (EIA) report recognizes and assesses the potential ecological and social effects which might result from project-related exercises and where important, acquaints measures with relieve unfriendly effects. The exploration exercises will prompt expansion of new hydrocarbon saves. The main object of the project is to acquire 3D seismic data for sub-surface evaluation of hydrocarbon resources of Noor Prospect in Ikhlas Block.

The seismic survey would cover an area of **264.391 Sq. Km** (Small towns and villages will fall within the survey area). The road infrastructure is available from Islamabad/Rawalpindi to access the project site. No trees will be cut in the project area during the seismic study. The total cost of the proposed project is **8.752 Million US\$**.

Objectives of the Proposed Project

The seismic survey program consists of three dimensional (3D) seismic surveys within the project area.

POL aims to achieve two goals from the proposed seismic activities.

- To delineate the subsurface hydrocarbon prospects using different geophysical investigation techniques
- To verify and authenticate the potential hydrocarbon reserve

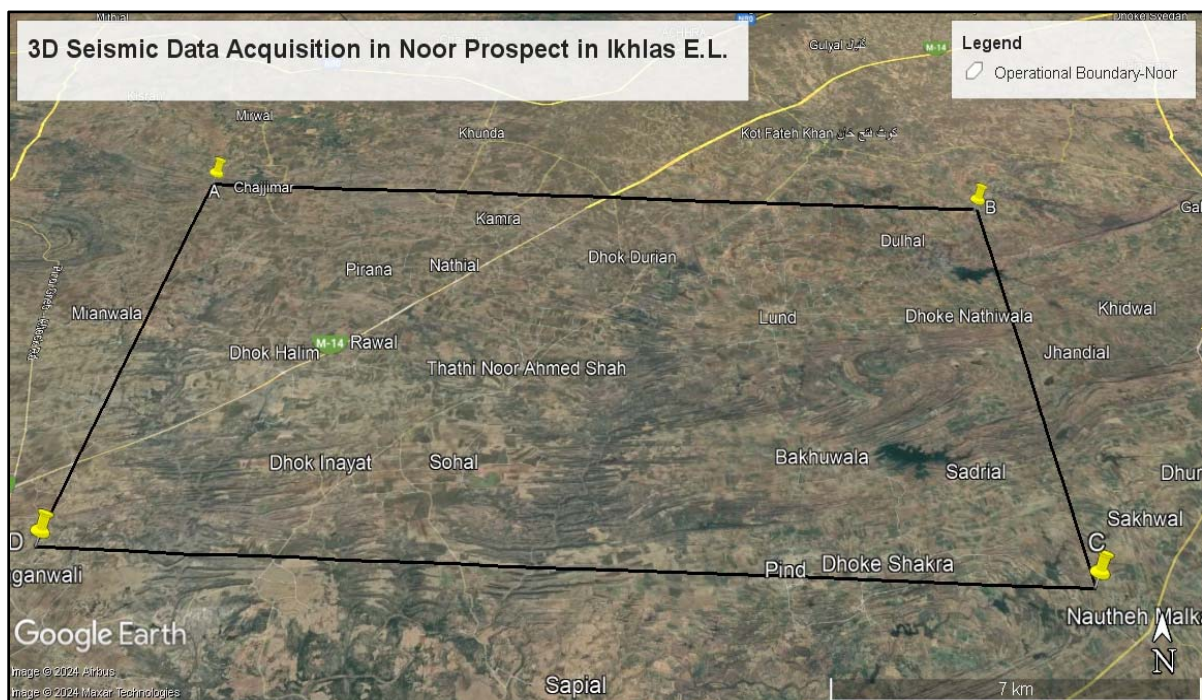
Project Description

The sound waves are generated through explosive (dynamite buried inside shot holes) or vibrators that travel inside earth and reflects from subsurface and are recorded back at surface by the help of sensors (geophones and recorder). The process begins with data acquisition, where seismic waves are generated using sources like dynamite or vibroseis trucks. These waves travel through the earth, reflecting off various subsurface rock layers, and are captured by an array of sensors called geophones. The collected data is then

processed using advanced computational techniques to create a 3D image of the subsurface, involving noise filtering, wave travel time correction, and image enhancement. Geologists and geophysicists interpret these 3D images to identify potential oil and gas reservoirs, focusing on specific geological formations like traps and faults where hydrocarbons might accumulate.

Project Location

The proposed project block is located in Tehsil Fateh Jang, Jand and Pindi Gheb of District Attock.



Satellite Image of the Proposed Project Area- 3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L.

Visit to the Project Site

The site visits to the location of the proposed project site and adjoining areas were undertaken by NCPC team in the second week of August, 2024 to gain first hand detailed knowledge of the environmental baseline of the area. The following team members visited the site:

- **Mr. Muhammad Ali** – Exploration Department (POL)
- **Mr. Muhammad Bilal Muzammil**-Environmental
- **Ms. Waliha Noor** – Environmental Engineer



Baseline, Social and Economic Conditions

A detailed survey of the site was conducted to establish the background environmental EIA study for 3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., in Attock District. This included but not limited to topography, geology, hydrology, climate, ambient air quality, seismology, flora and fauna, socio-economic conditions, archaeology, present infrastructure and future proposed development plans for the project area. Information describing the existing environment was gathered from various sources including the client, statutory bodies, and local interest groups and published work. The information collected was used to compose profiles of the natural and socioeconomic environments likely to be affected by the project. Information for the section describing the project came mainly from POL.

Environmental Impacts and Mitigation Measures

The potential impacts arising from each phase/ segment of the proposed project activities were comprehensively identified. These include effects of the proposed project activities on the physical, biological, socio-economic, archaeological and cultural environments of the area. Impacts were identified and assessed on the basis of field data, secondary data, expert's opinion and monitoring results of previous oil and gas exploration projects in Pakistan particularly in Punjab province. The mitigation measures to prevent or minimize all potential adverse environmental impacts of the project were identified based on a range of options including management and monitoring practices, alternative technologies, physical controls or compensation. The proposed mitigation measures are based on an appreciation of the sensitivity and behaviour of environmental receptors within the project area, past experience, case studies, legislative controls, and environmental guidelines and experts' advices. Monitoring measures have been recommended for residual impacts (impacts remaining after applying the recommended mitigation measures) or for impacts that cannot be accurately predicted at the EIA stage. In such cases advice on requisite monitoring measures was sought from experts involved in the EIA and case studies of similar monitoring exercises carried out in wildlife or forest protected areas elsewhere.

Environmental Management Plan

A detailed assessment of project activities was carried out during the Environmental Impact Assessment (EIA) study which involved identification of all major and minor impacts from the proposed exploration and mining activities. The following major factors have been assessed in particular in addition to other impacts:

- Emissions to air
- Wastewater and solid waste
- Alteration of landscape
- Damage to natural ecosystems/biological resources
- Resource consumption



- Socioeconomic impacts
- Occupational safety risks and hazards
- Management of hazardous materials

The above aspects have been covered in detail in the EIA study and mitigation measures are suggested side by side to manage the impacts that arise. The EMP reflects the commitment of POL to safeguard the environment as well as the surrounding population. The Plan provides a delivery mechanism to address the adverse environmental impacts, to enhance the project's benefits and to introduce standards of best practices to be adopted for all phases of the project. EMP has been developed for the project to provide a comprehensive action plan for each key player of the project particularly the HSE Manager, Site Supervisor and the Manager Operations to undertake and monitor each of the project activities in compliance with the EMP and other applicable guidelines.

Environmental Monitoring Report will be prepared of the project activities carried out during the construction phase of the project and will be submitted to Punjab Environmental Protection Agency.

Conclusions and Recommendations

The baseline survey of EIA team provides a thorough understanding of the natural, socioeconomic, and cultural environments that could potentially be affected by the proposed 3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L. Compliance with all relevant national and international environmental regulations has been ensured throughout the process, with the project details being primarily informed by POL. The assessment reveals that the project is expected to have significant benefits in enhancing oil and gas production, contributing to economic growth and resource development for the country. Additionally, the comprehensive environmental management and monitoring plan incorporated in the report offers a solid framework for sustainable exploration activities, demonstrating the project's environmental viability. POL will try to adapt and implement the following recommendations:

- Monitoring of environmental and socioeconomic impacts should be carried out throughout the project's lifecycle.
- To mitigate potential adverse impacts, a proactive approach to community engagement is essential. This includes keeping local communities informed and involved in decision-making processes, addressing concerns related to the socioeconomic and cultural aspects of the project.
- Efforts should be made to minimize environmental disruption, including resource conservation, waste minimization, and reducing the carbon footprint associated with exploration activities.

By adhering to these recommendations, the project can continue to enhance its potential benefits while mitigating environmental risks, ensuring both economic and ecological sustainability.



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1.0 INTRODUCTION AND BACKGROUND

1.1 Background

This Environmental Impact Assessment (EIA) report identifies and evaluates the potential environmental and social impacts which may result from project-related activities and, where necessary, introduces measures to mitigate adverse impacts. It ensures that possible adverse environmental impacts are identified and avoided or minimized. It finds ways and means to reduce adverse impacts and shape projects to suit the local environment and present the predictions and options to decision-makers.

Pakistan Oilfields Limited (POL), a leading oil and gas exploration and production company, intends to conduct “**3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., District Attock of Punjab**”. The exploration activities will lead to addition of new hydrocarbon reserves. In the same perspective POL intends to conduct a 3D seismic survey over Noor in Ikhlas E.L. which is located in Tehsil Fateh Jang, Jand and Pindi Gheb of District Attock in the province of Punjab.

National Cleaner Production Center (NCPC) has been hired to carry out an Environmental Impact Assessment (EIA) for the proposed exploration activity over Noor Prospect in Ikhlas E.L., District Attock of Punjab. The Environmental Impact Assessment (EIA) aims to ensure that environmental factors are considered early in the decision-making process. It ensures that possible adverse environmental impacts are identified and avoided or minimized. EIA find ways and means to reduce adverse impacts and shape projects to suit the local environment and present the predictions and options to decision-makers. The Review of EIA and IEE Regulations 2022 and Punjab Environmental Protection Act 1997 requires proponents of all projects involving any change in the environment, to submit an Initial Environmental Examination (IEE) report or where the project is likely to cause any adverse environmental effects, an Environmental Impact Assessment (EIA) report to the Provincial EPA.

1.2 POL-CSR Activities

POL has a proud history of supporting community initiatives. POL has implemented a forward-looking Community Development Program, dedicated to enhancing education, healthcare, and infrastructure, including the provision of free clean water to local communities.

POL strives to improve the quality of life within society by constructing schools and colleges. The Company remains actively engaged in community projects, working closely with local communities and administrations. Key focus areas include health and medical services, education, and infrastructure development.



Table 1-1: POL Social Welfare Activities in Ikhlas Block Tehsil Pindigheb and Fateh Jang, District Attock of year 2024

Sr. No.	Name of Schemes	Cost (Rs. Millions)	Schemes Recommended by
1.	Construction of street/ drain/ path village Jhandial.	6.915	Job is in progress
2.	Rehabilitation/ Improvement of water supply scheme Langrial, Tehsil Pindigheb, District Attock.	10.000	Tendering job is in progress
3.	Rehabilitation /Improvement of water supply scheme Jhandial Tehsil Fateh Jang, District Attock.	20.000	Tendering job is in progress
4.	Construction of nullah/ street in village Ikhlas, Tehsil Pindigheb, District Attock.	14.700	Job is in progress
5.	Rehabilitation /Improvement of water supply scheme Magana Tehsil Pindigheb, District Attock.	6.500	Tendering job is in progress
6.	Scholarship of Education Sector.	5.000	Scheme under process.
	Total Amount	63.115	

1.3 Purpose of EIA

The Environmental Impact Assessment (EIA) is a collection of data, prediction of quantitative and qualitative impacts, comparison of alternatives, evaluation of preventive, compensatory and mitigation measures, formulation of environmental management and training plans and monitoring arrangement, and framing of recommendations in simplest form, a planning tool that is now generally regarded as an integral component of sound decision making.

The purpose of this EIA process is to:

- Provide information for decision-making on the environmental consequences of proposed actions for exploration (3D seismic) activity in Noor Prospect in Ikhlas E.L.
- Identification and assessment of all major and minor impacts during the construction activities.
- Promote environmentally sound and sustainable development through the identification of appropriate enhancement and mitigation measures.
- Propose mitigation measures to minimize eliminate or compensate the potential adverse impacts identified in the EIA report.



- Identify all significant impacts that may require detailed assessment.

The identification, assessment and management of environmental effects have become an integral part of the development planning in the last two decades. An impact on the environment is defined as any incremental change in the biophysical and/or social environment caused by or directly related to a former, on-going, or proposed activity. The biophysical component addresses all living organisms and the natural and physical environment that sustains them (terrestrial, aquatic and atmospheric). The social component deals with socioeconomic aspects, human health, safety, and well-being of the society.

1.4 Project Categorization

The Review of Initial Environmental Examination (IEE) and Environmental Impact Assessment Regulations (EIA), 2022 categorizes projects in two categories provided in Schedule I and II. Schedule I categorizes the projects requiring an Initial Environmental Examination while Schedule II categorizes projects requiring an Environmental Impact Assessment (EIA). According to this categorization, **3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., District Attock** falls within Point 5 of Section A, Energy of Schedule II of Review of IEE and EIA Regulations, 2022.

- **Oil and gas extraction projects including exploration, production, gathering systems, separation and storage.**

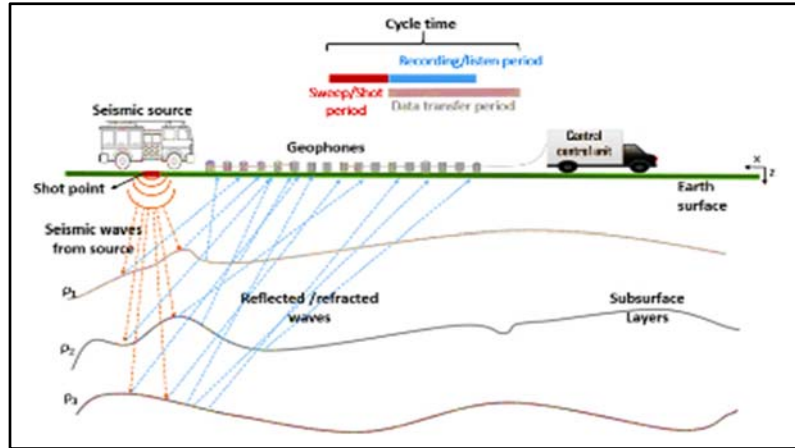
1.5 Project Justification

Pakistan is an energy deficit country wherein the energy demand exceeds its indigenous supply. Much of the energy is being met through imports, in the form of crude oil and petroleum products. On an average around 62% of the commercial energy mix becomes available locally while about 38% has to be imported in the form of crude oil and various petroleum products. The natural gas demand has so far been met solely using indigenous resources, even though the local supply is not sufficient as compared to demand. Unmet natural gas demand (which may reach up to 40-50%) especially in the case of the power and industrial sector, is usually met by furnace oil.

Oil and gas sector is among the most impactful sectors of Pakistan's economy. The total energy supply during 2019 was about 86 million tons of oil equivalents. To understand the impact of gas contribution, indigenous gas is about 35% of the total energy supply. About 4 Billion Cubic Feet (BCF) per day of gas is being produced by the local Exploration & Production (E&P) industry. The total requirement of the crude oil for the refineries is about 400,000 barrels out of which about 20% is being supplied by the local E&P industry. The local E&P industry is also producing about 75% of LPG demand. This shows that the oil & gas industry is the backbone of the country in every respect

including revenues and taxes as all E&P companies (national and international) operating in Pakistan are amongst the top taxpayers of the country.

Pakistan's oil & gas exploration and development activities need to be enhanced to decrease dependence on imported energy and to save foreign exchange. The government has provided ample incentives for oil & gas exploration and production in the Petroleum Policies over past two decades. To decrease oil imports and encourage more significant discoveries in the future, the existing petroleum policy and thrust of exploration and development activities need to be maintained, rather accelerated. Pakistan Oilfields Limited (POL) maintains a highly diversified exploration and production portfolio. POL exploration team is proactively evaluating exploration and exploitation opportunities within and outside Pakistan with an ultimate aim to sustain long-term production goals and bring value for the shareholders.



1.6 Proposed Environmental Approval and Management System

Preparation and approval of subject environmental assessment covers construction and 3D Seismic Data Acquisition survey in Noor, District Attock.

- Sufficient data collection and assessment of impacts to cover all environmental sensitivities;
- A mechanism that would require a site specific short study (if required) prior to start of each activity to incorporate any additional impacts and mitigation measures that were not addressed in the EIA; and
- A mechanism by which Punjab Environmental Protection Agency (Punjab-EPA) can continue to exercise its control over the proponent's activities and follow up on the environmental performance of the operations.

POL and NCPC have been fully cognizant of the above listed issues and have addressed them in the EIA by undertaking or proposing the following:

- The EIA is based on primary as well as secondary data. Primary data is collected on all physical, biological and socio-economic aspects;



- Assessment of all generic potentially significant impacts on the physical, biological and socio-economic receptors due to the proposed exploration and associated surface facilities development activities have been addressed in the EIA. Relevant mitigation measures have also been discussed in detail.
- In order to ensure that Punjab-EPA continues to regulate and oversee the environmental performance of proposed project activities within the concession, the EIA has recommended the following environmental approval, monitoring and management protocol:
 - o Once any activity is initiated, POL will undertake environmental monitoring according to the requirements of the project specific EMP and any additional requirements/bindings specified by the Punjab-EPA; and
 - o POL will accommodate any visits by Punjab-EPA or other concerned stakeholder's officials for the purpose of external audits or on-site inspections

1.7 Role of 3D Seismic Survey in Oil Exploration

The seismic survey is a method used during the exploration phase of oil and gas development. The method gives a first idea of what is present underneath the earth's surface. Energy produced by instruments such as a seismic vibrator (on land) or an airgun (in water) releases seismic waves that go through the earth's layers and "bounce-back" from different rock layers. The reflected and refracted seismic waves are recorded by a receiver (geophone or hydrophones in water) and give the first image of the subsurface. This technique allows for interpretation of what is underneath the ground or seabed (oil, gas, water, faults, folds etc.) without having to actually drill. This technique helps companies to make decisions about where to drill a well.

1.8 Project Overview

POL is going to conduct seismic reflection survey over Noor Prospect in Ikhlas E.L. The survey will involve the following activities:

- Leasing of land for seismic lines and camp
- Seismic line preparation
- Explosives
- Drilled shot holes
- Establishment and operation of the site camp
- Line and campsites clearing exploratory well(s) will be drilled to meet work commitments, if the seismic data analyses indicate any potential.



The purpose of the study is to assess the potential environmental impacts of the proposed 3D seismic survey over the Noor prospect area in Ikhlas E.L of District Attock.

1.8.1 Objectives of the Project

The main object of the project is to acquire 3D seismic data for sub-surface evaluation of hydrocarbon resources of Noor Prospect in Ikhlas Block.

1.8.2 Brief Description of the Proposed Project

POL will carry out seismic reflection survey over Noor Prospect in Ikhlas E.L. through a third-party contractor. 3D seismic reflection survey would be recorded using Vibroseis/ dynamite as a source of energy and recording the reflected subsurface data through geophones.

1.8.3 Project Detail

Table 1-2: Brief Description/ Detail of the Proposed Project

Nature of the Project	3D Seismic Survey for Oil & Gas Exploration
Type of the Project	Seismic data acquisition survey for hydrocarbon exploration
Name of the Proponent	Mr. Razzaq Goraya (AGM Operations)
Location of the Project Site	Tehsil Fateh Jang, Jand and Pindi Gheb of District Attock
Proposed Operational Area	264.391 Sq. Km
Project lifetime	07 Months
Distance from the Community	Camp site will be located away from population. The seismic survey would cover an area of 264.391 Sq. Kms. (Small towns and villages will fall within the survey area.)
Road Access to Project Site	Road infrastructure is available from Islamabad/ Rawalpindi to access the project site
Facilities/ Equipment's Installed	GPS Base stations for Surveying, Antennas for Communication Radio and Walkies-Talkies
Total Estimated Cost of the Project	Approximately US \$ 8.752 MM

1.8.4 Project Cost

Estimated development cost of the proposed project is **8.702 Million US \$** and installation cost **0.05 Million US\$**, with the total project cost of **8.752 Million US\$**.



1.8.5 Project Location and Coordinates

The proposed project area is located in Tehsil Fateh Jang, Jand and Pindi Gheb of District Attock and coordinates of the project area are given below:

Points	Latitude	Longitude
A	33° 26' 26.1437" N	72° 18' 46.0248" E
B	33° 25' 56.5050" N	72° 32' 58.2960" E
C	33° 19' 26.4717" N	72° 32' 38.6058" E
D	33° 19' 56.2316" N	72° 18' 27.2491" E
A	33° 26' 26.1437" N	72° 18' 46.0248" E

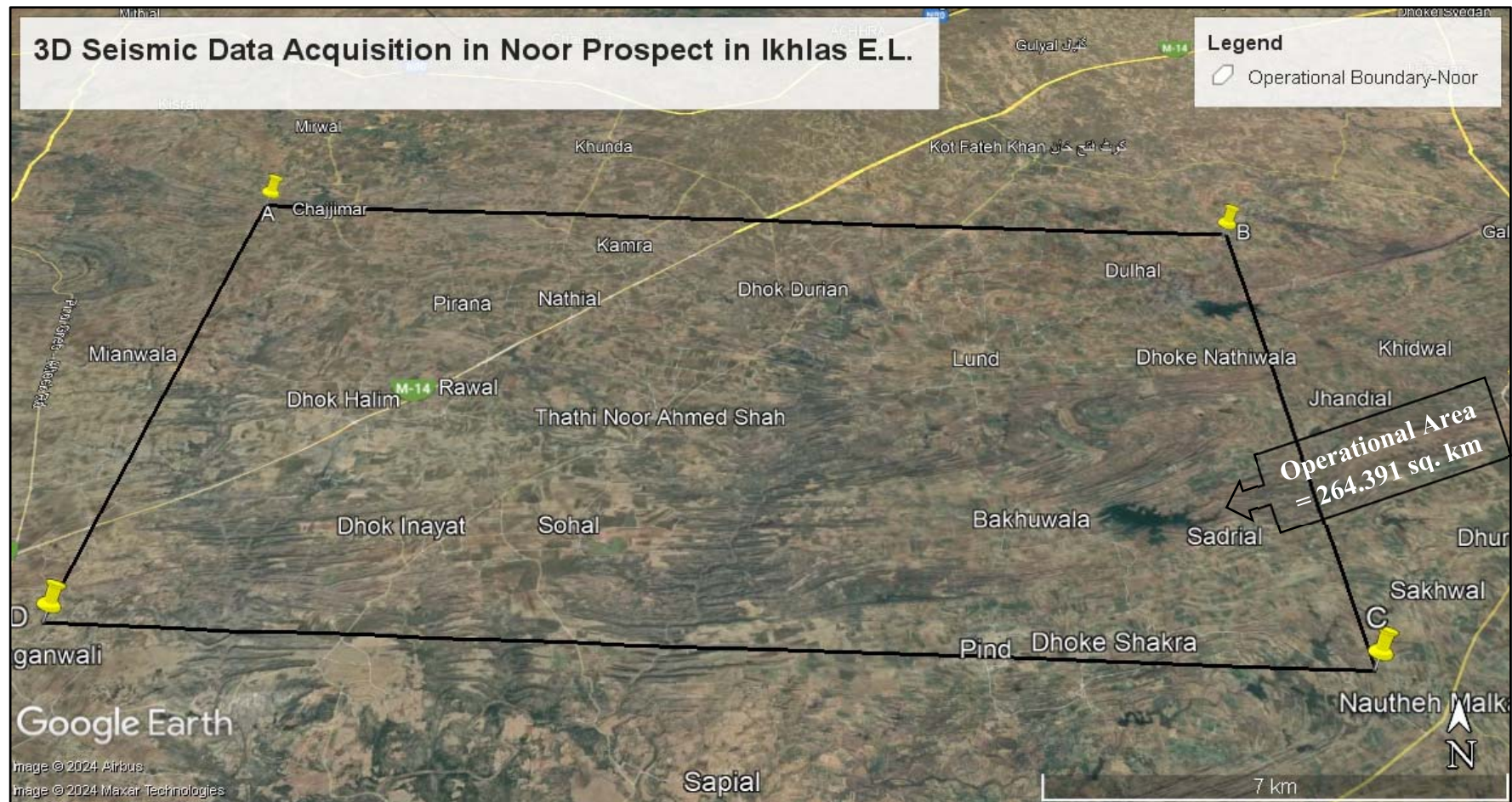


Figure 1-1: Satellite Image of Block Boundary and Operational Area of 3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L.

1.9 Pakistan Oilfields Limited (POL) – The Proponent

Pakistan Oilfields Limited (POL) is a leading oil and gas exploration and production company listed on Pakistan Stock Exchange. The Company's prime focus is to deliver performance through excellence in the field of exploration, drilling and production of crude oil and gas.

Pakistan Oilfields Limited maintains a highly diversified exploration and production portfolio. POL is presently operating nine Development and Production leases i.e. Pariwali, Meyal, Joyamair, Minwal, Dhulian, Khaur, Pindori, Turkwal and Balkassar. Similarly, new Exploration licenses (E.Ls) namely Dera Ghazi Khan, North Dhurnal, Multanai and Saruna West E.Ls have also been awarded to POL. POL exploration team is proactively evaluating exploration and exploitation opportunities within and outside Pakistan with an ultimate aim to sustain long-term production goals and bring value for the shareholders.



In addition to exploration and production of oil and gas, POL also manufactures LPG, Solvent Oil and Sulphur. POL markets LPG under its own brand named POLGAS as well as through its subsidiary CAPGAS (Private) Limited. POL also operates a network of pipelines for transportation of its own as well as other company's crude oil to Attock Refinery Limited. Around 28,000 barrels per day of crude oil is being pumped to Attock Refinery through POL's pipeline network.

1.10 NCPC – The Consultant

National Cleaner Production Center (NCPC) is working for the environment and social sector of Pakistan since 1999. The Center was established by UNIDO and is registered under Section 42 of the Companies Ordinance, 1984 by Government of Pakistan in 2002. NCPC is working as a non-profit organization and is certified by Pakistan Centre for Philanthropy (PCP) and also by FBR.

NCPC offers a wide range of services including Initial Environmental Examinations (IEEs), Environmental Impact Assessments (EIAs), Environmental and Social Monitoring, Environmental and Social Audits, Analytical Services, Incineration of Hospital Hazardous Waste, Air Quality Impact Assessments (AQIAs), Bioremediation of Oily Sludge and Oil Spillages, Energy Audits, Cleaner Production Projects and Trainings for capacity building etc. NCPC has also established Federal EPA certified Environment laboratory.

By providing quality services, NCPC has achieved Green Apple Award 2023, 2015 & 2014, ECO Green Industry Award 2011, 8th Annual Environmental Excellence Award 2011 (AEEA) by National Forum for Environment & Health (NFEH) and Platts Global Energy Award on Corporate Social Responsibility for the year 2007.



NCPC has a wide range of professional staff constituting environmental scientists, environmental engineers, chemical engineer, economist, biologist, social scientists, plant taxonomist, administrative and support staff. The core staffs have been selected to cater the diverse services offered by NCPC. NCPC can assemble multi-disciplinary teams from its other NCPCs worldwide and from its extensive list of external consultants. Diverse range of projects has been completed in this way. NCPC has about 25 years of experience in providing various services in its areas of expertise.

1.10.1 EIA Team

Table 1-3: Table showing EIA Team of NCPC

Sr. #	Name of Team Members	Role	Education
1.	Mr. Muhammad Irshad Ramay	Environmental Engineer	M.S Environmental Engineering and Management B.Sc. Chemical Engineering
2.	Dr. Amir Haider Malik	Hydrologist	PhD in Water, Soil and Environment
3.	Mr. Azhar Qureshi	Flora Fauna Expert	MSc in Zoology
4.	Mr. Tariq Khan	Biologist and Botanist	M. Phil Environment Sciences
5.	Mr. Tahir Hussain	Chemist	MSc Chemistry
7.	Mr. Naveed Akhtar	Socio-Economist	M. Phil Sociology
8.	Mr. Nayyar Humair	Air Quality Expert	MSc Chemistry
9.	Ms Sana Tahir	Environmentalist	M. Phil Environmental Sciences
10.	Mr. Bilal Muzammil	Environmentalist	B.S Environmental Sciences
11.	Ms. Waliha Noor	Environmental Engineer	M.Sc. Environmental Engineering

1.11 Contact Information

1.11.1 POL

Name: Mr. Razzaq Goraya
Designation: AGM Operations
Address: POL House, Morgah, Rawalpindi
Ph: (+92 51) 5487589-97
Email: razzaq@pakoil.com.pk

1.11.2 NCPC

Name: Mr. Muhammad Irshad Ramay
Designation: Coordinator NCPC
Address: Refinery Post Office, Morgah, Rawalpindi
Ph: (+92 51) 5450424
Email: ncpc.rwp@gmail.com

1.12 Site Visit

The credibility of the EIA study depends on the quality and reliability of the baseline information used in order to evaluate the impacts that the proposed project might have on the environment of the area. The site visits to the location of the proposed project site; 3D Seismic project area and adjoining areas were undertaken by NCPC team in the second week of August, 2024 to gain first hand detailed knowledge of the environmental baseline of the area. The following team members visited the site:

- **Mr. Muhammad Ali** – Exploration Department (POL)
- **Mr. Muhammad Bilal Muzammil**-Environmental
- **Ms. Waliha Noor** – Environmental Engineer



Figure 1-2: Environmental and Surrounding Area Characteristics of the Noor Prospekt (3D Seismic Project Area)

During the visits, baseline data regarding the physical, biological and socioeconomic environment of the area of the proposed project was collected, including information regarding the topography, geology, soils, surface and groundwater resources, climate, flora and fauna, cultural, archaeological or historical sites and socioeconomic conditions prevalent in the area.

1.13 EIA Scope and Methodology

1.13.1 Scope of Work

The scope of work for EIA study of Noor Prospect in Ikhlas E.L is as follows:

- To carry out EIA to assess the impacts of 3D seismic survey over **Noor Prospect** on the environment.
- The impacts created from 3D seismic survey on surrounding environment, the local population and habitats, the entire field facilities including base camp

The following are the Scope of work but not limited to:

- General description of the ecology, flora and fauna of the proposed area.
- physical environment.
- Baseline climate conditions for the site.
- Topography, geology soil and productivity.
- The hydrology, surface and ground water resources and quality of study area.
- Seismic history of the project area.
- To identify impacts from the existing activities (if any) on the local environment, population and personnel.
- Identify methods for environmentally safe disposal for waste generated during project.
- Identify the impacts due to air emissions from the various sources and suggest appropriate mitigation measures in the environmental report.
- Mention project specific potential impacts in environmental management plan along with appropriate mitigation measures.
- Socio-Economic Impacts (Collection and Scrutinizing Data).
- Identification of mitigation measures to be taken.
- To assess demography, community structure, public health.
- Archeological, historical and culturally sensitive resources.



- To describe the existing environmental condition in and around the proposed facilities
- To comply with the relevant regulation / legislations of the regulatory authorities of Govt. of Pakistan.

The major concerns examined during the study are:

- Effect of operation on the land and habitats.
- Effect of operation in the livestock.
- Effect of operation on the wildlife.
- Effect of operation on the water resources and underground water table.
- Air emission/ pollution effect of seismic operation.

1.13.2 The EIA Methodology

The various steps undertaken in the EIA preparation are summarized below:

1.13.3 Understanding of the Proposed Project and Review of Alternatives

Details of the proposed project activities were collected from POL and understood by the EIA Consultant. All alternatives to the proposed operations were reviewed including; the no project option, alternative site selection, timing and alternative technologies to establish the context that proposed operations will not depreciate the environmental quality/ soundness of the project area. Details of the proposed project and a review of alternatives have been provided in **Chapter # 03 and Chapter # 04** respectively of this EIA report.

1.13.4 Policy Legal and Administrative Framework

National and provincial legislations, international agreements, environmental guidelines, best industry practices and POL's environmental policy were reviewed to set environmental standards that POL would be required to adhere to during the project. A synopsis of these is provided in **Chapter # 02** of the EIA.

1.13.5 Secondary Data Collection

Previous environmental assessments for exploration projects in the area and other published and unpublished information was collected in order to gain a complete understanding of existing environmental conditions in the area including the following:

- **Physical environment** – topography, geology, geomorphology, soils, surface and groundwater resources and climate;



- **Biological environment** – habitat types, flora and fauna (particularly rare or endangered species), critical habitats and vegetation communities within the wildlife or forest protected areas falling in the proposed project area;
- **Socio-economic environment** – settlements, socio-economic conditions, infrastructure and land use; and
- **Heritage aspects** – sites of cultural, archaeological or historical significance.

1.13.6 Field Data Collection

Field survey for EIA study was carried out by a team of environmentalist, wildlife specialist and environmental engineers in the second week of August, 2024. Field data collection also included validation of available secondary information. Secondary information was collected from POL, in-house sources like previous environmental studies in the block and closer vicinities in addition to respective District Census Reports (DCRs) as well as respective district development profiles published by Government of Punjab. Where required, the secondary data collected from desktop analysis was also consulted for preparation of this EIA and analysed by the experts.

A description of baseline physical, biological and socio-economic conditions of the project area, impacts due to proposed project activities and their mitigation measures are provided in **Chapters # 05** and **Chapter # 06** of the EIA report respectively. The project area for EIA contains agriculture areas including orchards and human settlements and streambeds and springs. The sampling location was randomly selected, ensuring that sufficient locations are sampled for each identified habitat.

1.13.7 Community/ Stakeholders Consultation

The communities within the project area were meticulously consulted during the fieldwork. The objectives of the consultation were to brief the communities about the proposed exploration and development and to collect their views and concerns regarding the same. The outcome of the consultations is detailed in **Chapter # 08** of the EIA report.

1.13.8 Impact Identification and Assessment

The potential impacts arising from each phase/segment of the proposed project activities were comprehensively identified. These include effects of the proposed project activities on the physical, biological, socio-economic, archaeological and cultural environments of the area and are detailed in **Chapter # 06** of this EIA. Impacts were identified and assessed on the basis of field data, secondary data, experts' opinion and monitoring results of previous oil and gas exploration projects in Pakistan particularly in Punjab province.



1.13.9 Recommendations for Mitigation and Monitoring Measures

Mitigation measures to prevent or minimize all potential adverse environmental impacts of the project were identified based on a range of options including management and monitoring practices, alternative technologies, physical controls or compensation. The proposed mitigation measures are based on an appreciation of the sensitivity and behaviour of environmental receptors within the project area, past experience, case studies, legislative controls, environmental guidelines and experts' advices.

Monitoring measures have been recommended for residual impacts (impacts remaining after applying the recommended mitigation measures) or for impacts that cannot be accurately predicted at the EIA stage. In such cases advice on requisite monitoring measures was sought from experts involved in the EIA and case studies of similar monitoring exercises carried out in wildlife or forest protected areas elsewhere.

1.13.10 Development of Environmental Management Plan (EMP)

An Environmental Management Plan (EMP) for the proposed project activities has been prepared and provided in **Chapter # 07** of this EIA report. The EMP provides a framework for implementing and managing the mitigation and monitoring measures recommended in the EIA. The EMP includes the following:

- A mitigation and management plan;
- Definition of roles and responsibilities of the project proponent, execution contractors and monitoring teams;
- Requirements for communication, documentation and trainings during the project;
- Restrictions on design, timing and conduct of the project; and

1.13.11 Documentation

The documentation phase commenced parallel to the previous phases and included developing write-ups on the project description, regulatory aspects, environmental profile, potential environmental impact, gender issues and the recommended mitigation measures. Towards the end of the study, these write-ups were consolidated in the form of this EIA report.



2.0 POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

This report is intended to develop the legislative framework for the proposed project involving construction and seismic activities in providing a synopsis of environmental policies; legislation and guidelines applicable for the proposed project **3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., District Attock**. The legal responsibilities of the proponent in the context of the environmental and social management are described in subsequent sections. POL, the proponent of this project will be required to adhere to the requirements of the policies and legislations during the construction and seismic activities. In this section, policies, guidelines and legislation have been proposed for the relevant project. The proponent (POL) should ensure that it conforms to all rules and regulation of environmental excellence during all aspects of its operation. The local and international laws are to be complied with it.

This chapter describes the basic laws and regulations involved in exploration activities in environmentally sustainable manner and current legal responsibilities of the proponent in the context of the environment and sustainable development, and the institutions that exist in the country that may influence the environmental management of the proposed project.

2.1 International Treaties and Guidelines

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

The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires Parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programs and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use. Pakistan is a signatory to the Convention on Biological Diversity and is thereby obligated to develop a national strategy for the conservation of biodiversity. The Government of Pakistan has constituted a Biodiversity Working Group under the auspices of the Ministry of Environment, Local Government and Rural Development to develop a Biodiversity Action Plan for the country. After an extensive consultative exercise, an Action Plan has been developed. The Plan, which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country. The Pakistan Environmental Protection Council (PEPC) has approved the plan and a federal steering committee has been formed, while the provincial steering committees are in the process of being formed.



The Convention on the Conservation of Migratory Species of Wild Animals, 1979, requires countries to take action to avoid endangering migratory species, where the term ‘migratory species refers to species of wild animals of which significant proportions cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with research into migratory species. Under the International Plant Protection Convention, 1951, Pakistan is required to take steps to ensure the protection of certain plant species that face the threat of extinction.

Pakistan is also a signatory to the following additional conventions:

- Montreal Protocol (1987) and Copenhagen Amendments (1992) ratified by Pakistan in January 1995, which accelerate the phase-out of ozone depleting substances.
- Convention to Combat Desertification (1994), ratified by Pakistan in 1996, has led to a national action plan that combats desertification and mitigates the effects in countries experiencing serious droughts.
- Convention on International Trade in Endangered Species (CITES);
- Convention of Biological Diversity (CBD);
- World Heritage Convention.
- Ramsar Convention

The latter three conventions aim to protect and conserve components of biological diversity.

2.2 World Bank Environmental Guidelines

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

- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production (WB/ UNIDO/ UNEP, 1999);
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues (WB, 1991a);
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects (WB, 1991a).

In accordance with World Bank Guidelines (1999), noise abatement measures should achieve 55 dB (A) (Day) or 45 dB (A) (Night) for residential receptors, or a maximum increase in background levels of 3 dB (A). Measurements are to be taken outside the project property boundary at the noise receptors. Note that for listed pollutants common to both the NEQS and World Bank Guidelines, the NEQS guideline will prevail in the event of a conflict of documented emission standard between the two guidelines.



Guidelines for Public Consultation, May 1997, and Guidelines for Sensitive and critical Areas, October 1997 the guidelines on sensitive areas are more specific as they identify the officially notified protected areas in Pakistan, including critical ecosystems and archaeological sites, and present checklists for environmental assessment procedures to be carried out inside or in the vicinity of such sites. Environmentally sensitive areas include, among others, archaeological sites, biosphere reserves natural/national parks, wildlife sanctuaries and preserves. The guidelines state that the approach recommended in the document should extend to areas in the vicinity of such sensitive and critical sites.

2.3 Laws, Policies and Plans

Pakistan's statute book contains a number of laws concerned with the regulation and protection of the environment. However, the enactment of a comprehensive legislation on the environment, in the form of an act of parliament, which covers multiple areas of concern, is a relatively new phenomenon. Most of the existing laws on environmental issues were enforced over an extended period of time, and are context-specific. The laws relevant to the present project are briefly reviewed below:

2.3.1 The Canal and Drainage Act, 1873

The Canal and Drainage Act, 1873 prohibits corruption or fouling of water canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage. This requires that any of the project activities including waste streams generated from project activities do not contaminate the water bodies of project area. The project site does not have any canal within its vicinity which may be affected from the project.

2.3.2 The Land Acquisition Act (LAA), 1894

The Land Acquisition Act (LAA) of 1894 is the key legislation that has direct relevance to land acquisition, resettlement and compensation in Pakistan. Each province has its own interpretation of the LAA, and some provinces have also passed provincial legislations. The LAA and its implementation rules require that before implementation of any development project the privately owned land and crops are compensated to titled landowners and/or registered tenants/users etc.

It is envisaged that implementation of this project will require the acquisition of about 347.84 km² (square kilometres) of land along the alignments of pressure pipes and canals and for construction of storage tanks etc. The project offices and contractor camps will be established on private land which is available adjacent to proposed alignments.

There are three categories of laws, firstly, the law that regulates the relations between Employer and Employee; secondly those laws that provide for compulsory levies and thirdly those that provide for minimum standards for Employees; the same are as follows:

- Labor Laws regulating the Relation of Employer and Employee



- Labor Laws Assigning Levies
- Labor Laws Assigning Standards for Wages
- Labor Laws Setting Standards for Workplace

Following are the salient features of the labour laws:

- Improvement in health and safety at the workplace through promulgation of new OSH law.
- Ensure payment of wages through scheduled banks by all the industrial establishments in the province with the objective to address wage evasion, under payment, less payment and nonpayment of wages
- Promoting efforts towards sustained elimination of child and bonded Labor in the province.
- Facilitation of the workers in provision of their basic rights, social protection and welfare measures through education and awareness and establishment of facilitation desks.
- Special measures for youth, persons with disabilities and transgender including skill development, employment promotion and enterprise development.

Improvement in enforcement of Labor laws through framing subsidiary rules of Labor laws, capacity development of inspection staff and research and development.

2.3.3 The Forest Act, 1927

The Forest Act, 1927 empowers the provincial forest departments to declare any forest area reserved or protected. The act also empowers the provincial forest departments to prohibit the clearing of forests for cultivation, grazing, hunting, removing forest produce, quarrying, felling, and lopping. Since the project area is not located in any protected/ reserved forest protected under the Forest Act, this law's provisions do not apply to the project.

2.3.3.1 The Punjab Forest (Amendment) Act 2016

The Forest Act, 1927, as amended in 2016, serves to regulate the management, protection, and conservation of forests and forest resources. The amendment aimed to modernize the Act in light of evolving environmental challenges and socio-economic priorities. Key updates included stricter penalties for illegal logging, encroachments, and forest fires to deter violations and enhance enforcement. The amendment also emphasized sustainable forest management practices, community participation in forest conservation, and measures to combat deforestation and environmental degradation. It



aligns with Pakistan's commitment to environmental sustainability and addresses the need for enhanced legal frameworks to protect forest ecosystems.

2.3.4 National Conservation Strategy, 1992

The National Conservation Strategy (NCS) is the primary policy document of the Government of Pakistan (GoP) on national environmental issues. The Strategy approved by the Federal Cabinet in March 1992 was also recognized by International Financial Institutions, principally the World Bank. The NCS had identified 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage. It had also recommended immediate attention to the stated core areas in order to preserve the environment of Pakistan.

A mid-term review of the NCS in 2000 concluded that achievements under the NCS were primarily awareness raising and institutional building rather than meaningful improvement of the environment and natural resources. Thus the need for a more focused National Environmental Action Plan (NEAP) was formulated and approved by the Pakistan Environmental Protection Council in 2001 to practically improve the national environment with emphasis on poverty reduction, and economic as well as sustainable development. NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that would safeguard public health, promote sustainable livelihoods and enhance the quality of life for the people of Pakistan.

2.3.5 The Cutting of Trees (Prohibition) Act, 1992

The Cutting of trees (prohibition) Act, 1992 mandates that no person shall, without prior written approval from authorized officer shall cut, fell or damage trees growing in First Zone (Area adjacent to and beyond the external frontier of Pakistan to a line at four kilometers measured from the external frontiers of Pakistan) if the number of remaining trees in any field falls short of the number to be calculated at the rate of fifteen trees per acre; and

Second Zone (Area adjacent to and beyond the first zone extending towards Pakistan to a line at four kilometers measured from the first zone) if the number of remaining trees in any field falls short of the number to be calculated at the rate of ten trees per acre. This does not apply to a tree growing on land occupied as the site of a town or village or in a dwelling-house.

- Section 3: It prohibits any person, without prior approval, from cutting, felling or damaging any tree growing in first and second zones as mentioned above.
- Section 4: It imposes penalty of fine which may extend to five thousand rupees for contravention relating to first zone and imposes penalty of fine which may extend to two thousand and five hundred rupees for contravention relating to second zone.



2.3.6 The Biodiversity Action Plan, 2000

Pakistan is a signatory to the Convention on Biological Diversity, and hence obligated to develop a national strategy for the conservation of biodiversity. The Government of Pakistan constituted a Biodiversity Working Group, under the auspices of the Ministry of Climate Change; to develop a Biodiversity Action Plan for the country, which was completed after an extensive consultative exercise. The plan, which has been designed to complement the NCS and the proposed provincial conservation strategies, identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve biodiversity in the country.

The Pakistan Environmental Protection Council (PEPC) has approved the action plan and steering committees at federal and provincial levels have been formed to implement it. Developing the Biodiversity Action Plan for Pakistan, 2000 has been the most significant direct steps towards addressing the biodiversity loss.

2.3.7 National Environmental Action Plan, 2001

The GoP and United Nations Development Program (UNDP) have jointly initiated an umbrella support Program called the NEAP-Support Program that was signed in October 2001 and implemented in 2002. The development objective supported by NEAP-Support Program is environmental sustainability and poverty reduction in the context of economic growth. The objectives of new policy have total 171 guidelines on sectoral and cross sectoral issues. The objectives of new policy include assurance of sustainable development and safeguard of natural wealth of country. The following are the approved Sectoral Guidelines:

- Water Supply and Management.
- Air Quality and Noise.
- Waste Management.
- Forestry.
- Biodiversity and Protected Areas.
- Climate Change and Ozone Depletion.
- Energy Efficiency and Renewable.
- Agriculture and Livestock.
- Multilateral Environmental Agreements

2.3.8 The Pakistan Environmental Policy, 2005

The Pakistan Environmental Policy, 2005 provides an overarching framework for addressing the environmental issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation,

loss of biodiversity, desertification, natural disasters and climate change. It also gives direction for addressing the cross sectoral issues as well as the underlying causes of environmental degradation and meeting international obligations. The National Environmental Policy, 2005 while recognizing the goals and objectives of the National Conservation Strategy, National Environmental Action Plan and other existing environment related national policies, strategies and action plans, provide broad guidelines to the Federal Government, Provincial Governments, Federally Administrated Territories and Local Governments for addressing environmental concerns and ensuring effective management for their environmental resources.

2.3.9 Pakistan Climate Change Act, 2017

Federal Cabinet of Government of Pakistan approved Pakistan Climate Change Act 2017 in March. It was enacted in 2017 after it was passed by the National Assembly. Consequent to the Act, three relevant institutions have been setup namely Pakistan Climate Change Council, Pakistan Climate Change Authority, and Pakistan Climate Change Fund.

Section 5(2) establishes the Pakistan Climate Change Authority ('PCCA'), with the prerogative of being a corporate body, which is capable of being sued and can pursue a suo moto case, acquire assets, loans, and can enter into contracts whenever required. Section 8 defines the function of the authority. The main ones include formulation of mitigation policies and programs, in order to curb the crisis of climate change in the country. The technical aspects of compliance to the Paris Agreement also fall within this body's ambit, as it is responsible for the submission of the Nationally Determined Contributions to the United Nations Framework Convention on Climate.

2.4 Regulations for Oil and Natural Gas Exploration

Table 2-1 shows the legislative powers of federal and provincial government relevant to health, safety and environmental issues for the oil and gas projects.

Table 2-1: Relevant Environmental Laws and their Applicability

Category	Laws/ Regulations	Description	Applicability
Mineral Oil and Natural Gas	Pakistan Petroleum (Exploration & Production) Act, 2012	Governs exploration and production of petroleum resources.	Applies to oil and gas exploration and production activities.
	The Petroleum (Amendment) Act, 2023	The Act redefines petroleum into distinct classes based	The act imposes stricter regulations on the illegal importation, transportation, storage,



		on flashpoint temperatures.	sale, and refining of petroleum. The petroleum regulatory framework, enhance safety, and ensure compliance with contemporary standards.
	Oil and Gas Regulatory Authority (OGRA) Ordinance, 2002	Regulates the oil and gas industry, including pricing, quality, and safety.	Regulates upstream and downstream oil and gas sectors.
Explosives	Explosives Act, 1884	Regulates the manufacture, storage, and use of explosives.	Applies to industries using or producing explosives.
	Mining Act, 1923	Governs the use of explosives in mining operations.	Applies to mining activities using explosives.
Regulation of Labor and Safety in Mines, Factories, and Oil Fields	Mine Act, 1923	Regulates safety and working conditions in mines.	Ensures safety standards in mining operations.
	Factories Act, 1934	Provides regulations for safety, health, and working conditions in factories.	Applies to industrial and factory settings.
Electricity	Electricity Act, 1910	Regulates the generation, distribution, and supply of electricity.	Governs electricity infrastructure and operations.
	National Electric Power Regulatory Authority (NEPRA) Act, 1997	Establishes NEPRA to regulate electricity sector standards and pricing.	Oversees the electricity market and regulatory practices.
Forestry	Forests Act, 1927	Regulates the management and conservation of forest resources.	Applies to forestry management and conservation activities.

	Pakistan Forests Policy, 2015	Provides guidelines for sustainable forest management and conservation.	Aims at sustainable management of forest resources.
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2.4.1 The Explosives Act, 1884

This Act has been formed to regulate the manufacture, possession, use, sale, transport and importation of explosives. An explosive has been defined (Section 4(a)) as the gunpowder, nitroglycerine, dynamite, gun-cotton, dinitro-toluenes, trinitro toluene, picric acid, dinitro-phenol, trinitro resorcinol (styphnic acid), cyclotrimethylene trinitramine, penta erythritol-tetranitrate, tetryl, nitroguanidine, lead azide, lead styphnate, blasting powders, fulminate of mercury or of other metals, diazo dinitro phenol, colored fires and any other substances, whether a single chemical compound or a mixture of substances, whether solid or liquid or gaseous, used or manufactured with a view to produce a practical effect by explosion, or a pyrotechnic effect.

Section 5: Government may make rules to regulate, prohibit, manufacture, possess, use, transport, import or export explosives or any specified class of explosives. The following matters may be provided for:

- The authority by which licenses may be granted
- The fees to be charged

The manner in which application for licenses must be and the matters to be specified in such applications etc.

Section 6: Government may from time to time, either absolutely or subject to conditions, prohibit manufacture, possess, transport, import and export etc. any explosive.

Section 7: Government may make rules consistent with this Act authorizing any officer to enter, inspect, seize and examine etc. any place, carriage etc. in which an explosive is being used or sold etc.

Section 8: Any explosion by fire that causes loss of human life, serious injury to person or property etc. must be reported by the occupier or master etc. to Secretary Home Department and to the nearest police station.

Section 9: District Magistrate shall, in cases attended by loss of human life, or in any other case, direct a Magistrate Subordinate to hold an inquiry.

Sections 10 to 14: These sections deal with forfeiture of explosives by court; distress of aircraft or vessel; punishment for abetment and attempts; power to arrest without warrant persons committing dangerous offence; saving and power to exempt (to armed forces,



person employed under the Government for enforcement of this Act or by notification etc.) respectively.

Section 19: Transportation of explosives by air shall be carried out in accordance with rules and regulations of International Civil Aviation Organization (ICAO), International Air Association (IATA) and Civil Aviation Authority of Pakistan (CAA).

2.4.2 The Explosive Substances Act, 1908

The Explosive Substances Act, 1908 deals exclusively with the acts of explosions or intentions to cause explosions and gives detail of the punishments to be awarded to the non-compliant. This law regulates the possession and use of explosive substances, including materials for the manufacture of explosives as well as machinery, tools and materials that can be used to cause an explosion (Section 2). Causing an explosion is punishable with a maximum sentence of life in prison, whether or not the event causes any injury to persons or damage to property (Section 3). The same maximum penalty applies to making or possessing explosives with intent to cause an explosion (Section 4). Although the law does not specify conditions under which it is legal to possess explosive materials, possession of such substances for a purpose that is not “lawful” is an offence (Section 5), implying that some form of regulatory mechanism is to be put in place. Powers under this Act have been delegated to provincial governments, which may restrict or allow the courts to proceed with the trial of suspected offenders (Section 7).

2.4.3 The Petroleum Act, 1934

The Petroleum Act was enacted to consolidate and amend the law relating to the import, transport, storage, production, refining and blending of petroleum and other inflammable substances. The Petroleum Rules 1937 were made under the Act. According to this act, no one is permitted to import, transport and store any petroleum products and only federal government is the authority regulating the import of petroleum products, prescribing places where petroleum, may be imported and prohibiting its import elsewhere.

Federal government also has the authority to prescribe the conditions subject to which petroleum may be produced, refined or blended and regulate the removal of petroleum from places where it is produced, refined or blended.

2.4.3.1 The Petroleum (Amendment) Act, 2023

The Petroleum (Amendment) Act, 2023, made several significant changes to the original Petroleum Act of 1934 in Pakistan. Here are the key amendments: The Act redefines petroleum into distinct classes based on flashpoint temperatures:

- **Petroleum Class A:** Flashpoint below 24°C
- **Petroleum Class B:** Flashpoint between 24°C and 55°C
- **Petroleum Class C:** Flashpoint between 55°C and 93°C



- **Excluded Petroleum:** Flashpoint above 93°C

The act imposes stricter regulations on the illegal importation, transportation, storage, sale, and refining of petroleum. The Federal Government replaces the Secretary of the relevant division in various regulatory roles. These amendments aim to modernize the petroleum regulatory framework, enhance safety, and ensure compliance with contemporary standards.

2.4.4 Oil and Gas Regulatory Authority (OGRA) Ordinance, 2002

Oil and Gas Regulatory Authority (OGRA) issues the licenses related to Oil & Gas sector. Section 23 states that no person shall construct or operate any installation relating to oil, undertake storage of oil, or undertake marketing of refined oil products unless a general or specific license to undertake such activity has been issued and in full force and effect and the person is the licensee. The authority may grant a license subject to such conditions, restrictions or stipulations as may be set out in, or attached to, the license.

2.4.4.1 OGRA Ordinance, 2002 (Amended up to March 05, 2022)

The OGRA Amendment 2022 introduced several key changes to modernize and strengthen the regulatory framework of Pakistan's oil and gas sector. It enhanced OGRA's regulatory powers, allowing for stricter compliance and enforcement of safety and environmental standards. The amendment emphasized digitalization, increasing transparency and efficiency in regulatory processes. It also streamlined licensing procedures to attract more investment and facilitate faster project approvals. Provisions were introduced to encourage investment in renewable energy, aligning the regulatory framework with global sustainability trends. Additionally, the amendment included measures to strengthen consumer protection, ensuring fair pricing and service delivery. Overall, the amendment aimed to create a more dynamic, transparent, and consumer-friendly energy market in Pakistan.

2.4.5 The Pakistan Onshore Petroleum (Exploration and Production) Rules, 2009

These rules contain provisions related to reconnaissance surveys; license for petroleum exploration, lease for petroleum development and production; accounts, records, inspection, reports; and, miscellaneous matters. The rules allow any company incorporated inside or outside Pakistan to apply for reconnaissance permit, exploration license or a development and production lease. The manner in which application may be made has also been prescribed i.e. in writing, mentioning principle place of business of applicant, furnishing of guarantee and deposit of fees etc. The petroleum right, if not exercised within three months, shall lapse. Every permit, license or lease shall be subject to terms and conditions mentioned in these rules included in second schedule and any other conditions which Government may deem fit to insert.



Permit for reconnaissance survey, petroleum exploration would be granted by the Government to any company in accordance with the rules and the holder must perform the work program stipulated in the license. The holder would not be entitled to extract any petroleum from discoveries other than such test production as the Government may in its discretion permit. Initial period of license shall not exceed three years.

The grant of lease for development and production, not exceeding twenty-five years, with certain terms and conditions including the work program shall be granted by the Government on being satisfied that the deposit can be commercially produced. The lease holder shall have exclusive right to perform activities in connection with the development and production including the right to undertake transportation subject to approval. The holder shall pay royalty at the rate of 12.5 percent of the wellhead value of the petroleum produced and saved. In addition to these powers of Government for recovering yearly lease rent, surface rent and revocation of lease have also been described.

The lease or license holder shall maintain full and accurate accounts, and shall submit periodic or occasional reports to DG, Petroleum Concessions. Any person authorized by Director General, Petroleum Concessions, or any other competent authority shall have power to examine the wells, plants, appliances etc. The lease or license holder shall maintain safety in operations including non-interference with navigation, fisheries and agriculture. All reasonable precautions shall be taken to prevent pollution or accumulation of trash and to prevent damage to the environment and surroundings. Pakistani goods and services should be used subject to their quality, employment and training of Pakistani personnel to develop the capability should be ensured. Indemnity and force majeure have also been provided.

2.4.5.1 *Pakistan Onshore Petroleum (Exploration and Production) Rules, 2009 (Amendment 2023)*

The Pakistan Onshore Petroleum (Exploration and Production) Rules, 2009 were amended in 2023 to strengthen the regulatory framework governing oil and gas exploration and production in Pakistan. The 2023 amendments introduced enhanced reporting and compliance requirements for exploration and production companies, with a particular focus on timely submission of environmental impact assessments (EIAs) and other relevant documentation. Environmental management standards were tightened, mandating more rigorous waste management and pollution control measures. Safety standards were updated to include stricter operational protocols and emergency response plans. Financial and performance guarantees for companies were revised to ensure adequate coverage for potential liabilities. Regulatory oversight was strengthened, with increased roles for authorities in monitoring compliance through improved inspection and audit processes. Additionally, the amendments emphasized the need for local community engagement, requiring companies to address community concerns and contribute to local development. These changes aim to improve environmental protection, safety, and overall regulatory compliance in the petroleum sector.



2.4.6 Petroleum Exploration and Production Policy, 2012

The purpose of this Petroleum Exploration and Production policy, 2012 is to establish the policies procedures, tax and pricing regime in respect of petroleum exploration and production (E&P) sector. The principal objectives of this Policy are:

- To accelerate E&P activities in Pakistan with a view to achieve maximum self – sufficiency in energy by increasing oil and gas production.
- To promote direct foreign investment in Pakistan by increasing the competitiveness of its terms of investment in the upstream sector.
- To promote the involvement of Pakistani oil and gas companies in the country’s upstream investment opportunities.
- To train the Pakistani professionals in E&P sector to international standards and create favorable conditions for their retaining within the country.
- To promote increased E&P activity in the onshore frontier areas by providing globally competitive incentives.
- To enable a more proactive management of resources through establishment of a strengthened Directorate General of Petroleum Concessions (DGPC) and providing the necessary control and procedures to enhance the effective management of Pakistan’s petroleum reserves.
- To ensure the energy security of the country by enhancing domestic exploration.
- To decrease reliance on imported energy by providing additional incentives to exploration and production companies for enhancing indigenous production.
- To undertake exploitation of oil and gas resources in a socially, economically and environmentally sustainable and responsible manner.

2.4.6.1 Petroleum Policy (Amendment) Rules, 2024

The Council of Common Interests (CCI) approved amendments to the Petroleum Policy 2012, aiming to boost oil and gas exploration. These changes allow petroleum exploration and production companies to use both old and new licenses for exploring reserves. This is expected to encourage further exploration of new reservoirs. The policy amendments also include better wellhead prices for companies operating in challenging zones like the southern border areas of Khyber Pakhtunkhwa and Balochistan.



2.5 Provincial Laws and Regulations

2.5.1 Punjab Environmental Protection Agency (Review of IEE and EIA Regulations), 2022

Punjab Environmental Protection Agency (Review of IEE and EIA Regulations), 2022 (the Regulations) prepared by the Punjab Environmental Protection Agency under the powers conferred upon it by the Act, provide the necessary details on preparation, submission and review of the IEE and the EIA. Categorization of projects for IEE and EIA is one of the main components of the Regulations.

Projects have been classified on the basis of the expected degree of adverse environmental impacts. Project types listed in Schedule-I are designated as potentially less damaging to the environment and those listed in Schedule-II as having potentially serious adverse effects. Schedule-I projects require an IEE to be conducted, provided they are not located in environmentally sensitive areas. For the schedule-II projects, conducting an EIA is necessary.

Categories of projects requiring IEE and EIA are issued through two schedules attached with the regulations. Salient features of the regulation, relevant to the proposed project are listed below:

- A fee, depending on the cost of the project, has been imposed for review of EIA and IEE.
- The submittal is to be accompanied by an application in prescribed format included as schedule IV of the Regulations.
- The EPA is bound to conduct preliminary scrutiny and reply within 10 days of submittal of the report a) confirming completeness, b) asking for additional information, or c) requiring additional studies.
- The EPA is required to make every effort to complete the review process for IEE within **30 days** and of the EIA within **45 days**, of the issue of confirmation of completeness.
- EPAs accord their approval subject to following conditions:
 - Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
 - Before commencing operation of the project, the proponent is required to obtain from EPA a written confirmation of compliance with approval conditions and requirements of the IEE/ EIA.



- An EMP is required to be submitted with the request for obtaining confirmation of compliance.
- The IEE/ EIA approval will be valid for three years from the date of the accord.
- A monitoring report is required to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operations.

2.5.2 Pakistan Environmental Protection Act of 1997

PEPA, 1997 is an improvement over PEPO of 1983. The Pakistan Environmental Protection Act, 1997 (PEPA) was the basic environmental legislation in the country, enacted on 6 December 1997 with the objective of "protection, conservation, rehabilitation and improvement of environment for the prevention and control of pollution, and promotion of sustainable development".

The Pakistan Environmental Protection Act (Amendment 2017) was appeared to amend the Pakistan Environmental Protection Act 1997. The project will be subjected to four basic provisions relating to pollution control under the Pakistan Environmental Protection Act, 1997 (Amended 2012), as contained in section 11, 13, 14 and 15 as follows:

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

2.5.3 Punjab Environmental Quality Standards (PEQS), 2016

With the PEPA, 1997 the Pak EPA revised the NEQS with full consultation of the private sector, industrialist, trade and business associations and NGOs. The municipal and liquid industrial effluent standards cover 32 parameters. The standards for industrial gaseous emissions specify limits for 16 parameters, and the standards for motor vehicles prescribe maximum permissible limits for smoke, carbon monoxide and noise. Revised standards cover discharges limits of effluents into inland water, sewage treatment plant and the sea. The PEQS are primarily concentration based. Unfortunately, the limits on industrial effluents are neither industry specific nor do they have any relationship with the quantum of production. The PEQS prohibit dilution, but this can be easily circumvented.

2.5.4 PEQS for Gaseous Emissions

The Punjab Environmental Quality Standards (PEQS) for permissible limits of gaseous emission from industry are presented in **Table 2-2**.

Table 2-2: PEQS for Gaseous Emission

Parameter	Source of Emission	Standard
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number
Particulate Matter	Boilers and Furnaces:	
	Oil Fired	
	Coal Fired	300
	Cement Kilns	500
	Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	300 500
Hydrogen Chloride	Any	400
Chlorine	Any	150
Hydrogen Fluoride	Any	150
Hydrogen Sulphide	Any	10
Sulphur Oxides	Sulphuric Acid/sulphonic Acid Plants	5000
	Other Plants except power plants operating on oil and coal	1700
Carbon Monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of Nitrogen	Nitric Acid Manufacturing Unit	3000
	Other plants except for power plants operating on oil or coal:	
	Gas fired	400
	Oil fired	600
	Coal-fired	1200

2.5.5 PEQS for Municipal and Liquid Industrial Effluents

The Punjab Environmental Quality Standards (PEQS) for the municipal and liquid industrial effluents are presented in **Table 2-3**.

Table 2-3: PEQS for Municipal and Liquid Industrial Effluents (Source: PEQS)

Parameters	Into Inland Waters	Into Sewage Treatment
Temperature	$\leq 3^{\circ}\text{C}$	$\leq 3^{\circ}\text{C}$
pH Value	6-9	6-9
Biological Oxygen Demand (BOD) ₅	80	250
Chemical Oxygen Demand (COD)	150	400
Total Suspended Solids (TSS)	200	400
Total Dissolved Solids (TDS)	3500	3500
Grease and Oil	10	10
Phenolic Compounds (as phenol)	0.1	0.3
Chlorides (as Cl ⁻)	1000	1000
Fluoride (as F ⁻)	10	10
Cyanide (CN ⁻) total	1.0	1.0
An-ionic Detergents (as MBAs)	2.0	20
Sulphate (SO ₄ ⁻²)	600	1000
Sulphide (S ⁻)	1.0	1.0
Ammonia (NH ₃)	40	40
Pesticides	0.15	0.15
Cadmium	0.1	0.1
Chromium (trivalent and hexavalent)	1.0	1.0
Copper	1.0	1.0
Lead	0.5	0.5
Mercury	0.01	0.01
Selenium	0.5	0.5
Nickel	1.0	1.0
Silver	1.0	1.0

Total Toxic Metals	2.0	2.0
Zinc	5.0	5.0
Arsenic	1.0	1.0
Barium	1.5	1.5
Iron	8.0	8.0
Manganese	1.5	1.5
Boron	6.0	6.0
Chlorine	1.0	1.0

2.5.6 PEQS for Vehicular Emissions

The Punjab Environmental Quality Standards (PEQS) for permissible limits of exhaust emissions from vehicles are presented in **Table 2-4**.

Table 2-4: PEQS for Vehicular Emissions

Parameters	Standards (Maximum Permissible Limits)	Measuring Method
Smoke	40% or 2 on the Ringlemann Scale during engine acceleration mode	To be compared with Ringlemann chart at a distance of 6 meters or more
Carbon Monoxide	6%	Under idling conditions: non-dispersive infrared detection through gas analyzer.
Noise	85 dB (A)	A sound meter at 7.5 meters from the source

2.5.7 PEQS for Drinking Water Quality

The Punjab Environmental Quality Standards (PEQS) for drinking water quality 2016 are presented in **Table 2-5**.

Table 2-5: PEQS for Drinking Water Quality

Parameter	Standard Values	WHO Standards
Biological		
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample.	Must not be detectable in any 100 ml sample.



Treated water entering the distribution system (E. Coli or Thermo-tolerant Coliform and total Coliform bacteria)	Must not be detectable in any 100 ml sample.	Must not be detectable in any 100 ml sample.
Treated water in the distribution system (E. Coli or Thermo-tolerant Coliform and total Coliform bacteria)	Must not be detectable in any 100 ml sample. In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Must not be detectable in any 100 ml sample. In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.
Physical		
Color	≤ 15 TCU	≤ 15 TCU
Taste	Non-objectionable / Acceptable	Non-objectionable / Acceptable
Odour	Non-objectionable / Acceptable	Non-objectionable / Acceptable
Turbidity	< 5 NTU	< 5 NTU
Total hardness	< 500 mg/L	---
TDS	<1000	<1000
pH	6.5- 8.5	6.5- 8.5
Chemical		
Essential Inorganic	mg/L	mg/L
Aluminium	≤ 0.2	0.2
Antimony	≤ 0.005 (P)	0.02
Arsenic	≤ 0.05 (P)	0.01
Barium	0.7	0.7
Boron	0.3	0.3
Cadmium	0.01	0.003
Chloride	< 250	250
Chromium	≤ 0.05	0.05
Copper	2	2
Toxic Inorganic	mg/L	mg/L
Cyanide	≤ 0.05	0.07
Fluoride	≤ 1.5	1.5
Lead	≤ 0.05	0.01

Manganese	≤ 0.5	0.5
Mercury	≤ 0.001	0.001
Nickel	≤ 0.02	0.02
Nitrate	≤ 50	50
Nitrite	≤ 3 (P)	3
Selenium (Se)	0.01 (P)	0.01
Residual Chlorine	0.2 – 0.5 at consumer end 0.5 – 1.5 at source	-
Zinc (Zn)	5.0	3
Organic		
Pesticides mg/L		
Phenolic Compounds		<0.002
Poly-nuclear aromatic hydrocarbons (as PAHS) g/L		0.01 (By GC / MS Method)
Radioactive		
Alpha emitters bq/L or pCi	0.1	0.1
Beta emitters	1	1

2.5.8 PEQS for Ambient Air

The Punjab Environmental Quality Standards (PEQS) for Ambient Air, 2016 are presented in **Table 2-6**.

Table 2-6: PEQS for Ambient Air Quality

Pollutants	Time Weighted Average	Concentration in Ambient Air ($\mu\text{g}/\text{m}^3$)
Sulphur Dioxide (SO_2)	Annual Average*	80
	24 hrs**	120
Oxides of Nitrogen gas (NO)	Annual Average*	40
	24 hrs**	40
Oxides of Nitrogen gas (NO_2)	Annual Average*	40
	24 hrs.**	80
Ozone (O_3)	1 hour	130
Suspended Particulate Matter (SPM)	Annual Average*	360
	24 hrs**	500
Respirable Particulate Matter (PM_{10})	Annual Average*	120
	24 hrs**	150

Respirable Particulate Matter (PM_{2.5})	Annual Average*	15
	24 hrs**	35
	1 hr	15
Lead (Pb)	Annual Average*	1
	24 hrs**	1.5
Carbon monoxide (CO)	8 hrs	5 mg/m ³
	1 hr	10 mg/m ³

** Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at a uniform interval

* 24 hourly /8 hourly values should be met 98 % of the year, 2 % of the time, it may exceed but not on two consecutive days.

2.5.9 PEQS for Noise

The Punjab Environmental Quality Standards (PEQS) for Noise are presented in **Table 2-7**.

Table 2-7: PEQS for Noise

Category of Area / Zone	Limits in db (A) Leq*	
	Day time	Night-time
Residential Area (A)	55	45
Commercial Area (B)	65	55
Industrial Area (C)	75	65
Silence Zone (D)	50	45

* Time weighted average of the level of sound in decibel on scale a is relatable to human hearing



3.0 PROJECT DESCRIPTION

This chapter of EIA presents a brief overview of the project including location, scope, need and schedule of the project. This chapter gives a clear picture of the project, its context and its associated activities.

3.1 Background of the Proposed Project

3.1.1 Objectives of the Project

The objective of the proposed seismic survey is to identify the most probable drilling locations for future wells. The seismic survey program consists of three dimensional (3D) seismic surveys within the project area.

POL aims to achieve two goals from the proposed seismic activities.

- To delineate the subsurface hydrocarbon prospects using different geophysical investigation techniques
- To verify and authenticate the potential hydrocarbon reserves

3.1.2 Project Description

Sound waves are generated through explosive (dynamite buried inside shot holes) or vibrators that travel inside earth and reflects from subsurface and are recorded back at surface by the help of sensors (geophones and recorder). The process begins with data acquisition, where seismic waves are generated using sources like dynamite or vibroseis trucks. These waves travel through the earth, reflecting off various subsurface rock layers, and are captured by an array of sensors called geophones. The collected data is then processed using advanced computational techniques to create a 3D image of the subsurface, involving noise filtering, wave travel time correction, and image enhancement. Geologists and geophysicists interpret these 3D images to identify potential oil and gas reservoirs, focusing on specific geological formations like traps and faults where hydrocarbons might accumulate.

3.1.2.1 Equipments Required

GPS Base stations for Surveying, Antennas for Communication Radio and Walkies-Talkies. The following equipment will be required for seismic survey:

- Vibrators
- Recording truck
- Drilling Jack robs

- Tractor mounted
- Up-hole rig
- Personnel and equipment loading vehicles
- Dozers and tractors for tracks preparation

3.1.3 Current Land use on the Project Site

The project area is abundant in oil and gas resources, with POL holding a significant lease for the Ikhlas Exploration Block. The License Block is primarily surrounded by agricultural land with a sparse population. The land designated for the seismic survey does not include any residential areas, so no resettlement plan is necessary. The local communities are situated at a safe distance from the project site.



Figure 3-1: The Surrounding Area of the Project Site

3.1.4 Schedule of Activities

The schedule of activities is expected to be as follows:

Table 3-1: Expected Schedule of Construction and Seismic Activities

Sr. No.	Activities to be Conducted	Planned Days
1	Crew/Equipment Mobilization & Setup of Base Camp	40
2	Equipment Setup and Calibration	15
3	Permitting from locals	210
4	Equipment Audit by POL	7
5	GPS Networking	3
6	Parameter Test	14
7	Topographic Survey on Source & Receiver Lines	200



8	Line Clearance For Vibrators	160
9	Drilling of Shot points	80
10	Geophones and Cable layout	185
11	Recording	170
12	Restoration of Camp and Demobilization	10

3.1.5 Lease Information

The Ikhlas E.L. block was granted to POL by government of Pakistan in 2003. The lease information and block award document is attached in **Annexure II** of EIA report.

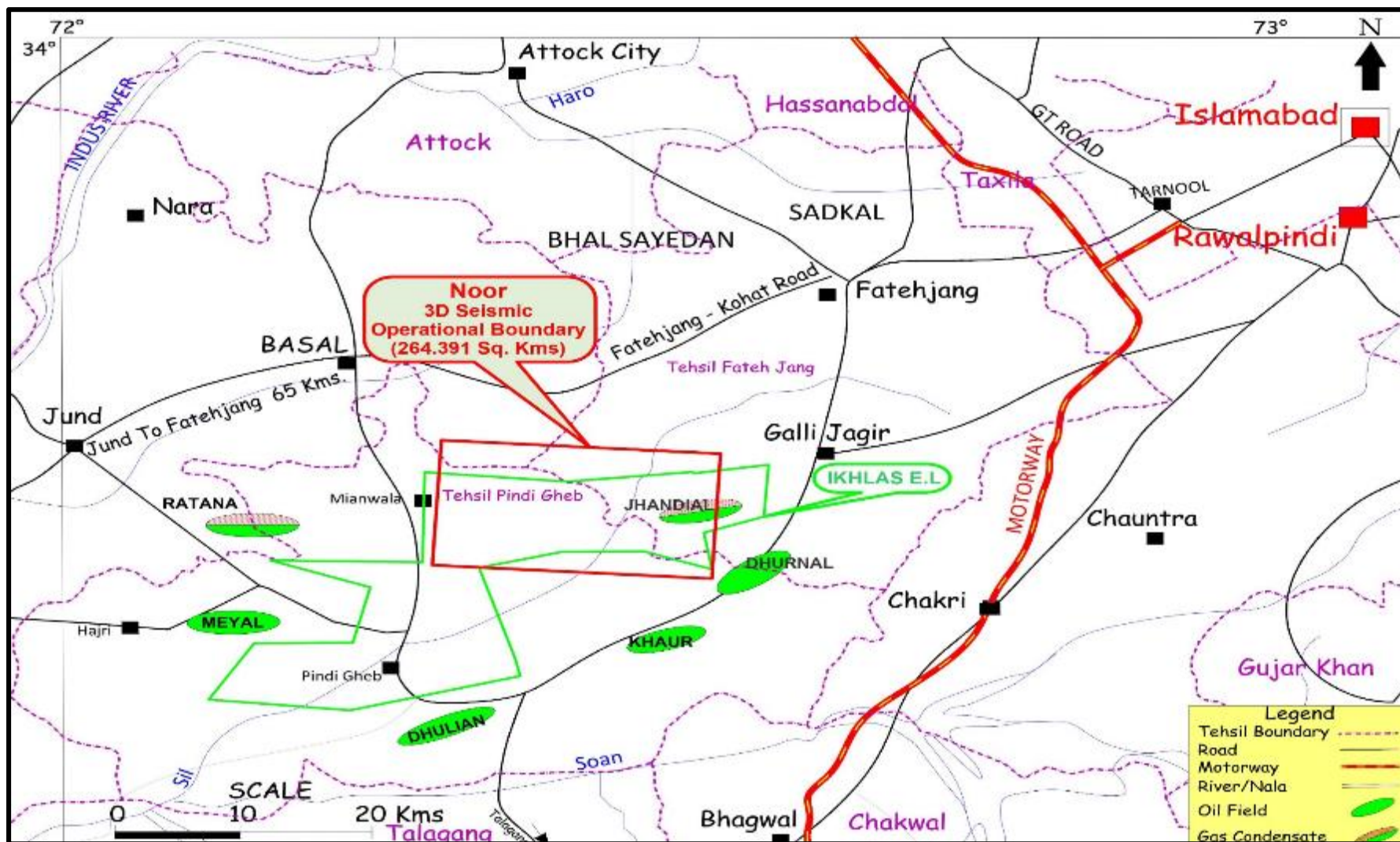
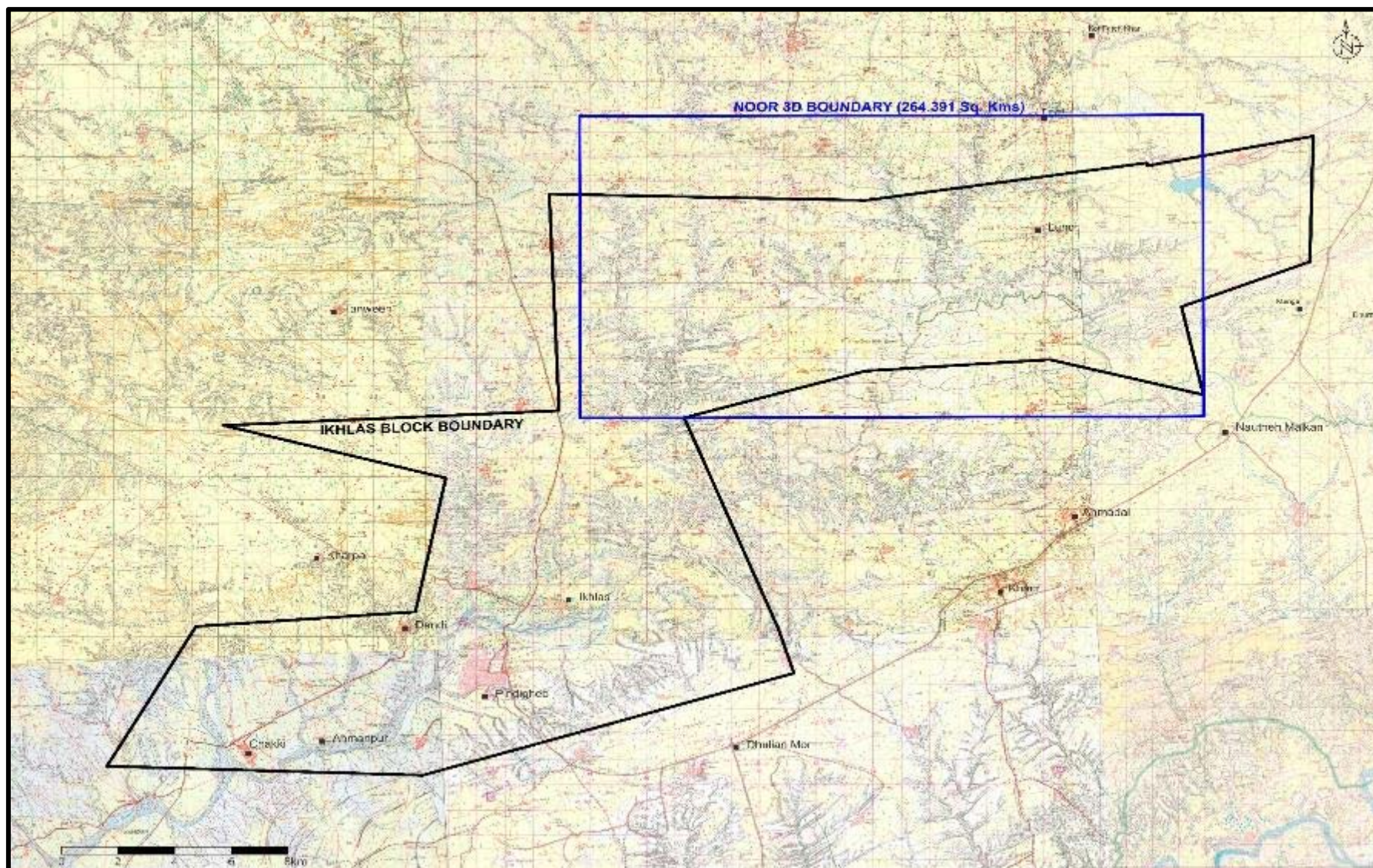


Figure 3-2: Location Map for 3D Seismic Survey over Noor Prospect in Ikhlas E.L



Project Description

3.2 Source Lines and Receiver Lines

In 3D seismic data acquisition, source lines and receiver lines are essential for collecting the data necessary to create a detailed image of the subsurface. Source lines are the linear arrangements where seismic energy sources, such as dynamite charges or vibroseis trucks, are strategically placed. These sources generate seismic waves that propagate through the earth and reflect off different subsurface structures. The arrangement and spacing of these source lines are carefully planned to ensure comprehensive coverage of the survey area.

On the other hand, receiver lines are the linear arrays where geophones or other seismic sensors are positioned to detect the reflected seismic waves as they return to the surface. The data collected by the receivers are then used to construct a three-dimensional image of the subsurface, revealing potential geological formations, such as oil and gas reservoirs. The precise configuration and alignment of both source and receiver lines are critical to achieving high-resolution seismic data and accurate subsurface imaging.

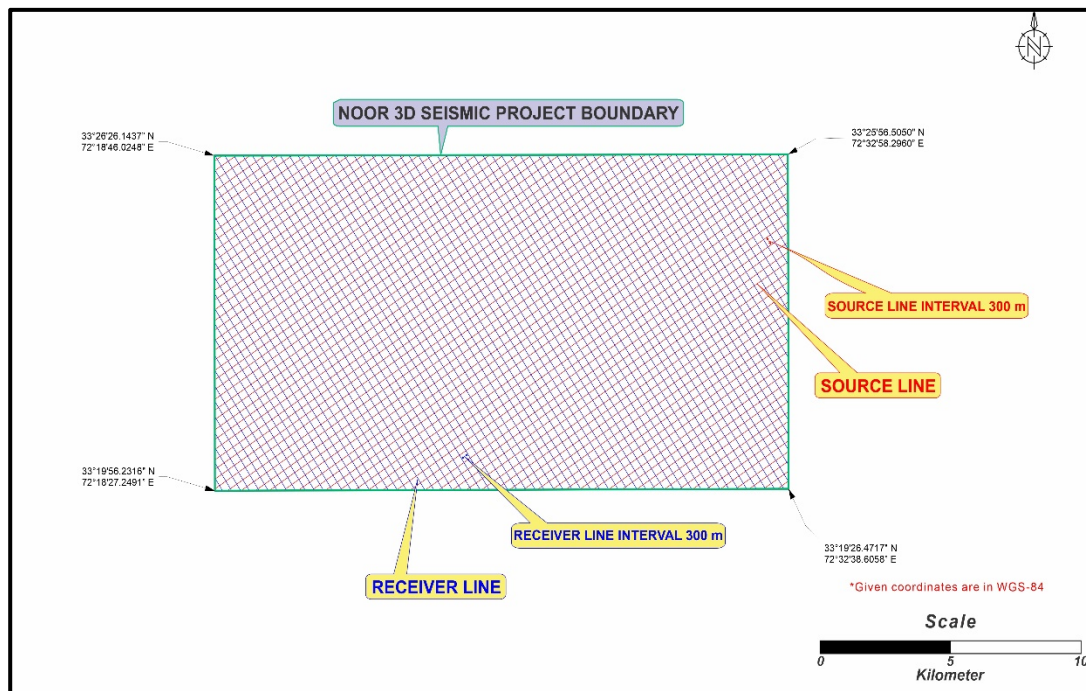


Figure 3-4: Diagram illustrating Source Lines and Receiver Lines in 3D Seismic Data Acquisition (The interval between two consecutive blue lines represents the Receiver Line Interval, which is 300 meters)

3.3 Seismic Survey Methodology

During the seismic survey, information about subsurface geology is gathered by directing shockwaves into the ground and recording the time taken by them to reflect off the subsurface rock layers. The reflected shock waves are recorded using geophones or motion detectors (sensitive microphones), which receives sound signals generated either by controlled explosions or by computer-controlled mechanical vibrators.

Seismic surveys can be conducted using a number of methods, including deep holes, shallow holes (also referred to as the pop shot methods) and surface shots. A comparison of different seismic survey methods including the quality of data acquired and overall environmental intrusiveness.

Factors that influence the selection of a particular method include land type, economics and environmental concerns. Dynamite technology will be used as a source of energy at places where less clearing of agricultural lands and trees is required; at place of less population, in hilly terrain and in nonurban areas for obvious reasons. Dynamite is the mostly used seismic source on land. Dynamite itself is very cheap; the costs involved are mainly the costs of drilling the shot-holes to place the dynamite. It is labour intensive for making shot holes. Dynamite is a chemical composition which burns extremely fast when detonating.

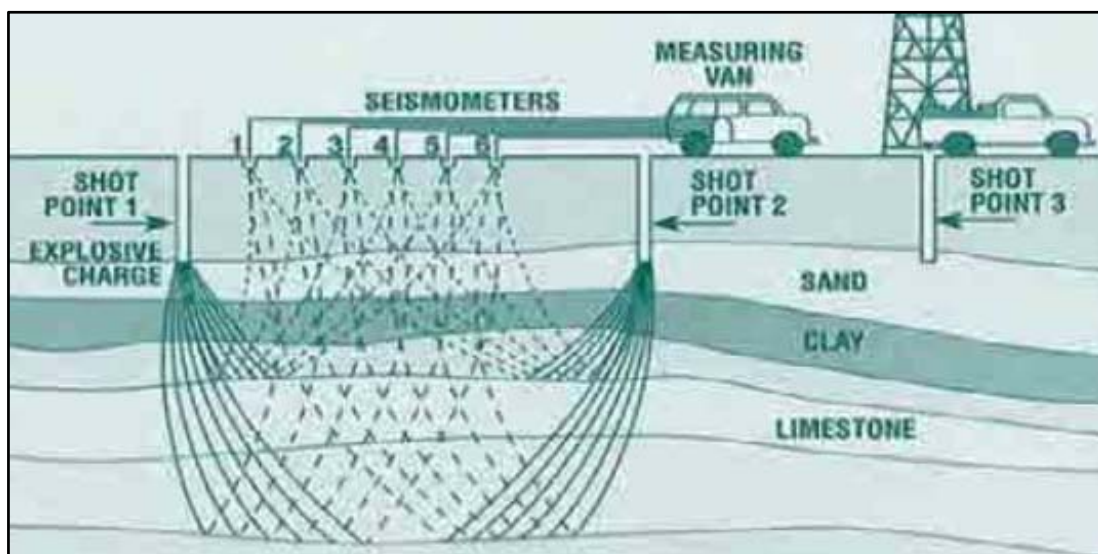


Figure 3-5: Pictorial Illustration of Seismic Survey Methodology

Typically, 1 kilogram of dynamite burns in about 20 microseconds. Since the burning of the dynamite takes place in a very short time generating sudden high pressures and temperatures, it is obvious that in the ground, immediately around the explosive a non-linear zone is created, that means the rock or soil will have undergone some permanent change by the explosion. In seismic exploration, the use of a vibrator as a seismic source has become widespread ever since its introduction as a commercial technique in 1961. The vibrator is a surface source, and emits seismic waves by forcing vibrations of the Vibrator base plate which is kept in tight contact with the earth through a pull down weight. It is less destructive than dynamite and can operate in urban areas as well. It is not labour intensive.

Table 3-2: Seismic Data Acquisition Procedure and Equipments

	
Seismic Recording Truck	Seismic Drilling Truck
	
Data Recorder	Seismic Exploration Equipment

3.4 Seismic Data Acquisition Methodology

The activities involved in the proposed seismic survey include:

- Access track improvement and development
- Mobilization and camp establishment
- Line surveying
- Land permitting
- Line Clearance
- Laying of cables and geophones along the seismic lines
- Data acquisition
- Restoration and rehabilitation of the land and facilities

A brief description of the activities is discussed below;



3.4.1 Access Track development

One of the earliest activities of the seismic program is to select the camp location. Once that is done, the need to either develop a new access track, or upgrade an existing one, is established. The existing track network is mostly relied upon to access the seismic lines.

3.4.2 Camp Establishment and Mobilization

Once the access track is complete, mobilization and camp establishment are started. Flatbed trucks are used for heavier loads and ordinary trucks (with a 10-15 ton carrying capacity) for others. It takes about 15 days to complete camp establishment. The seismic crew is mobilized once the camp is fully operational.

The base camp will be established near project site that will have accommodation for seismic crew and associated staff, storage space for equipment, parking space and maintenance ground for vehicles, and messing facilities. Fly camps, if needed, will be much smaller and will only provide temporary accommodation for crew working in areas away from the base camp. Standards adopted for base camp construction will also apply to fly camp. Campsites will be located in flat and arid areas with little vegetation cover. There will be no settlements within 500m of any campsite. The distance of worker camp from project site varies with activity.

Project related traffic during the mobilization and demobilization phases of the seismic program will consist of vehicles transporting equipment and personnel (flat-bed trucks for heavy equipment and smaller vehicles for personnel). During the seismic operation, the vehicular traffic will consist of the movement of the seismic equipment and personnel between camp and the seismic lines, and supplies for camp operation.

3.4.3 Line Surveying

After obtaining permission from team, the seismic locations are surveyed. The survey team will mark the designated survey locations on the ground and determine their coordinates and elevation. The survey crews will layout station markers every 50.0 meters along the lines. The survey team will also identify obstacles along the lines and determine safe distance.

3.4.4 Land Permitting

After completion of the line survey, land permitting team will visit all seismic areas prior to the commencement of all other activities. The land permitting team will be responsible for informing people living in the affected areas about the seismic survey. The land permitting team will be responsible for compensating the land owners of land acquired and damage caused (if any) due to project activities.



The permitting team will identify the ownership of the land areas over which the seismic operation will be undertaken. In consultation with district administration and following agreed rates, compensation will be given to the landowners.

3.4.5 Line Clearance

No significant clearing and filling is expected for the seismic operation in the project area.

3.4.6 Laying Cables and Geophones

Geophones planted into the ground, will be used to record the seismic waves field reflected back to the surface. Cables connecting all groups of geophones to the recording truck will be laid.

3.4.7 Data Acquisition

After the survey crew marks the source points, drilling crew drill the holes. Drilling team drills either single hole or multiple holes. Once the cables and geophones have been laid, recording can commence. At each source location, typically at 50.0 meters a dynamite charge will be exploded if deep shot method is employed.

3.4.8 Restoration and Rehabilitation

After work has been completed in an area, a restoration and rehabilitation crew will be mobilized to ensure that the affected areas are left in a condition that is as close to the original state as possible. The team will ensure that all holes and pits are backfilled and that no debris or trash is left behind. Further activities would include:

- Demobilization of all equipment and machinery;
- Removal of all cables, geophones, station units, flags, stakes and wastes from the lines;
- Backfilling of all soak pits and septic tanks;
- Backfilling of all holes and pits;
- Dismantling and removal of fence or barriers surrounding the camp area, and;
- General restoration of the site area including landscaping and restoration of drainage where required.



3.5 Staffing

Unskilled employment opportunities will be given to the local people. The camp construction and 3D seismic survey activities will require a work force of labourers during the following phases:

Construction Phase: **100 personnel**

Operation Phase: **1050 personnel**

3.6 Project Utilities

Table 3-3: Table showing Utilities Requirement during Project Phases

Sr. #	Utility Information	Source	Project Phase and Capacity
1.	Power	Diesel will be used as fuel for generators to generate electricity.	Capacity: <u>Construction Phase: 1160KVA</u> <u>Operation Phase: 2500KVA</u>
2.	Utility Water	Local Water Sources such as local tube wells	Campsite: Approximately 1800 gallons/day Project Activities: 6000 gallons/day
3.	Fuel	Diesel and Petrol will be used as fuel	<u>Construction Phase:</u> Diesel= 1000 litres per day Petrol= 60 litres per day <u>Operation Phase:</u> Option-1 (if Vibroseis will be used as a source) Diesel = 6500 litres per day Petrol= 600 litres per day Option-2 (if Dynamite will be used as a source) Diesel = 4000 litres per day Petrol = 1500 litres per day

3.7 Waste Type and Quantity

Table 3-4: Table showing Type of Waste Generated in Different Project Phases and its Quantity

Sr. #	Waste Type	Project Phase and Quantity
01.	Solid Waste	Approximately 20 kg/day
02.	Wastewater	<u>Construction Phase:</u> Approximately 20 gallons/day



		Operation Phase: Approximately 150 gallons/day
--	--	--

3.8 Supplies

- **Water:** It will be required for camp operation and human consumption in the field. Water will be transported to the project facilities from existing local water wells/tube well in the project area to meet the water requirements. Approximately **600 gallons per day** will be required during seismic operation. Filtered water will be arranged for drinking purpose and for other uses; water will be bought from some local tube well owner.
- **Fuel:** Diesel will be the primary requirement for the vehicles and generators operation during seismic survey. An estimated **5500 to 7000 liters** of fuel per day will be required during different phases of the project.
- **Electricity:** Approximately **1160 to 2500 kVA** power will essentially be required for seismic operation. Consumption of electricity can increase or decrease depending on survey operation.
- There will be no air or steam consumption.

3.9 Waste Management

3.9.1 Emissions and Discharges

The sources of gaseous emissions during a typical seismic survey include:

- Vehicle exhaust;
- Machinery exhaust;
- Diesel engine, power generator, and compressor exhaust;
- Dust emission caused by vehicle operation on unpaved tracks and along seismic lines, and;
- Fugitive emissions from detonation of explosives.

The sources of liquid and solid wastes generated during the seismic program include:

- Food Waste: Animal, fruit or vegetable residues;
- Packaging waste: Paper, plastic, rubber, wood, glass, tin cans, aluminum cans;
- Medical waste: Syringes, glass bottles, bandaged, expired drugs, dressings;
- Workshop waste: used oil, ferrous/nonferrous materials, batteries;



- Demolition waste: Dirt, concrete, plaster, plumbing, heating and electrical parts, and;
- Liquid waste: Wastewater from kitchen and washing areas, sewerage.

Noise from generators will be minimized by regular maintenance and keeping them within enclosures. Noise from vehicles will be minimized by regular maintenance.

3.10 Relocation, Damage and Rehabilitation of Existing Utilities

Following measures would be applied:

1. Photographs would be taken before and after the restoration of camp sites and seismic lines including Drilling Shot Holes
2. Campsites, routes and survey lines would be restored to their original condition (as far as Reasonably practicable)
3. No refuse or wastes to be left behind in campsites
4. Concrete slabs from the water treatment facility to be removed to the certified dump
5. Ditches and sump to be backfilled
6. Cloth flags, stakes, signs, and refuse would be removed
7. Damaged natural water courses to be restored where practicable.
8. All uphole drill points are to be back filled and restored properly.

3.11 Waste Management Plan

Waste management plan is developed under industrial standards and local law requirements for the project and all waste is disposed of as per waste management plan. All medical waste such as contaminated soiled dressings and contaminated sharps are stored in sharps containers and transferred to the Government Hospital in District or Tehsil of the project area for incineration. Hazardous waste is segregated on crew to avoid cross contamination. Vehicle tyres, batteries (vehicles and recording), aerosols, waste oil and filters were transported up to proposed site for disposal through the local municipality. The food waste is buried in bury pit. Similarly, an agreement is made with the local municipality for the disposal of black water from the camp sites. Waste water is sucked from the pits to the dedicated waste water tankers and is disposed of on a location designated by local municipality. The grey water is sprinkled on the local tracks in areas near the camps through a local grey water disposal tanker.



3.12 Noise, Air Emissions, Effluents and Solid Waste Generation

3.12.1 Noise

Noise is likely to be generated by the following during the proposed project will include:

- Vehicular traffic on the access road.
- Construction machinery operation along the access road, and at the well site and campsite.

Vehicular traffic is expected to generate 60 to 70 dB of noise and construction machinery up to 98 dB (measured at 15 m). Necessary measures will be taken to minimize the noise level, if required.

3.12.2 Wastes and Effluents

Categories of wastes generated during construction and drilling along with their proposed methods of disposal are discussed below:

- **Sewage and Grey Wastewater:** Sewage and grey water will be disposed of through septic tanks and soak pits.
- **Medical Wastes:** These will be stored separately from other wastes and sent to an offsite commercial or private incinerator.
- **Combustible Wastes:** Combustible wastes will include kitchen wastes, paper, packaging material etc. and will be disposed of by burning in a burn pit located and operated at the campsite.
- **Recyclable Wastes:** These will include used oil, glass, tin, plastic, metals, workshop wastes etc. All recyclable wastes will be sent to waste contractors for recycling or re-use.

3.12.3 Emissions

Emissions produced during the proposed project will include:

- Exhaust emissions from vehicles and machinery;
- Dust emissions caused by vehicle and equipment operation, excavation, and other similar activities.



3.12.4 Fuels, Oils and Chemicals

Used fuels, oils, and chemicals will be stored in containers in areas lined with impervious floors. Recyclable material will periodically be transported out of the project area and sold to contractors. Non-recyclable material will be transported to lined pits or burn pits for appropriate disposal. The contaminated soil will be collected and buried, or burned, as appropriate.

3.12.5 Solid Waste

Septic tanks of adequate size will be provided for the treatment of sewage. Excess water from the septic tanks, as well as effluents from kitchen and washing areas will be released into soaking pits. The solid residue from the septic tanks will be transported periodically to a municipal sewage treatment facility. The waste from proposed project activity result primarily from gaseous emissions, wastewater discharges, solid wastes, noise, odour and visual or aesthetic effects viz.:

- Food waste
- Ordinary waste (Recyclable and Non-recyclable)
- Liquid waste/ Wastewater (Grey water, Sewage/ Black water)
- Clinical waste
- Oily and Hazardous waste
- Oil spills / Soil contaminated by oil leakages or spills
- Produced water/ condensate

3.12.5.1 Solid Waste Management System

The solid waste will be managed in proper way by following operations:

- Placement of separate waste bins for domestic and project related waste in all working areas and designated points.
- Collection of waste from all the working areas at one designated point by the sanitary workers on daily basis.
- Careful collection of ash and sludge on regular basis and temporary storage at designated point.

After collection of waste from designated area and handling to the solid waste contractors for its final disposal.



3.13 Occupational Health and Safety

All the methods and procedures for machinery and chemical handling and storage will be displayed and implemented at the project site. Health and safety rules for chemical handling and storage will be maintained.

3.13.1 Personal Protective Equipment

Following PPEs will be available for the workers in the proposed unit:

- Coveralls
- Dust Mask
- Ear Plugs
- Ear muffs
- Safety Boots
- Safety Gloves
- Safety Belt
- Helmet
- Goggles

Table 3-5: Types of PPEs used during Construction and Operation Phase of the Project

Protection	Occupational Hazards	PPEs
Head Protection	Falling objects, inadequate height clearance, and overhead power cords	Helmets with or without electrical protection
Hand Protection	Hazardous material, cuts or lacerations, vibrations, extreme temperature	Synthetic or Rubber gloves, leather, insulating material etc.
Eye and Face Protection	Flying particles, molten metal, liquid chemicals, gases or vapours, light radiation	Glasses, shield protective, etc.
Hearing Protection	Noise, ultra sound	Hearing protectors like ear plugs, ear muffs
Respiratory Protection	Dust, fogs, fumes, gases, smokes, vapours, oxygen deficiency	Facemasks or air supply
Body Protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Aprons, insulating clothing etc. of appropriate materials



4.0 ANALYSIS OF ALTERNATIVES

4.1 Background

Identification and assessment of feasible alternatives to project design and implementation is among the main components of an environmental impact assessment (EIA) study. The alternatives illustrate and contrast the environmental implications and consequences of different options available to achieve the proposed objective.

This chapter helps to analyze whether the project should be carried on or not. An analysis of the available alternatives is necessary to establish that the most suitable management and technology options will be adopted for the project. Identification and assessment of feasible alternatives to project design and implementation is among the main components of EIA.

4.2 Project Alternatives

The two significant alternative management options are the 'no-project' option and the 'alternative-site' option. The outcomes and implications of adopting each option are discussed below.

4.2.1 No-Project Option

The 'No-Project' option, if taken, will prevent the country from exploring the potential to significantly increase its oil production. Petroleum products are necessary to run the wheel and for economic development. Other impacts of the 'No-Project' option would be loss in employment and social welfare in the project area, as the project is bound to create jobs and improve the existing condition of the community of the area through different community development and social welfare projects.

POL has done many Social Welfare Projects to fulfil its Corporate Social Responsibility (CSR). From the environmental point of view, this option would result in a loss of opportunity in further improvement of the environmental management of the area, environmental baseline data, and the mitigation and compensatory programs.

From the environmental point of view, this option would result in a loss of opportunity in further improvement of the environmental management of the area, environmental baseline data, and the mitigation and compensatory programs.

4.2.2 Alternative Site Option

To fulfil the commercial aspects of the project under reference of this EIA Report, it is to be sited at a place where commercial processing activity is either already going on or there are bright prospects of the same. Concurrently, it must also meet the legal requirements of the Punjab Environmental Protection Act, 1997 (Amended 2012, 2017) and Review of EIA



and IEE Regulations 2022. Availability of land at the best convenient place is equally important among other considerations for the site selection. Availability of access roads, communication facilities, electricity, basic infrastructure, sewerage etc. is yet the other necessary requirements. Obviously, environmentally sound, neat and clean environment are the other considerations for site selection.

4.2.2.1 Alternatives with respect to Project Location and Alignment of Survey Lines

Many national and multinational companies, in addition to public sector organizations, are actively engaged in oil and gas exploration activities in different concession areas and exploration sites in Pakistan. The site for oil and gas exploration is chosen after extensive geological and land surveying, and not every concession area necessarily shows promise. When a porous reservoir rock forms an anticline deep in the subsurface, it may trap migrating hydrocarbons. The presence of such a structure at depth is indicated by surface geological studies and confirmed by recording seismic surveys. The alignments of the seismic lines proposed by the proponent represent areas of highest potential. Given the low to medium significance of the impacts associated with the project, no change in alignment of the survey lines will be required.

The site for oil or gas exploration is chosen after extensive geological and land surveying. The area of Noor Prospect in Ikhlas E.L. has been granted to POL on lease and may be considered an attractive area for oil exploration for a variety of geological reasons. Geological and geophysical investigations have been undertaken to assess the characteristics of reservoir rocks whether they hold hydrocarbons within their pores or not. Factors that influence the selection of a particular method include type of land use (e.g. cultivated or non-cultivated), economic factors, and environmental concerns.

The site is well located in regard to the following:

- Easy road access to the market.
- No settlements in close vicinity.
- No watercourse within a safe distance.
- No ecologically sensitive or declared protected area within 10 km of the selected site.

4.2.3 Technology Options

Seismic data can be acquired using the following methods:

- **Deep shot hole survey:** In this method, a truck-mounted drilling unit drills a single hole. After the drilling is completed, a small explosive charge is placed at its bottom, and then the hole is refilled. Detonation of the buried charge creates a seismic sound wave.
- **Vibrating energy sources:** The Vibroseis method involves surface vibration. Vibroseis is undertaken using vibrator pads attached to the chassis of heavy-duty



four-wheel-drive (4WD) vehicles. Working in convoy, the vehicles lower the pads to the ground and vibrate them for about 30 seconds. The pads are then raised, the vehicles move a short distance forward, and the process is repeated. Several of these vehicles operate together to form the energy source. After careful analysis of technical aspects, POL has opted for this method to ensure that geophysical data of the highest possible quality are collected.

Factors that influence the selection of a particular method include type of land use (e.g., cultivated or non-cultivated), economic factors, and environmental concerns. Great care must be exercised in selecting the method to ensure that geophysical data of the highest possible quality are collected.

4.2.4 Alternative with respect to Project Schedule

The timing of the operation can be changed on finding of significant impacts associated with the timing of the operation e.g. disturbance to wildlife species during their breeding season. The proponent will carefully schedule the project activities with the ultimate objective to create least possible disturbance to the environment and the communities.

4.2.5 Alternatives to Ancillary Operations

The ancillary operations like setting up of camp sites, camp operation etc. are necessary for conducting the operations and are assessed to have no significant impacts on the environment if the suggested mitigation measures are adopted and EMP is implemented in letter and spirit. The water requirements of the project activities will be fulfilled mainly by purchasing water from local tubewells in the project area.

4.3 Conclusion

No Alternative Location that was environmentally superior to the proposed project has been identified. The site is chosen after extensive geological and land surveying. Therefore, Noor Prospect in Ikhlas E.L. is considered an attractive area for oil exploration.



5.0 BASELINE SOCIAL AND ENVIRONMENTAL PROFILE OF THE PROJECT AREA

This chapter covenants with the prevailing environmental conditions of the project area. Information that has been collected from different sources, including public literature, reports of other studies conducted in this area, knowledge with the proponent and the concerned government departments and the first-hand surveys and field measurements has been presented in this section. This encompasses all the important aspects of local environment; such as biological resources, socioeconomic development and quality of living values.

5.1 District Attock

Demographic Profile	
Area of District Attock	6,857 km ²
Population Density	270 persons/ km ²
Population	1,883,556 persons
Road Network	1312 km
District Profile	
Languages	Urdu, Punjabi and Pashto
District Headquarter	Attock City
Tehsils	6 (Attock Tehsil, Fateh Jang Tehsil, Jand Tehsil, Pindi Gheb Tehsil, Hasan Abdal Tehsil, Hazro Tehsil (newly established).)
Union Councils	72
Villages	455
Municipal Committees	06
National Assembly Seats	02
Provincial Assembly Seats	05
Police Station	14

Attock is located at the rim of the Potowar (Potohar) Plateau, overlooking the Kabul-Indus River confluence to its north. It is the historic gateway to Central Asia. It is located between 33° 46' 20" to 34° north latitudes and 71°43' to 72° 56" east longitude. It has an altitude of 348 m (1,145 feet). The district is bounded on the north by Haripur and Swabi districts of Khyber Pakhtunkhwa (KPK), in the east by Rawalpindi district, by Chakwal district in the southeast, Mianwali district in the southwest, and by Kohat and Nowshera

of KPK in the west and northwest respectively. The River Indus forms the western boundary of the district.

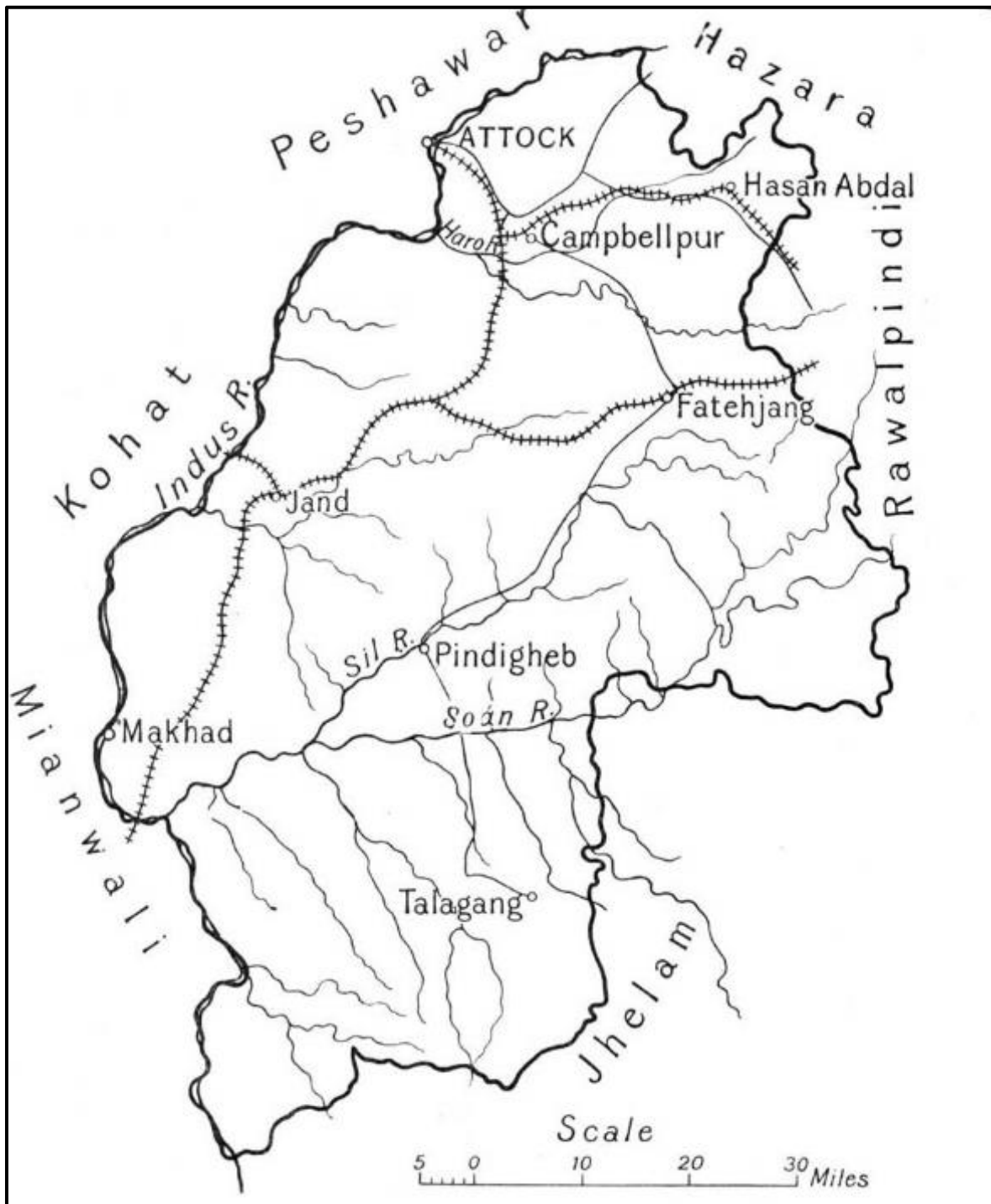


Figure 5-1: Layout Map of District Attock

Under the Local Government and Community Development Act, Attock district has one District Council and 6 Municipal Committees as follows:

- Attock
- Hazro

- Hassan Abdal
- Fatehjang
- Pindi Gheb
- Jand

5.2 Physical Environment

This part examines the physical resources such as topography, soil, climate, surface and ground water resources and quality, ambient air quality and geology of not only the project site but also the city as a whole to assess whether the project under assessment can or does have any impacts on any of these parameters.

5.2.1 Geographical Characteristic

Attock is located near the Haro River, a tributary of the Indus River, 80 km (50 mi) from Rawalpindi, 100 km (62 miles) from Peshawar, and 10 km (6 miles) from the Pakistan Aeronautical Complex, Kamra. Geographically, the District is mainly hills, plateaus, and dissected plains. The Indus River flows on the northern and western borders of the district. After Haripur, the Haro River passes through the north of the Tehsil of Attock where there is a flood plain with fertile soil.

5.2.2 Soils

Attock slates are Precambrian and contain gritty layers of an arenaceous type. On weathering, they give rise to fertile, loamy clay, which collects only in sheltered places. The major part of the area (of the Kala Chitta forest area) is composed of limestone.



Figure 5-2: Soil Structure and Characteristics in the Project Area



5.2.3 Topography

The topography of the Attock district is a combination of hills and plains. The proposed area and its surroundings is a blend of mountainous and plain areas. The plain areas are mostly used for agricultural purposes. Only near Pindi Gheb town does the broad bed of the Sill River show a bright oasis of cultivation among the dreary uplands which compose the rest of the tehsil.

Most of Attock district is located in the Potowar plateau of Punjab. Geographically, the district consists of mainly hills, plateaus, and plains. The Indus River flows on the northern and western borders of the district. The district is in the shape of an irregular oval; on its north, there are hills which are the southern extensions of the hills of Abbottabad district (the southern hills of the Gandgar Range of Haripur district) that form a projection in the north of Attock tehsil. In the middle of the district, along its western boundary in Jand and Attock tehsils are the Kala Chitta Mountains. This range of mountains divides the district into two distinct parts, with one on the north and northwest of the Kala Chitta Range, and the other to the south and east of it. The former includes Attock and Hasan Abdal Tehsils and the latter includes Fateh Jang, Pindi Gheb, and parts of Jand tehsils. The Kala Chitta Range of mountains is almost 56 km long; its greatest height in the west, near River Indus, is more than 1,000 m. The range is rugged and covered with brush forests, and consists of several limestone ridges.

Another range of mountains, the Khari Moorat Range is situated in the Fateh Jang tehsil. This range rises to a height of about 950 m and consists mostly of limestone ridges. The southern boundary of the district is formed by the Soan River, which is a tributary of River Indus.

Fateh Jang and Pindi Gheb tehsils are upland plains which are dissected by numerous streams and hills.

The northern extremity of Attock district falls into two (02) zones: the northern and the southern. The northern zone is the fertile Chhachh plain and the southern is a dry, sandy, and stony tract which rises to the Kala Chitta Range of mountains.

An important feature of the topography of Attock district is the general slope, the direction of which is northeast to southwest.

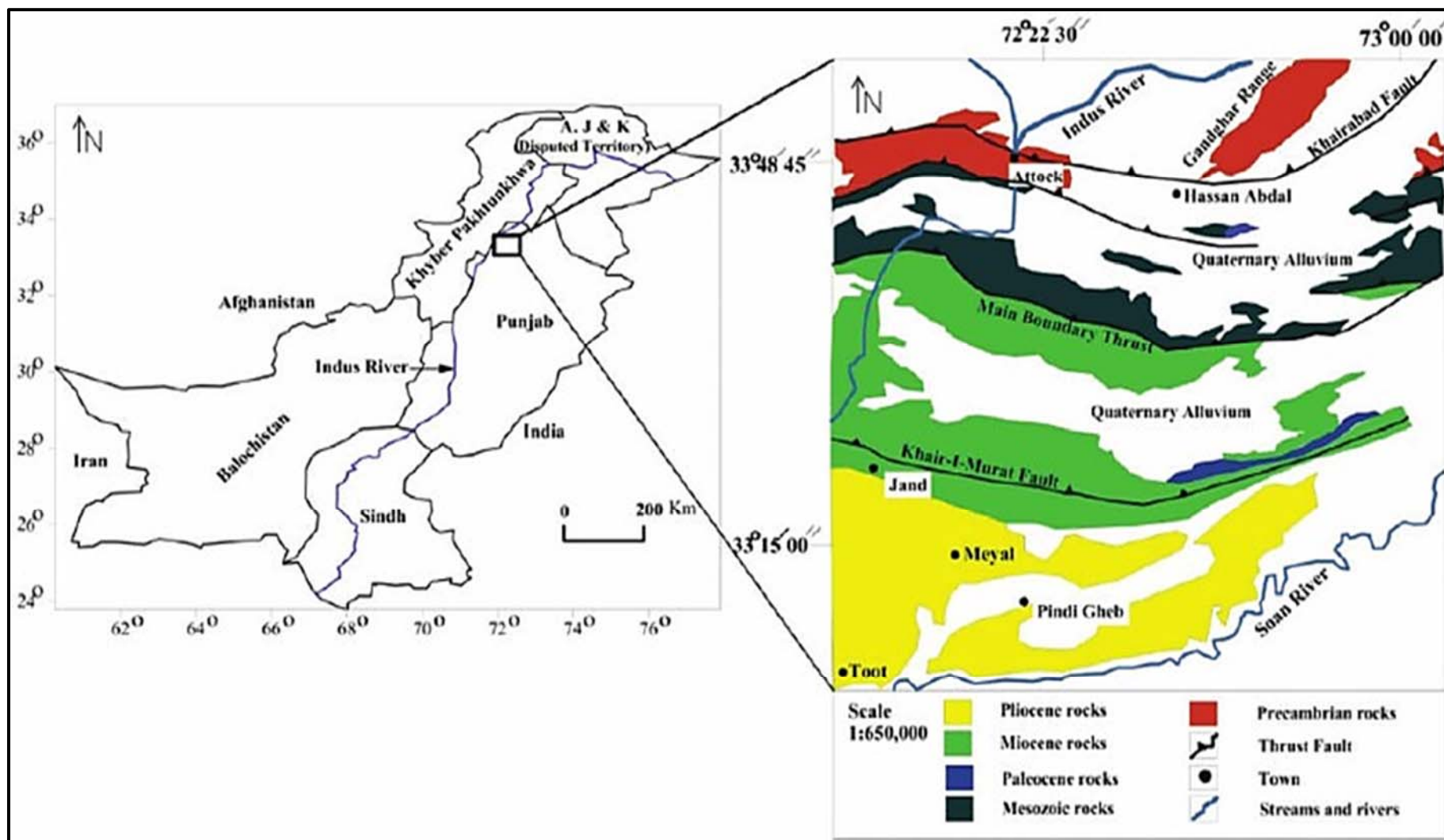


Figure 5-3: Topographic Map of District Attock

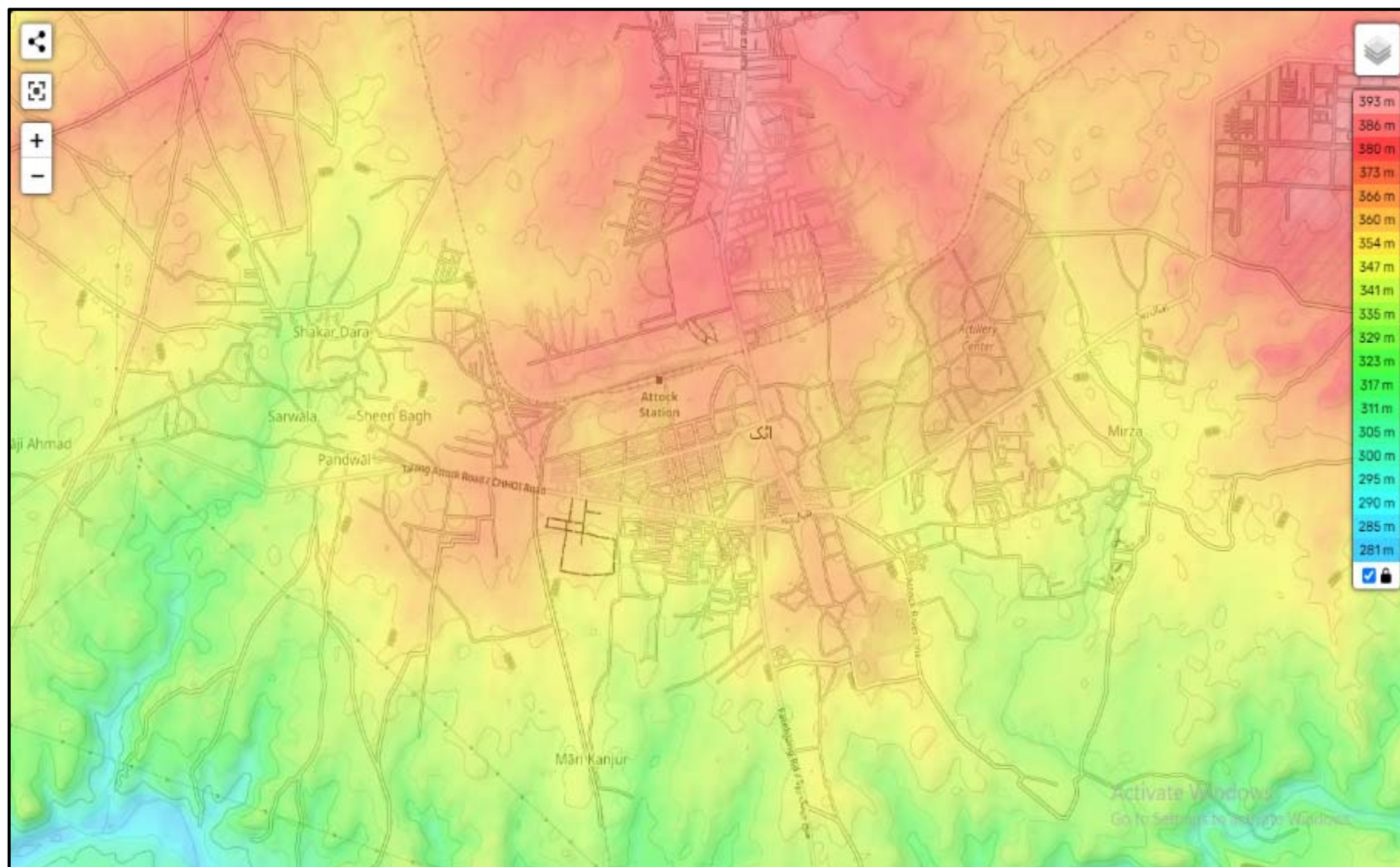


Figure 5-4: Topographic Map of District Attock with Scale

- Average Elevation: **392 m**
- Minimum Elevation: **256 m**
- Maximum Elevation: **1,031 m**

5.2.4 Rivers, Streams and Lakes

The River Indus flows on the western and northern sides of the district; Soan River flows along the eastern boundary of the district and joins River Indus. The Haro River originates from Haripur town and passes through the Attock tehsil on the north of the Kala Chitta Range. There are 14 perennial streams and nullahs in the district. These are Haro, Soan, Sill, Naindna, Dotal, Raisi, Ghambir, Namal, Soka, Gandakas, Saghar, Ghanir, Jhablat, and Kala Pani.

There are a number of small and mini-dams built on various streams for the collection and storage of water. The common reservoir of these dams attracts a large number of migratory birds.



Figure 5-5: Rivers in District Attock; Left: River Indus and Right: Haro River

5.2.5 Forests

The following **Table 5-1** shows the total area of and types of, forests in the district:

Table 5-1: Forest Area Statistics in District Attock

Total Forest Area	180,247 Acres	Under Provincial Govt.	815 Acres
Resumed Lands	4,412 Acres	Linear Plantation	679 km
Reserved Forests under Provincial Govt.	175,020 Acres		



The forests of the district are Subtropical Scrub Forests and are mostly located on the Kala Chitta and Khairi-Moorat Ranges. These forests support a scattered growth of olives, khair (*Acacia catechu*) and lesser shrubs. Other trees found in these forests are shisham (*Dalbergia sissoo*) and dhreh.

Some of the Reserved Forests of the district are Mukhad West Forest, Ghoko Forest, Tora Bera Forest, Amanpur Forest, Ban Ramay Sha Forest, Naka Afghan Forest, Mera Nilhad Forest, Tanwin Forest, Maryala Forest, Kali Dilli Forest, Nara Forest, Sanwalian Forest, Chatti Forest, and Dhoke Tahli Forest.

There is a wide range of plants in the forests of Attock District. Amongst them, the following trees and bushes are most abundant:

- *Acacia modesta* (Phulai)
- Prickly lettuce (Kahu)
- *Dodonaea Viscosa* (Sanatha)

5.2.6 Ambient Air

The project area lies predominantly in an agricultural area. The industrial activities in the area were quite low as no appreciable number of industries was witnessed during the field visit. The minor sources of air pollution are vehicular emissions and dust from kacha tracks whose effect is fairly localized. The air quality in this project area appears good based on observation during the study period. Emissions, if any, shall be controlled at source under the EMP. There will be a few items of powered mechanical equipment to be used in the proposed works that may give rise to limited quantities of dust and other emissions. However, these should be minor and easily dissipated.

Ambient air quality is a key to measure the concentration of the various chemicals in atmosphere; especially of the chemicals which pose detrimental effects on health, safety and environment, to have a comparison with their safe concentrations, as established in PEQS and NAAQS. The ambient air monitoring was conducted at the project site and ambient air monitoring report is attached in **Annexure IV**.

5.2.7 Noise Level

There is no continuous major source of noise in the existing well site and its surroundings. Intermittent sources include farm tractors, farm equipment, and road traffic. Considering the intermittent nature of these noise sources, it can be concluded that the noise pollution in the area is low and is below the various guideline values. The noise monitoring was conducted at the project area and report is attached in **Annexure IV**.

5.2.8 Climate

The climate of Attock district is extreme. The western portion of the district is hotter and drier than the eastern and northern parts. The winter is bitterly cold, while the summer is unbearably hot. The temperature rises first in April and then remains almost steady due to windstorms from Baluchistan, up to the middle of May, when it shoots up again. June and July are the hottest months (average maximum temperature 42 °C), while December and January are the coldest months (average minimum temperature 1.7 °C). The monsoon begins by the third week of July and continues till the beginning of September when the nights get cooler. The cold weather sets in by the middle of October. During winter, the days are bright, and the nights are clear. Early spring frosts are common, and sufficiently severe to cause widespread injury to plants, even to the indigenous tree growth in a fairly advanced stage of development. Frost may occur, especially at the upper altitudinal limits and in the depths of the valleys.

The area south of the Kala Chitta Range is an upland plateau, and is intensely hot in the summer, while in winter, a chilly North Wind prevails. In Attock tehsil, the summer is short while the winter is severe and long. The minimum, maximum and average temperatures for District Attock from 2009 to 2022 are displayed in **Figure 5-6** below:

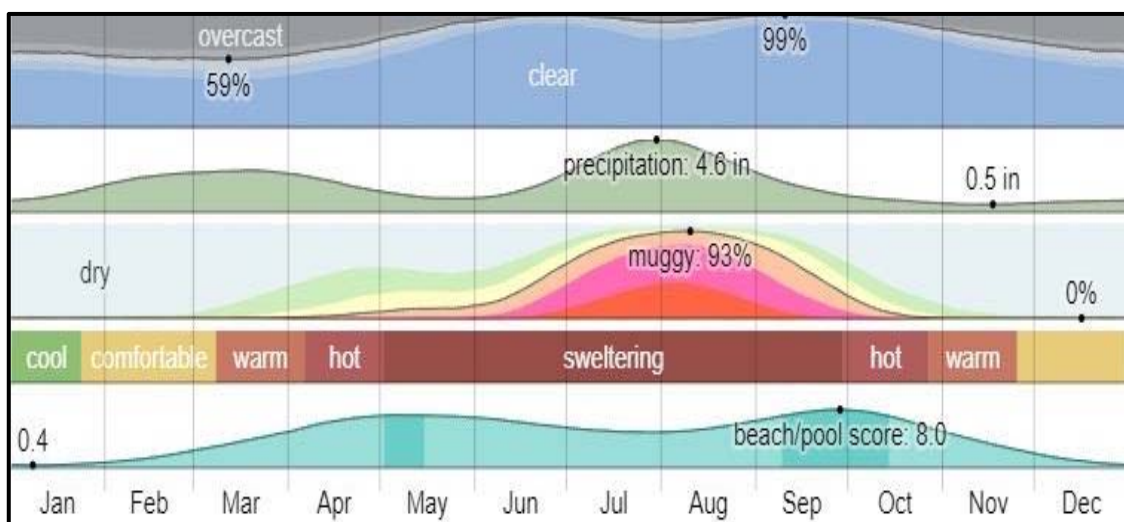


Figure 5-6: Minimum, Maximum and Average Temperature of District Attock

Rainfall is scanty and uncertain, and its annual distribution is very uneven. The annual rainfall varies from 250 to 750 mm. Monsoons start late in July, and most of the annual rain falls before September. Spring and fall rains are rare and uncertain. Winter rains start by the end of December and stop by the end of February when the windstorms set in. Winter rains generally extend over a shorter period than the Monsoons, which are followed by a prolonged period of dry weather. The average rainfall for District Attock from 2009 to 2022 is displayed in **Figure 5-7** below.

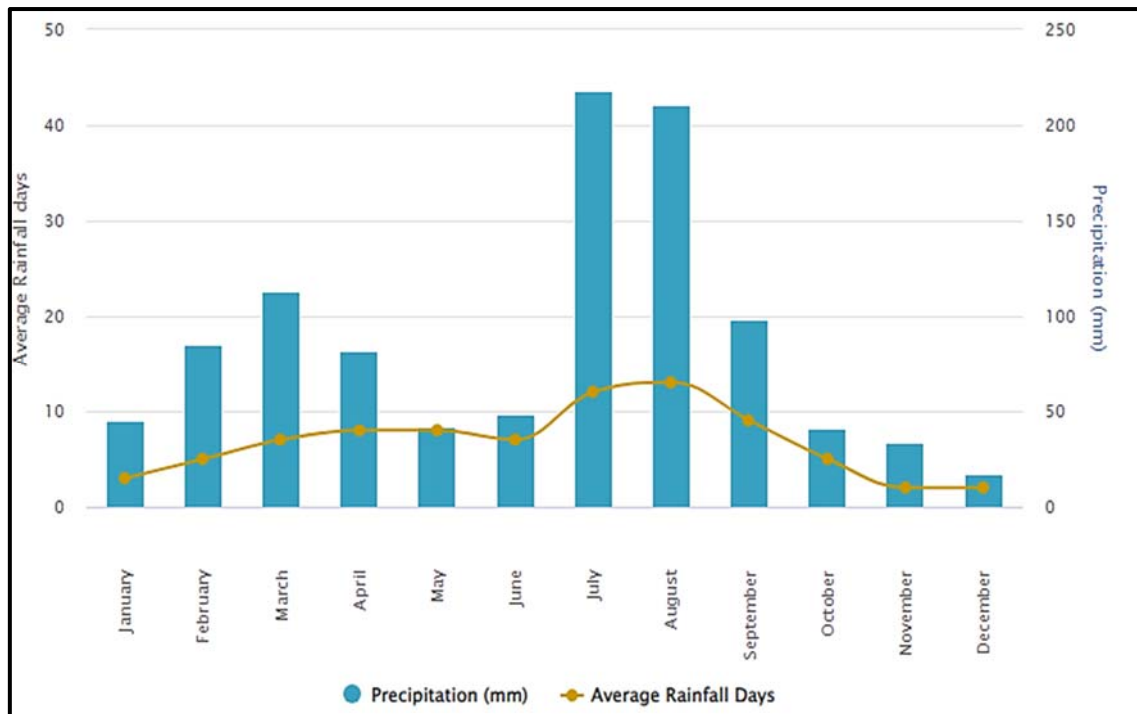


Figure 5-7: Average Rainfall/ Precipitation (mm) and Rainy Days of District Attock

5.2.8.1 Humidity

Attock City experiences extreme seasonal variation in the perceived humidity. The muggier period of the year lasts for 3.7 months, from June 13 to October 2, during which time the comfort level is muggy, oppressive, or miserable at least 23% of the time.

5.2.8.2 Wind

The windier part of the year lasts for 3.7 months, from May 6 to August 30, with average wind speeds of more than 4.7 miles per hour. The windiest day of the year was once recorded on July 20 with an average hourly wind speed of 5.7 miles per hour.

The meteorological data of Project Area (Noor, Attock) is attached in **Annexure IX**.

5.2.9 Water Resources and Drainage System

The presence of a groundwater aquifer containing considerable amount of water was observed in the project area. The water table is **45 - 80 feet**; however; the level of ground water in district Attock has decreased drastically and has reached **150- 170 feet**. A number of open dug wells, tube wells and bores in and around the project area were observed. Water quality of these water sources is sweet and is being used for drinking and domestic purposes. Few hand pumps were also observed that had been installed by locals along with a number of bores.

Water sample from the project area was taken from the well and the report is provided as **Annexure III**.

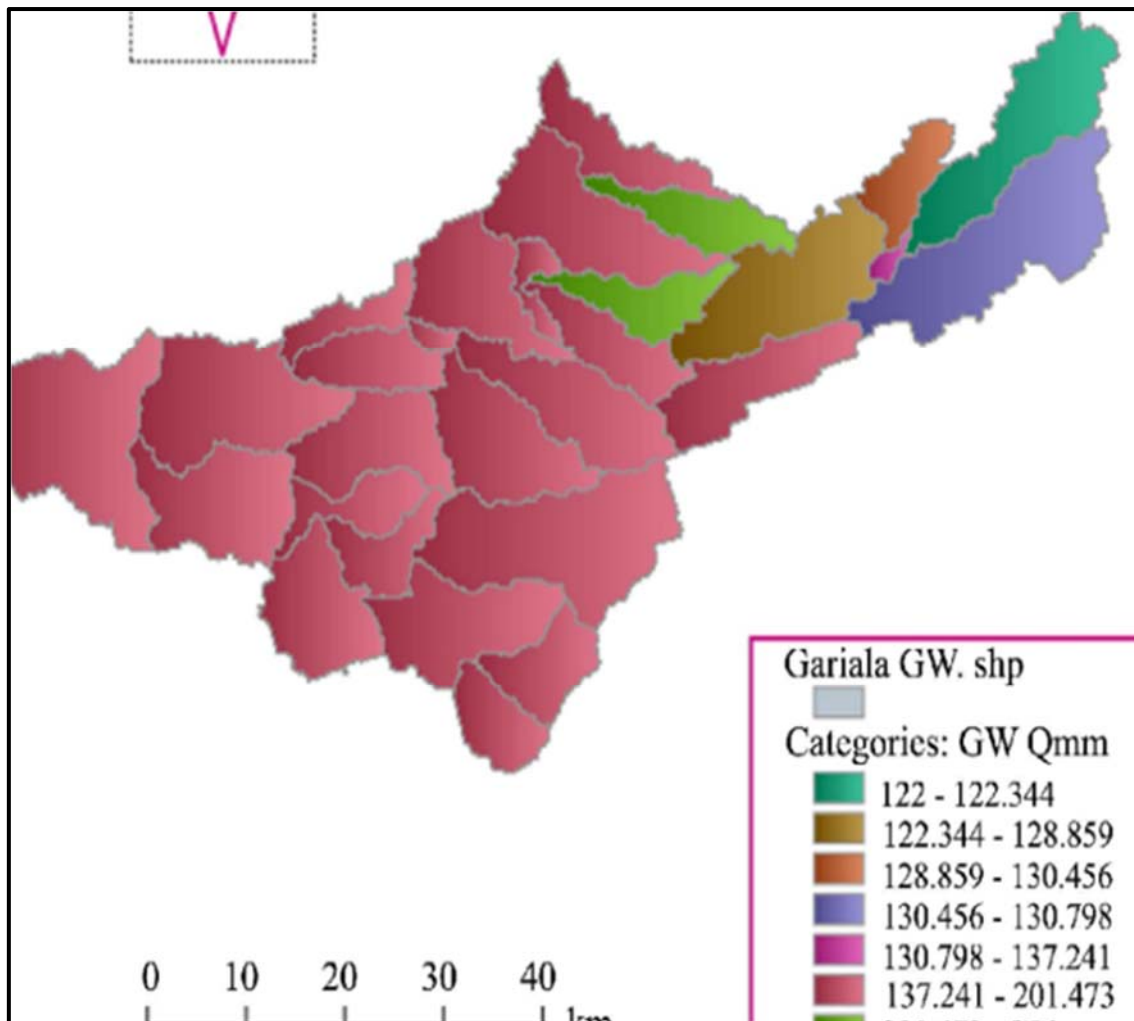


Figure 5-8: Groundwater Level of Haro River Basin

5.2.10 Minerals

Important minerals like limestone, marble, and fire clay are found in the area. Limestone is found abundantly in the Mar gala Hills and marble in the western section of Mar gala Range. Clay soils in the district exhibit five distinct strata, from bottom to top: (i) coarse pebbles with sand or clay, (ii) an alluvial stratum deposited by an older river system in the Soan Basin, (iii) alluvial deposits of the present river system, (iv) an airborne top layer of silt or clay (loess), and (v) conglomerate and loose gravel deposits.

5.2.11 Seismic Activity/ Seismicity

The district belongs to Zone 2B of the Seismic Zone Map of Pakistan which means there will be low hazard to moderate hazard due to earthquakes.

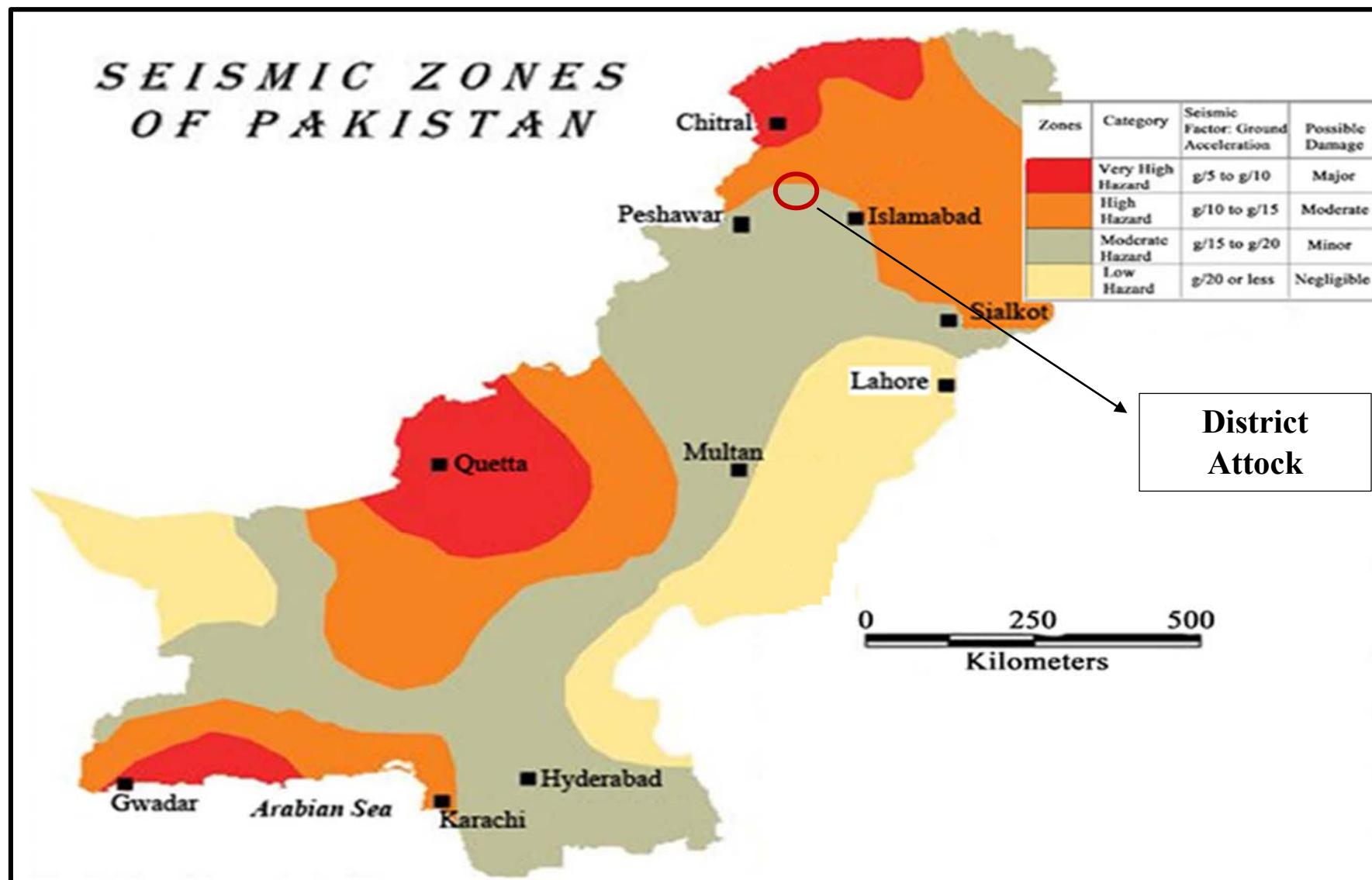


Figure 5-9: Seismic Zones of Pakistan showing District Attock Seismic Zone

5.3 Biological Environment

Attock district forms part of the Potowar Plateau which typically consists of dry, sparsely vegetated plains intersected by streams and rivers that cut valleys and gorges into sandstones, siltstones, and shales. Low rainfall, the clearing of vegetation for fuel wood, and the development of agricultural land contribute to the parched nature of the landscape.

The district's Chhachh plain, with its numerous wells, is extremely fruitful. The remainder of the district is deficient in natural resources. The landscape is dominated by wild expanses of Desert Mountains and rock. The soil is light and shallow, with stone on the surface and steep ravines separating it. Besides the Kala Chitta Range, the Makhad, and Narrara hills enclose the barren ravines of the central zone of the district.

5.3.1 Flora of District Attock

The main flora of Kala Chitta Range consist of phulai (*Acacia modesta*), babul or kikar (*Acacia nilotica*), puth kunda or prickly chaff plant (*Achyranthes aspera*), sufaida or snow bush (*Aerva javanica*), wild fig (*Ficus polymata*), bakain (*Melia azerdorach*), kikar (*Acacia nilotica*), pipal (*Ficus religiosa*), Dhrek (*Melia azadirach*), poplar (*Populus alba*), Ber (*Ziziphus nummularia*), Paper Mulberry (*Broussonetia papyrifera*), mulberry (*Morus alba*), simal (*Bombax ceiba*), shisham (*Dilbergio sissoo*), white sirin (*Albizia procera*), siris or shirin (*Albizia lebbeck*), aloe or kanwar gandal (Aloe Vera), amaranth or khardar chulari (*Amaranthus spinosus*), amaranth or chulai (*Amaranthus viridis*), kuntze or gulabi booti (*Anisomeles indica*), peanut or moong phali (*Arachis hypogaea*), musli (*Asparagus adscendens*), neem (*Azadirachta indica*), koch or black mustard/ kali surson (*Brassica nigra*), swallow wort or aak (*Calotropis procera*), naudin or chibar (*Cucumis melo* var. *agrestis*), khabal grass (*Cynodon dactylon*), Stapf or murga ghas (*Datura innoxia*), sanatha (*Dodonaea viscosa*), globe thistle or untkatara (*Echinops echinatus*), and snake weed or chatri dudhak (*Euphorbia helioscopia*).

Table 5-2: Life forms of Floral Species with Percentage Presence in the Project Area

S. No	Life form	Percentage %
1	Herbs	39.47
2	Grasses	22.36
3	Trees	19.73
4	Shrubs	14.47
5	Sedges	2.63
6	Parasite	1.31

Vegetation grows for the most part in scattered clumps. No forests are present at the proposed site. A total of 49 species belonging to 29 families of medicinal plants are found in the district.

The major Kharif crops usually include maize, bajra, jawar and most commonly ground nuts while Rabi crops include wheat, gram, mung, and other pulses, etc.

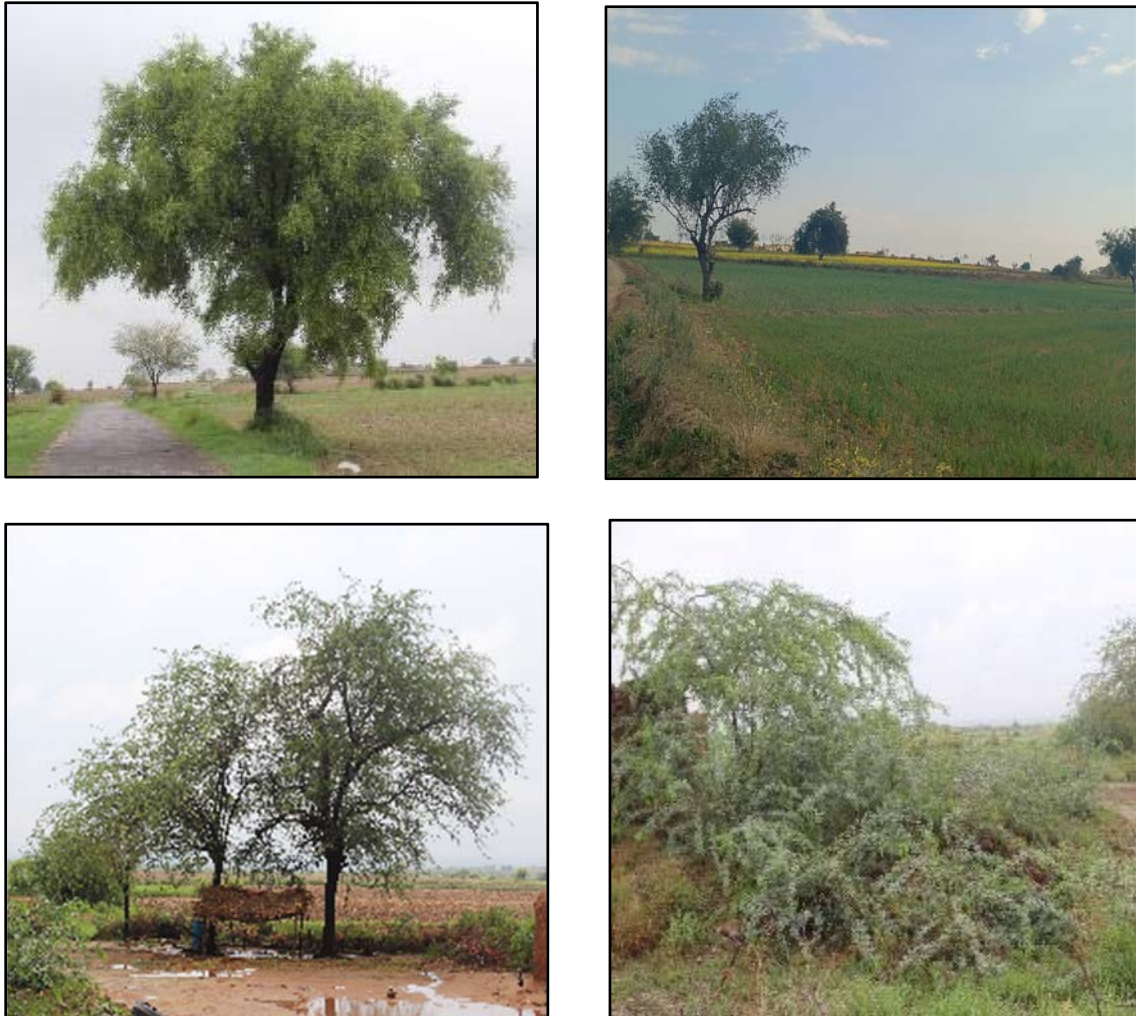


Figure 5-10: Flora of the Proposed Project Area

5.3.2 Fauna of District Attock

The forests of Kala Chitta Range are home to 9 different species of mammals, which include Punjab urial, barking deer, goral, chinkara, wild sheep, gazelle, wolves, leopards, Asiatic jackal, rhesus monkeys, wild boar, flying squirrel, porcupine, fox, and palm squirrel. Urial, chinkara, chakor, hare, mongoose, wild boar, and yellow-throated martin are also abundant.

The rocky areas and rangelands provide both feeding and breeding habitat for several bird species, which include black and grey partridges, see-see partridge, chakor, bank



myna, cuckoo, bulbul, hoopoe, parrots, egrets, ruddy shelduck, mallard, falcon, shikra, eagle tilor, and dove.

5.3.2.1 Bird Species

Based upon the observations collected during the field visit, twenty bird species were recorded in the project area. These areas also include larger as well as smaller patches of dry scrub vegetation which further extended up to the scrub forests of the Potwar plateau.

Overall little number of bird species has been counted, perhaps due to the closeness of the project area to the residential areas. On the other hand, it is interesting that number of birds of each recorded species is encouraging.

Calls of Brown Partridge could be abundantly heard from the surrounding areas of scrub vegetation, while few calls of Black Partridge also proved their presence in the vicinity of project area. Abundant presence and prey of Brown Partridge and common Quail was proved by interviewing of locals in Attock. They further added about less common status of Black Partridge in the area.

Apart from above mentioned species of interest, common species were also observed. These include House sparrow, House crow, Parakeet, Red vented Bulbul, Collared dove and Rock Pigeon. All these species are commonly found in other ecological zones of the country including Black Partridge and one migratory species.

5.3.2.2 Mammalian Species

Although most of the study area comprises of agricultural lands, but due to presence of scrub forest patches in the surroundings, including information about their presence, status etc. Dense vegetation of these forests provides living shelter to the mammals like Asian Jackal, Indian Porcupine, Indian wild boar, Wild Rabbit and Wolf. Loamy and sandy soils of boundaries of agricultural fields provide suitable habitat to Grey Mangos, Indian Porcupine and Asian Jackals. Based upon the comments of locals it is concluded that Wild Hare also residing in the agricultural fields of the study area, while growing crops (Ground nuts in particular) of these agricultural fields directly or indirectly provide food to these mammals.

All the seven species are commonly found in the project area as well as in country and not any significant threat can be expected from any activity.

5.3.2.3 Reptilian Species

Reptiles are also very important taxa among animals. During the study, several types of burrows and droppings were found which indicate the presence of concerned reptiles. Presence of Garden lizard was confirmed by direct sighting. Similarly, the local knowledgeable confirmed the presence of Saw scaled viper, and Indian Monitor. Some

of the common reptiles of the district include frogs, house geckos, lizards, water snakes, sand snakes, Indian python, kraits, vipers, cobra, rat snake, and fresh water turtles.

A detailed list of flora and fauna is attached in **Annexure VII** of the EIA report.

5.3.3 Protected Wildlife Areas and Endangered Fauna

Some of the Protected Wildlife areas include:

- **Kala Chitta:** This is a protected Game Reserve which was given the status of Nature Park under the Pakistan Environmental Protection Act in 2009. Indian wolf, jungle cat, barking deer, panther, and common serotine bat (chimgadur) are threatened species of mammals and are given protection in the Kala Chitta Game reserve. It includes a wildlife breeding center
- Rakh Kheri Murat Game Reserve
- Zoo and Wildlife Breeding Center (Wildlife Park) Attock

5.4 Socioeconomic Environment

5.4.1 Population

Attock district is spread over an area of 6,857 Sq. km comprising of following six tehsils:

1. Attock;
2. Fateh Jang;
3. Jand;
4. Hassan Abdal;
5. Hazro, and
6. Pindi Gheb.

Table 5-3: Population of District Attock Census: 2023 (Reference: Pakistan Bureau of Statistics)

Attock District		Rural	Urban
Population 2023	All Sexes: 2,170,423	1,546,439	623,984
Male: 1,089,655		775,779	313,876
Female: 1,080,687		770,642	310,045
Population Density per Sq. km		316.53	
Urban Proportion		28.75	
Average Household Size		6.1	

Population 2017	1,886,378	1,395,470	490,908
Average Annual Growth Rate	2.37	1.73	4.09

Total population of the district is 2.17 Million, 0.623 million (20%) of which is urban while the remaining 1.546 million (80%) is rural. Population growth is influenced by many factors, like birth rate, death rate, disasters, migration etc.

The Awans, Milars and Khattaks are major tribes of the Attock District. Punjabi Language is being spoken in the area. The dialect of Punjabi in Pindi Gheb is called "Ghebi". Ghebi is quite similar to the Potowari dialect, but differs slightly. English is also spoken by educated people.

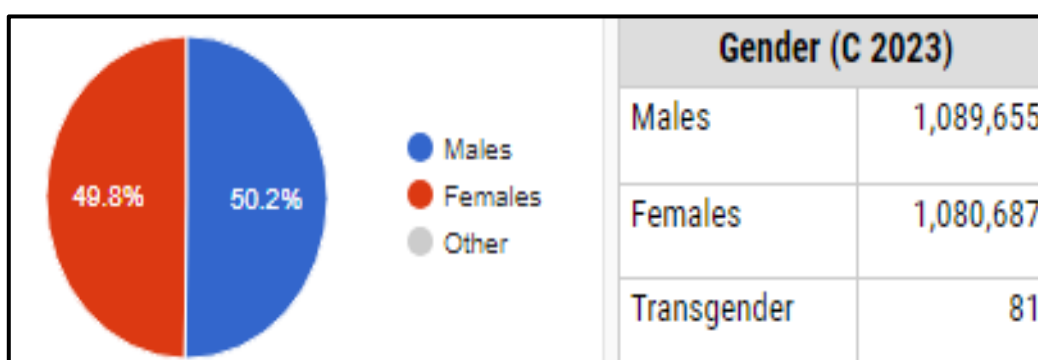


Figure 5-11: Gender Distribution Chart in District Attock

5.4.2 Economic Activity

The major economic activity of the rural areas of the district is agriculture and its allied livestock breeding. The major employers of the district include:

- Agriculture with its Allied Livestock Breeding and Fishing (50%)
- Elementary Workers (37.3%)
- Service, Shop and Market Sales (6.7%)
- Professionals (3.5%)

5.4.3 Irrigation Network

The district relies heavily on rains for its agriculture. The total area under barani irrigation is **374,613 acres** and **43,818 acres** are irrigated through wells and tube wells. There are a total of **3,737** government and privately-owned tube wells in the district.

There are a large number of small dams which store rain water for irrigation purposes. These include Tanaza Dam, Sipiala Dam, Bango Dam, Ratti Kassi Dam, Qibla Bandi Dam, Kanjoor Dam, Chani Bor Dam, Shahpur Dam, Kamra Dam near Kamra, Nurpur Kamalia Dam, Kalu Khurd Dam on Nullah Sehat, Nara Kas Dam on Nara Kas stream,

Dhok Jhalar on Nochindi Kas stream, Saghri Dam on Namal Kas stream, Trimni Kas Dam on Trimni Kas stream, Jabbi Dam on Lelamar Nullah, Shakarda Dam on Shakarda Kas stream, and Mirwal Dam on Noorpur Kas stream. In addition, there are more than 26 mini-dams in the district.

The following **Table 5-4** shows the mode of irrigation and the area served by the system as per Punjab Development Statistics 2018-19:

Table 5-4: District Attock Irrigation Statistics

Irrigation Type	Area	Irrigation Type	Area
Total Area Sown	216,000 Hectares	Irrigated Area	30,000 Hectares
Un-Irrigated Area	186,000 Hectares	Canal Irrigated	3,000 Hectares
Dug Wells	16,000 Hectares	Tube Well Irrigated	7,000 Hectares
Canal Well Irrigated	1,000 Hectares	Canal Tube Wells	—
Others	3,000 Hectares		

5.4.4 Land Use

The following **Table 5-5** shows the main land use statistics of the district as per Punjab Development Statistics 2018-19:

Table 5-5: District Attock Land Statistics

Total Area	685,700 Hectares	Reported Area	692,000 Hectares
Total Cultivated Area	320,000 Hectares	Net Sown	204,000 Hectares
Current Fallows	116,000 Hectares	Total Uncultivated Area	372,000 Hectares
Culturable Waste	42,000 Hectares	Forest Area	73,000 Hectares

5.4.5 Agriculture

The district falls under the Barani Agro-Ecological Zone of Pakistan and relies on rain for its agriculture. The main crops of the district are bajra, barley, guar seeds, ground nut, jawar, Kharif pulses, moong, mash, maize, rapeseed and mustard, sun hemp, sugarcane, sesame, tobacco, wheat, and millet.

The main fruits grown in the area are apricots, citrus, and guavas. Main vegetables include onions, potatoes, tomatoes, spinach, olives, chilies, coriander, garlic, peas, cauliflower, eggplant, and cucumber.

5.4.6 Livestock

Dhani cow and Salt Range sheep are famous livestock breeds of Attock district. The district is also known for horse breeding. The following **Table 5-6** shows the livestock population as of the 2010 Census of Livestock as quoted in Punjab Development statistics 2018-19:

Table 5-6: District Attock Livestock Statistics

Livestock	Number	Livestock	Number	Livestock	Number
Cattle	391,000 Heads	Buffaloes	124,000 Heads	Sheep	125,000 Heads
Goats	442,000 Heads	Camels	2,366 Heads	Horses	2,191 Heads
Mules	561 Heads	Asses	28,277 Heads		

5.4.7 Poultry Farms

There are a total of 392 government owned poultry farms in the district. Also according to Punjab Development Statistics 2018-19 there are 389 broilers, 62 layer and 02 poultry breeding privately owned farms in the district.

5.4.8 Fishing

There is a fish breeding centre at Hattian in Attock district, from where fish seeds are supplied to privately-owned fish farms as well as to government-owned farms. The fish seeds are also stocked in small dams across the district. Masher, Bachman, and other fish are caught in Haro, Soan, and the Indus Rivers. Most of this fish is consumed locally.

Fishing is carried out in River Indus Tehsil Attock and Jand as well as Sukh Nullah and Shahpur Dam Reservoir. Reservoirs of other small dams are also used for fishing.

5.4.9 Bee Keeping/Apiary

Commercial bee keeping is carried out in various forests and farms in the district.

5.4.10 Minerals and Mining

Attock has the distinction of being the first region in Pakistan to have an oil well, which is in Chore. It was established in 1946. Attock also has an oil and gas field, Dakin, near Jand, and in Fateh Jang tehsil.

Argillaceous clay, fire clay, marble, silica sand laterite is mined in Attock district. Coal is found in the Kala Chitta Range. Limestone and gypsum occur abundantly.

5.4.11 Industry and Manufacturing

Kamra Aeronautical Complex and Sanjawal Ordinance Factories are located in the district. There are a total of 52 industrial units in the district. Major industries include flour mills, glass and glass products, industrial/ burn gases, iron and steel re-rolling mills, packages, poultry feeds, textile spinning, vegetable ghee and cooking oil production and woollen textile spinning and weaving mills.

The following **Table 5-7** shows the number and type of industry present in the district:

Table 5-7: Industries Statistics of District Attock

Type of Industry	Number	Type of Industry	Number
Carpets	02	Cement	01
Cold Storage	02	Flour Mills	30
Food Products	01	Glass And Glass Products	03
Iron And Steel Re-Rolling	01	Light Engineering	01
Motor Pumps	01	Packaging	01
Poultry Feeds	01	Power Generation	01
Textile Spinning	02	Vegetable Ghee/Cooking Oil	03
Woollen Textile/Spinning	02		

5.4.12 Handicrafts

The traditional crafts of Attock include embroidered shoes, painted and lacquered woodwork, calico printing, and handloom cloth and blankets. Attock and Pindi Gheb produce elegant zari embroidered shoes. Pindi Gheb is also famous for lacquer woodwork, toys, and carved legs used for bridal beds. Calico printing of bed sheets, table covers, and similar articles are done at Fateh Jang. Iron vessels are made at Mukhad and blankets are manufactured in Pindi Gheb and Fateh Jang tehsils.

5.4.13 Road Statistics

Some of the important roads include:



- Pindi Gheb-Attock Road
- Jand-Pindi Gheb Road
- National Highway N-80 passes very near to Jand and connects the district to National Highway N-55 or Indus Highway, which connects Karachi and Peshawar, running on the east bank of River Indus.

The following **Table 5-8** shows the road statistics of the district, as per Punjab Development Statistics 2018-19:

Table 5-8: District Attock Road Statistics

Roads	Total Length (Km)
Total Road length	2,407.8
National Highways	68.5
Provincial highways	2331.26
Motorways	8.0

5.4.14 Rail and Airways

The main Peshawar-Karachi railway line passes through Attock district. The district is also linked with Rawalpindi and Peshawar through the railway network. The main railway stations are Attock, Basal, and Jand.

There is a military airbase (Kamra Airbase or Minhas Airbase) in the district.

5.4.15 Economic Infrastructure

The district is linked with Rawalpindi, Kohat, Nowshera, Haripur, Mianwali, and Chakwal districts through black topped roads. The G.T. Road (now known as N-5) passes through Attock city. There is a railway track which links Attock to both Peshawar and Karachi.

5.4.16 Radio and Television

There is a private local radio station called Awaz Radio FM 105 broadcasting in the district. Cable TV can also be viewed throughout the district.

5.4.17 Telecommunications

There are 56 telephone exchanges operating in the district, each ranging in capacity from 50 lines to 45,639 lines. Nearly all of the major cellular companies also operate in the district.

5.4.18 Educational Institutions

The following table shows the details of educational facilities in the district as per Punjab Development Statistics 2018-19:

Table 5-9: District Attock Educational Institutes

Institution	Boys/Girls	Institution	Boys/Girls
Primary Schools	420/429	Middle Schools	88/113
Secondary Schools	119/96	Higher Secondary	13/12
Degree Colleges	10/07	Other Higher Secondary	07/-
Other Degree Colleges	01/-	Technical Training Institutes	06/-
Vocational Institutes	-/05	Commercial Training Institutes	03/-
Universities	01	Govt. Mosque Schools	—
Medical Schools	01	Engineering Schools	—

There are two (02) privately-owned universities in the district and a government-owned Cadet College at Hasan Abdal.

In addition, there are number of primary, middle and high schools that are privately-owned in the district.

5.4.19 Healthcare Facilities

The District Health Officer (DHO) is in charge of health services provided in the district. The DHO is supported by doctors, paramedics, technicians, and other support staff. The following **Table 5-10** shows the number of health institutions in the district as per Punjab Development Statistics 2018-19:

Table 5-10: Health Care Institutes of District Attock

Institution	No./Beds	Institution	No./Beds
Government hospitals	08/535	Dispensaries	20/38
Rural Health Centres	05/100	Basic Health Units	63/126
TB Clinics	-/-	Mother Child Health Centres	05/-
Private Dispensaries/Hospitals	50/NA	Sub Health Centres	02/-

5.4.20 Language

The below **Table 5-11** provides a real picture of languages spoken in the District Attock and percentage spoken.

Table 5-11: Languages in District Attock

Languages	Number	Percentage Spoken
Urdu	34,080	1.80%
Punjabi	1,224,870	65%
Sindhi	4,222	Negligible
Pushto	274,230	14.5%
Balochi	1,215	0.064%
Kashmiri	5,652	0.3%
Saraiki	8,502	0.2%
Hindko	311,493	16.5%
Brahvi	1,865	0.099%
Other Language	20,249	1.07%

5.4.21 Archaeological and Cultural Sites

5.4.21.1 Gandhara

Gandhara was an historic region of ancient India, (which corresponds to areas of North West Pakistan including Attock). Situated astride the middle Indus River, the region had Taxila and Peshawar as its chief cities. It was originally a province of the Persian Empire and was reached (327 B.C.) by Alexander the Great. The region passed to Chandragupta, founder of the Maurya Empire, in the late 4th cent. B.C., and under Asoka was converted (mid-3d cent.) to Buddhism. It was part of Bactria from the late 3d cent. To the 1st century B.C., under the Kushan dynasty and especially under Kanishka, Gandhara developed a noted school of sculpture, consisting mainly of images of Buddha and relief's representing scenes from Buddhist texts, but with marked Greco-Roman elements of style.

5.4.21.2 Shrines

There are two main shrines present in the area which are very famous. The one is Baba Laal Hussain and the other is Suhray wali Sarkar. People come with great respect and recite fatiha and say prayers. They come with great belief of fulfilling their wishes. In Prem nagar, the famous tomb is Mundran Wali Sarkar.



5.4.21.3 Attock Fort

Attock fort was completed in 1583 under the supervision of Khawaja Shamsuddin Khawafi, a minister of Emperor Akbar. The Mughal caravan sarai outside the fort, which is almost on the G.T. Road, was also built during this period.

5.4.22 Heritage Sites/ Tourist Attractions

There are a number of buildings and heritage sites protected under the Government of Pakistan Laws in the district. These include:

- Lala Rukh Tomb, Hasan Abdal
- Begam Ki Serai, on the left bank of River Indus, near Attock Fort, constructed by Empress Nur Jehan, as a caravan sarai (rest stop for caravans)
- Saidan Baoli, Hattian
- Chitti Baoli, Pindi Suleiman Makhan
- Attock Fort, constructed by Emperor Akbar in 1581 AD
- Attock Tomb, on Grand Trunk (G.T.) Road (now N 5), near Ziarat Hazrat Baba Sahib
- Behram ki Baradari
- Tope and Monastery (Buddhist remains), 8 km (5 mi) east of Hasan Abdal, Baoli Pind
- Kallar (Temple) or Sassi da Kallara, Shah Muhammad Wali village, Tehsil Talagang
- Site at Garhi, Malak Mala village, 9.6 km (6 mi) east of Hasan Abdal
- Inderkot Mosque, Fatehjang, Inderkot
- Buddhist Site, (Behari Colony) Hasan Abdal Town, Behari Colony

Non-protected heritage sites include Hakimon Ka Maqbara, Gurdwara Panja Sahib, and the Mosque of Fateh Khan in Fatehjang Tehsil. This mosque is a prototype of Mughal mosques. Other buildings include the many Sikh Buildings built during the British period, Samadhi and Gurdwara of Than Singh (a pious Sikh during British rule), Bilal Mosque, and Muslim tombs in the Malahi Tola Village. There are a number of shrines and tombs in the district, prominent among which is that of Syed Pir Noori Badshah in Mukhad Sharif (a small village near Makhad town). Other shrines in the same village include the shrines of Hazrat Pir Qasim Ali Shah and Hazrat Maulana Muhammad Ali Chishti.



6.0 POTENTIAL ENVIRONMENTAL IMPACTS AND THEIR MITIGATION MEASURES

EIA study carried out to review the available information for 3D seismic data acquisition over Noor prospect in Ikhlas E.L. The consultant team visited the area and identified and collected primary data from the project site. The environmental implications may be beneficial or adverse, but the main objective of impact identification is to specify areas that are likely to be affected by the implementation of a project.

6.1 Definitions of Environmental Impacts

Physical (air, water, and soil resources), vegetation and land use.

- **Major:** Exists when physical or chemical changes (or alterations in vegetation patterns) are expected to be detected beyond 1.0 km of the proposed facilities for more than three Years from the onset of disturbance.
- **Moderate:** Exists when physical or chemical changes (or alterations in vegetation patterns) are expected to be detectable within 1.0 km of the proposed facilities for less than three years from the onset of disturbance).
- **Minor:** Exists when physical or chemical changes (or alterations in vegetation patterns) are expected to be detectable only within 0.5 km of the proposed facilities for less than One year from the onset of disturbance.
- **Negligible:** Exists when the degree of anticipated physical or vegetation effects are less than minors).

6.2 General

Discussion with the local villagers, suggest that so for the POL's activities in Noor Prospect in Ikhlas E.L. will not create any significant negative impact on air, water, sub soil, agriculture, livestock, wildlife and human beings. The farmers of the selected villages were quite aware of the seismic operations at Noor prospect. They perceived it as a sign of national pride. They think that beside this, a large number of local people will get employment, which will bring economic prosperity for them and for their families, after the development of the project area.

However, some of the link roads connecting the project area are un-metal, therefore any Movement on foot or vehicle will cause lot of dust which is injurious for the health of



human Beings, livestock, plant, crops and wildlife. These will be a need of permanent link roads connecting the project area to avoid any mishap.

The potential impacts of the proposed seismic survey on the area's geomorphology, surface and groundwater resources, air quality, biological resources, and socio-cultural environment, have been discussed in the following sections.

6.3 Geomorphology and Soil

6.3.1 Potential Impacts

Impacts on geomorphology and soils may arise due to the following project activities:

- Clearing and leveling of land along seismic lines for short holes' operation
- Clearing of top soil and vegetation for up-holes drilling
- Earthworks, paving and construction during camp site preparation and access track development/ improvement
- Vehicular and machinery mobilization
- Storage of fuels, oils and chemicals at the camp.

The likely impacts of these activities may include:

- Physical scarring of the landscape
- Increased risk of land slippage
- Accelerated soil erosion
- Alteration of soil quality by loss of top soil
- Blockage of natural drainage
- Soil contamination by accidental spillage or leakage from project vehicles and machinery or during regular course of work at the campsite.

Physical scarring, or the project's geomorphologic footprint, caused by clearing and levelling for seismic lines, access tracks and up holes drilling has the potential to be prominent in all the topographical zones identified in the previous section. However, it would be more prominent in the hilly and alluvial zones, since these zones represent uneven surfaces, which, if levelled, would not naturally revert to their original states with time. Clearing and levelling may also increase the risk of land slippage and soil erosion. The loss of top soil is only likely to take place along the access tracks, if needed, and at 1 or 2 locations, such as the landfill site, within the camp. However, in view of the limited area covered by the access tracks and campsites, this impact is expected to be insignificant.



The natural drainage might be affected by project activities, such as clearing, levelling and construction works. The dry, hill-torrent dependent, channels passing through most of the area might be damaged thus, changing the drainage patterns of the area. This would not only alter the geomorphology but also has the potential to affect people dependent on existing drainage patterns.

The spillage and leakage of fuels, oils and other chemicals may lead to soil contamination. Possible contaminant sources include fuel, oil and chemical storage areas at campsites, and vehicles and machinery used in the field.

6.3.2 Mitigation Measures

- The seismic lines cleared will avoid dense vegetation, where scarring might otherwise be more prominent. Any new development or improvement of existing access tracks will generally also try to avoid dense vegetation and sand dunes. The shortest possible route from an existing track to the campsite or seismic lines will be chosen for marking all new access roads
- Minimizing vegetation loss can reduce the risk of land slippage and soil erosion, given that vegetation prevents slippage and erosion.
- POL will use the shot-hole method, described in section three and which involves relatively less clearing and leveling, if it is deemed that the clearing and leveling required for short hole will result in significant physical scarring in the hilly and alluvial zones

POL will try to avoid damage to the water channels, by say breaking its embankments, and will repair any damage that is caused. Conforming to the safeguards given in the environmental management plan (EMP) will ensure that the overall impact of the proposed seismic survey on the area's geomorphology and soil remains insignificant.

6.4 Water Resource

6.4.1 Potential Impacts

Project activities could adversely affect the area's water resources in two ways: depletion from overuse, and contamination. Excessive water depletion is not expected to be an issue since seismic surveying is a temporary activity and only a limited quantity of water will be required (about 600 gallons per day). POL expects to purchase water for project purposes near the project area.

The quality of surface and groundwater supplies may deteriorate if pollutants mix with surface runoff during rain is carried to water resources in the vicinity, or if pollutants leach into the ground. Potential sources of pollution in such cases may include:



- Domestic waste (sanitary and kitchen discharge)
- Oil and grease from vehicles and machinery
- Sediments from altered land surfaces (campsites and new access tracks)
- Stored Fuel, oil and other chemicals

The storage and handling of fuels and lubricants may also contaminate surface and groundwater resources, if there are spillages that wash into surrounding areas or seep into the ground.

6.4.2 Mitigation Measures

- It will be ensured that the project's water consumption does not reduce the water supply available to other users. This will be done by assessing existing supply and demand, for water, conditions in the area.
- Sewage discharge from the camp will go into a concrete lined septic tank.
- Only that water, meeting the Punjab Environmental Quality Standards (PEQS), will pass from the septic tank into a sump for absorption into the ground. The lining of the septic tank will prevent untreated sewage from polluting groundwater.

On sewage disposal, the guidelines simply state that, "handle sewage so that surface and groundwater are not contaminated." Following the environmental guidelines given in the EMP the project area's water resources are not contaminated.

6.5 Ambient Air Quality

6.5.1 Potential Impacts

Air emissions from project-related activities are likely to include:

- Dust emissions produced during clearing, leveling and earthworks and construction operations along the seismic lines and campsite
- Dust raised on dirt tracks by project-related vehicles
- Dust raised during access track development/improvement
- Combustion products (nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, and volatile organic compounds) from diesel engines used in the camps to generate electric power
- Combustion products from vehicles used for project-related activities

The potential impacts of gaseous emissions include the following:



- Increase of pollutants in the ambient air for local communities
- Damage to vegetation and wildlife

There is a casual link between emission of air pollutants and health impacts. An analysis of the health impacts requires an evaluation of the following:

- The nature of the pollutants such as (particulate matter, nitrogen oxides, sulfur dioxide, etc.)
- Emission rate and duration of emission
- The emission conditions (temperature, location of point of emission with respect to the ground, etc.)
- Dispersion characteristics (wind, temperature, terrain, etc.)
- Location of receptors (communities) with respect to the emission sources
- Exposure of communities to the pollutants (concentration of pollutants in ambient air)
- Health risk due to the pollutants.

The impacts of the project on air quality will remain the same in all areas except when the campsite and seismic lines are located close to the settlements. The nature of source pollutants, and the typical period and nature of emissions are shown in **Table 6-1**

6.5.2 Mitigation Measures

- The maximum possible distance will be kept from settlements.
- Vehicle speed will be reduced on roads passing through or close to settlements.
- If required, water will be sprinkled on tracks in areas where dust is generated. The EMP gives the limits on speed and distance from settlements.

6.6 Natural Vegetation

6.6.1 Potential Impacts

As discussed in project description, natural vegetation in most of the project area is sparse and has been replaced by invasive species, it is therefore expected that the overall impact of the seismic survey on natural vegetation will be insignificant.

When conducting the seismic survey, it will not be necessary to remove much vegetation. Shot holes can be moved a few meters to any side to avoid trees and shrubs. Campsites will have no impact on natural vegetation since they will be located in existing clearings.



The trampling or damaging of vegetation will not harm the overall diversity of plant communities or the genetic diversity of species, since the population size of the species found is large.

6.6.2 Mitigation Measures

The following mitigation measures will further reduce any adverse impacts of the seismic survey.

- When developing new tracks, routes that minimize vegetation loss will be chosen.
- Camps will be established in natural clearings.
- Shot holes will be shifted to avoid trees and shrubs whenever technically possible.
- Felling of trees will be avoided.
- Open fires will not be allowed anywhere outside the campsites

6.7 Wildlife and Habitat

6.7.1 Potential Impacts

The seismic survey will involve the movement of a large number of people, vehicles and machinery. This could affect wildlife directly, through the destruction of nests or forage, or indirectly due to noise and other disturbances.

Most parts of the project area are highly disturbed and modified, and only support common and adaptable animals. Conducting the seismic survey in such areas will not have a negative impact on wildlife.

6.7.2 Mitigation Measures

In order to reduce the impacts of the proposed seismic survey activities on the wildlife resources of the area, the following restrictions will be imposed.

- Hunting, fishing or capturing wildlife, or otherwise discharging firearms will be prohibited.
- Harassment or pursuit of wildlife will be prohibited.
- Dens of large mammals and colonies of small mammals and reptiles will be given appropriate offset from project activities.
- Construction of new tracks will be minimized.
- Off-road driving will be minimized in order to avoid accidental killing of reptiles.
- Project crew will not buy wild birds from local trappers.
- Waste of any kind will not be discharged in open.



- Movement of project personnel will be restricted to work areas only. They will not be allowed to stray away in wild areas

6.8 Socio-Economic Cultural Impacts

Social impact assessment and analysis techniques were employed during the field survey and community consultation sessions to identify the potential socioeconomic and cultural impact of the proposed project, and the impact of related project activities on the area and its people. The effects identified were screened, and their relevance determined through a review of baseline data and a thorough study of project activities and processes. The effects were analyzed on the basis of positive or negative impact, and the intensity and permanence of each.

6.8.1 Potential Impacts

6.8.1.1 Impacts on the Livelihood due to Acquisition of Productive Land

a) Potential Decline in Household Income

The community's livelihood (household income) is dependent on:

- Agriculture
- Livestock farming

The proposed program will utilize land for various project activities, such as:

- Campsite establishment
- Laying of seismic line

Approximately 30-40- % of the study area is agricultural land. Conducting the seismic survey in an agricultural zone will result in crop damage. While land will not be required for more than a few days at a time for seismic survey, there are two potential effects related to land acquisition:

- Generally, when land is acquired, compensation is only paid to those individuals who hold titles to the land. However, in many cases, people with traditional rights over the land are farming it. Similarly, many grazing areas are considered common community property with no single person holding titles to them. If compensation is paid only to the titleholder many people whose livelihood is associated with the land may not get compensated.
- The second issue with land acquisition and crop compensation is the process of compensation payment to the communities and titleholders. The compensation is basically a tradeoff to offset the economic impact of acquiring land or damaging



crops. As stated earlier, land is life for the community, providing them with an income to support food security. If compensation is not paid on time, the effects on the communities living below poverty line or at the borderline in the project area will face difficulties to manage.

6.8.1.2 Mitigation Measures

POL will manage the land acquisition issue by adopting the following procedure:

- Before the commencement of construction activity for any project, the titleholders of the land will be determined through the local administration.
- Compensation will be paid to the titleholders before land is acquired. Alternatively, an agreement will be reached with the owners of the land regarding the terms of the transaction (area of land that will be used, compensation rate, and payment date).
- In addition to individual property rights, traditional rights of lands and community ownership will also be recognized during compensation.
- All financial transactions will be conducted and recorded in an open and transparent manner.
- The compensation will be paid on mutually agreed rates that will not be less than the prevalent market rates.
- Similar procedure will be followed for compensation for crop loss.
- All compensation, particularly to small claimants, will be paid within one month of the acquisition of land.

6.8.1.3 Community Disturbance due to Project Activity

Community disturbance is likely to become an issue if seismic work is conducted close to settlements. Various field activities, such as the operation of field equipment will generate noise, which may disturb people in nearby houses. Vehicles on access tracks passing close by villages also have the potential to create a disturbance.

6.8.1.4 Mitigation Measures

The project proponents will keep communities informed of work schedules and of the nature of work to be undertaken. They will also take advantage of local knowledge regarding any possible sensitive sites (such as sources of water) or sites of historical or cultural interest that are located in close proximity to seismic operations. These sites will not be disturbed during the course of the project.



a) Induction of Labor

b) Employment of Non-locals

During the proposed program, unskilled, semi-skilled, and skilled labour will be employed for various jobs. As persons with relevant skills are not available in the locality, most of the skilled and many of the semi-skilled jobs may be filled by people from outside the project area.

In addition, the number of unskilled jobs available may be limited. All of this means that the proposed program will create few job opportunities for the local community. Skilled labour for the project brought in from outside the project area may cause resentment among local communities.

A second issue related to hiring of labour is the distribution of the available jobs within clans, tribes, and villages. Employment opportunities for paid work in the area are virtually non-existent and, for the duration of any project, there might be a sharp increase in the expectation of opportunities for paid work.

Families close to the project activities expect an improvement in their quality of life and employment not equitably and judiciously distributed between the tribes of the project area will result in intertribal conflict.

6.8.1.5 Mitigation Measures

POL will adopt a transparent process for the employment of semi-skilled and unskilled labourers. All unskilled jobs related to the seismic survey will be provided to the local communities.

Before any project, the local communities and other stakeholders in the project area will be informed of the employment policy in place and the number of people that can be employed from the local communities.

Locals will be employed based on the following criteria.

- The employment process will be transparent, fair, and open
- Local people from villages closest to the project site (and therefore the most likely to be affected by project activities) will be given preference.

In order to benefit local communities and avoid causing resentment and dissatisfaction, unskilled jobs will be reserved for the local population. POL will ensure the balance employment of tribal groups, with preference given to those most directly affected by the project.



A proportionate share will be given to the locals in unskilled, semi-skilled, and security-related jobs in order to mitigate employment-related conflicts and to build local human capital.

c) Health Impacts

People from the project area travel to other cities, and thus cannot be considered isolated from the rest of the county. They are regularly exposed to illnesses common to urban populations, and have similar levels for immunity. Nevertheless, the influx of outsiders has the potential to bring in communicable disease(s).

6.8.1.6 Mitigation Measures

The seismic crew will undergo medical examinations before being hired, and will be screened for communicable diseases. The project is therefore very unlikely to lead to an epidemic of any sort among local communities.

d) Safety

Safety Project activities, such as the handling of fuels and field equipment operation for drilling/ surveying could become a hazard if conducted in populated areas, where local people, especially children, are likely to gather around to watch any ongoing activity. The other safety issue concerns traffic, especially along access roads close to settlements. Sudden loud noise can cause discomfort and may even instil fear in the young.

The community showed certain apprehensions in this respect during the survey. Particularly, they feared that the blasting noise from seismic survey would disturb their children and elders. The typical noise from the seismic survey is generally of low intensity and is not audible beyond few hundred meters.

Rarely a louder noise may generate if an explosive shot is misfired. Shooting and recording on a seismic line is a one-time activity that is not repeated. Thus the noise is unlikely to create any real discomfort or nuisance.

6.8.1.7 Mitigation Measures

- The seismic lines will pass at a safe distance from human settlements. The safe distance will be determined prior to the project on the basis of the noise generated by the quantity of explosive used.
- The communities' local leaders, men and women will be informed well ahead of the project activities near their village so that no inconvenience is caused to the communities and vulnerable groups.

6.8.1.8 Interactions with Communities and Mobility of Women

There is expected to be very little interaction between seismic crews and local communities, except for the local people who are hired for the project. However, the

influx of outsiders may affect the mobility of local women. Project activities may also restrict the movement of pilgrims.

6.8.1.9 Mitigation Measures

The seismic survey workers will not remain in one area for more than a couple of days, so the impact will be temporary. Seismic workers will be instructed to avoid interacting with local people when outside the camp enclosure. POL will strive to maintain contact with major stakeholders, particularly local communities, through all stages of project implementation.

This is necessary to engender a sense of community in the project proponents and to ensure that the community's concerns are responded to at every stage. The purpose of such contact is to develop a relationship of trust with the local communities, keeping in mind that the exploration may lead to the development of long-term interests in the region.

6.9 Damage to Cultural, Infrastructure and Archaeological Resources

6.9.1 Potential Impacts

It is possible that the seismic survey may damage structures, such as archaeological sites, houses, water wells and canals and water courses, owned and used by local people. Damage could be caused if seismic lines and up-holes are located too close to structures, or due to the frequent use of vehicle.

6.9.2 Mitigation Measures

The following mitigation measures will be taken to reduce the impacts on the area's cultural resources and infrastructure:

- All graveyards and shrines and other cultural sites in the vicinity of the project area will be identified before the survey.
- No seismic shooting will take place within a circle of 'safe' radius from the sites. The safe radius will be determined on the basis of the quantity of explosive used.
- Communication will be established with the local spiritual leader and the communities to explain about the activities near the sites
- To reduce the chances of damage, a safe distance between the seismic lines and the structures will be maintained (**Table 6-4** provides some safe distances for reference purpose).

The following mitigation measures will be implemented to prevent damage to archaeological resources:



- Before any project, the archeological sites in vicinity of the project will be identified.
- When locating the project facilities, an attempt will be made to avoid these scatters.
- Any site that is within 200 m of any project activity or facility will be cordoned off so that they do not get accidentally damage. Appropriate project staff will be trained to identifying items of archaeological importance so that no artifact is inadvertently destroyed during the project construction activities.

6.10 Water Use

6.10.1 Impact on Availability of Drinking Water

The water resources of the project area are limited and cannot meet the water needs of the project. Any extraction of water from the shallow aquifer could deplete the amount of water available to the community.

- Water, if extracted from the project area, will only be extracted from the deep aquifer (below 30 m).
- No existing community wells will be used to meet the project's water requirement.
- New wells for the project activities will be installed 500 m away from any water body and community well, if technically feasible.

6.11 Overall Project Activities

6.11.1 Seismic Vehicles and Support Vehicles

The use of seismic vehicles, such as

- Vibroseis AHV-IV trucks for flat, open areas,
- Vibroseis small scale UNIVIB trucks for congested or heavily urbanized areas due to its increased maneuverability in small spaces,
- OnSeis units for use in difficult terrain and areas with limited access, including environmentally sensitive areas. Also support vehicles could cause harm and the loss of financial resources.

6.11.2 Mitigation Measures

Following are the mitigation measure for the seismic and support vehicles usage':

- To determine the characteristics and state of the land, buildings and crops that may be influenced by the 3D Seismic Survey Activities, a walkover survey will be



carried out along the seismic survey line (in advance of the 3D Seismic Survey team).

- As a means of connecting with the communities and pertinent authorities, a Communication and Consultation Management Plan will be established and maintained. As part of the strategy, CLOs will schedule meetings with local officials, farmers, and property owners, tell the populace about the seismic activities, and keep a record of any complaints.
- Any harm to crops or infrastructure brought on by the survey must be reported and documented by the seismic contractor.
- A compensation system will be designed and executed to examine and manage claims made by the public and stakeholders for damage specifically caused as a direct result of 3D Seismic Survey operations.
- All onshore survey activities will take place exclusively during the day.

6.11.3 Communities Grievances

A framework for addressing community grievances in the context of the project is necessary. POL will address all community grievances in order to avoid conflict between the company and the local communities.

6.11.4 Mitigation Measures

All the grievances of the communities (men and women) will be addressed through social complaint register as well as through continuous contact with the communities in a culturally sensitive manner. Specifically, POL will create a system to register and manager social complaints against the company.

All complaints, raised by anyone in the community and communicated by any means, will be recorded. One senior staff member will be designated as the manager of the system. Once recorded, the complaint will be screened by the manager and genuine cases identified. The screening will be done on the basis of preset criteria, which may be in the form of simple check list.

If it is determined that no action is required, the decision and its justification will be recorded. If it is determined that no action is required, the responsibility and the target completion date will also be recorded.

Alternatively, an investigation may be carried out. The decision of the company on any issue will always be communicated back to the complainant. All complaints recorded in

the system will be periodically reviewed in a high-level meeting or by a nominated committee.

Table 6-1: Sources of Air Pollution

Class	Source Classification	Nature of Pollutant	Period and Nature of Emission
I	Combustion exhausts at well sites construction equipment, cranes, diesel generator, incinerator, burn pit, flare and vehicles)	SO ₂ , NO _x , CO and unburned hydrocarbons	Continuously with varying intensity during drilling of holes
II	Dust from earthwork and road construction at well site	Particulate matter ranging in size from 5 micron to 50 microns	Periodically throughout the day during construction period (20 days)
III	Vehicle exhaust on roads near Communities	SO ₂ , NO _x , CO and unburned hydrocarbons	Periodically throughout the day during construction and mobilization period (30 days) and intermittently during drilling of holes
IV	Dust from traffic on unpaved roads near communities	Particulate matter ranging in size from 5 microns to 50 microns	Periodically throughout the day during construction and mobilization period (30 days) and intermittently during drilling of holes

Table 6-2: Potential Impacts and their Mitigation Measures on Land/ Soil

Potential Impacts	Mitigation Measures
Soil Compaction	Plowing of the affected area after the project has been completed
Soil and Water Contamination	Hydrological isolation of waste and mud pits Storage of fuels, oils and chemicals in dyke areas with impervious floors
	Machinery placed in dyke areas with impervious floors
	Washing of vehicles only in designated Areas
	Treatment of sewage in concrete lined septic Tanks
	Storage of chemicals in covered areas
	Construction of dykes around pits to prevent runoff from entering Lining of drilling mud and cuttings pits with impervious pit liner

Impact of diesel emissions from machinery project vehicles on ambient air	Proper maintenance of all machinery and vehicles
	Speed limit of 30 km/h on access road
Dust Generation	Water to be sprinkled on access road periodically
Hunting of Wild Animals	Prohibition of hunting by project personnel
Hazard due to project traffic merging into highway traffic	Erection of stop sign and construction of speed breaker
Employment of Local People	Maximum number of jobs possible to be given to local people
Reduction in Mobility of Women	Project personnel will not interact with local Women Project personnel will stay in work areas as much as possible

Table 6-3: Environmental Monitoring Plan

Mitigation Measures	Implementation Schedule	Responsibility
Plowing of the affected area after the Site restoration project has been completed	Site restoration	Contractor
Hydrological isolation of waste and mud contractor	Site preparation	Contractor
Storage of fuels, oils and chemicals in dyked areas with impervious floors	Mobilization, Seismic Survey, Demobilization	Contractor
Machinery placed in dyke areas with impervious floors	Mobilization, Seismic Survey, Demobilization	Contractor
Washing of vehicles only in designated areas	Mobilization, Seismic Survey, Demobilization	Contractor
Treatment of sewage in concrete lined contractor- Septic Tanks	Site preparation	Contractor
Storage of chemicals in covered areas	Mobilization, Seismic Survey, Demobilization	Contractor
Construction of dykes around pits to Prevent runoff from entering	Site preparation	Contractor
Lining of drilling mud and cuttings pits with impervious pit liner	Site preparation	Contractor
Proper maintenance of all machinery and vehicles	Mobilization, Seismic Survey, Demobilization	Contractor

Speed limit of 30 km/h on access road contractor	Throughout	POL and Contractor
Water to be sprinkled on access road Periodically	Throughout	Contractor
Prohibition of hunting by project personnel	Throughout	POL and Contractor
Erection of stop sign and construction of speed breaker	Site Preparation	Contractor
Maximum number of jobs possible to be given to local people	Throughout	POL and Contractor
Project personnel will not interact with local women	Throughout	POL and Contractor
Project personnel will stay in work areas as much as possible	Throughout	POL and Contractor

Table 6-4: Minimum Distance from Structure

Structure	Distance (m)	
Residence, barn irrigation headwork, dam, cemetery, or building or Structure with a concrete base	180	
Water well	180	
Residential driveway, gateway or buried water	10	
Survey monument, buried telephone or telecommunication line	2	
High pressure oil or gas pipe line (measured from the center line of the Pipeline) or an oil or gas well	32	
Low pressure distribution line (measured from the center line of the Pipeline)	3	
Irrigation Canal more than four meters wide	10	
Radio Transmitter		
a) For commercial Am broadcast transmitters (Frequency 0.535 to 1.605 MHz)		Transmitter Power(Watts)
	230	Up to 4,000
	260	5,000
	400	10,000
	600	25,000
	850	50,000
	1,200	100,000
	27,00	500,000
b) Other transmitter (any power)	1600	



c) Guy wires (all transmitters)	100	
Microwave tower guy wires	100	

If the field activities, including the implementation of all mitigation measures are carried out as described in the report, the anticipated impact of the project on the area's natural and socioeconomic environment will be well within acceptable limits. The project will also comply with all statutory requirements.



7.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

An environmental management plan (EMP) is required to effectively monitor and implement the required mitigation and environmental protection measures identified in this EIA. The EMP is presented in this section, outlines the aims and objectives, defines the responsibilities of the project sponsors/owners and contractor(s), lays down the required communication and reporting procedures and mechanism through which the proposed measures will be monitored.

The environment plan will cover but will not be limited to the following items:

- The contractor's Corporate Environmental Policy
- Environmental Management
- Line Responsibilities
- Identification Procedures
- Reporting Procedures
- Field Monitoring
- Audits
- Training
- Operational Guideline
- Seismic Source Impact Monitoring
- Base Camp
- Quality Water (Consumption)
- Sewage Disposal
- Waste Minimization Plan
- Waste Disposal Method
- Hazardous Materials
- Fuel Storage, Oils, Chemicals
- Fuel Withdrawal from Storage System
- Fuel Replenishment
- Explosive Handling and Storage
- Environment Emergency
- Response Plan- Reporting



7.1 Purpose and Objectives of EMP

An EMP provides a delivery mechanism to address the adverse environmental impact of a project during its execution, to enhance project benefits, and to introduce standards of good practice to be adopted for all projects works.

The primary objectives of the EMP are to:

- Facilitate the implementation of the mitigation measures identified in the IEE/ EIA
- Define the responsibilities of the project proponents, contractors, and environmental monitors, and provide a means of effectively communicating environmental issues among them

Define a monitoring mechanism and identify monitoring parameters in order to:

- Ensure the complete implementation of all mitigation measures
- Ensure the effectiveness of the mitigation measures
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations

7.2 Components of the EMP

The EMP consists of the following components:

- Organizational structure; roles and responsibilities
- Mitigation plan
- Environmental monitoring plan
- Outline emergency response and contingency plan
- Communication and documentation
- Change management
- Environmental and Local-sensitivities training.

7.2.1 Methodology

The basic approach to prepare this plan comprises of:

- A review of relevant environmental policies, legislations and guidelines;
- A review of past environmental studies carried out in Noor Prospect in Ikhlas E.L.;
- A review of relevant environmental data in Noor Prospect and project area in particular;



- On the basis of past experience gained during the monitoring of similar projects in relation to construction and seismic activities; and
- Consultation with POL's staff.

7.2.2 Structure of the EMP

The EMP consists of the following sections:

- Legislations, policies and guidelines;
- Organizational structure with roles and responsibilities
- Change management plan; and
- Mitigation management matrix.

7.3 Legislation and Guidelines

This EIA has discussed national and international legislation and guidelines and their relevance to the proposed project. POL shall ensure that the operation is conducted in conformance to POL's corporate environmental policy, national legislation and relevant international conventions and that guidance is sought from national and international guidelines. All relevant legislation, guidelines, convention and corporate requirements are discussed in Chapter # 02 of this EIA. POL shall also ensure that the key project management staffs are aware of these legislation and guidelines.

- **IEE and EIA Regulation 2022:** The project will be conducted in conformance with EIA regulation and relevant international conventions and that guidance is sought from national and international guidelines.
- **PEQS Requirements:** PEQS will be followed throughout the project activities and operation. The PEQS are available for industrial gaseous emissions, motor vehicle emissions and noise levels, and industrial and municipal effluents.

7.4 Components of EMP

EMP consists of the following components:

- Legislation and Guidelines
- Organizational Structure and Responsibilities
- Mitigation Plan
- Environmental Monitoring Plan
- Emergency Procedures and Contingency Plan
- Emergency Action



- Communication and Documentation
- Change Management
- Environmental Training

7.4.1 Organizational Structures and Responsibilities

This section outlines the duties and responsibilities of the various stakeholders throughout the duration of the project and offers an organizational structure for the environmental management during the planned project execution. The following list of organizational positions and duties is an overview:

7.4.1.1 Primary Responsibilities

- The major duty for ensuring plan compliance will be borne by the project sponsor/owner (i.e., POL) and the contractor by their respective senior people involved in project implementation and operation.
- During the construction phase, POL's responsibilities will be undertaken by its Project Manager, and during the operating phase, by its Operation Manager. He will be helped by the Health, Safety, and Environment (HSE) Officer, who will be assisted by the HSE Manager.
- Through its HSE Manager, POL will coordinate with appropriate government departments.

7.4.1.2 Quality Control and Field Management

The Contractor will be responsible for carrying out project operations in an ecologically sound way; necessary provisions for compliance will be put into the construction contract. POL's HSE Officer will be in charge of environmental safety during the project's duration.

7.4.1.3 Monitoring and On Job Supervision

Compliance with the environmental management plan will be monitored by a committed HSE Officer that the Contractor has hired. Additionally, he will be in charge of informing and educating the project crews on each aspect of the environmental management plan.

7.4.1.4 Communication

The following methods will be used to convey environmental concerns among staff members.

**a. Kick-off Meetings**

A meeting to discuss environmental concerns will be held in the primary contractor's camp at the start of the project. The purpose of the meeting will be to present the environmental management plan to the field personnel. The following individuals will be present at the meeting:

❖ POL

- Project Manager
- HSE Manager
- HSE Officer

❖ Contractor

- Site Manager
- HSE Officer
- Senior Supervisor
- Camp In-charge

b. Regular Meeting

At least twice in a month the following personnel will meet. Any relevant environmental issues, progress of the monitoring team, and areas of concern will be discussed during these meetings.

❖ POL

- Field Representative/ QC Officer
- HSE Officer

❖ Contractor

- Site Manager
- HSE Officer

7.4.2 Social Complaints Register

The POL's site representative will maintain a register of complaints received from local communities and measures taken to mitigate these concerns. All community complaints received will be sent to the POL's HSE Management for further action.

7.4.3 Change Record Register

All changes to the EMP or the project will be handled through the Change Management Plan provided in the EMP. These changes will be registered in a Change Record Register.



7.4.4 Photographic Record

POL will ensure that a photographic record including the following is maintained:

- All areas used by the project activities; before use, during use and after restoration;
- Key non-compliances; and
- Key project activities.

7.5 Health and Safety

All health and safety requirements and procedures should be strictly and faithfully followed in all areas ranging from worker health to monitoring of gas pipeline for failure.

This development represents the use of well-developed industrial technology for which occupational safety and health hazards are relatively well defined. The hazards associated with overall operation of project area could be controlled primarily using two strategies.

7.5.1 The First Strategy

The first strategy involves the preparation seismic survey and allied facilities in such a way that minimize safety hazards and control health hazards associated with routine operations. This strategy is the most effective means of minimizing impacts to workers' health and safety such as:

- Installation of handrails, toe boards and non-slip surfaces for all elevated plate forms, walk ways, stairways and ramps to prevent slip and falls.
- Adequate grounding and Insulation of electrical equipment, to prevent electric shocks.
- Provision of adequate sanitary and washing facilities to reduce worker dermatitis from extended contact with chemical agents in the workplace.
- Provision of facility ventilation to minimize heat stress.
- Specification of low noise equipment and the enclosure of noisy equipment to limit workers noise exposures to 90 DBA on an 8-hour time weighted-average basis.

7.5.2 The Second Strategy

The second strategy necessary to control health and safety impacts is implementation of an effective program for health and safety for Project area. The program should be designed to educate workers regarding overall operation, and allied facilities hazards and the methods to be employed to control them such as following: -



- Provision and use of hearing protection devices in hazardous noise areas where noise level equal or exceed 90 dBA.
- Establishment of good housekeeping practices.

Fence and warning signs at the potentially danger places The EMP for construction and seismic activities is provided in the **Table 7-1**.

7.6 Environmental Budget

The 2% of the project cost will be allocated for the environmental budget. The cost allocated for the implementation of EMP will be between **175,040 US\$**.

Table 7-1: Mitigation Measures/ Actions for Probable Impacts in Different Phases of the Proposed Project

Sr. #	Project Component / Impact	Mitigation Measures / Action	Controlling Document	Responsibility	Timing
01	Management of Contractors	All contractors to comply with the PEPA Act 1997 and HSE policy of POL	Contract Documents	POL	BC
02	Impacts on Landform and Soil Contamination	Impacts on landform and soil contamination	Machinery Travel Plan	Contractor, POL	DC
		Ensure that earthworks are limited to within the demarcated construction camp area, well sites unnecessary land uptake and clearing outside of the construction camp and fly camp	Engineering drawings of construction camp and well site	Contractor	DC
		Ensure that the access road level is set such that the cut and fill operations are minimized and excavations are used as fill material only on the existing tracks. No new access tracks to be constructed.	Road engineering and cross sectional drawings	Contractor, POL	DC
		Ensure that all excavated material is confined within a work corridor.	Construction schedule	Contractor, POL	DC
		Ensure that lubricants and fuels are properly stored with impervious lining.	Fuel storage protocol	Contractor, POL	DC
		Ensure the washing of all vehicles in the designated area	Camp protocol	Contractor, POL	DC
		Ensure the construction of appropriate storm water drainage and culverts along the access tracks	Construction drawings	Contractor, POL	DC



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03	Access Road Construction	Ensure that the width of the road does not exceed 5m at bends, where it can increase to a maximum width of 8 m	Road construction drawings	Contractor, POL	BC and DC
		Ensure that a 150-mm compacted gravel surface is overlaid the access road.			
		Ensure that the construction corridor along the road is properly marked before the construction is started			
		Ensure the restoration of construction site and access tracks to its original location.	Restoration protocol	POL and Contractor	AC
04	Impact on Water Resources	Efficient and low water consumption technology to be selected for the construction.	Contract documents	POL	DC
		Ensure that the use of water obtained from the designated high recharge ground water resources / or community well is done after the payment of water compensation.	Water tables monitoring results	POL and Contractor	DC
		Ensure that sewage is disposed off into the septic system comprising of septic tanks and soak pits.	Design and drawing of septic tank	Contractor	AC
		Ensure that the company installed tube well is 2 Km away from the community	Plan of tube wells	Contractor and POL	DC & AC
		Ensure that ground water survey is conducted to ascertain the yield of the aquifer before installation of tube well.	Resistivity survey results	Contractor and POL	DC & AC
		Ensure that soak pits are constructed such that surface runoff cannot enter the pits.	Alignment plan	Contractor	DC
		Prohibit the washing of vehicles near water bodies or water channels	Camp protocol	Contractor, POL	DC



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		Ensure that oil or fuel leakages from construction machinery are prevented	HSE policy Contractor,	POL DC	
05	Impact on Air Quality	Ensure that degraded patches emitting dust are sprinkled regularly with water to avoid dust emissions.	Air Monitoring Report	Contractor, POL and DC	
		Ensure that generators and boilers are kept well maintained.	Maintenance Report	Contractor, POL	DC
		Ensure that emissions monitoring comply with the PEQS limits	Monitoring Report	Contractor, POL	DC & AC
		Ensure that access tracks near communities are regularly sprinkled with water.	Plan	Contractor, POL	DC
		Ensure that dust collection is done through dust collection drums and system.	Monitoring data	POL	AC
06	Noise	Ensure that vehicles and equipment are regularly monitored for noise.	Vehicle maintenance e protocol	Contractor, POL	DC & AC
		Ensure that appropriate equipment (silencers, etc.) are used to minimize noise.	Safety protocol	Contractor, POL	DC
07	Impact on Biological Resources (Wild Life)	Ensure that domestic garbage and leftover food is disposed off appropriately and is not discarded in the open	Camp protocol	Contractor, POL	DC
		Ensure that clearance is minimal from the project site	Project drawing	Contractor, POL	DC
		Ensure that small mammals and wild life in the project area are not harmed and threatened by project activities	Work protocol	Contractor, POL	DC



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		Ensure that construction activity starts as a low intensity activity so that small mammals leave the area without harm.	Work protocol	Contractor, POL	DC
		Ensure that wildlife is not hunted, captured, or trapped	Monitoring Report	Contractor, POL	DC
		Activities in critical wildlife habitats to be planned in a manner that they do not coincide with the time when animals are particularly Sensitive to disturbance such as periods when they are breeding.	Monitoring Report	Contractor, POL	SS
		A safe distance to be maintained from all sensitive locations and features. Setting of camps, equipment stores, or other supplies to be prohibited near the isolated water sources. These sites should be no closer than 300 m away, if not within sight of the water source, and 500 m away, if they are within sight.	Site Plan	Contractor, POL	SS
		Avoid habitats that include potential resting places, extreme care to be taken when operating in these areas. Areas that are critical to wildlife should be avoided. These may include feeding grounds and watering holes.	Site Plan	Contractor, POL	SS
		Avoid ravines and dry wadis for climbing or descending from the hills. Any use of these to be allowed only if it is established that it is not a critical habitat	Site Plan	Contractor, POL	SS
		If project activities occur during the nesting season for breeding birds in the project area, the nesting	Work Protocol	Contractor, POL	SS



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		locations for breeding raptors should be identified prior to project initiation, and a setback of 500 m should be maintained.			
08	Impact on Biological Resources	Cooking fuel to be supplied through bottled gas and fuel wood cutting should not be allowed. Employees to be trained in fire prevention and control	Training Plan	Contractor, POL	SS
		Vegetation disturbance to be minimized through the use of existing roads and tracks and through the prevention of creation of new access trails tracks	Road Alignment	Contractor, POL	SS
		Botanist should accompany the survey teams in sensitive communities to ensure that disturbance to rare or special plants are avoided / minimized.	Monitoring Report	Contractor, POL	SS
09	Socioeconomic and Gender Impacts	Ensure that unskilled employment is reserved for local residents. Ensure that all skilled vacancies are properly advertised through local council and local newspapers.	Employment Policy	POL	DC & AC
		Ensure that dust emission is not discharged above the PEQS limits to avoid harm to the communities of the project area.	Monitoring Report	POL	DC & AC
		Ensure that all emissions are within PEQS limits.	Monitoring Report	POL	DC & AC
		Ensure that the construction machinery is not left unattended	Complaint Register	Contractor	DC & AC
		Ensure that all possible conflicts are resolved through a complaint management system through a complaint management register kept at the construction camp gate and UC Nazim Office.	Complaint Register	POL	DC & AC



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		Ensure that community is compensated for its loss of land and livelihood as per the Government of Pakistan Land Compensation Policy and Act.	Compensation on Policy and Report	POL	BC
		Ensure that payment is done in an open and transparent manner.	Compensation on Policy and Report	POL	BC
		Ensure that local labor is given preference from the Union Council for labor work during construction, for hiring by the contractor. Only people living in the vicinity of the exploratory well site and construction camp site to be hired.	Employment Policy	Contractor	DC
10	Archaeological Site	Ensure that no exploratory well passes through the protected site.	Monitoring Report	Proponent, POL	DC
		Detailed archaeological survey to be carried out if an archaeological remains is found.	Staff Training Program	Proponent, POL	DC
		Staff to be sensitized about the cultural and social attributes of the area.	Monitoring Report	Proponent, POL	DC
		All art affects found to be reported to the Archaeology Department.			

- DC: During Construction
- AC: After Construction
- BC: Before Construction
- SS: Seismic Survey



7.7 Change Management and Operation Plan

An environmental assessment of the proposed project has been made on the basis of the project description available at the time the EIA was conducted. However, it is possible that changes in the project design will be required when the project is implemented. This section describes the mechanism that will be put into place to manage changes that might affect the project's environmental impact. The changes in the project design have been categorized as first-order, second order, and third-order. These are defined below:

7.7.1 First-order Change

A first-order change is one that leads to a significant departure from the project described in the EIA and consequently requires a reassessment of the environmental impact associated with the change. In such an instance, an independent consultant will be required to reassess the environmental impact of the proposed change, the results of which will then be sent to the EPA for approval. Examples of such changes include:

- Change in the location of campsite such that minimum distances required in the EIA are not met
- Increase in water requirement by more than 50%
- Increasing the crew size by more than 50%

7.7.2 Second-order Change

A second-order change is one that may entail project activities not significantly different from those described in the EIA, which may result in project effects whose overall magnitude would be similar to the assessment made in this report. In the event of such changes, the HSE Manager POL will be required to reassess the impact of the activity on the environment, specify additional mitigation measures, if necessary, and report the changes to the EPA. Examples of such changes include:

- An increase in project personnel by more than 25%.
- Increase in the water needs by more than 10% but less than 50%.
- A change in the location of the campsite such that minimum distances required in the EIA are still met.

7.7.3 Third-order Change

A third-order change is one that is of little consequence to the EIA findings. This type of change does not result in effects beyond those already assessed in the EIA; rather it may be made onsite to minimize the impact of an activity, such as relocating construction



campsites to minimize clearing vegetation, etc. The only action required for such changes will be to record the change in the Change Record Register.

7.8 Training Program

Environmental trainings will be part of the continual environmental improvement program. The training will be directed towards all personnel for general environmental awareness. The suggested training program for construction and seismic survey with associated construction activities is provided in **Table 7-2** below:

7.8.1 Objectives

The key objective of training program is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related restrictions specified in the EIA and EMP.

7.8.2 Roles and Responsibilities

The contractors will be primarily responsible for providing environmental training to all project personnel on potential environmental issues of the project. The contractors will be responsible to arrange trainings and ensure the presence of targeted staff.

7.8.3 Roles and Responsibilities

The environmental awareness, EIA and EMP trainings will also be carried out during the entire course of the proposed exploration and associated development operation on the basis of following criteria.

a. Training Logs

All training logs will be maintained by the contractors. The training log will include:

- Topic
- Date, time and location
- Trainer
- Participants

b. Training Needs Assessment

In addition to the training specified in the training log special/additional trainings will be provided during the project activity. The criteria to assess the need of training will be based on the following:

- When a specified percentage of staff is newly inducted in the project;

- When any non-compliance is repeatedly reported refresher training will be provided regarding that issue;
- When any environmental incident/accident of minor or major nature occurs;
- Arrival of new contractor/sub-contractor; and
- Start of any new process/activity.

c. Training Material

The contractors will develop and prepare training material regarding environmental awareness, sensitivity of the area, EIA, EMP and restrictions to be followed during the project. Separate training material will be prepared for each targeted staff.

Table 7-2: Environmental Training Program

Staff	Trainer	Contents	Schedule
Selected Management Staff From POL and Contractors	Project Coordinator	- Environmental sensitivity of the project area - Mitigation measures - EMP - Social and cultural values of the area	Prior to the start of the project activities
All Personnel	Contractor- HSE Department	- Environmental sensitivity of the project area - Wildlife and vegetation - Community issues - Mitigation measures - Contingency plan - Social and cultural values	Prior to the start of the project activities
Drivers	Contractor- HSE Department	- Road safety - Road restrictions - Vehicle restriction - Defensive driving - Waste disposal - Cultural values and social sensitivity	Before and during the field operations
Mechanics	Contractor- HSE Department	- Waste disposal - Vehicle restrictions	Before and during the field operations
Camp Staff	Contractor- HSE Department	- Camp operation - Waste disposal - Natural resource conservation - Housekeeping	Before and during the field operations



Restoration Teams	Contractor- HSE Department	- Restoration requirements - Waste disposal	Before the start of the restoration activities
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7.9 Emergency Procedures

The proponent and contractor will prepare contingency plans to deal with any emergency situation that may arise during the operation e.g. evacuation, major oil spill, etc. and communicate these to the regulatory agencies, if required by these agencies.

7.9.1 Restoration

Once the entire operation is completed, restoration and rehabilitation of the campsites, seismic lines, bore holes and access tracks will be undertaken. The seismic contractor will form a Green Team that will undertake the restoration activities. The HSE Advisor will train the Green Team before the start of restoration activities. The following procedures will be adopted during the process:

- All concrete structures at the campsites will be removed and buried in garbage or soak pits and the pits backfilled with at least 1 m of soil cover below the surrounding natural surface level.
- All holes, ditches, and sumps will be backfilled; an extra cap of soil will be added to cater for compaction.
- At the time of restoration, septic tanks will be dismantled in place and backfilled with at least 1 m of soil cover below the surrounding natural surface level.
- All signs and refuse will be removed from survey lines
- It will be ensured that after restoration activities the campsites are clean and that no refuse has been left behind.
- If any damage to tracks, slopes, drainage paths, stream banks, or other topographical feature is caused by construction and seismic related activities; proper repairs will be carried out.
- Re-vegetation measures will be carried out where necessary.

7.9.2 Post Project Reporting

The project proponent will prepare a brief post project report describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to during the operation, any damages to the environment and the mitigation or compensation provided, and monitoring information of scientific or environmental interest (e.g. sightings of

wildlife species) that is not proprietary in nature. The report can make use of the HSE reports prepared during the operation for that purpose. The report will be submitted to the Punjab EPA. Any findings and recommendations relating to the operation that may improve future similar operations will also be reported.

7.9.3 Worker's Health and Safety Plan

A good workplace safety plan is a comprehensive description of how the company works to create a safe working environment. A good workplace safety plan must have essential elements such as commitment shown by company; monitoring of company equipment, work conditions and employ behaviour in workplace; an escape plan which should include escape routes; and, regulatory compliance of federal and provincial laws etc. The plan should give equal importance to other issues such as; communication; active participation; organization's clarity and transparency; organizational safety committee; minimum standard; and, accident insurance.

A typical Health and Safety plan is mentioned along with mitigation measures and best management practices as shown in **Table 7-3**. The Plan should be implemented to ensure that no significant adverse worker's health and safety issues arise from activities associated with the Project. The Plan will apply to all POL personnel, employees and contractors for the project. The plan is based on the following objectives:

- To identify the specific stress factors in work;
- To find out strategies for the reduction, prevention and cures for such stress factors;
- To identify corresponding measures to improve health and safety in workplaces;
- To make available the gathered knowledge to other organizations and thereby make a contribution to the successful work with and for multicultural and marginalized clients and in multicultural work teams;
- Preparation of training manual, conflict resolution for staff and others, and the advice; and
- Arrange availability of appropriate emergency response, rescue, and first-aid personnel and services.

Table 7-3: Worker's Health and Safety Plan

Aspects	Safety Guidelines
Workplace Health & Safety Committee	• An occupational health and safety committee is a forum for cooperative involvement of employees representing both labor and management which assists in bringing the responsibility system into practice. Committee can be more effective in resolving OHS problems than a single individual

Safe and Effective Work Practices	• Rules should be specific to health safety concerns in the workplace; • Occupational health and safety committee should participate in their formulation of rules; • Rules should be stated in clearly understandable terms; • The reasons for the rule should be explained; • Rules must be enforceable, since disregard for one rule will lead to disregard for others; • Rules should be available to all employees in written form, in the languages of communication of employees; and • Rules should be periodically reviewed to evaluate effectiveness and to make changes for improved effectiveness
Training	• Survey employees should be trained for the work they carry out and be familiar with the manufacturer's safe operating procedures (SOPs) and guidelines in the instruction manuals that accompany the survey equipment and tools they use.
Tracking System	• Develop a tracking system to record where employees are working each day; • Record the planned survey routes or work sites on a centrally located map or white board at the camp or base; and • Location updates including changes in plans should be called in and recorded.
Communication System	• Develop a communication call-in system to maintain contact with employees; and • Employees should carry functioning communications equipment appropriate for the area
Emergency Response Plan (ERP)	• Survey crews should acquire induction on ERPs that address site specific risks and hazards and potential injuries associated with specific surveys, terrain and the degree of remoteness; and • When a contractor's employees are based at a project site, the ERP for survey crews should be integrated with the exploration project ERPs
Tool and Equipment Check	• Before departing for work, each survey crew should check their equipment. They should have: (a) all tools, fully charged communication and navigation equipment with spare batteries; (b) required personal protective equipment (PPE), as appropriate; (c) suitable clothing for the weather and potential changes; and (d) appropriate survival kits and first aid kits. If conditions are dry, carry fire suppressant materials when using tools or survey equipment that

	could start a fire (e.g., chainsaw, small generator or electrical equipment).
Transportation	• Crews should perform an inspection check of their mode of transportation to make sure it is in good working order and all equipment is present.
Supervision	• Workers should receive appropriate supervision in the field while performing survey.
Weather Related Risks	• Be fully prepared for the local weather and climate; • Carry a suitable survival kit, extra water and food, etc.; • Wear appropriate clothing and carry rain gear and extra clothing in case you become stranded and must spend a night away from camp; and • Lightning can be a serious risk depending on the location and especially when carrying out electrical surveys.
Personal Protective Equipment (PPEs)	• Required PPEs will vary depending on the risks and hazards of type of survey procedures and the terrain; • Safety glasses are required. It is usually advisable to wear high visibility vests; and • Hearing protection may be required (e.g., when using a chainsaw). Wear gloves to protect hands from cuts and infections.
Fire Risks	• Carry appropriate fire extinguishing equipment, including: a fire extinguisher, extinguishing powder, water and/or a small shovel when using gasoline powered machinery (e.g., chainsaws, generators, brush cutters, power augers); and • Keep the exhaust area clear of vegetation and place hot machinery on bare rock so it will not start a fire. Always observe fire bans.
Seismic Survey	• Employees who carry out seismic surveys should be competent and fully trained; • If explosives are used, obtain appropriate permits and make sure blasters have proper certification; • Most willow holes used to contain explosives are dug by hand so employees should be trained to use their tools safely and keep them in good working order; • Wear appropriate PPEs when using tools and equipment, which may include ear protection from noise as well as eye protection, good footwear and high visibility vests; • Develop a protocol to make sure the area is clear before a blast takes place



Activity Completion	• When an activity is completed, remove all equipment, including wires. Fill in holes if they present a future tripping hazard to workers or to animals; • Care should be taken in dismantling of industrial components and transporting large equipment.
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7.10 Waste Disposal Plan

The waste disposal plan described below will be employed during the proposed construction and seismic activities.

7.10.1 Effluents and Solid Waste

Every effort will be made to minimize the waste generated while the project is in progress. Following are the types of waste that can be generated.

- Fuels, oils, and chemicals
- Garage waste
- Sewage
- Camp waste
- Medical waste
- Demolition waste
- Packing waste
- Excess construction material

7.10.2 Fuel, Oils and Chemicals

Used fuels, oils and chemicals will be stored in containers in areas lined with impervious floors surrounded by containing dykes at the campsite. Recyclable material will periodically be transported out of the project area and sold to contractors. Non-recyclable material will be transported to burn pits for appropriate disposal.

Spilled fuels and oils will be collected and burned in the burned pit. Spilled chemicals will be handled and disposed of according to the material safety data sheet. The contaminated soil will be collected and buried, or burned, as appropriate.

7.10.3 Garage Waste

Most Garage waste, such as filters and spare parts, can be recycled, and will be collected and transported out of the project area and sold to recycling contractors. Non-recyclable garage waste will be collected and transported to burn pit for appropriate disposal.



7.10.4 Sewage

Sewage from toilets will go into septic tanks, from which, after being treated, the wastewater will go into a soak pit, and the solid waste will be collected. The solid waste from septic tanks will be emptied periodically, and the waste transported in tankers to municipal sewage treatment facilities in nearby city.

A drainage and sewerage system will be constructed for the camps. The sewerage system will consist of soak pits for the collection and treatment of wastewater from the camp kitchen, laundry, and showers. Water from the soak pits will be sprayed over the ground, allowing it to soak away or evaporate.

7.10.5 Camp Waste

All combustible domestic waste will be burned at burn pit and the remainder will be buried in lined pits. Any non-combustible and non-biodegradable waste, such as glass metal, or plastic, will be separated and transported out of the project area, where it will be sold to a contractor for recycling.

7.10.6 Medical Waste

Medical waste will be stored in sealed containers and transported to the Hospital in nearby city for incineration.

7.10.7 Demolition Waste

Recyclable demolition waste will be given away for reuse. The remaining waste will be buried in lined pits.

7.10.8 Packing Waste

Recyclable packing waste will be given away to approved recycling contractors. Non-recyclable packing waste will be buried at the burn pit.

7.10.9 Excess Construction Waste

Leftover construction material will be given away to material suppliers or other users. The remainder will be buried in lined pit.

Table 7-4: Table Showing Waste Disposal Plan with Respective Project Phases

Type of Waste	Description	Project Phase	Disposal Method
Camp Waste	Animal, fruit and vegetable residue, domestic garbage	All phases	Recyclable waste to be given away for recycling, non-recyclable ,combustible to be burned at burn pits or buried in lined pits



Packaging Waste	Paper, plastic, textiles, cardboard, rubber, wood, glass, tin cans, aluminum cans	All Phases	Combustible waste to be burned at burn pits, recyclable waste to be provided to recycling contractor
Medical Waste	Syringes, glass bottles, soiled bandages, expired drugs, dressings	All phases	To be incinerated in a facility through contractors
Workshop Waste	Used oil, ferrous/non-ferrous materials, batteries, oil	All phases	Provided to a certified recycling contractor
Sewage and Gray Wastewater	Wastewater from kitchen and washing areas, sewage	All phases	Sewage to be disposed of using septic tanks and soak pits; solid residue to be disposed of in sewage treatment facilities. Wastewater from kitchen and washing areas to be disposed of in soak pit



8.0 STAKEHOLDERS CONSULTATION

The consultation with general public and concerned stakeholders is a tool used for the purpose of communication, taken to include; information dissemination, exchanging views, soliciting feedback and suggestions on issues pertaining to the project, plan future actions, initiate a needs assessment and identify areas of concern.

During the EIA field survey for this study, meetings were held with the communities residing within the project area of Noor Prospect in Ikhlas E.L. and its immediate surroundings. In the same vein, meetings were held with community and members of local and provincial government. All the stakeholders were briefed regarding the proposed exploration and associated development activities planned by POL. Their concerns and suggestions were recorded in details which are reproduced in this chapter.

Various stakeholders including the local communities, local leaders, local government representatives, NGOs, workers/ employees of POL and others were consulted in detail about the proponent's likely activities in the area.

8.1 Objectives of Public/ Stakeholders Consultation

Consultation with stakeholders and public/communities residing in the project area i.e. where the project activities are planned, provides better dissemination of information about project and also gives the proponent a clearer understanding of the stakeholder's and general public's perspective. Effective consultation process can add substantial value to the EIA process. The information gained through consultation process can provide stakeholders/ public concerns, interests and their ability to influence decision making and also helps to identify key causes of environmental problems.

This can be used to evaluate direct and indirect environmental impacts and assess short term and long-term resources use implications. The input from local communities and affected stakeholders can help evaluating alternatives and strengthen the management planning by incorporating local inputs and know-how. These factors contribute towards improved project implementation sensitized to the socio-economic environment of the area. The objectives of stakeholders/ public consultation were to:

- Promote better understanding of the proposed operation through explaining its objectives and potential positive and negative impacts particularly on the local communities;
- Identify and address the concerns of all interested and affected stakeholders;



- Provide a mechanism to resolve issues identified by communities, before project plans are finalized and development begins thereby, avoiding public outcry and resentment; and
- Instill trust between various stakeholders and the proponent to promote cooperation

8.2 Project Stakeholders

Stakeholders are those people who may be directly or indirectly affected by the project or who may have an influence on, or an interest in, the project. While planning the public consultation process, stakeholders were split into two categories: primary stake holders and secondary stakeholders.

- The term ‘**primary stakeholder**’ has been used for all those people who may be directly affected by the project activities. For this project, primary stakeholders are limited to local community members.
- The term ‘**secondary stakeholders**’ refers to individuals and organizations that will not be directly affected by project implementation, but that do have an influence on or an interest in the area.

During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. Different stakeholders were identified during the field survey and they had different types of stakes and concerns according to their professions.

8.3 Community Consultations

Community consultations were carried out in the project area through formal and informal meetings, focus group discussions and in depth interviews especially covering issues related to ‘gender’. Environmentalist having a vast experience of carrying out socio-economic surveys and consultations, initiated the sessions by giving a brief, simple and non-technical description of the project providing an overview of all likely positive and negative impacts. This was followed by an open discussion in which all participants were encouraged to voice their concerns and opinions. Feedback obtained from the stakeholders was documented and all issues and suggestions raised were recorded in detail. Through this process the consultant reached out to a wide segment of the population of the area, whereby actively involving all stakeholders in the decision making process.

All information was imparted to the communities and other stakeholders in such a manner that their expectations were not unnecessarily or unrealistically raised in order to avoid any future conflict involving local public, leaders or administrators.



Formal and informal community consultations and focused group discussions were carried out in almost all visited villages during the field survey for the EIA.

8.3.1 Consultation Process

Primary stakeholders were consulted during informal and formal meetings held in the project area. The consultation process was carried out in the Punjabi and Urdu languages. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the proposed project, their feedback was documented during the primary stakeholder consultation. The issues and suggestions raised were recorded.

Secondary stakeholder consultations were more formal as they involved government representatives and local people during face-to-face meetings and through telephonic conversations. They were briefed on the EIA process, the project design, and the potential negative and positive impact of the project on the area's environment and communities.

It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid undue conflict with tribal leaders or local administrators. The issues recorded in the consultation process were examined, validated, and addressed in the EIA report.

8.4 Stakeholder Consultation Technique

In recognition of the diversity of views within any community, it is very important to obtain a clear understanding of the different stakeholders and to analyse their capacity and willingness to be involved in some or all of the project and its planning process. It is important to be aware of how different power relations can distort participation. It is also important to examine how community skills, resources, and 'local knowledge' can be applied to improve project design and implementation. All of this can be achieved by careful use of the various tools of Stakeholder Consultation. Therefore, the following participatory techniques were employed during stakeholder consultations:

- Informal meetings with communities in villages. Men and village elders attended these meetings
- Focus Groups participants in villages

8.4.1 Stakeholders Consulted

In the consultation process for EIA, following key stakeholders were consulted:

- Local communities, Men and village elders attended meetings.



Meetings with stakeholders consisted of community consultation meetings, focus group discussions, and in-depth interviews with men and limited focus-group discussions. The location of the meetings, the process followed, and the outcomes are discussed in this section.

8.5 Stakeholder Concerns and Recommendations

All these have been addressed in various sections of the EIA, and the mitigation plans have been incorporated into the EMP.

8.5.1 Community Concerns

Project Approval

The community consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities was evident. The consultations were considered a good gesture and appreciated, especially by the villagers. The poverty level is such that communities are looking to any project proponent to improve their financial well-being to an extent. POL recognizes that benefits from the project should be distributed judiciously and equitably especially among primary stakeholders in the project area, and will continue to ensure that this principle is followed in its projects and community development program.

Resettlement/ Relocation

It is the desire of the members of the community that all resettlement issues shall be resolved prior to the commencement of the proposed project.

Interaction with Local Community

Non-Local work force coming in the project area that will not be aware of the local customs and norms, may result in conflicts with the local community, keeping in mind the sensitive law and order situation and culture of the area.

Impact on Livelihood

The communities also expressed some fear that vehicles would disturb their cattle and that their livestock might get hurt or run away or die accidental death due to vehicular movement.

8.6 Alternative Site Options

Several concession areas and exploration sites exist in Pakistan and a number of national and international companies, in addition to public sector organizations, are already actively engaged in oil and gas exploration.

The site for oil or gas exploration is chosen after extensive geological and land surveying, and not every concession area necessarily shows promise. They are considered an attractive area for gas exploration in Pakistan for a variety of geological reasons. Geological and geophysical investigations have been undertaken to assess whether the characteristics discussed below exist in the earth's subsurface in the region.

Trap / Structure

When a porous reservoir rock forms an anticline deep in the subsurface, it may trap migrating hydrocarbons. The presence of such a structure at depth is indicated by surface geological studies and confirmed by recording seismic surveys.

Reservoir Rock

This is a porous rock capable of holding hydrocarbons within its pores. These rocks can be limestone or sandstone. The Pab sandstone forms an excellent reservoir within the block area.

Table 8-1: Consolidated Matrix of Concerns Raised by the Communities during Stakeholder Consultations

Sr. No.	Issues	Concern Raised by the Community	Communities' Remarks
1.	Interaction/ Conflict with Local Community	Non-Locals unaware of the local customs may lead to conflicts.	No project activity at times when women must leave their homes for chores.
2.	Employment	Provision of semi-skilled and unskilled jobs for the local labour.	Maximum unskilled jobs should be allocated to be locals. Training program should be initiated to train locals who should then be employed for the project.
3.	Livelihood	Restriction of livelihood grazing and accidental killings of livelihood.	Grazing and vegetation areas should be protected and speed of vehicles should be limited to avoid accidents.

Table 8-2: Table Showing Remarks/ Suggestions from the Stakeholders of the Proposed Project

Sr. #	Name	Study Area/ Department	Remarks/ Suggestions
1.	Divisional Forest Officer (DFO)	Divisional Forest Office- District Attock	No major concerns related to seismic data acquisition. Economic benefit for the country as well as local area.
2.	Mr. Mehmoob Hussain	Dewal Village	We have no Major concern about proposed project. We expect that project will provide opportunities to the local enhance business and excel the economy of the country.
3.	Mr. Shakir	Dewal Village	Environmental pollution and deterioration of aesthetic view.
4.	Mr. Zafar	Dhok Dhurian Village	The workers and staff members will abide by local cultural values
5.	Mr. Muhammad Ali	Lund	No issues with POL or their operations in the area.
6.	Mr. Hikmat Khan	Thathi Noor Ahmed Shah	Do not affect any irrigation channel in surrounding and do not contaminate irrigation channel with any type of solid waste.
7.	Mr. Shahid	Dhok Inayat	Disturbance caused due to project activities.
8.	Mr. M. Ghufraan Mr. Ch. Ijaz Khan	Lund	The project contractors will ensure to fulfill all the requirements of environmental protection so that minimum environmental disturbance is created.
9.	Mr. Amjad Ali	Dhok Dhurian Village	Damage to Environment
10.	Mr. Ahsan Riaz	Dhok Inayat Village	Health Impacts due to improper waste disposal



3D Seismic Data Acquisition over Noor Prospect in Ikhlas E.L., District Attock

11.	Mr. Imran	Sohal	- Public health concerns - Solid Waste should be properly disposed off
12.	Mr. Raja Amir	Sohal	Economic development and job opportunities

8.7 Pictorial Evidence

Table 8-3: Pictorial Evidence of Stakeholders Consultation during the Site Visit

	
Views from the Local Utility Store Owner in Dewal	An interaction with the Local Landowner in Dhok Dhurian
	
A discussion with Shopkeepers of the Project Area	
	
Opinions Shared by Principal of Higher Secondary School	Government Primary School near the Project Area



9.0 CONCLUSIONS AND RECOMMENDATIONS

The EIA study has evaluated the project activities in detail. Impacts from these activities have been considered and mitigation measures are proposed therein. The report includes a comprehensive environmental management plan to be owned and implemented by POL during the time frame of the project as a tool to enable sustainable construction and seismic activities while they are being conducted in the demarcated area of Noor in Ikhlas E.L.

9.1 Findings

The EIA Study has identified the significant environmental aspects likely to arise from the project activities. Assessment of the environmental aspects and screening of potential impacts of the proposed activities pertaining to the project finds that:

- The impacts of construction activities in most of the project area will be insignificant, provided the mitigation measures proposed in this report are implemented. Elements on which activities may have a significant impact, additional mitigation measures are given to reduce impacts to as low as reasonably possible.
- Project construction activities will cause temporary impact on local environment all of which are reversible.
- Existing access roads will be used as much as possible to minimize environmental impacts in the area.
- The access track will be properly compacted at the time of construction and thereafter properly maintained by watering and compaction (where required) throughout the entire project activities.
- No significant damage to wildlife, vegetation or habitats is anticipated from the proposed project.
- No residential property, cultural/historical or archaeological sites would be affected by the project.
- No adverse socioeconomic impact of the project is envisaged.
- Employment opportunities will be provided to local population.
- By adopting recommended mitigation and safety measures little environmental impact of the project can be eliminated.



- Apart from adopting of earlier discussed mitigation and safety measures during construction and operation phases of the project an environmental management plan has been proposed. This plan will further ensure that any adverse environmental impact is mitigated and managed appropriately.

9.2 Recommendations

A number of proactive measures have been suggested in the EIA report, which should be commended. In order to ensure mitigation is successful and impacts are minimized, the focus should be on ensuring operations follow the established procedures, training of key personnel in oil spill response is carried out and exercises are run to ensure that all personnel receive basic environmental awareness training and contingency plans are in place to deal swiftly with any potentially polluting incidents. Some key recommendations include:

- The structures and materials conform to recommended standards and follow standard practice of civil works.
- Environmentally sound materials and goods are selected, with priority being accorded to products meeting national and international standards.
- Traditionally well-tried materials are chosen for provision of utilities services in the project.
- Temporary inconveniences due to construction works are minimized through planning and coordination with local population and organizations in the neighborhood.
- Monitoring will be an integral part of the project to ensure environmental safeguards.
- In order to control emissions, technological controls and advanced process interventions may be installed.
- To assess water feasibility, it is recommended that groundwater study to assess underground water potential may be done by proponent to assess feasibility of groundwater abstraction.
- Water conservation practices are adopted at all stages of project. Concept of rainwater harvesting and groundwater recharge through inverted wells may be considered in project plans which will increase water availability and also enable groundwater recharge. Utilization and adoption of green energy sources, solar panels, into the project.



9.3 Conclusions

In conclusion, there is obvious dedication by POL to carrying out these activities to a high environmental standard. Given the current operational commitments and proposed mitigation measures, it is considered that the proposed construction and exploration activities can be undertaken without significant impacts to the project's macro-environment. The study therefore recommends that the EIA Report may be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management Plan (EMP) will be followed in letter and spirit.



Annexure I: References

- Meteorological Data (<http://power.larc.nasa.gov/data-access-viewer/>)
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- Punjab Environmental Quality Standards (PEQs)
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- Water Resources of Pakistan (waterinfo.net.pk)
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- Zoological Society of Pakistan (<http://zsp.com.pk>)
- Fauna and Endangered Wildlife of Pakistan (<http://pakistanpaedia.com>)
- Worldwide Fund Pakistan (<http://www.wwfpak.org/>)
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- Pakistan Seismic Activities and Zoning Map by Seismic Monitoring and Early Tsunami Warning Center, Pakistan Meteorological Department.
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Annexure II: Lease Information-Block Award

PETROLEUM CONCESSION
AGREEMENT

FOR

BLOCK 3372-18 (IKHLAS)
Zone I

BETWEEN

THE PRESIDENT OF THE ISLAMIC
REPUBLIC OF PAKISTAN

AND

PAKISTAN OILFIELDS LIMITED



IN WITNESS WHEREOF this Agreement has been duly signed by the respective Parties hereto as of the 22nd day of November 2003.

For and on behalf of
THE PRESIDENT OF THE ISLAMIC
REPUBLIC OF PAKISTAN

BY : [Signature]

WITNESSES:

1) [Signature]

2) [Signature]

For and on behalf of
PAKISTAN OILFIELDS LIMITED

BY : [Signature]

WITNESSES:

1) [Signature]

2) [Signature]

Annexure III: Water Sample Analysis Report



National Cleaner Production Center Foundation

Registered under Section 42 of the Companies Ordinance, 1984



NCPC/EL/F20-9/24092024
September 24, 2024

Test Report of Drinking Water Analysis
POL -EIA Study for 3D Seismic Data Acquisition in Noor Prospect in
Ikhlas E.L., District Attock

Sample Description: Drinking water	Contact Person: Mr. Nayyar Humair
Date of Sampling: 03-09-2024	Customer's Address: Tehsil Fateh Jang and Pindi Gheb of District Attock.
Date of Reporting: 24-09-2024	No. of Samples: 01
Sample No: EL/25/2	

Sr. No.	Parameter	Results	PEQS	LOD	Units
1.	pH	7.2	6.5-8.5	0.01	-
2.	TDS	729	< 1000.0	1.0	mg/L
3.	Chloride	183.3	< 250.0	0.24	mg/L
4.	Total Hardness	120	< 500.0	0.1	mg/L
5.	Alkalinity	4.0	-	0.5	mg/L
6.	Turbidity	< 0.1	< 5.0	0.1	NTU
7.	Nitrate	3.2	≤ 50	0.1	mg/L
8.	Odor	odorless	Non-Objectionable	-	-
9.	Taste	sweet	Non-Objectionable	-	-
10.	Color	< 1.0	≤ 15 TCU	1.0	Pt/Co
11.	Sodium	11.7	-	0.0037	mg/L
12.	Potassium	0.03	-	0.0009	mg/L
13.	Calcium	27.2	-	1.0	mg/L
14.	Magnesium	12.6	-	1.0	mg/L
15.	Sulphate	73.7	-	0.41	mg/L
16.	Carbonates	< 0.12	-	0.12	mg/L
17.	Bi-Carbonates	4.8	-	1.2	mg/L
18.	Conductivity	1,167.0	-	1.0	µs/cm
19.	Total Coliform	Negative	Must not be detectable in any 100mL sample	-	Cfu/100mL
20.	Fecal Coliform	Negative	Must not be detectable in any 100mL sample	-	Cfu/100mL
21.	E. Coli	Negative	Must not be detectable in any 100mL sample	-	Cfu/100mL

PEQS: Punjab Environmental Quality Standard
NGVS: No Guideline Value Set

BDL: Below Detection Limit
MPN: Most Probable Number

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REFINERY P.O. MORGAH, RAWALPINDI (PAKISTAN)
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EMAIL: ncpc.rwp@gmail.com Website: www.ncpc.com.pk



National Cleaner Production Center Foundation

Registered under Section 42 of the Companies Ordinance, 1984

Note:

1. All Parameters results are in mg/L except pH, Colour, Turbidity, Electrical Conductivity, Total Coliform, Faecal Coliform and E. Coli

REMARKS:

1. This report shall not be reproduced / made part of any investigation / inquiry or for any litigation purpose.
2. Tests performed by EPA certified laboratory. NCPC is an EPA Certified Laboratory (Certificate No. 168/DD (Lab) /EPA /05 /2019) w.e.f May 28, 2019.


Environmental Lab Incharge
Date: 24-09-2024


Coordinator NCPC
Date: 24-09-2024



Annexure IV: Ambient Air and Noise Analysis Report



National Cleaner Production Center Foundation

Registered under Section 42 of the Companies Ordinance, 1984



NCPC/EL/F20-9/24092024
September 24, 2024

Test Report of Ambient Air Analysis
POL -EIA Study for 3D Seismic Data Acquisition in Noor Prospect in Ikhlas E.L., District Attock

Sample Description: Ambient Air Analysis	Contact Person: Mr. Nayyar Humair
Date of Testing: 02,03-09-2024	Customer's Address: Tehsil Fateh Jang and Pindi Gheb of District Attock.
Date of Reporting: 24-09-2024	No. of Samples: 01
Sample No: EL/25/1	

Sr. No	Parameters	Results	PEQS	Unit
1	Carbon Monoxide (CO)	1.4	5.0 (08 Hours)	mg/Nm ³
2	Sulphur Dioxide (SO ₂)	1.38	120 (24 Hours)	µg/Nm ³
3	Nitrogen Dioxide (NO ₂)	16.5	80 (24 Hours)	µg/Nm ³
4	Nitrogen Oxide (NO)	3.4	40 (24 Hours)	µg/Nm ³
5	Ozone = (O ₃)	51.1	130 (01 Hours)	µg/Nm ³
6	Respirable Particulate Matter (PM ₁₀)	62.5	150 (24 Hours)	µg/Nm ³
7	Respirable Particulate Matter (PM _{2.5})	6.7	15 (1 Hours)	µg/Nm ³

PEQS: Punjab Environmental Quality Standards.

Remarks:

1. This report shall not be reproduced / made part of any investigation / inquiry or for any litigation purpose.
2. NCPC laboratory is an EPA certified laboratory (Certificate No. 168/DD(Lab) /EPA /05 /2019) w.e.f May 28, 2019.

Environmental Lab Incharge

Date: 24-09-2024

Coordinator NCPC

Date: 24-09-2024

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National Cleaner Production Center Foundation

Registered under Section 42 of the Companies Ordinance, 1984



NCPC/EL/F20-9/24092024
September 24, 2024

Test Report of Noise Monitoring Analysis POL -EIA Study for 3D Seismic Data Acquisition in Noor Prospect in Ikhlas E.L., District Attock

Sample Description: Noise Level	Contact Person: Mr. Nayyar Humair
Date of Sampling: 03-09-2024	Customer's Address: Tehsil Fateh Jang and Pindi Gheb of District Attock.
Date of Reporting: 24-09-2024	No. of Samples: 01
Sample No: EL/25/1	

Sr. No	Sampling Locations	PEQS (Industrial Area) 75 dB (A) Day Time 65 dB (A) Night Time
1	Point 1	58.6 (Day Time)

PEQS: Punjab Environmental Quality Standards.

REMARKS:

1. This report shall not be reproduced / made part of any investigation / inquiry or for any litigation purpose.
2. Test performed by NCPC EPA certified laboratory (Certificate No. 168/DD(Lab) /EPA /05 /2019) w.e.f May 28, 2019, but Noise monitoring is not certified.

f. Waqar
Environmental Lab Incharge
Date: 24-09-2024

M. Javed
Coordinator NCPC
Date: 24-09-2024

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Annexure V: Soil Sample Analysis Report



National Cleaner Production Center Foundation

Registered under Section 42 of the Companies Ordinance, 1984



NCPC/EL/F20-9/24092024
September 24, 2024

Test Report of Soil Analysis

POL -EIA Study for 3D Seismic Data Acquisition in Noor Prospect in Ikhlas E.L., District Attock

Sample Description: Soil	Contact Person: Mr. Nayyar Humair
Date of Sampling: 03-09-2024	Customer's Address: Tehsil Fateh Jang and Pindi Gheb of District Attock.
Date of Reporting: 24-09-2024	No of Sample.: 01
Sample No: EL/25/2	

Sr. No	Parameter	Results	Units
1	pH	8.47	-
2	Electrical Conductivity	1.9	mS/cm
3	Arsenic	1.64	ppm
4	Lead	9.46	ppm
5	Zinc	29.9	ppm

REMARKS:

1. This report shall not be reproduced / made part of any investigation / inquiry or for any litigation purpose.
2. Test performed by EPA Certified Laboratory. NCPC laboratory is an EPA certified laboratory (Certificate No. 168/DD (Lab) /EPA /05 /2019) w.e.f May 28, 2019.


Environmental Lab Incharge

Date: 24-09-2024


Coordinator NCPC

Date: 24-09-2024

Annexure VI: EPA Validation Sheet



ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore



Validation for Stack & Ambient Monitoring / Sampling

Emission Monitoring under CTM-34 or OTM-39			
Facility Name & Address	POL	No of Stacks / Sampling Point	
Phone	POL, Noor Prospect in Ikhlas, District Attock.	01	
Industry Category	Oil & Gas Industry.		
Analyzer Model & Make			
Average stack emission Values of CO, NOx (in mg/nM3)			
Excess Air / Excess Oxygen (%age):-			
Analyzer exposed for Ramp-Up phase to the sample gas for 5 minutes	Yes	NO	NA
Analyzer flow rate and EC temperature monitored during calibration and testing	Yes	No	NA
Test Data Phase of sample gas recorded with 15 second interval	Yes	No	NA
All key requirements to ensure QA/QC complied for said EPA approved Method	Yes	No	NA
Particulate Matter (PM) Monitoring / Sampling under USEPA Method 5 / 17			
Model & Make of Iso-kinetic PM Assembly			
The PM sampling train is complete as per Method 5 & 17	Yes	No	NA
Leak Test performed prior to sampling	Yes	No	NA
Field data Sheet for PM Sampling filled during PM sampling	Yes	No	NA
Data for determining of "K" factor & DGM "Y" Factor filled during sampling	Yes	No	NA
All method key requirements during sampling were complied to ensure QA/QC	Yes	No	NA
Filter of Particulate matter is suitable for metal Testing	Yes	No	NA
SOx sampling as per Method 8 (Thorin Indicator Method)			
The right absorbent solution are available for SOx Sampling	Yes	No	NA
The equipment is capable to maintain flow rate @ 2.0LPM or as per method 8 requirement	Yes	No	NA
Sampling for SOx is performed as per method	Yes	No	NA
Ambient Air Quality Monitoring by Automatic Monitors for CO, O3, SO2, NOx, PM2.5 & PM10			
In case of continuous monitoring at a site, One Point QC Check Single analyzer & Zero/span check is performed every 14 days.	Yes	(No)	NA
The CE of NOx analyzer is ensured to be maintained within 96% - 104.1%	Yes	(No)	NA
Zero/span check is performed prior to starting ambient monitoring	Yes	(No)	NA
All key requirements for Critical & Operational Criteria for ambient air monitoring by automatic monitors were complied during monitoring	(Yes)	No	NA
The measuring techniques of monitors comply PEQS	(Yes)	No	NA
Ambient Air Sampling of SPM, PM10, Pb by High Volume Sampler			
In case of Sampling for SPM through samplers, the flow rate of sampler comply PEQS (1.1m3/min).	(Yes)	No	NA
Calibration of Sampler performed prior to sampling	Yes	(No)	NA
Vehicular Emissions & Noise Measurement			
Sampling of Vehicle emissions and noise measurement have been performed as per method and SOPs	Yes	No	NA

Remarks (If Any):-

Signature: *13-11-2024*

Name of EPA Officer with Office Address: *Research with Office Address*

Environmental Protection Agency
Govt. of the Punjab, Rawalpindi

Dated 02-09-2024

Mr. Nayyar Humair
Chemist, NCPC

Signature: *13-11-2024*

Name of Assistant /Deputy Analyst, Analyst:



ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF THE PUNJAB
National Hockey Stadium, Gate No. 08
Gaddafi Stadium Complex, Lahore



Validation for Wastewater & Drinking Water

Facility /Project Name & Address Phone	POL POL, Noor Prospect in Ikhlas, District Attock		Sampling Point 01
Waste Water (WW) Treatment facility Primary Secondary Tertiary NA		Drinking Water (W) Treatment Facility	
Total WW collected Sample		Total Collected Drinking water samples	
Sample Tag for testing parameter is assigned on sample container		Yes	NO NA
Sample is preserved properly for each testing parameter		Yes	NO NA
Sample size is adequate for testing the target parameters		Yes	NO NA
Wastewater Flow Measurement performed to ensure sample representativeness		Sample Type	
No. of Waste Water outlets	Waste Water Flow m ³ /hr from each outlet (Optional)	Water Intake m ³ /hr (Optional)	Water Mass balance compiled during sampling (Optional)
			Grab
			Grab Composite
Parameter	Matrix W WW	Container	Sample Size Preservation
Coliform, Total or Fecal	✓	Sterile Container	100 mL Refrigerate 6 C
Coliform, Total or Fecal, Chlorinated Water		Sterile Container	100 mL 0.008% Thiosulphate & cooled 6 C
Color, Turbidity	✓	P.G	500 mL Cool 6 C
Hardness, Total		P.G	500ml HNO ₃ to pH < 2
Nitrogen, Nitrate + Nitrite, Phenolic Compounds, Oil & Grease, COD, NH ₃	✓	P.G	2000 mL H ₂ SO ₄ to pH < 2, Cool 6C
Metals, General		P.G Rinsed I.I HNO ₃	500 mL HNO ₃ to pH < 2
Cyanide, Total		P.G	500 mL NaOH to pH > 12, Cool 6C
Pesticides, General		Glass	1 Liter Cool 6 C
Field Parameters*			
Field parameter		pH meter, Model Make	Measurement Method
pH			Calibrated In Field Measured value
Temp			Yes NO
Cl			

* Field testing parameters only be validated by RAs, ROs, DD (Labs)

Remarks for Sample Quality (if Any):-

Signature *13-11-2024*
Name of EPA Officer/Assistant
Inspector RAs, ROs or ADs /DDs
Environ. Poll. Control
Govt. of Punjab

Dated 03-09-2024

Mr. Nayyar Humair
Chemist, DDC

Signature
Name of Assistant /Deputy Analyst, Analyst
with Name of Private Lab along with Address

Annexure VII: List of Flora and Fauna

Flora of the Area

Sr. #	Botanical Name	Family	Life Type	Status	Habitat type	
					Agri. Land	Eroded Shrub Land
1	<i>Acacia modesta</i>	Mimosaceae	Tree	C		✓
2	<i>Acacia nilotica</i>	Mimosaceae	Tree	C	✓	✓
3	<i>Achyranthus aspera</i>	Amaranthaceae	Herb	C	✓	✓
4	<i>Acrachne ramosa</i>	Poaceae	Grass	C	✓	✓
5	<i>Aerva javanica</i>	Amaranthaceae	Herb	R	✓	
6	<i>Amaranthus graecizans</i>	Amaranthaceae	Herb	R	✓	
7	<i>Amaranthus viridis</i>	Amaranthaceae	Herb	C	✓	
8	<i>Aristida mutabilis</i>	Poaceae	Grass	C	✓	✓
9	<i>Artemisia scoparia</i>	Asteraceae	Herb	C	✓	✓
10	<i>Boerhaavia procumbens</i>	Nyctaginaceae	Herb	C	✓	✓
11	<i>Broussonetia papyrifera</i>	Moraceae	Tree	R	✓	
12	<i>Brachiaria ramosa</i>	Poaceae	Grass	C	✓	✓
13	<i>Calotropis procera</i>	Asclepiadaceae	Shrub	C	✓	✓
14	<i>Capparis deciduas</i>	Capparidaceae	Shrub	R		✓
15	<i>Carthamus oxycantha</i>	Asteraceae	Herb	C	✓	✓
16	<i>Cenchrus ciliaris</i>	Poaceae	Grass	C	✓	
17	<i>Chenopodium album</i>	Chenopodiaceae	Herb	C	✓	
18	<i>Chromophores obliqua</i>	Euphorbiaceae	Herb	C	✓	✓
19	<i>Chrysopogon aucheri</i>	Poaceae	Grass	C	✓	✓
20	<i>Alternanthera sessilis</i>	Amaranthaceae	Herb	C		✓
21	<i>Convolvulus arvensis</i>	Convolvulaceae	Climber	C	✓	
22	<i>Asphodelus tenuifolius</i>	Liliaceae	Herb	C		
23	<i>Conyza canadensis</i>	Asteraceae	Herb	C	✓	✓
24	<i>Cordia myxa</i>	Boraginaceae	Tree	R	✓	
25	<i>Cymbopogon jwarancusa</i>	Poaceae	Grass	C		✓
26	<i>Coronopus didymus</i>	Brassicaceae	Herb	C	✓	
27	<i>Cuscuta reflexa</i>	Cuscutaceae	Parasite	C	✓	✓
28	<i>Celosia argentia</i>	Amaranthaceae	Herb	C	✓	
29	<i>Albizia lebbeck</i>	Meliaceae	Tree	R	✓	
30	<i>Cynodon dactylon</i>	Poaceae	Grass	VC	✓	
31	<i>Schoenoplectus sp.</i>	Cyperaceae	Sedge	C	✓	
32	<i>Cyperus rotundus</i>	Cyperaceae	Sedge	VC	✓	
33	<i>Dactyloctenium scindicum</i>	Poaceae	Grass	VC	✓	
34	<i>Dalbergia sissoo</i>	Papilionaceae	Tree	C	✓	
35	<i>Cassia absus</i>	Caesalpiniaceae	Herb	C	✓	



36	<i>Desmostachya bipinnata</i>	Poaceae	Grass	VC	✓	✓
37	<i>Dicanthium anulatum</i>	Poaceae	Grass	C	✓	
38	<i>Fagonia indica</i>	Zygophyllaceae	Herb	C	✓	✓
39	<i>Dodonea viscosa</i>	Sapindaceae	Shrub	R		✓
40	<i>Eragrastis japonica</i>	Poaceae	Grass	C	✓	✓
41	<i>Eucalyptus globulus</i>	Myrtaceae	Tree	Cult.	✓	
42	<i>Heliotropium strigosum</i>	Boraginaceae	Tree	cult	✓	✓
43	<i>Ficus religiosa</i>	Moraceae	Tree	Cult.	✓	
44	<i>Ficus virgata</i>	Moraceae	Shrub	C	✓	
45	<i>Heliotropium europaeum</i>	Boraginaceae	Herb	R		✓
46	<i>Ipomoea carnea</i>	Convolvulaceae	Shrub	C	✓	
47	<i>Imperata cylindrica</i>	Poaceae	Grass	C		✓
48	<i>Lantana camara</i>	Verbenaceae	Shrub	C	✓	✓
49	<i>Launaea procumbens</i>	Asteraceae	Herb	C	✓	✓
50	<i>Mangifera indica</i>	Anacardiaceae	Tree	Cult.	✓	
51	<i>Euphorbia helioscopia</i>	Euphorbiaceae	Herb	C		
52	<i>Pongamia pinnata</i>	Papilionaceae	Tree	Cult.		
53	<i>Malva sylvestris</i>	Malvaceae	Herb	C		
54	<i>Malvastrum coromendelianum</i>	Malvaceae	Herb	C	✓	✓
55	<i>Maytenus royleanus</i>	Celastraceae	Shrub	C		✓
56	<i>Melia azadirach</i>	Meliaceae	Tree	Cult.	✓	
57	<i>Prosopis glandulosa</i>	Mimosaceae	Shrub	C		✓
58	<i>Morus alba</i>	Moraceae	Tree	C	✓	
59	<i>Ochthocloa compressa</i>	Poaceae	Grass	VC	✓	✓
60	<i>Parthenium hysterophorus</i>	Poaceae	Grass	VC	✓	✓
61	<i>Pennisetum orientale</i>	Poaceae	Grass	C	✓	✓
62	<i>Pennisetum typhoides</i>	Poaceae	Grass	Cult.	✓	
63	<i>Periploca aphylla</i>	Asclepiadaceae	Shrub	C		✓
64	<i>Persicaria glabra</i>	Polygonaceae	Herb	R	✓	
65	<i>Echinops echinatus</i>	Asteraceae	Herb	R		✓
66	<i>Phoenix sylvestris</i>	Palmae	Tree	R	✓	
67	<i>Populus euphratica</i>	Salicaceae	Tree	Cult.	✓	
68	<i>Pupalea lappacea</i>	Amaranthaceae	Herb	R		✓
69	<i>Psidium guajava</i>	Myrtaceae	Tree	Cult.	✓	
70	<i>Tamarix aphylla</i>	Tamaricaceae	Tree	R		✓
71	<i>Salvia aegyptiaca</i>	Labiatae	Herb	C	✓	✓
72	<i>Solanum indicum</i>	Solanaceae	Shrub	R	✓	✓
73	<i>Saccharum bengalense</i>	Poaceae	Grass	C	✓	✓
74	<i>Saccharum spontaneum</i>	Poaceae	Grass	C		✓
75	<i>Salvia moorcroftiana</i>	Labiatae	Herb	C		✓
76	<i>Solanum nigrum</i>	Solanaceae	Herb	C	✓	✓
77	<i>Sorghum halepense</i>	Poaceae	Grass	C	✓	
79	<i>Sorghum vulgare</i>	Poaceae	Grass	Cult.	✓	
79	<i>Tribulus terrestris</i>	Zygophyllaceae	Herb	C	✓	



80	<i>Withania somnifera</i>	Solanaceae	Herb	C	✓	✓
81	<i>Xanthium strumarium</i>	Asteraceae	Herb	C	✓	✓
82	<i>Zaleya pentandera</i>	Aizoaceae	Herb	C	✓	✓
83	<i>Ziziphus nummularia</i>	Rhamnaceae	Tree	C	✓	✓
84	<i>Musa indica</i>	Musaceae	Tree	Cult.	✓	

C: Common

VC: Very Common

R: Rare

Cult: Cultivated

B. Birds observed in the area

Sr. #	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	<i>Trachybaptus ruficollis</i>	Little Grebe		X				X
2	<i>Coturnix</i>	Common Quail		X				X
3	<i>Columba livia</i>	Rock Pigeon		X				X
4	<i>Psittacula krameri</i>	Parakeet		X				X
5	<i>Centropus sinensis</i>	Common crow		X				X
6	<i>Alcedo atthis</i>	Kingfisher		X				X
7	<i>Merops orientalis</i>	Blue tailed ant eater		X				X
8	<i>Coracias benghalensis</i>	Indian roller/ Blue jay		X				X
9	<i>Pycnonotus cafer</i>	Red vented, Bulbul		X				X
10	<i>Saxicola caprata</i>	Pied bush		X				X
11	<i>Acridotheres ginginianus</i>	Myna		X				X
12	<i>Francolinus</i>	Black Partridge			X			X
13	<i>Streptopelia decaocto</i>	Collared dove		X				X
14	<i>Francolinus pondicerianus</i>	Grey Partridge	X					X
15	<i>Corvus splendens</i>	House Crow	X					X
16	<i>Passer domesticus</i>	House Sparrow	X					X
17	<i>Acridotheres tristis</i>	Indian Myna		X				X
18	<i>Streptopelia senegalensis</i>	Little Brown Dove		X				X
19	<i>Pycnonotus leucogenys</i>	White cheeked Bulbul		X				X



C. Mammals Observed in the Area

Sr. #	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	<i>Canis aureus</i>	Asian Jackal		X				X
2	<i>Canis lupus</i>	Wolf		X				X
3	<i>Felis chaus</i>	Jungle Cat		X				X
4	<i>Herpestes javanicus</i>	Grey Mangoos		X				X
5	<i>Hystrix indica</i>	Indian Porcupine		X				X
6	<i>Lepus nigricollis</i>	Indian Hare, Wild Hare		X				X
7	<i>Sus scrofa</i>	Indian Wild Boar		X				X

D. Reptiles Observed in the Area

Sr. #	Scientific Name	Common Name	Status				Occurrence	
			Abundant	Common	Less Common	Rare	Migratory	Resident
1	<i>Calotes versicolor</i>	Garden Lizard		X				X
2	<i>Echis carinatus</i>	Saw scaled viper			X			X
3	<i>Spalerosophis diadema</i>	Diadem Snake			X			X
4	<i>Uromastix hardwicki</i>	Spiny Tailed Lizard			X			X
5	<i>Varanus bengalensis</i>	Indian Monitor			X			X

C: Common

VC: Very Common

LC: Less Common

R: Rare

Cult: Cultivated



Annexure VIII: Emergency Response Plan (ERP)

Objective

This Emergency Response Plan (ERP) aims to outline the necessary actions and procedures to ensure the safety of personnel, protect the environment, and minimize damage to infrastructure during construction and seismic exploration activities in the Noor Prospect, Ikhlas E.L., Attock District. It provides a structured approach for responding to potential emergencies such as seismic events, accidents, fires, and other unforeseen incidents.

Scope

The ERP applies to all construction and exploration activities within the Noor Prospect of Ikhlas E.L. It covers:

- Seismic exploration activities
- Construction work (roads, camps, facilities, etc.)
- Personnel safety
- Equipment safety
- Environmental protection

Risk Assessment

The primary risks associated with seismic exploration and construction in this area include:

- **Seismic hazards:** Natural earthquakes or tremors induced by exploration activities.
- **Construction accidents:** Injuries, machinery failures, or structural collapse.
- **Fire hazards:** Potential fires during construction or exploration due to equipment or electrical failures.
- **Environmental risks:** Oil or chemical spills, contamination of water sources, and habitat disruption.

Roles and Responsibilities

- **Incident Commander (IC):** Oversees emergency response efforts, responsible for decision-making and resource allocation.
- **Safety Officer:** Ensures safety protocols are in place and followed, conducts risk assessments, and monitors ongoing operations.



- **Emergency Response Team (ERT):** Trained personnel responsible for immediate response to emergencies such as fire, seismic events, or accidents.
- **Environmental Officer:** Manages environmental concerns, including spill control and containment, and coordinates with local environmental agencies.
- **First Aid and Medical Personnel:** Provide immediate medical care in case of injuries.

Emergency Communication

- Establish a 24/7 emergency communication system, including:
- Dedicated emergency hotline
- Two-way radios for field personnel
- Satellite phones in remote areas
- Predefine contact points for:
- Local authorities (police, fire department, medical)
- Environmental Protection Agency (EPA)
- Local community leaders
- Company headquarters and response teams

Emergency Response Procedures

a. Seismic Event Response

During the event:

- Stop all operations immediately.
- Evacuate personnel from hazardous areas and assemble at designated safe zones.
- Assess the structural integrity of on-site buildings and infrastructure.

Post-event:

- Conduct a thorough inspection of all equipment, structures, and geological conditions before resuming operations.
- Provide medical attention to any injured personnel.
- Report the event to local authorities and relevant agencies.

Ongoing mitigation:

- Monitor seismic activity using specialized equipment.
- Train all personnel in seismic emergency drills.



Fire Response

Immediate actions:

- Activate the fire alarm and shut down all equipment.
- Use fire extinguishers or suppression systems if safe to do so.
- Evacuate personnel to designated fire assembly points.

Containment:

Fire Response Team engages in extinguishing the fire if manageable, while awaiting assistance from local fire services.

Post-fire actions:

- Assess the damage to the site and equipment.
- Investigate the cause and implement preventive measures.

Accidents and Injuries

First response

- Administer first aid and evacuate the injured to a medical facility if necessary.
- Isolate the accident area to prevent further injuries.

Investigation:

- Conduct an incident investigation to identify the cause.
- Implement corrective actions to prevent recurrence.

Spill Control (Oil or Chemical)

Containment:

- Immediately deploy spill control kits to contain the spill.
- Block off drainage channels to prevent contamination of water sources.

Reporting:

- Report the spill to environmental authorities.
- Engage specialized cleanup teams to remove and remediate the contaminated areas.



Evacuation Procedures

- Predefine evacuation routes and muster points.
- Conduct regular evacuation drills.
- Ensure that all personnel are familiar with evacuation protocols and locations of emergency equipment such as fire extinguishers, first aid kits, and emergency exits.

Coordination with Local Authorities

- Maintain regular communication with local authorities, including the district disaster management office, environmental agencies, and local health services.
- Notify authorities immediately in the event of a major incident requiring external assistance.
- Involve local communities in awareness programs regarding seismic and environmental risks related to exploration activities.

Training and Drills

- Provide all personnel with regular safety training covering:
- Emergency response procedures
- First aid
- Firefighting techniques
- Seismic event preparedness
- Conduct periodic emergency response drills to ensure readiness.

Emergency Equipment

Ensure the availability and maintenance of the following equipment at the site:

- Fire extinguishers and suppression systems
- First aid kits and medical supplies
- Spill control kits
- Seismic monitoring devices
- Emergency lighting and communication devices

Post -Emergency Review

Following any emergency, a detailed review of the response should be conducted to identify lessons learned and improve future preparedness. This should include:



- Incident debrief with all key personnel.
- A written report documenting the response, outcomes, and any corrective actions.
- Updated training and procedures based on the findings.

Conclusion

This ERP is designed to ensure that all risks are managed effectively, and that personnel, equipment, and the environment are safeguarded during construction and seismic exploration activities in the Noor Prospect of Ikhlas E.L. The plan is subject to periodic review and updates to reflect changes in operations or regulations.

This plan should be shared with all relevant stakeholders and regularly updated to ensure alignment with best practices and regulatory requirements.



Annexure IX: Meteorological Data

Meteorological Data of District Attock

Dates (month/day/year): 01/01/2023 through 12/31/2023
Location: Latitude 33.4744 Longitude 72.2364
Elevation from MERRA-2: Average for 0.5 x 0.625 degree lat/lon region = 447.46 meters
The value for missing source data that cannot be computed or is outside of the sources availability range: -999
Parameter(s):
T2M MERRA-2 Temperature at 2 Meters (C)
TS MERRA-2 Earth Skin Temperature (C)
T2MWET MERRA-2 Wet Bulb Temperature at 2 Meters (C)
QV2M MERRA-2 Specific Humidity at 2 Meters (g/kg)
RH2M MERRA-2 Relative Humidity at 2 Meters (%)
PRECTOTCORR MERRA-2 Precipitation Corrected (mm/day)
PS MERRA-2 Surface Pressure (kPa)
WS10M MERRA-2 Wind Speed at 10 Meters (m/s)
WS10M_RANGE MERRA-2 Wind Speed at 10 Meters Range (m/s)
WD10M MERRA-2 Wind Direction at 10 Meters (Degrees)
WS50M MERRA-2 Wind Speed at 50 Meters (m/s)
: Wind Direction at 50 Meters (Degrees)

YEAR	MO	DY	T2M	TS	T2MWET	QV2M	RH2M	PRECTOTCORR	PS	WS10M	WS10M_RANGE	WD10M	WS50M	WD50M
2023	1	1	10.06	6.12	4.9	3.91	50.38	0	96.74	1.25	1.9	176.25	1.69	161.81
2023	1	2	9.62	5.9	5.08	4.09	54.69	0	96.88	1.52	1.94	150.75	2.04	151.69
2023	1	3	8.3	4.89	4.23	3.97	57.62	0	97.02	2.01	2.71	247.81	2.66	248
2023	1	4	8.78	5.14	4.19	3.85	53.88	0	97.01	1.95	1.9	234.25	2.65	234.56
2023	1	5	10.33	5.7	4.64	3.66	45.56	0	97.05	1.08	1.61	169.94	1.41	169.88
2023	1	6	8.62	5.01	4.5	4.09	56.69	0	97.12	1.32	1.59	184.69	1.86	184.25
2023	1	7	8.44	6.7	5.65	4.88	68.56	0	97	2.24	2.16	234.06	3.46	234.25
2023	1	8	9.05	7.66	7.4	5.98	80.62	2.4	96.77	2.76	2.71	246	4.49	246.12
2023	1	9	10.65	8.94	8.68	6.35	77.75	0.01	96.8	2.55	3.72	279.44	3.74	279.94
2023	1	10	11.48	8.62	9.08	6.35	72.94	0.04	96.71	1.23	1.77	238.56	1.6	239.19
2023	1	11	10.17	9	9.2	7.08	88	13.64	96.17	1.88	3.77	175.75	2.66	176.31
2023	1	12	5.58	5.33	2.95	4.21	70.44	12.66	96.22	4.53	4.44	281.69	6.59	281.44
2023	1	13	2.92	1.62	-1.65	2.5	52.44	0.17	96.23	3.88	4.15	320.12	5.7	320.31
2023	1	14	4.43	2.8	1.08	3.36	64.38	1.11	96.52	2.88	2.11	316.38	4.28	317.44
2023	1	15	6.35	3.16	1.42	3.05	50.5	0	96.32	2.14	1.73	271.31	2.9	271.69
2023	1	16	5.83	3.27	1.62	3.3	56.88	0	96.47	2.16	1.73	234.81	3	235.75
2023	1	17	8.18	3.98	2.9	3.36	48.12	0	96.47	1.58	2.05	249.19	2.02	264.12
2023	1	18	7.37	3.97	3.01	3.66	54.62	0	96.66	1.68	2.39	161.12	2.46	161.06
2023	1	19	9.3	6.54	4.01	3.6	48.44	0	96.69	1.05	2.37	285.69	1.46	280.31
2023	1	20	8.82	6.99	5.04	4.33	61.38	0.38	96.56	1.97	1.91	249.06	2.87	249
2023	1	21	8.03	7.41	6.25	5.43	79.94	3.85	96.65	1.77	2.2	177.81	2.71	177.31
2023	1	22	7.33	6.36	4.97	4.76	74	0.34	96.6	2.15	2.06	313.12	3.23	312.25
2023	1	23	6.13	5.65	4.17	4.64	77.88	0.07	96.64	3.11	2.37	336.5	4.76	337.19
2023	1	24	6.74	5.29	3.62	4.15	66.44	1.7	96.3	2.56	2.1	325.81	3.76	326
2023	1	25	6.67	4.94	4.71	4.88	77.81	5.05	96.5	2.66	2.85	249.75	3.73	250.06
2023	1	26	7.05	5.46	4.26	4.46	69.31	0.49	96.8	2.45	1.05	332.56	3.52	333.75
2023	1	27	8.8	6.37	4.78	4.21	58.88	0	96.78	2.59	2.03	241.5	3.7	241.88
2023	1	28	9.6	7.52	5.26	4.27	56.12	0	96.39	2.48	1.62	243.81	3.62	244.38
2023	1	29	10.83	9.27	7.68	5.55	67.19	0.04	96.11	2.69	4.37	141.69	4.31	141.56
2023	1	30	8.09	7.64	7.65	6.59	93.44	20.59	96.68	3.37	3.98	66.62	5	67.44
2023	1	31	9.66	8.62	7.84	6.04	79.56	0	96.9	2.71	1.38	295.44	3.9	295.94
2023	2	1	9.61	8.1	5.92	4.7	62.12	0	96.74	3.13	3.46	256.62	4.6	256.94
2023	2	2	10.91	9.71	8.49	6.16	73.5	0	96.56	2.49	2.43	310.25	4.18	310.75
2023	2	3	10.6	9.53	8.37	6.1	74.75	0	96.55	2.78	1.78	217	4.47	231.88
2023	2	4	12.14	10.64	9.59	6.59	72.38	0	96.34	2.85	1.98	329.56	4.14	329.75

2023	2	5	13.87	11.3	9.76	5.98	59	0.83	96.09	1.69	1.98	147.38	2.28	146.88
2023	2	6	11.09	11.03	9.44	6.9	81.25	4.43	96.29	3.36	2.52	234.81	5.27	235.19
2023	2	7	11.13	9.26	7.48	5.25	63.56	0.02	96.21	2.78	2.99	325.06	3.95	325.5
2023	2	8	12.24	9.29	7.01	4.52	49.81	0	96.27	1.47	1.3	195.19	2.03	195.62
2023	2	9	9.77	8.95	8.04	6.35	79.56	10.29	96.08	3.42	4.41	105.19	5.35	106.94
2023	2	10	10.48	10.73	8.61	6.41	79.81	0.12	95.97	2.34	3.73	168	3.68	166.31
2023	2	11	9.81	7.77	4.86	4.03	54.31	0.24	96.31	3.16	4.7	205.19	4.74	205.12
2023	2	12	7.68	5.98	2.89	3.42	53.56	0	96.79	2.73	2.54	332.94	3.91	333.56
2023	2	13	10.19	7.44	4.19	3.48	45.88	0	96.58	2.45	3.8	234.88	3.36	235.5
2023	2	14	13.26	10.69	8.26	5.13	52	0	96.49	2.54	1.68	239.94	3.65	240.5
2023	2	15	16.26	13.39	11.48	6.47	53.81	0	96.3	2.12	2.23	202.12	2.88	202.19
2023	2	16	17.81	14.87	13.32	7.45	56.75	0	96.36	1.59	1.65	165.31	2.26	151.19
2023	2	17	18.69	15.76	13.85	7.45	54.94	0	96.46	1.42	2.65	96.75	2.09	114.12
2023	2	18	15.76	13.45	12.65	7.81	67.12	0	96.4	1.79	1.93	140.94	2.55	141.38
2023	2	19	15.91	14.79	12.94	8	69.38	0.04	96.23	2.68	2.82	83.5	4.8	69.81
2023	2	20	15.93	15.37	13.22	8.3	71.94	0.72	96.05	2.44	1.84	152.88	3.89	153.44
2023	2	21	15.68	14.01	11.66	6.84	61.75	0	96.2	2.8	1.84	289.12	4.16	289.5
2023	2	22	15.01	12.26	10.43	6.04	55.44	0	96.28	1.65	1.8	209.06	2.31	210
2023	2	23	15.15	13.09	10.33	5.92	54.75	0	96.31	2.86	2.48	253.56	4.08	254
2023	2	24	18.38	15.19	11.9	5.86	44.19	0	96.33	1.38	1.73	167.94	1.84	168.12
2023	2	25	17.22	16.03	12.78	7.2	58.31	0.01	96.48	2.48	4.58	117.75	4.16	117.62
2023	2	26	17.08	16.87	14.33	8.85	72.44	0.74	96.69	2.52	2.76	98.69	4.45	96.94
2023	2	27	17.62	16.41	13.81	8	63	0	96.68	2.12	2.18	206.94	3.09	207.06
2023	2	28	16.01	15.18	13.17	8.12	69.94	1.01	96.75	2.1	2.73	251.88	2.95	251.12
2023	3	1	15.34	15.12	13.23	8.54	77.31	2.62	96.92	1.47	2.13	219.56	2.41	217.88
2023	3	2	14.23	13.65	12.86	8.73	84.38	1.92	96.96	1.82	2.13	178.12	2.59	178
2023	3	3	15.57	14.96	12.65	7.75	70.69	0.48	96.96	2.31	1.76	288.62	3.43	289
2023	3	4	17.04	16.13	13.39	7.81	64.5	0.01	96.83	1.87	2.25	241.81	2.85	243.5
2023	3	5	17.88	16.4	13.66	7.69	59.44	0	96.74	2.02	0.77	228	2.79	228.06
2023	3	6	19.03	16.64	13.76	7.2	52.38	0	96.45	1.59	1.54	233.94	2.11	233.12
2023	3	7	19.28	16.76	13.82	7.14	50.88	0	96.43	1.41	1.92	194.25	1.86	178.94
2023	3	8	19.96	17.3	13.81	6.84	47.12	0	96.51	1.18	2.26	201.19	1.62	197.06
2023	3	9	19.42	17.4	13.95	7.2	51.81	0	96.54	1.75	2.62	144.12	2.49	143
2023	3	10	20.21	18.3	14.76	7.63	52.06	0	96.39	1.89	2.07	148.12	2.7	147.94
2023	3	11	20.44	19.37	15.51	8.3	56.06	0	96.33	1.93	2.66	112.94	2.89	114.56
2023	3	12	20.73	20.24	16.74	9.64	62.81	0.05	96.42	2.26	1.82	141.88	3.66	142
2023	3	13	21.86	20.57	16.83	9.03	57.06	0	96.27	2.11	2.74	228.75	3.14	228.88
2023	3	14	22.16	20.5	16.52	8.48	50.56	0	95.95	1.81	1.94	158	2.42	157.25
2023	3	15	21.4	20.31	15.87	8.24	52.69	0	95.76	1.82	2.05	164	2.68	162.69
2023	3	16	17.12	16.86	15.52	10.38	82.06	9.03	95.97	2.91	5.56	143	4.45	143.56
2023	3	17	17.35	17.17	15	9.52	75.56	3.9	96.19	2.23	1.89	107.69	3.98	107.19
2023	3	18	17.51	18.12	15.13	9.58	76.19	0.27	96.07	2.02	1.39	90	3.28	90.25
2023	3	19	17.26	16.1	14.9	9.46	74.69	4.07	95.92	1.33	2.28	218.94	1.73	218.62
2023	3	20	18.4	17.27	14.9	8.79	65.94	1.3	95.69	1.31	1.52	156.31	1.66	156.88
2023	3	21	18.11	16.89	14.82	8.91	66.38	8.2	95.78	1.51	1.53	126.25	2.02	125.06
2023	3	22	17.67	17.08	14.73	9.03	69.88	1.23	95.97	1.47	1.6	153.5	2.02	166.88
2023	3	23	17.63	17.24	15.24	9.7	74.5	4.98	95.9	1.64	2.48	173.25	2.57	172.62
2023	3	24	14.53	14.02	13.12	8.97	83.31	16.9	95.77	3.13	5.52	87.25	4.77	87.81
2023	3	25	14.61	14.25	13.26	9.09	84.25	10.16	96.19	2.05	2.77	165.75	3.16	165.69
2023	3	26	16.08	15.98	12.61	7.51	67.19	0	96.22	1.95	2.33	250.31	3.11	237.25
2023	3	27	18.31	17.12	13.48	7.32	55.44	0.01	95.98	1.47	2.23	197.94	1.98	198
2023	3	28	18.73	17.34	14.74	8.48	61.25	0.51	95.97	2.03	2	209	2.83	209
2023	3	29	17.41	17.07	15.23	9.83	76.62	0.3	96.07	3.31	4.15	233.62	4.77	234.06
2023	3	30	19.59	19.89	16.81	10.5	73.56	10.69	95.87	2.56	3.22	157.06	4.4	159.94
2023	3	31	15.68	15.65	14.74	10.31	88.75	12.64	95.78	2.05	2.16	118.5	3.41	119.5

2023	4	1	16.33	16.77	14.72	9.83	82.5	3.56	95.88	1.85	2.82	75.06	3.27	76.31
2023	4	2	17.76	18.24	15.75	10.25	78.19	2.4	95.83	1.68	2.29	150.56	2.58	151.19
2023	4	3	18.89	18.51	16.56	10.62	75.38	6.13	95.72	1.51	1.59	107.94	2.16	107.88
2023	4	4	17.98	17.48	15.48	9.77	73.56	0.13	96.04	1.8	1.77	163.75	2.41	163.31
2023	4	5	18.55	18.32	15.01	8.85	66.38	0.01	96.01	1.83	3.12	196.69	2.72	196
2023	4	6	18.36	18.94	15.28	9.22	70.81	1.47	96.32	2.28	2.36	147.19	3.7	162.38
2023	4	7	19.58	18.58	14.81	8	56.94	0	96.45	2.48	2.38	224.62	3.46	239.75
2023	4	8	21.65	20.23	15.72	7.87	49.38	0	96.32	1.65	2.45	181.75	2.35	182.75
2023	4	9	22.99	22.04	17.22	8.85	51.5	0	96.29	2.21	2.48	173.12	3.32	174.12
2023	4	10	24.44	23.29	18.8	9.89	52.75	0	96.14	2.05	1.89	202.88	2.98	202.88
2023	4	11	24.76	24.01	19.14	10.13	51.62	0	96.1	1.84	2.04	211.81	2.62	210.38
2023	4	12	26.08	24.63	19.49	9.7	47	0	96.07	1.65	2.28	155.19	2.24	154.88
2023	4	13	26.19	24.15	18.65	8.73	41.88	0	95.88	1.81	2.32	184.06	2.38	184.25
2023	4	14	26.64	24.58	18.6	8.36	39.38	0	95.79	1.88	2.35	197.5	2.55	197.38
2023	4	15	27.26	26.12	19.44	9.09	42.38	0	95.66	2.39	2.27	128.56	3.56	129.25
2023	4	16	24.55	24.51	19.53	10.8	56.06	0.59	95.8	3.71	5.1	159.56	5.64	160.88
2023	4	17	25.08	25.5	19.83	10.93	56.88	0.58	95.76	2.51	1.77	291.94	4.05	292.94
2023	4	18	21.73	21.94	19.38	12.7	75.56	11.5	95.95	3.13	4.54	161	4.69	162.38
2023	4	19	21.09	21.77	18.24	11.47	72	16.86	95.64	1.92	3.78	186.44	3.16	215.56
2023	4	20	20.53	20.91	17.36	10.62	68.56	7.37	95.39	1.9	1.74	102.38	2.76	130.06
2023	4	21	20.19	20.55	15.58	8.61	58.69	0.08	95.56	2.13	2.19	144.94	3.12	143.62
2023	4	22	21.39	21.21	15.52	7.87	51.06	0.92	95.74	2.51	3.39	284.19	3.57	285.06
2023	4	23	22.52	21.61	15.33	7.14	43.75	1	95.71	2.12	1.52	234.44	2.93	235.56
2023	4	24	24.05	22.62	15.93	6.96	38.88	0	95.87	2.21	3.96	205	3.06	204.5
2023	4	25	24.02	23.82	16.95	8.06	45.44	0	95.94	2.22	2.65	104.5	3.3	106.44
2023	4	26	25.26	25.33	18.51	9.09	47	0.16	95.65	2.1	2.8	136.38	3.21	133.5
2023	4	27	25.17	25.62	19.46	10.38	53.44	1.62	95.64	3.09	4.35	85.12	4.93	86.06
2023	4	28	23.46	24.36	19.86	12.08	66.38	10.66	95.9	2.25	2.66	122.75	3.88	126.06
2023	4	29	24.44	24.74	19.37	10.68	56.5	0.01	95.65	2.28	2.73	306.62	3.38	307.12
2023	4	30	25.34	25.71	19.65	10.5	52.31	0	95.46	1.8	2.99	225.88	2.62	224
2023	5	1	23.24	24.42	20.12	12.7	69.75	2.06	95.53	2.22	4.11	154.81	3.53	155.25
2023	5	2	19.87	20.01	18.54	12.82	85.06	14.06	95.81	3.56	2.61	150.25	5.04	150.88
2023	5	3	20.93	21.66	18.72	12.27	77.31	1.97	95.92	1.95	2.1	115.25	3.24	117.56
2023	5	4	23.12	24	19.71	12.08	68.44	3.25	95.84	2.39	1.34	175.5	3.71	176.12
2023	5	5	24.17	24.8	20.11	11.96	63.06	6.2	95.72	1.7	2.36	164.38	2.45	177.56
2023	5	6	25.46	25.72	20.34	11.35	55.88	1.71	95.46	2.28	3.44	134.5	3.38	134.81
2023	5	7	22.42	23.51	18.93	11.54	66.75	3.84	95.55	2.77	4.36	61.88	4.05	62.62
2023	5	8	23.27	23.61	17.26	8.79	50.31	1.26	95.56	2.59	2.2	191.69	3.62	192
2023	5	9	23.12	23.16	16.15	7.63	44.56	0	95.84	2.23	1.4	250.5	3.02	236.56
2023	5	10	24.96	24.15	16.55	7.14	39.69	0	95.68	2.91	4.12	318.31	4.14	318.94
2023	5	11	28.73	26.83	18.54	7.2	31	0	95.67	1.55	2.25	202.12	2.05	216.81
2023	5	12	30.37	29.84	21.45	9.58	36.62	0	95.51	1.24	2.33	187.31	1.75	186.38
2023	5	13	28.65	29.75	21.75	11.17	46.88	0.01	95.57	5.16	7.64	203.06	6.94	201.81
2023	5	14	27.14	28.2	20.76	10.86	50.44	0.33	95.39	2.77	1.77	170.88	4.06	171.25
2023	5	15	28.36	29.15	20.78	10.07	44.38	0.33	95.25	2.36	1.52	135.88	3.4	135.62
2023	5	16	26.33	26.81	20.81	11.41	52.94	0	95.51	3.74	4.27	202.62	5.64	202.56
2023	5	17	29.43	30.65	22.48	11.66	48.19	0	95.5	1.83	3.41	177.62	2.95	177.38
2023	5	18	27.77	28.56	22.4	12.76	55.12	6.46	95.92	1.91	3.48	263.25	2.64	262.69
2023	5	19	28.68	29.13	21.19	10.38	44.5	0	95.62	2.44	3.33	215.06	3.22	213.69
2023	5	20	29.44	29.23	19.74	8.36	35.5	0	95.37	2.4	2.04	171.5	3.23	171.06
2023	5	21	30.98	30.8	20.85	8.61	32.75	0	95.43	2.66	2.95	252.88	3.92	268
2023	5	22	30.05	31	22.08	10.74	44.06	0	95.47	3.24	9.75	271.31	4.79	270.31
2023	5	23	30.42	30.3	23.71	12.82	47.56	2.03	95.36	2.02	3.27	222.94	3.2	220.69
2023	5	24	28.47	30.44	23	13.24	55.25	1.39	95.26	2.7	4.15	179.5	4.08	181.5
2023	5	25	28.23	30.1	23.05	13.55	57.5	5.03	95.29	3.02	4.06	124.69	4.68	127.44
2023	5	26	26.03	27.26	21.53	12.82	61	4.34	95.41	3.35	2.61	152.81	5.08	153.19
2023	5	27	26.46	27.99	20.46	10.93	52.88	0.01	95.49	2.06	1.84	138.56	2.73	124.75
2023	5	28	27.69	29.39	20.35	9.95	44.62	0.12	95.58	2.05	2.68	100.5	3.11	88.81
2023	5	29	25.18	25.8	21.12	12.76	62.06	2.85	95.79	3.56	3.55	310.38	4.95	310.12
2023	5	30	22.55	23.33	19.37	12.08	69.62	2.06	95.95	3.51	4.66	122.88	4.73	122.69
2023	5	31	21.41	21.56	19.83	13.73	82.44	14.25	95.64	3.01	4.48	185.06	4.35	185.75
2023	6	1	19.2	19.32	18.05	12.63	86.56	25.71	95.72	2.85	2.55	104.25	4.04	105.75
2023	6	2	25.33	26.33	19.86	10.74	55.5	0.04	95.54	1.74	2.84	243.56	2.56	230.19
2023	6	3	26.98	28.97	21.58	12.15	55.06	0	95.52	1.36	2.49	173.19	2.19	174.25
2023	6	4	29.31	30.48	23.18	12.82	50.56	0.04	95.51	1.58	1.75	169.69	2.12	183.62
2023	6	5	29.89	30.81	23.52	12.94	49.19	0.18	95.33	1.36	2.48	172.94	1.98	173.69
2023	6	6	30.56	31.82	23.62	12.63	48.25	0.12	95.29	1.96	1.23	193.88	2.79	191.81
2023	6	7	30.13	31.01	23.78	13.24	49.94	5.02	95.28	2.39	2.91	171.56	3.45	174.38
2023	6	8	31.01	32.73	25.07	14.65	53.12	0.07	95.26	1.7	3.94	215.44	2.63	214.56
2023	6	9	33.17	33.98	25.44	13.49	42.69	0	94.93	1.23	1.75	208.5	1.62	209.75
2023	6	10	33.55	34.19	26.23	14.65	44.88	5.42	94.77	1.14	1.47	168.88	1.49	178.44
2023	6	11	33.19	34.48	26.76	15.99	50.69	1.29	94.83	1.87	1.72	236.56	2.52	237

2023	6	12	33.33	34.5	25.72	13.92	44.62	0	94.75	1.55	1.67	209.56	2.21	209.62
2023	6	13	33.28	34.6	26.32	15.01	47.5	0.64	94.8	2.27	2.59	194.69	3.39	194.38
2023	6	14	33.67	34.87	26.53	15.01	46.44	7.89	94.74	1.84	4.02	114.75	2.56	116.19
2023	6	15	31.9	33.45	26.65	16.91	55.62	7.06	94.92	2.01	2.91	179.25	2.9	181.31
2023	6	16	31.17	33.37	26.55	17.46	60.31	0.33	94.99	1.73	2.1	210.75	2.56	211.94
2023	6	17	32.94	34.94	27.3	17.27	54.69	0.39	94.96	1.59	0.85	213.06	2.32	213.62
2023	6	18	34.14	35.58	27.9	17.27	51	1.78	94.9	1.52	2.53	205.88	2.07	205
2023	6	19	34.14	35.63	27.87	17.15	50.75	2.21	94.91	1.74	2.29	224	2.56	224.56
2023	6	20	34.32	35.68	27.24	15.81	47.19	0	94.8	2.17	2.13	197.56	2.87	197.19
2023	6	21	35.52	37.38	28.7	17.46	47.81	0	94.84	1.58	2.88	183.81	2.42	182.38
2023	6	22	37.15	38.23	29.33	17.15	43.94	0	94.79	1.78	3.42	194	2.47	193.75
2023	6	23	37.47	38.94	29.39	17.09	43.44	0	94.74	1.77	2.45	188.5	2.59	185.62
2023	6	24	36.94	38.99	29.55	17.82	45.12	0.13	94.68	1.98	2.92	150.88	3.26	157.25
2023	6	25	35.51	36.18	28.99	18.13	48.5	11.09	94.67	2.64	4.64	163.38	4.37	165.75
2023	6	26	30.23	31.4	27.16	19.9	70.81	33.16	95.01	5.42	1.96	138.38	6.74	139.19
2023	6	27	30.56	32.6	26.59	18.25	65.5	2.81	95	2.06	3.5	143.44	3.05	159.44
2023	6	28	30.58	32.36	27.05	19.17	67.88	5.81	95.12	1.59	3.48	188.88	2.24	188.56
2023	6	29	31.44	33.19	27.35	18.92	64.19	6.44	94.97	2.02	1.75	205.69	3.34	206.88
2023	6	30	30.71	32.03	26.98	18.92	66.38	26.79	94.85	1.53	1.31	191.12	2.31	191.94
2023	7	1	30.99	32.63	26.65	17.88	62.12	3.49	94.93	1.44	2.54	177.62	2.14	178
2023	7	2	32.57	34.25	27.62	18.31	59.75	0.14	94.95	1.55	2.73	204.06	2.42	204.56
2023	7	3	32.49	33.43	27.93	19.17	61.69	19.54	94.86	1.64	1.05	177.94	2.48	179.94
2023	7	4	30.85	31.57	27.44	19.9	69.12	12.71	94.72	3.84	2.83	115.44	5.43	116.69
2023	7	5	29.73	31.26	26.17	18.25	67.88	0.46	94.76	2.73	3.14	124.44	3.79	124.62
2023	7	6	30.17	31.52	26.52	18.49	67.75	7.79	95.05	1.98	1.88	175.94	3.3	177.5
2023	7	7	29.3	29.91	26.01	18.25	69.25	22.91	95.2	2.17	2.37	136	3.22	136.56
2023	7	8	28.26	29.03	25.01	17.27	70.25	1.95	95.22	2.66	4.45	159.44	3.8	159.56
2023	7	9	28.65	30.21	25.1	17.03	69.06	3.59	95.09	2	4.27	166.69	3.18	166.31
2023	7	10	29.73	31.51	26.29	18.43	69.62	2.56	95.16	1.38	3.86	141.62	2.27	142
2023	7	11	31.64	32.9	26.91	17.76	61.25	0	95.06	1.59	2.27	213.25	2.59	215.06
2023	7	12	32.12	33.37	27.83	19.29	63.12	0.01	94.95	2.24	0.86	196.75	3.42	197.81
2023	7	13	32.64	33.69	28.47	20.14	64.12	1.45	94.89	3.07	1.54	209	4.83	210.5
2023	7	14	31.67	32.56	27.9	19.9	65.81	6.46	95	3.21	2.54	204.25	5.07	205.62
2023	7	15	28.48	29.24	26.56	20.57	80.38	24.29	95	2.29	3.3	140.44	3.27	154.69
2023	7	16	30.4	31.16	27.56	20.63	73.44	13.58	95.02	1.42	1.77	155.38	2.12	156.5
2023	7	17	31.75	32.79	28.33	20.94	69.38	2.07	94.91	1.39	2.48	190.31	2.47	192.81
2023	7	18	31.52	32.38	28.58	21.91	72.69	17.41	94.82	2.18	3.61	187.38	3.61	189.44
2023	7	19	28.4	28.37	27.44	22.95	89.44	48.92	94.89	3.61	4.21	167.06	5.15	167.94
2023	7	20	28.97	29.16	27.19	21.48	81.75	13.89	95.03	2.81	5.07	181.31	3.75	180.69
2023	7	21	29.43	29.85	27.71	22.28	82.44	1.07	95.09	3.11	5.09	142.19	4.18	142.56
2023	7	22	29.24	29.71	27.63	22.28	83.81	14.49	95.3	4.3	2.84	157.62	5.82	158.06
2023	7	23	28.97	29.12	26.83	20.51	78.75	17.9	95.47	3.45	5.71	140.5	4.48	141.19
2023	7	24	29.43	29.55	26.94	20.32	75.69	17.5	95.18	1.09	2.19	159.31	1.65	158.44
2023	7	25	29.51	29.85	27.3	21.06	78.12	17.25	95.17	1.84	2	189	2.87	189.19
2023	7	26	29.51	29.98	27.32	21.12	78.69	5.55	95.17	2.54	3.36	206.56	3.91	207.44
2023	7	27	28.76	29.12	27.03	21.36	82.38	19.26	95.14	2.83	2.12	194.94	4.1	195.31
2023	7	28	28.59	28.9	26.7	20.81	81	35.36	94.86	2.59	1.03	185.56	4.19	186.44
2023	7	29	28.59	28.94	26.73	20.87	81.31	10.63	94.87	2.28	1.29	174.56	3.77	175.56
2023	7	30	29.65	29.62	26.84	19.84	73.25	0.01	94.84	1.73	3.15	190.25	2.73	190.88
2023	7	31	29.87	29.9	27.05	20.14	73.12	1.83	94.76	1.38	1.65	185.62	1.95	187.88
2023	8	1	30.35	30.55	27.38	20.32	72.25	4.82	94.69	1.48	1.56	155.5	2.25	157.75
2023	8	2	30.83	30.97	28.21	21.85	75.06	4.3	94.65	2.11	1.24	160.25	3.47	161.5
2023	8	3	30.32	30.56	28	21.91	77.56	7.24	94.71	2.43	2.23	198.44	3.95	199.31
2023	8	4	30.43	30.54	28.05	21.85	77.06	12.25	94.88	2.22	2.21	176.88	3.77	177.94
2023	8	5	30.38	30.43	28.14	22.16	78.25	7.8	95.05	2.67	2.18	160.5	3.86	162.06
2023	8	6	30.8	30.55	27.87	21	72.56	9.97	94.7	2.09	2.07	200.44	3.2	200.62
2023	8	7	29.69	30	27.29	21	77.19	14.16	94.56	1.91	1.53	158.31	3.14	159.81
2023	8	8	30.75	30.68	27.28	19.65	68.5	2.16	94.69	1.52	2.07	175.25	2.26	176.19
2023	8	9	30.46	30.7	28.02	21.79	76.31	0.42	94.98	1.89	1.94	180.69	3.14	182.5
2023	8	10	30.54	30.65	28.03	21.67	75.88	1.4	95.09	2.37	1.62	190.75	4.09	191.88
2023	8	11	28.84	28.87	26.87	20.87	80.38	5.12	95.2	2.76	1.82	138.12	4.38	141.06
2023	8	12	30.61	30.71	27.77	20.94	73.56	0	94.94	1.94	1.15	175.06	3.27	177
2023	8	13	30.62	30.58	27.48	20.32	71.25	0.01	94.67	2.46	2.23	184.69	4.07	185.88
2023	8	14	29.93	30.01	27.65	21.48	78.19	20.15	95.02	3.73	2.88	149.56	5.59	150.88
2023	8	15	29.23	29.3	27.05	20.81	78.88	13.39	95.22	2.55	3.9	177.62	3.67	178.69
2023	8	16	29.58	29.78	27.18	20.69	76.31	3.27	95.26	1.59	1.21	169.75	2.59	171.62
2023	8	17	29.91	29.86	27.5	21.06	76.44	5.93	95.17	1.58	1.8	161.44	2.41	163.69
2023	8	18	30.04	30.27	27.62	21.18	76.62	1.16	95.22	1.4	1.98	148.19	2.37	150.12
2023	8	19	30.09	30.32	27.66	21.24	76.56	0	95.34	1.71	1.88	119	2.91	120.31
2023	8	20	30.11	30.46	27.45	20.69	74.81	0	95.36	1.25	2.11	149.25	2.07	149.44
2023	8	21	30.6	30.58	27.86	21.12	74.19	0	95.16	1.63	2.09	162.62	2.69	166.12
2023	8	22	31.09	31.08	28.22	21.48	73.38	0	94.9	1.96	1.97	175.75	3.23	177.38

2023	8	23	30.89	30.82	28.18	21.67	74.5	11.81	94.67	2.2	1.91	137.94	3.89	139.81
2023	8	24	29.58	29.44	26.69	19.65	73.31	5.71	94.72	1.72	2.95	167.5	2.93	164.62
2023	8	25	28.54	28.37	25.37	17.82	71.31	11.66	94.79	2.27	1.99	141.88	3.98	143.56
2023	8	26	27.52	27.7	25.01	18.01	75.56	3.63	95.06	1.97	2.05	111.25	3.3	112.88
2023	8	27	28.09	28.25	25.28	18.01	73.06	2.18	95.04	1.59	1.98	167.25	2.48	167.38
2023	8	28	28.29	28.57	25.4	18.07	72.81	1.25	94.98	1.53	2.61	167.81	2.63	171.88
2023	8	29	28.64	28.54	25.67	18.19	71.5	0.09	95.28	1.06	2.53	163.75	1.79	164.06
2023	8	30	29.18	28.62	25.59	17.46	67.19	0	95.42	1.31	2.03	195.44	2	199.06
2023	8	31	29.28	29.3	26.28	18.86	71.88	0	95.45	1.96	1.73	152.56	3.27	155.44
2023	9	1	29.4	29.52	26.58	19.41	73.69	0	95.45	2.06	1.86	132.12	3.6	134.69
2023	9	2	29.23	29.14	25.95	18.19	70.12	2.16	95.31	2.38	1.14	128.62	3.97	129.81
2023	9	3	27.98	28.26	25.18	17.88	73.62	0.03	95.26	2.07	3.27	100.06	3.53	102.62
2023	9	4	29.07	29.31	25.98	18.43	71.31	0.35	95.17	1.73	2.89	110.94	3.12	113.19
2023	9	5	27.07	27.22	25.15	18.8	80.5	11.21	95.39	2.26	2.35	100.38	3.69	102.44
2023	9	6	28.37	28.39	25.41	17.88	72.19	0	95.47	1.55	2.28	96.31	2.53	99.06
2023	9	7	29.13	28.95	25.82	17.94	69.19	0	95.45	1.34	2.01	125.94	2.07	124.62
2023	9	8	28.65	28.76	25.53	17.88	71.06	0.32	95.34	2.21	3.62	100.56	3.68	103.12
2023	9	9	28.58	28.62	25.89	18.8	74.31	15.74	95.28	2.14	3.13	138.25	4.02	140.5
2023	9	10	28.19	28.31	25.52	18.43	74.94	0.62	95.13	2.05	2.44	169.38	3.62	169.06
2023	9	11	28.65	28.66	25.92	18.8	74.19	0.59	95.15	1.8	2.24	175.44	3.02	176.5
2023	9	12	29.17	29.26	26.05	18.49	70.88	0	95.19	1.66	2.02	163.94	2.7	161.38
2023	9	13	29.65	29.73	26.61	19.23	72.06	0	95.19	1.5	1.91	130.75	2.66	135.06
2023	9	14	30.32	30.33	27.08	19.53	70.75	2.95	95.28	1.49	2.58	135.31	2.68	140.25
2023	9	15	29.88	29.94	26.76	19.29	71.69	2.13	95.34	2.2	1.27	157.56	3.73	158.94
2023	9	16	28.11	28.25	26.06	19.71	79.5	38.41	95.4	2.38	3.29	140.94	3.8	143.19
2023	9	17	27.89	28.23	25.9	19.59	80.19	6.57	95.34	1.66	1.86	159.62	3.04	160.56
2023	9	18	27.22	27.42	25.37	19.1	81.38	1.49	95.4	2.26	1.98	154.56	3.71	154.81
2023	9	19	27.04	27.34	25.03	18.49	80	0	95.65	2.12	0.98	138.88	3.26	139.44
2023	9	20	27.37	27.82	25.13	18.31	78.19	0.01	95.61	1.43	2.12	154.5	2.51	154.81
2023	9	21	27.72	27.98	25.28	18.31	76.31	2.89	95.47	1.74	2.14	163.31	3.13	162.31
2023	9	22	27.3	27.58	25.19	18.62	79	4.94	95.46	1.77	2	129	3.3	131.31
2023	9	23	26.94	27.05	25.22	19.04	82.5	14.54	95.55	2.33	3.23	106.19	3.78	106.88
2023	9	24	26.01	26.19	24.15	17.7	81.31	2.88	95.51	2.06	1.25	144.25	3.37	144.75
2023	9	25	24.66	24.88	22.54	15.75	78.56	11.84	95.67	1.55	1.95	132.94	2.59	134.81
2023	9	26	24.88	24.14	21.34	13.37	67	0	95.8	1.52	1.72	138.88	2.2	138.06
2023	9	27	24.97	24.22	21.12	12.94	64.06	0	95.73	1.62	1.8	117.56	2.38	130.44
2023	9	28	24.8	24.28	21.09	13.06	65.62	0.01	95.64	1.98	2.17	101.44	3.11	102.31
2023	9	29	23.87	23.71	20.27	12.45	66	0.79	95.73	2.26	2.51	130.19	3.8	132
2023	9	30	23.45	21.91	18.89	10.74	60.5	18.23	95.79	1.98	3.91	240.56	3.16	254.31
2023	10	1	24.42	22.37	18.02	8.97	47.06	0	95.64	1.3	2.09	128.25	1.84	86
2023	10	2	24.05	22.42	18.37	9.64	51.38	0	95.68	1.65	1.45	78.69	2.34	78
2023	10	3	23.78	22.48	18.77	10.31	56	0	95.76	1.52	2.02	134.12	2.16	146.94
2023	10	4	24.63	22.77	18.44	9.34	49.56	0	95.75	1.49	2.42	143.31	2.23	144.31
2023	10	5	24.88	22.65	18.39	9.16	47	0	95.64	1.78	2.34	146.94	2.52	148.19
2023	10	6	24.37	22.92	18.2	9.28	49.56	0	95.49	2.15	2.69	120.44	3.33	121.31
2023	10	7	24.88	24.26	19.68	10.86	55.75	0	95.64	1.91	2.85	136.38	3.17	135.06
2023	10	8	25.38	25.03	21.32	12.94	63.31	0	95.7	2.02	2.36	164.75	3.04	164.19
2023	10	9	25.32	25.23	22.28	14.65	70.62	5.94	95.76	1.92	2.32	135.38	3.12	135.88
2023	10	10	24.25	24.23	21.1	13.43	69.81	2.34	96.05	1.51	2.19	140.44	2.29	153.81
2023	10	11	23.32	22.64	18.57	10.31	59.81	0	96.03	2.38	2.63	212.12	3.5	212.94
2023	10	12	23.28	22.6	18.15	9.83	56.38	0	96.03	2.27	2.68	143.19	3.76	144.06
2023	10	13	23.26	23.36	19.08	11.05	62.75	0.02	96.09	2.69	1.87	130	4.85	130.88
2023	10	14	22.66	22.48	19.84	12.63	71.69	7.85	96.15	1.73	1.36	78.31	2.75	79
2023	10	15	21.63	21.53	18.7	11.72	71.56	2.78	95.98	1.9	2.2	134.06	3	133.38
2023	10	16	18.8	19.14	16.92	11.11	79.75	9.28	96.06	2.24	2.07	158.38	3.4	157.75
2023	10	17	18.12	18.02	16.76	11.35	85	13.65	96.51	2.38	2.17	95.62	3.62	96.19
2023	10	18	18.35	17.69	14.98	8.85	68.19	0	96.52	1.71	2.39	224.75	2.56	239.5
2023	10	19	19.41	18.63	15.39	8.73	61.62	0	96.37	1.53	2.43	162.12	2.23	163.19
2023	10	20	20.15	19.8	16.43	9.58	64.44	0	96.41	1.53	2.23	146.12	2.27	146.12
2023	10	21	20.8	20.65	17.41	10.44	67.62	0	96.44	1.71	2.62	139.94	2.85	140.44

2023	10	22	19.44	19.31	17.31	11.17	77.75	3.69	96.54	1.67	2.42	137.56	2.79	136.88
2023	10	23	19.83	19.21	16.4	9.7	68.19	0	96.4	1.84	2.4	228.88	2.6	229.44
2023	10	24	20.97	19.55	16.36	8.97	57.94	0	96.34	1.26	2.16	150.81	1.76	151.69
2023	10	25	21.57	19.76	16.57	8.85	55.56	0.07	96.41	1.8	2.1	140.38	2.45	140.31
2023	10	26	21.92	20.2	16.58	8.67	53.31	0	96.33	1.75	2.37	130.69	2.48	129.94
2023	10	27	21.37	20.52	17.04	9.58	59.94	0	96.23	1.94	2.54	181.62	2.91	181.12
2023	10	28	22.02	20.88	17.74	10.01	60.62	0	96.25	1.8	2.05	175.38	2.59	175.25
2023	10	29	21.84	21.08	17.9	10.38	63	0	96.28	1.66	1.81	130.62	2.46	130.31
2023	10	30	21.28	20.81	17.91	10.8	67.75	0	96.36	1.59	2.13	145.75	2.45	145.81
2023	10	31	21.48	20.73	18.04	10.8	67	0	96.49	1.34	1.97	151.38	2.03	151.88
2023	11	1	20.78	19.83	18.01	11.23	71.75	0.31	96.58	1.41	2.01	158.38	2.13	158.38
2023	11	2	20.41	19.75	17.74	11.11	72.69	2.57	96.41	1.7	1.92	196.25	2.45	196.5
2023	11	3	20.37	19.15	16.02	8.91	60.75	0	96.16	1.79	2.2	214.5	2.54	214.75
2023	11	4	20.49	18.65	15.21	7.93	53.56	0	96.2	1.43	2.15	129.06	2	128.56
2023	11	5	20.29	18.32	15.21	8.06	53.44	0	96.31	1.63	2.28	132.25	2.2	131.5
2023	11	6	20.9	19.57	16.19	8.79	56.75	0	96.45	1.24	2.41	125.19	1.88	125.06
2023	11	7	19.16	18.39	16.53	10.31	72.5	0	96.44	1.66	1.33	228.94	2.67	228.81
2023	11	8	19.61	18.94	16.77	10.31	71.56	0	96.3	1.4	1.45	192.69	2.01	191
2023	11	9	19.86	18.91	16.42	9.77	66.56	22.78	96.28	1.35	2.04	118.06	2.03	117.5
2023	11	10	16.66	16.44	14.81	9.7	80.12	33.5	96.61	2.07	2.47	154.38	3.1	125.81
2023	11	11	16.39	14.12	11.98	6.77	57.81	0.01	96.73	1.22	1.42	198	1.58	198.31
2023	11	12	16.8	13.98	12.07	6.65	54.75	0	96.71	1.29	2.05	191.44	1.69	192.19
2023	11	13	16.67	14.27	12.02	6.65	55.5	0	96.68	1.33	2.41	164.06	1.82	164.31
2023	11	14	16.81	13.96	11.9	6.47	53.88	0	96.69	1.56	2.69	219.19	2.06	219.69
2023	11	15	16.77	14.43	11.65	6.29	53.19	0	96.63	1.87	2.38	280.31	2.59	281.06
2023	11	16	18.4	15.03	12.15	5.98	45.31	0	96.74	0.94	1.58	162.94	1.27	152.06
2023	11	17	17.94	15.09	12.11	6.16	47.62	0	96.77	1.28	1.15	187.75	1.7	188.5
2023	11	18	16.86	14.37	12.08	6.65	54.38	0	96.57	1.33	1.84	229.69	1.88	229.25
2023	11	19	17.57	15.34	12.73	6.9	54.12	0	96.61	0.84	1.64	155.81	1.11	142.19
2023	11	20	15.92	13.94	11.88	6.84	60	0	96.71	1.67	2.23	238.88	2.29	224.5
2023	11	21	16.6	13.68	11.9	6.59	55.5	0	96.58	1.51	2.44	218.62	1.98	218.44
2023	11	22	15.95	13.71	11.8	6.84	59.12	0	96.22	1.65	2.39	172.38	2.33	172.62
2023	11	23	15.82	14.22	12.01	7.08	62.75	0	96.23	1.73	2.48	112.69	2.66	113.12
2023	11	24	15.58	13.72	11.76	6.9	62.31	0	96.59	2.43	2.61	278.44	3.34	278.69
2023	11	25	15.26	13.38	10.75	6.16	57.31	0	96.6	1.71	2.3	167.38	2.57	168.75
2023	11	26	14.89	13.35	11.79	7.32	67.06	0	96.71	1.73	1.88	133.75	2.6	133.75
2023	11	27	15.33	13.81	11.68	6.96	62.81	0	96.57	1.7	2.07	245.31	2.61	245.94
2023	11	28	17.23	14.98	12.56	6.9	56.38	0	96.51	1.67	1.95	249.25	2.35	249.88
2023	11	29	17.53	15.3	13.03	7.2	57	0.04	96.45	1.55	1.7	154	2.07	154.25
2023	11	30	15.58	15.55	13.44	8.67	76.62	4.07	96.55	2.59	3.23	89.5	4.48	103.94
2023	12	1	14.03	13.32	12.1	8	79.31	1.3	96.74	2.79	2.07	246.69	4.04	246.94
2023	12	2	14.51	12.89	10.36	6.16	60	0	96.68	1.93	1.8	260.25	2.73	262.12
2023	12	3	15.04	14.11	10.46	6.04	56.69	0	96.63	1.88	2.88	200.25	3.19	204.5
2023	12	4	15.25	12.59	9.99	5.55	50.94	0	96.56	1.76	2.05	215.75	2.33	215.75
2023	12	5	13.91	11.12	8.87	5.19	52.19	0	96.46	1.95	2.18	209.31	2.69	209.62
2023	12	6	13.35	10.44	8.08	4.82	50.88	0	96.6	1.67	1.95	225.06	2.29	225.12
2023	12	7	13.1	10.23	7.83	4.76	50.06	0	96.49	1.68	1.92	235.12	2.26	235.94
2023	12	8	13.65	10.05	7.91	4.64	47.5	0	96.37	1.03	1.82	112	1.39	111.31
2023	12	9	13.76	9.9	8.27	4.82	49	0	96.45	1.61	2.68	200.88	2.1	200.69
2023	12	10	12.55	9.02	7.49	4.76	51.56	0	96.29	2.27	2.23	239.19	3.07	239.44
2023	12	11	12.39	8.67	6.09	3.91	44.12	0	96.24	1.46	2	131.44	2.01	130.81
2023	12	12	11.62	9.12	6.66	4.46	52.88	0	96.3	1.49	2.58	106.12	2.19	107.44
2023	12	13	10.86	8.55	6.43	4.58	56	0	96.47	1.66	2.12	139.62	2.35	140.06
2023	12	14	11.49	8.67	6.9	4.64	55.31	0	96.56	1.56	2.23	138.94	2.15	139.94
2023	12	15	11.94	9.42	7.58	5	57.06	0	96.59	1.77	3.47	101.81	2.5	86.38
2023	12	16	10.99	9.33	7.6	5.37	64.75	0.18	96.49	1.55	2.3	125.5	2.23	125.44
2023	12	17	10.37	8.67	7.16	5.25	66.25	0	96.69	2.27	1.87	214.5	3.16	214.88
2023	12	18	10.65	8.53	6.39	4.58	58.56	0	96.86	2.5	1.66	280.81	3.52	281.25
2023	12	19	11.78	7.98	5.65	3.85	44.75	0	96.78	1.66	1.39	240.75	2.19	241.12
2023	12	20	12.02	8.51	5.87	3.91	43.69	0	96.68	1.96	1.71	186.75	2.69	187.12
2023	12	21	13.3	8.55	6.27	3.78	38.81	0	96.56	1.55	2.9	194.5	1.99	194.69
2023	12	22	13.58	10.4	7.19	4.21	43	0	96.5	1.66	2.52	162.94	2.26	163.19
2023	12	23	13.93	11.15	8.21	4.7	48.38	0.58	96.85	1.63	2.27	207.69	2.24	208.81
2023	12	24	13.65	10.89	8.92	5.31	54.06	0.86	96.97	1.8	1.36	207.44	2.57	207.88
2023	12	25	14.87	11.78	9.92	5.62	53.44	0	96.72	1.63	2.16	224.56	2.22	225.31
2023	12	26	15.23	11.54	9.62	5.25	48.94	0	96.69	1.2	1.45	148.25	1.55	148.25
2023	12	27	13.72	10.54	8.58	5.07	51.38	0	96.88	1.85	2.45	224	2.45	224.38
2023	12	28	12.33	10.34	7.67	4.94	55.94	0	96.62	2.7	1.78	268.62	3.97	269.12
2023	12	29	12.53	10.56	8.5	5.43	61.44	0	96.77	1.93	3.06	142.94	3.03	142.56
2023	12	30	12.47	9.72	8.37	5.37	58.06	0	96.65	1.03	1.76	68.31	1.42	67.56
2023	12	31	12.12	8.91	7.9	5.13	58.12	0	96.63	1.45	0.94	129.81	1.96	130.06