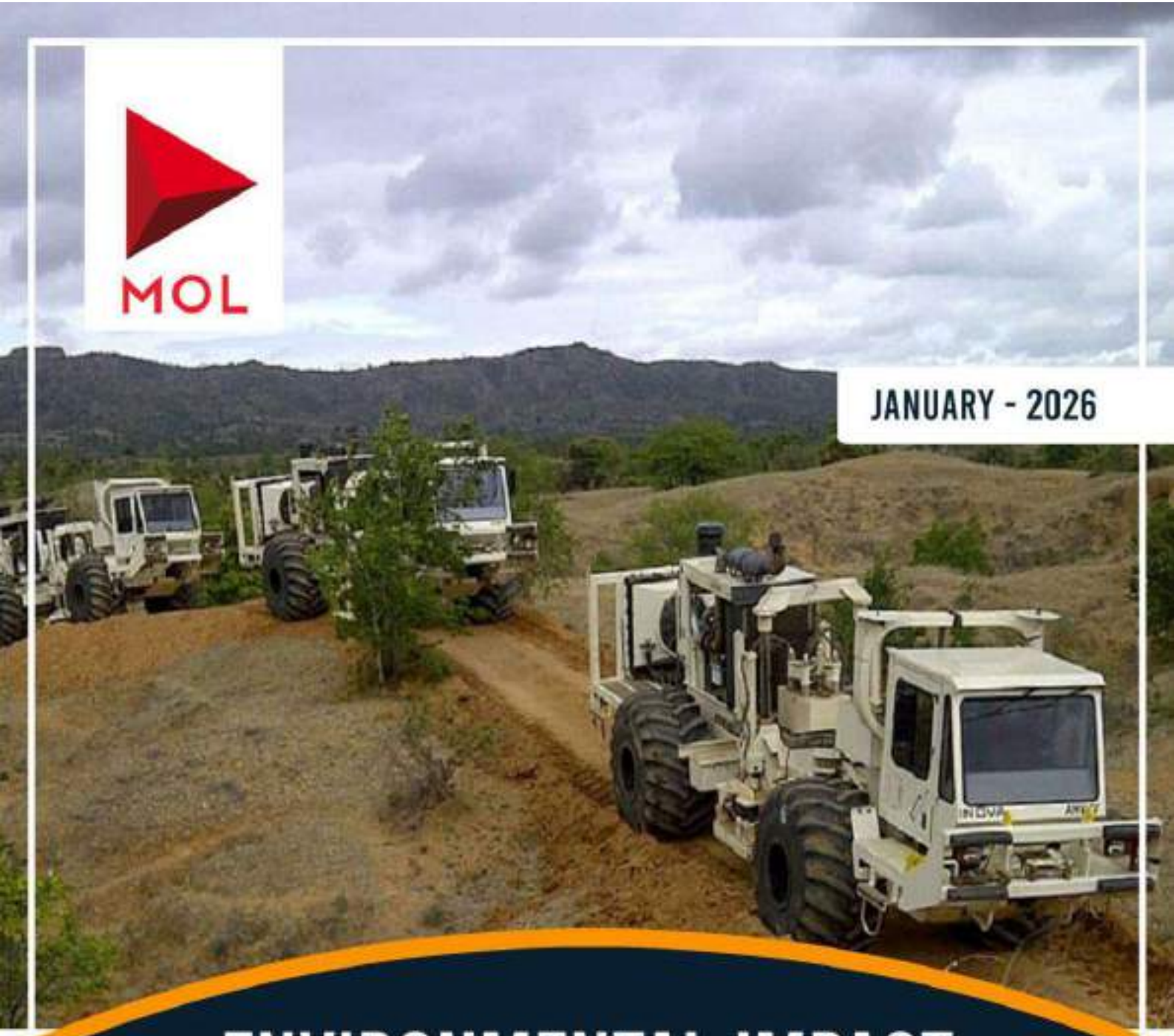

JANUARY - 2026

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

2D AND 3D SEISMIC ACTIVITIES IN MARGALLA BLOCK, PUNJAB PORTION

EMC Pakistan Private Limited

MOL PAKISTAN OIL AND GAS CO B.V.

MOLGROUP

Environmental Impact Assessment (EIA)

Seismic Activities in Margalla Block, (Punjab Portion), District Attock & Rawalpindi, Punjab

Final Report

Feburary 2025

Ref: EMC 25/12/99

EMC PAKISTAN PVT. LTD.

503, Anum Estate, Opp. Duty Free Shop, Main Shahrah-e-Faisal, Karachi.

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DOCUMENT ISSUE & REVISION RECORD

REFERENCE NO.	
TITLE	Environmental Impact Assessment (EIA)
SUBJECT	Seismic Activities in Margalla Block (Punjab Portion), Punjab
CLIENT	MOL Pakistan

REVISION RECORD

Rev.	Date	Issue, Modification	Prepared	Checked	Approved
01	19-01-2026	All comments have been addressed	Ayesha Noor	Dr.M Mohiuddin	Asif Shuja Khan
02	22-01-2026	All comments have been adressed	Dr M Mohiuddin	Farhat Shaheen	Asif Shuja Khan

APPENDIX-I: GLOSSARY & DEFINITION

Client /Proponent:	**MOL Pakistan Oil & Gas Company B.V**
Proposed Project:	Seismic Activities in Margalla Block, (Punjab Portion)
Environmental Consultant:	EMC Pakistan Private Limited
Project Site/Area:	District Rawalpindi and District Attock, Punjab
EPD	Environment Protection Department
Study	Environmental Impact Assessment (EIA)
Seismic Vibrator:	A seismic vibrator is a truck-mounted or buggy-mounted device that is capable of injecting low-frequency vibrations into the earth
Geophones:	A device used in surface seismic acquisition, that detects ground velocity produced by seismic waves and transforms the motion into electrical impulses.
Bentonite mud:	Bentonite mud will be used during seismic operations for drilling of upholes and deep holes to avoid the holes from collapsing. The mud and the cuttings will be disposed of into earthen pits backfilled after drying the mud and cuttings. This mud is prepared by mixing bentonite with water. Bentonite is a natural clay material and non-hazardous in nature. The use of the mud and its preparation and disposal in earthen pits will therefore have negligible impact on groundwater or soil quality.
Shot hole	Any borehole in which explosives are detonated for the purpose of seismic investigations.

APPENDIX-II: ABBREVIATIONS

Abbreviation	Explanation
API	American Petroleum Institute
BOD	Biological Oxygen Demand
CBD	Convention on Biological Diversity
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibility
DGPC	Directorate General of Petroleum Concessions
E&P	Exploration and Production
EHS	Environment, Health & Safety
EIA	Environmental Impact Assessment
EL	Exploration License
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
GOP	Government of Pakistan
GPS	Global Positioning System
HAVS	Hand-Arm Vibration Syndrome
HSE	Health, Safety and Environment
IUCN	International Union for Conservation of Nature
LSO	Louisiana State Wide (Order)
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NEQS	National Environmental Quality Standards
NFPA	National Fire Protection Association
NGOs	Non-Government Organizations
OEM	Original Equipment Manufacturer
OGRA	Oil and Gas Regulatory Authority
OHSAS	Occupational Health and Safety Assessment Series
PEPA	Pakistan Environmental Protection Agency
PEQS	Punjab Environmental Quality Standards
PPC	Pakistan Penal Code
PPE	Personal Protective Equipment
QMS	Quality Management System
RH	Relative Humidity
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

APPENDIX-III: LIST OF INDIVIDUALS AND ORGANIZATIONS CONSULTED ALONG WITH THEIR CONSULTED AND WITH THEIR WRITTEN FEEDBACK

Written feedback form – Consultation with local people

Project: EIA 2D & 3D Seismic Activities in Margalla Block (Punjab Portion), Punjab

Sr No	Name	Occupation	Area/Residence	Feedback	Signature
1.	کامران علی	مزدور	بھوٹہ	بہتر سہولیات فراہم کی جائے۔	کامران
2.	منیب احمد	دکاندار	بھوٹہ	کاروباری مواقع فراہم کی جائے۔	[illegible]
3.	اسماعیل	دکاندار	بھوٹہ	ہسپتال بنایا جائے۔	[illegible]
4.	وحید الرحمن	پرائیوٹ ٹیچر	بھوٹہ	سکول اور کالج بنائے جائیں۔	[illegible]
5.	فیاض احمد	پرائیوٹ نوکری	بھوٹہ	انڈسٹری لگائی جائے۔	[illegible]
6.	وقاص احمد	الیکٹریشن	بھوٹہ	نوکریوں کے مواقع فراہم کیے جائیں	[illegible]
7.	رمضان	ڈرائیور	بھوٹہ	سڑکیں ٹھیک کی جائیں۔	رمضان
8.	رومان شاہ	سٹوڈنٹ	بھوٹہ	کالج اور یونیورسٹی نہیں ہے۔	[illegible]
9.	خدا محمد	کسان	بھوٹہ	نہری نظام کو بہتر بنایا جائے	خدا محمد
10.	عبدالرب	مزدور	اکھوڑی	مہنگائی کو ختم کی جائے۔	[illegible]
11.	نور احمد	سٹوڈنٹ	اکھوڑی	روزگار کے مواقع فراہم کی جائیں۔	[illegible]
12.	شریف الدین	مزدور	اکھوڑی	پراجیکٹ کے حوالے سے لوگوں کو روزگار مہیا کیا جائے	شریف الدین
13.	محمد فہیم	دکاندار	اکھوڑی	بجلی اور گیس کی فراہمی کو بہتر بنایا جائے	[illegible]
14.	عرفان اللہ	مزدور	اکھوڑی	روزگار کے مواقع فراہم کی جائے۔	عرفان اللہ
15.	محمود خان	ڈرائیور	اکھوڑی	سڑکیں خراب ہے۔	
16.	محمد کامران	الیکٹریشن	اکھوڑی	صاف پانی کے لیے پلانٹ لگایا جائے۔	[illegible]
17.	جنید حیدر	پرائیوٹ نوکری	اکھوڑی	سکول کے نظام کو بہتر [illegible]	[illegible]
18.	ارشد خان	کاروبار	اکھوڑی	بجلی لوڈشیڈنگ ختم کی جائے۔	Rashid
19.	عمران علی	دکاندار	اکھوڑی	خوردونوش کی اشیاء کو سستی کی جائے۔	عمران

20.	محمد شاہان	کیٹرنگ سروس	نوٹ	ٹرانسپورٹ سسٹم کو بہتر بنایا جائے۔	
21.	اطہر حسین	شیف	نوٹ	لڑکیوں کے لیے باقی سکول بنایا جائے۔	
22.	خرم جاوید	پرائیویٹ نوکری	نوٹ	نوکریوں کے مواقع فراہم کی جائے۔	
23.	وہاج علی	منیجر	نوٹ	پراجیکٹ میں لوگوں کو روزگار کے مواقع	
24.	علی حیدر	سرکاری ملازم	نوٹ	سکول سسٹم کو بہتر بنایا جائے۔	
25.	زبیر اختر	کاروبار	نوٹ	ٹرانسپورٹ نظام کو بہتر بنایا جائے	
26.	محمد رمیز	پرائیویٹ نوکری	نوٹ	سیوریج سسٹم کو بہتر بنایا جائے تاکہ بیماریاں	
27.	امین خالد	ٹرانسپورٹر	نوٹ	سڑکوں کو کھلی اور بہتر کی جائے۔	
28.	نذیر اکبر	کسان	نوٹ	گاڑیاں سستی کی جائے۔	
29.	اطہر علی	پرائیویٹ نوکری	نوٹ	سیوریج سسٹم کو اپگریڈ کیا جائے۔	

Sr. No	Departments	Date:	Feedback	Pictorial Evidence
1.	EPA Attock	26th Nov, 2025	• Environmental disturbance should be strictly avoided during all phases of seismic survey activities. • No survey activities should be conducted near residential communities or sensitive settlements to avoid noise and social disturbance. • No tree cutting is allowed under any circumstances during project implementation. • If any vegetation damage occurs unintentionally, compensatory tree plantation must be carried out as per environmental regulations and EPA guidelines. • The proponent shall not dispose of waste outside the campsite. • Jobs shall be provided to local residents.	
2.	Wildlife Department, district Attock	26th Nov, 2025	• Seismic survey activities are strictly prohibited in game reserves and national forests. • Prior to the initiation of any field activities, a No Objection Certificate (NOC) must be obtained from the Ministry of Defence, especially due to security and restricted area concerns. • Project activities should avoid sensitive wildlife habitats and protected zones. • In the event that the area is designated as a protected area, the proponent will require an NOC (No Objection Certificate) from the department to conduct Seismic Survey. • No hunting or poaching activities shall be carried out in the area.	

3.	Forest Department, district Attock	26th Nov, 2025	• No tree cutting or clearing of vegetation is permitted in any forest areas. • There is only one National Park located within their jurisdiction. • If any project activity is to be conducted in a community game reserve, prior approval and consent from the local community must be obtained before commencement of operations.	
4.	Punjab Wildlife Department, Rawalpindi	25th Nov, 2025	• The Wildlife Department informed that while general guidance for wildlife protection is available within existing laws and regulations, no additional SOPs or project specific implementation plans have been developed by the department. • The officials confirmed that project activities within the district will require formal approval from the Wildlife Department prior to commencement. • The approval process involves submission of a complete application through the proper administrative channel, ensuring that all necessary project details and supporting documents are provided. • The department stated that approvals are typically processed without significant delay, provided that the submitted documents are complete and meet regulatory requirements. • The Wildlife Department expressed concerns regarding the potential impacts of project activities on local wildlife, highlighting that wildlife in the region is highly sensitive to human disturbance. The use of	

			explosives was particularly mentioned as a high-risk activity that may adversely affect wildlife movement, breeding, and habitat conditions.	
5.	EPA Rawalpindi	28th Nov, 2025	• Waste shall not be disposed off openly • Tree plantation shall be carried out at the end of project	

APPENDIX IV: SOURCES OF DATA AND REFERENCE MATERIAL

- Geological survey of Pakistan
- Pakistan Meteorological Department
- Field surveys conducted in project area
- Environmental monitoring conducted in project area
- Pakistan Social and Living Standards Measurement Survey
- Pakistan Bureau of Statistics
- Punjab Bureau of Statistics
- Punjab Forest and Wildlife Departments
- Revenue Department, Government of the Punjab
- Official website of MOL Pakistan https://molgroup.info/en/our-business/exploration-and-production/pakistan

APPENDIX V: TERMS OF REFERENCE

Title: Seismic Activities in Margalla Block, (Punjab Portion), District Rawalpindi & Attock, Punjab

Location: District Attock & District Rawalpindi

Project Proponent: MOL Pakistan

Project Description:

This document presents the findings of an Environmental Impact Assessment (EIA) carried out by EMC Pakistan (Pvt.) Limited for the project "Seismic Activities in Margalla Block (Punjab Portion), Distirct Rawalpindi and Attock, Punjab" proposed by MOL Pakistan. The proposed project includes 2D & 3D Seismic Survey to acquire seismic data for the exploration of hydrocarbon in Margalla Block (Punjab Portion).

The Margalla Block encompasses parts of the Islamabad Capital Territory (ICT), Rawalpindi and Attock districts of Punjab, and Haripur and Abbottabad districts of Khyber Pakhtunkhwa (KPK), covering a total area of approximately 1847.18 sq.km.

Within Punjab, 3D seismic surveys will be conducted over an area of 65.9 sq.km in District Rawalpindi. In addition, a 2D seismic line of 25.70 line-kilometers (L-km) falls within District Rawalpindi, while approximately 76.43 L-km of 2D seismic lines lie within the administrative jurisdiction of District Attock.

The main objective of the proposed project is to explore new hydrocarbon reserves through seismic surveys on the basis of promising geological features and to enhance the production of fossil-fuels in order to reduce energy deficiencies of the Pakistan.

The project activities include:

- Temporary land acquisition
- Construction of access tracks (where required) to facilitate survey operations
- Establishment of campsites for logistical support
- Mobilization of equipment and personnel
- Conducting the 2D & 3D seismic survey
- Restoration and rehabilitation of the surveyed areas to their original state
- Demobilization

EIA Requirement:

- Section 12 of Punjab Environmental Protection Act, 2012 (amended 2017)
- Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations, 2022

Objectives:

To obtain environmental approval as required under Section 12 of Punjab Environmental Protection Act, 2012 (amended 2017)

Scope of EIA:

- Complete description of the project
- Collection, analysis and presentation of baseline data
- Identification of significant environmental issues
- Assessment of direct, indirect impacts on environment

- Mitigation measures to minimize predicted adverse impacts
- Review of the relevant Policies, Legislation and regulations
- Environmental Management and Monitoring plan
- Conclusion & Recommendations

APPENDIX-VI: LIST OF NAMES, QUALIFICATIONS AND ROLES OF TEAM MEMBERS CARRYING OUT THE IEE/EIA STUDY

S#	Name of Experts	Position in EIA Study Team	Role and Responsibility
1.	Asif Shuja Khan	Project Manager	• Overall Management of EIA Study
2.	Ms. Farhat Shaheen	Senior Environmentalist	• Technical Review of Report
3.	Dr. Muhammad Mohiuddin	Senior Environmentalist	• Risk Assessment • Development of EMP • Overall team coordination • Technical Review of Report
4.	Mr. Owais Ahmad	Environmentalist	• Baseline Survey and monitoring • Assistance to senior team members in data collection • Reporting
5.	Ms. Ayesha Noor	Environmentalist	• Assistance to senior team members in report writing • Secondary data collection

APPENDIX-VII: APPROVALS FROM CONCERNED DEPARTMENTS

- Approval from EPD has been applied.

EXECUTIVE SUMMARY

Project Title:	**Seismic Activities in Margalla Block, District Rawalpindi and Attock (Punjab Portion), Punjab**
Proponent:	**MOL Pakistan Oil and Gas Co. B.V.** **Address:** Islamabad Stock Exchange (ISE) Towers, Floor No.17, 55-B, Jinnah Avenue, Islamabad, Pakistan **Tel:** +92-51-8846000 **Fax Number(s):** +051-2655828 **Fax.:** +92-51-265 5828 **Email:** habib.mahar@molpakistan.com
EIA Consultant:	**EMC Pakistan Pvt. Limited** **Address:** Office # 403, Green Trust Tower, Jinnah Avenue, F6/1, Islamabad **Phone:** +92-51- 874415, +92-51-8744055 **Website:** www.emc.com.pk **Email:** mail@emc.com.pk; info@emc.com.pk

This document presents the findings of an Environmental Impact Assessment (EIA) carried out by EMC Pakistan (Pvt.) Limited for the project "Seismic Activities in Margalla Block (Punjab Portion), District Attock & Rawalpindi, Punjab", proposed by MOL Pakistan. The proposed project includes 2D & 3D Seismic Survey to acquire seismic data for the exploration of hydrocarbon potential in Margalla Block. The Margalla Block encompasses parts of the Islamabad Capital Territory (ICT), Rawalpindi and Attock districts of Punjab, and Haripur and Abbottabad districts of Khyber Pakhtunkhwa (KPK), covering a total area of approximately 1847.18 sq.km.

Within Punjab, 3D seismic surveys will be conducted over an area of 65.9 sq.km in District Rawalpindi. In addition, a 2D seismic line of 25.70 line-kilometers (L-km) falls within District Rawalpindi, while approximately 76.43 L-km of 2D seismic lines lie within the administrative jurisdiction of District Attock. The proposed 2D seismic survey will be carried out in Punjab Portion only.

Tentative location coordinates for proposed 2D and 3D Seismic lines are given below in Table-1.1 while project location map of Margalla Block is given as Figure-1.1.

Table ES 1: Tentative Location Coordinates of 3D Seismic Area

Description		GPS Coordinates	Area (sq.km)
3D	North East	33°39'51.02"N, 73° 5'20.71"E	65.9
	South West	33°33'3.37"N, 73° 5'53.26"E	
	South East	33°34'47.92"N, 73° 9'11.70"E	
	North West	33°38'11.52"N, 73° 2'7.56"E	

Table ES 2: Tentative Location Coordinates of 2D Seismic Lines				
Seismic Line	Description	GPS Cordiantes (X, Y)		**Length L (km)**
1	Start	33°39'1.80"N,	73° 5'40.97"E	39.89
	End	33°27'37.29"N	72°43'59.01"E	
2	Start	33°38'57.39"N	72°44'51.66"E	30.25
	End	33°38'56.86"N	72°25'16.35"E	
3	Start	33°48'49.38"N	72°39'11.43"E	31.60
	End	33°31'52.70"N	72°39'55.64"E	
Total Line Km				**≈100 L.km**

It is noteworthy to highlight that the positioning of the seismic lines mentioned above may undergo deviations of 1 km at the time of the planning the execution of the exploration program. This may be needed to address a particular requirement e.g. protection of settlement, water body or other sensitive environmental feature or based on a technical requirement.

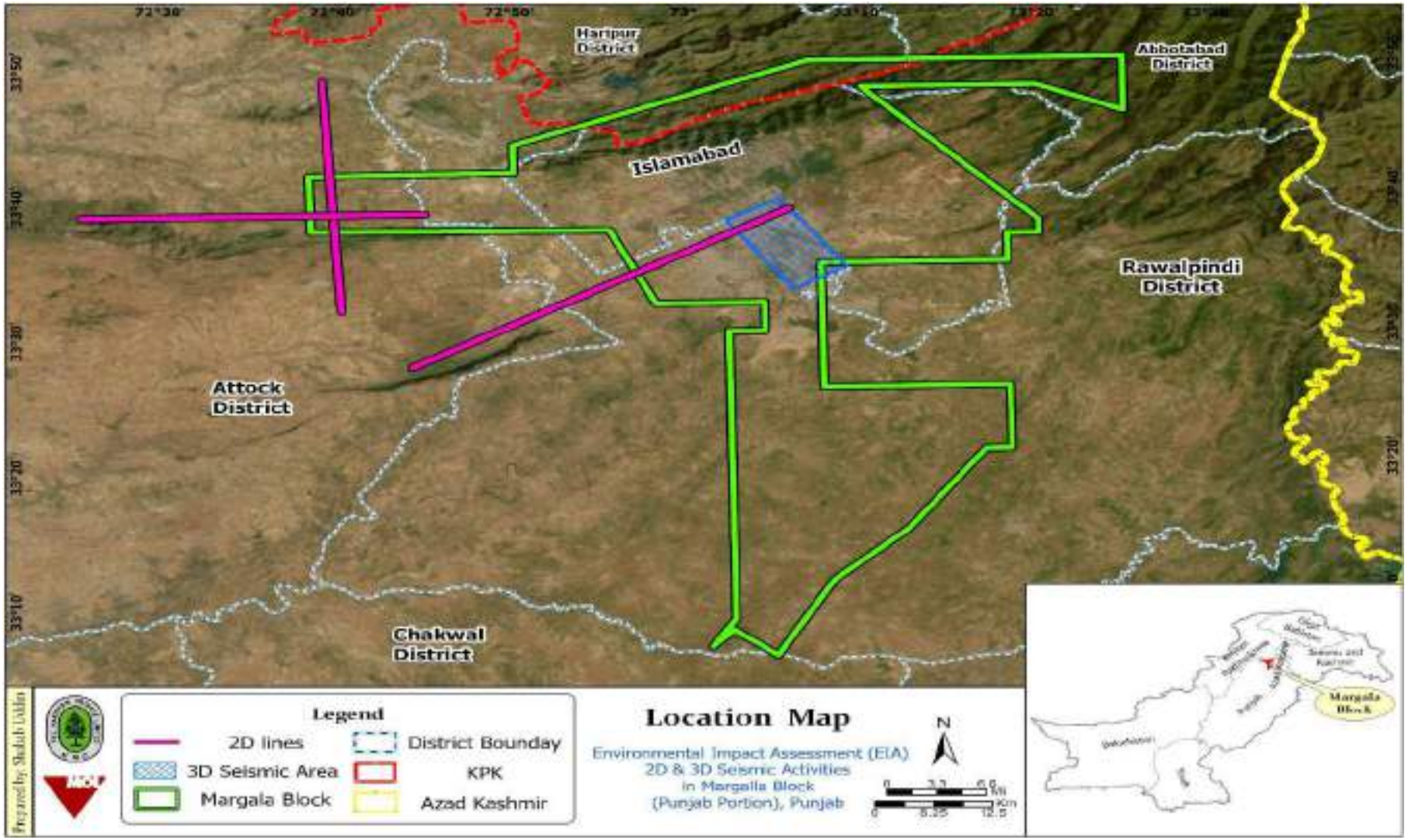

Figure ES 1: Map showing 2D Seismic Lines in Margalla Block of (Punjab Portion), Punjab

It is noteworthy to highlight that the positioning of the seismic lines mentioned above may undergo a deviation of 1 km at the time of the inception of the exploration.

The schedule of exploration activities is given below. The tentative duration of key activities will be approximately of about 10-12 months:

Table ES 1: Expected Schedule of Seismic Activities

Activities	**Duration**
Mobilization (if base camp is established)	4 weeks
Seismic Survey	10-12 months
Site restoration	3 weeks
Demobilization	1 week

Potential Impacts and Mitigation Measures

The potential environmental and socioeconomic impacts related to the proposed project have been identified through literature review, scrutinizing baseline data (both primary and secondary), professional opinions, experience, understanding of the proposed project activities, field observations and site surveys.

Screening and assessment of potential environmental impacts for the project finds that:

- The project area comprises of mixed of hilly terrain, urban & rural settlements and agricultural land.
- During the seismic survey near settlements and urban areas, a traffic management and mobilization plan will be developed in coordination with the local government to minimize inconvenience and ensure the safety of local communities.
- Agriculture has been carried out within block at some places. Compensation will be paid for the land acquired and crop damaged.
- The proposed activities may have impacts which can be mitigated by adopting best industrial practices and restoration of the area after activity.
- Fuel or oil leakage or spill during the project activities can result in contamination of soil and water and can be categorized as minor, moderate or major.
- Proper implementation of plan for hazardous waste management will reduce the soil and water contamination.
- Impacts on air quality during project activities would include emissions and dust from earth-moving equipment, and vehicles. By minimizing the disturbance and areas cleared of vegetation, using dust control techniques, following restoration and using well maintained machinery and vehicles can effectively reduce the impact on air quality.
- The primary impacts due to noise pollution generated by project activities would be localized disturbance to wildlife and inhabitants.
- Operation of different equipment during various phases causes varying degree of vibration depending on the type of equipment and operations. Protecting workers from the effects of vibration is essential otherwise it may lead to an increased risk of hand-arm vibration syndrome (HAVS).

Screening of potential environmental and socio-economic impacts resulting from various activities associated with the project reveals that majority of the impacts will occur on temporary basis and

will be reduced with adaptation of good industrial practices, mindful planning, design and control of operations in each phase.

The risks identified have been addressed by recommendations of various mitigation measures to reduce the severity of each impact. Assessment of the identified impacts was validated using the information obtained through site surveys. The experts engaged for the EIA study visited the project area to gather information on the environmental and social characteristics of the project area. The proponent shall oversee the entire activities with an objective to ensure environmental protection. The mitigation matrix for the proposed activities is included in the section 8 of this report.

During the project, environmental monitoring of following parameters has been suggested:

- Exhaust and Emissions Monitoring
- Waste water
- Noise
- Solid Waste
- Occupational Safety

The EMP has been prepared in accordance to national and provincial guidelines. Several actions have been identified in the EMP to prevent or mitigate the environmental impacts of proposed project.

All activities associated with the proposed project have been reviewed and their possible impacts methodically analyzed. A comprehensive Environmental Management Plan has been put together and provided in the report for adherence which will ensure the evasion of environmental degradation or contamination. Screening of potential impacts from the project activities finds that:

- The project's impacts on the ambient environment will be short term and mostly localized.
- The project location (location of seismic profiles) are safely away from key sensitive receptors e.g. settlements and infrastructure.
- Vegetation density of the site and surroundings is low and mature trees are less common. The predominant vegetation type of the area includes shrubs and grasses. Project activities will not significantly affect the vegetation density of the area.
- Animal density in the project area is very low due to current land use pattern. Wild animals are limited to small mammals and reptiles while domestic animals are found in the nearby villages.
- Impact from project related transportation activities can occur in areas falling close to communities. Adoption of safe driving practices and careful scheduling of activities will be required near these areas.
- The project is not water intensive, the impact on area's water availability is not expected from project's water consumption. However, water conservation measures will still be adopted to prevent any unanticipated impact.
- No protected area falls within the block boundary.
- Socioeconomic impacts on micro-scale would be insignificant if any. Social issues like removal of existing business, property and resettlement are not anticipated from any project activity.

Based on the risk assessment carried out for the project, it is recommended that:

- The impact on animal life can be prevented by careful clearance, excavation works and adopting a "No Hunting, No trapping" Policy.

- Temporary inconveniences due to construction works are minimized through planning and coordination with local population and organizations in the neighborhood.
- Environmental Performance Monitoring is made an integral part of the Project to ensure environmental safeguards.
- Water conservation practices may be adopted at all stages of project.

A series of mitigation and monitoring measures have been included to address the concerns for these measures. Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental Management Plan, the adverse environmental and social impacts of the proposed project activities are likely to remain within the acceptable limits. The project is not expected to have long-term significant or irreversible negative environmental impacts neither at the construction, nor at operation phases. The environmental Monitoring plan has been devised and provided in table ES-3.

Table ES-3: Environmental Monitoring Plan for Seismic Activities in Margalla Block (Punjab Portion)

S. No.	Monitoring Aspects	Monitoring locations	Parameters	Frequency	Responsibility	Documentation
1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Annually	Contractor	Laboratory test Reports
2	Waste water	Campsite	Effluent Flow, Temperature, pH, COD, BOD_5, TSS, TDS, Oil & Grease, Chloride & Phenolic Compounds	Quarterly (if wastewater discharged into any nullah)	Contractor	Laboratory test Reports
3	Noise level	Boundaries of the camp sites	Noise level (dBA)	Quarterly	Contractor	Internally / externally
4	Solid Waste	Project site	Solid waste collection, storage, transportation and disposal	Daily	Contractor	Complete record waste generation record, waste disposal record & disposal certificate)
5	Occupational Safety	Campsite, project roads	HSE Records, Incidents and injuries	Daily	Contractor	Record of observations.

It is thus recommended that the EIA for the proposed project be approved with the condition that all corrective and mitigation measures proposed in this report will be implemented with diligence. The provided EMP in the report will provide guidelines and measures to ensure sustainable and eco-responsible execution of the project activities.

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Purpose of Report

This report presents the findings of an Environmental Impact Assessment (EIA) study conducted by EMC Pakistan Pvt. Ltd. for the 2D/3D Seismic Activities in Margalla Block (Punjab Portion), District Attock, Punjab. The EIA study of the seismic survey site has been carried out in accordance with Section 12 of Punjab Environmental Protection Act, 1997 (amended 2012 and 2017) and rules and regulations enclosed thereunder.

1.2. Identification of Project, Proponent and Consultant

Project Title:	Seismic Activities in Margalla Block, (Punjab Portion), District Attock Punjab
Proponent:	**MOL Pakistan Oil and Gas Co. B.V.** **Address:** Islamabad Stock Exchange (ISE) Towers, Floor No.17, 55-B, Jinnah Avenue, Islamabad, Pakistan **Tel:** +92-51-8846000 **Fax Number(s):** +051-2655828 **Fax.:** +92-51-265 5828 **Email:** habib.mahar@molpakistan.com
EIA Consultant:	**EMC Pakistan Pvt. Limited** **Address:** Office # 403, Green Trust tower, Jinnah Avenue, F 6/1, islamabad **Phone:** +92-51-874415, 8744055 **Fax:** +92-21-34311467 **Website:** www.emc.com.pk **Email:** mail@emc.com.pk; info@emc.com.pk

1.3. Brief Description of the Nature, Size and Location of Project

This document presents the findings of an Environmental Impact Assessment (EIA) carried out by EMC Pakistan (Pvt.) Limited for the project “Seismic Activities in Margalla Block (Punjab Portion), District Attock & Rawalpindi, Punjab”, proposed by MOL Pakistan. The proposed project includes 2D & 3D Seismic Survey to acquire seismic data for the exploration of hydrocarbon potential in Margalla Block. The Margalla Block encompasses parts of the Islamabad Capital Territory (ICT), Rawalpindi and Attock districts of Punjab, and Haripur and Abbottabad districts of Khyber Pakhtunkhwa (KPK), covering a total area of approximately 1847.18 sq.km.

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	South East	33°34'47.92"N, 73° 9'11.70"E	
	North West	33°38'11.52"N, 73° 2'7.56"E	

Table 1.1b: Tentative Location Coordinates of 2D Seismic Lines

Seismic Line	Description	GPS Cordiantes (X, Y)		Length L (km)
1	Start	33°39'1.80"N,	73° 5'40.97"E	39.89
	End	33°27'37.29"N	72°43'59.01"E	
2	Start	33°38'57.39"N	72°44'51.66"E	30.25
	End	33°38'56.86"N	72°25'16.35"E	
3	Start	33°48'49.38"N	72°39'11.43"E	31.60
	End	33°31'52.70"N	72°39'55.64"E	
Total Line Km				**≈100 L.km**

It is noteworthy to highlight that the positioning of the seismic lines mentioned above may undergo deviations of 1 km at the time of the planning the execution of the exploration program. This may be needed to address a particular requirement e.g. protection of settlement, water body or other sensitive environmental feature or based on a technical requirement.

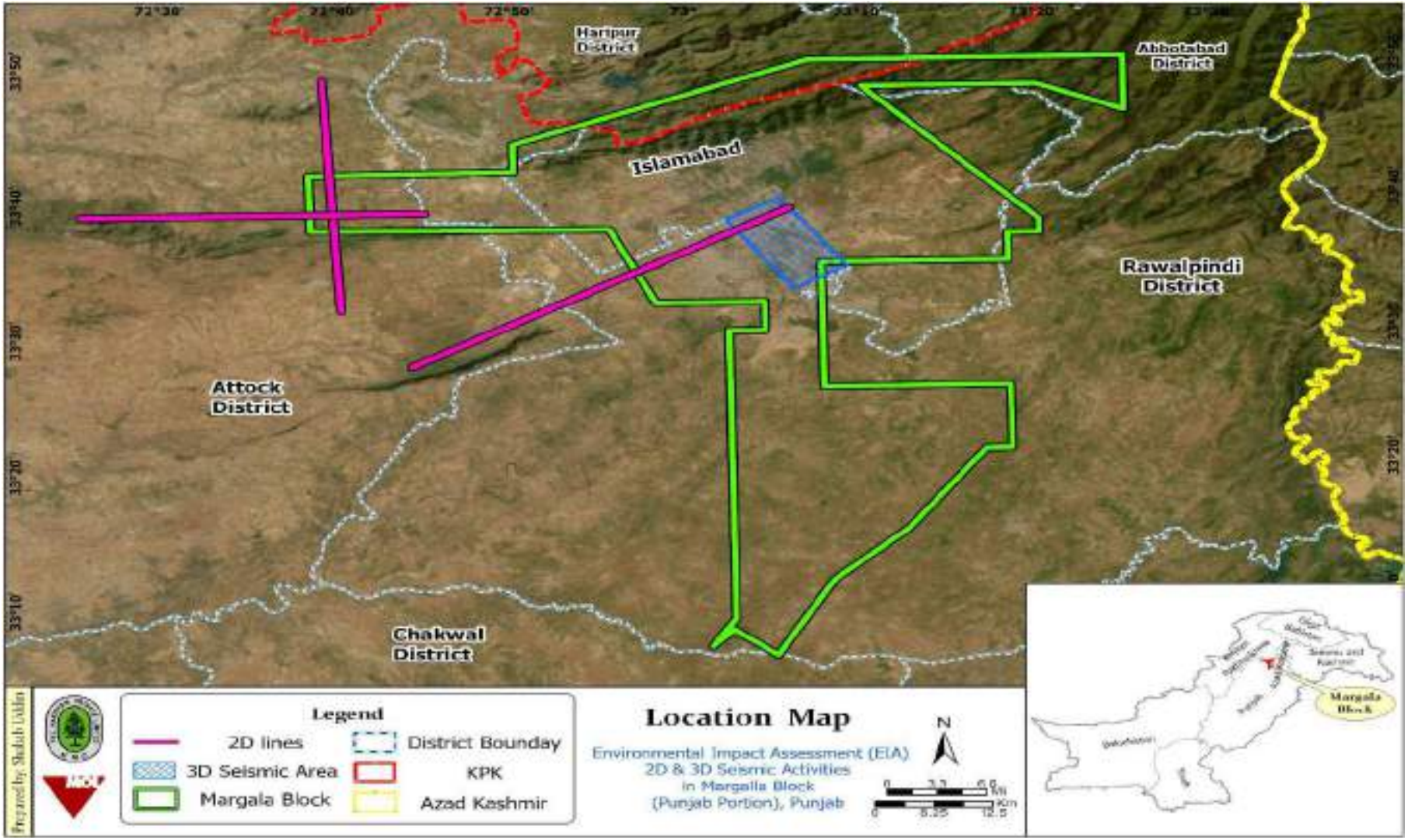

Figure 1.1: Location Map of Proposed Project Showing Margalla Block Punjab Section

1.4. Project Proponent – MOL Pakistan

MOL Pakistan, a fully owned subsidiary of MOL Group, has been operating in the country since 1999. Pakistan plays a pivotal role in the company's international portfolio, particularly in production and exploration. MOL Pakistan holds working interests in three blocks, operating the TAL and Margalla blocks, while the Karak block is non-operated. Additionally, the company is a major producer of condensate, crude oil, LPG, and natural gas in Pakistan, contributing significantly to the country's energy supply.

Health, Safety and Environment[1]

- **WORK SAFETY**

To achieve the high level of safety awareness, MOL Group continuously seeks opportunities to widen its communication channels to involve all levels of employees from top management to shop-floor workers, as well as contractors in improving safety. Our vision is to be in the top quartile of international oil companies in our peer groups in terms of several parameters, naturally including safety issues. To measure our status, we compare our safety performance on Group and Business/Flagship/Opco levels to industry benchmark figures published by Concawe, IOGP and CEFIC.

We all at MOL Group are committed to acting responsibly on the health, safety, environmental (HSE) and social impact of our activities as part of day-to-day business and improving asset integrity and preventing incidents of every type, whilst maintaining a high standard of emergency response. As a result of these systematic efforts and programs implementation, we aim to improve our safety performance year by year. Ultimately, this means our employees and contractors could return home safely after our working day.

- **CONTRACTOR SAFETY**

Contractors and suppliers that perform work or deliver services for MOL Group may have impacts on personnel, our operations and our reputation. The contracting of services, the purchasing, hiring or leasing of assets and activities from partners are carried out so as to minimise any adverse consequences to health, safety and environment. In the framework of our Contractor Management system we put strong emphasis on health & safety elements during the procurement processes – selected contractors are pre-evaluated prior to contracting to assess if they are able to comply with our HSE Management System. The baseline for the Contractor Management system is a range of HSE-critical activities (e.g. work at height, confined space entry, scaffolding, lifting etc.), locations and relevant personal and material requirements. In line with industry practice, compulsory 24/7 safety coordination and frequent site inspections are undertaken for complex, high risk activities.

The gradual introduction of mandatory VCA/SCC (Safety Checklist Contractors) certification for contractors and MOL Group Single Service Companies is obligatory implemented in in Downstream and European Upstream operational areas from January 2017. In order to encourage our contractors to obtain their certificates, bonus scores awarded during the tender evaluation process if suppliers have already obtained an SCC or OHSAS 18001 qualification (for high-risk

[1] https://molgroup.info/en/sustainability/health-and-safety

work). The results of post-evaluation analysis have been incorporated into the evaluation process as well.

- **PROCESS SAFETY MANAGEMENT**

From process safety point of view are committed to control the risks related to the operation of all hazardous technologies we are operating and keep these risks on an acceptable level – as low as reasonably possible. The goal of process safety management (PSM) is to ensure that technology-related process incidents which could result in fire, explosion and harm to people or the environment are prevented. It involves a process of identifying, understanding and reducing risks related to our chemical and non-chemical hazardous processes. PSM ensures a unified approach and the same high-level process safety performance across the company. This includes identifying risks using the most appropriate methodology (HAZOP, "What if study", etc.), management of change procedures, regular PSM meetings and a networking of dedicated PSM professionals. The efficiency of the PSM system implementation is regularly assessed through internal and external compliance audits.

1.5. Screening

Environmental Impact Assessment (EIA) of the project has been carried out in compliance with the mandatory requirement of Section 12 of Punjab Environmental Protection Act, 1997 (amended 2012 & 2017) which requires that: "No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency an initial environmental examination or where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the Provincial Agency approval in respect thereof." In compliance with the above cited regulations, an EIA study has been prepared and its report is being filed with the Punjab Environmental Protection Agency for approval.

On the basis of categorization given in Schedules I and II of the Punjab Environmental Protection Agency (Review of IEE and EIA) Regulations, 2022, the proposed project falls in ***Schedule II Category A5 (Energy): Oil & gas extraction projects including exploration, production, gathering systems, separation and storage.***

1.6. Scoping

Scoping is an early step during the environmental assessment study to identify the important issues to be considered and eliminate those that are not important. Scoping helps identify the boundaries of the project and TORs for later stages of baseline collection and impact identification and evaluation and help to save extra efforts and resources.

Scoping for the project was conducted to identify the key issues that need to be covered in the EIA and determine the scale and magnitude of same for further planning and management. The proposed project comprises exploration activities for the identification of hydrocarbon resources in Margalla Block (Punjab Portion), District Rawalpindi and District Attock, Punjab.

1.6.1. Spatial and temporal Boundaries for Environmental Assessment

The project activities have been assessed w.r.t project's impacts on micro and macro-environment. The project area considered as microenvironment comprises the project site and its immediate surroundings in 1000 meters radius. Macro-environment is studied with respect District Rawalpindi and District Attock. The EIA study has covered assessment of impacts on physical and ecological environment. Due to location social impacts are anticipated to be small scale.

Exploration activities can have potential impacts on the environment if proper mitigation measures are not taken into consideration. Inadequate management of project activities can lead to potential impacts which may include soil contamination, disturbances to local communities, loss to the wildlife, damage to or destruction of habitats or living sanctuaries, pollutions and erosion etc. With the thorough identification of control measures for the potential impacts, the scale and magnitude of environmental and social impacts can be greatly reduced, thereby rendering the project environmentally and socially conducive.

The EIA study aims to provide complete environmental assessment of the Seismic Activities in Margalla Block, Punjab Portion. The assessment covered the project's anticipated impacts on the surrounding biological, physical and socio-economic environment. Overall scope of the EIA study included:

- Description of project activities
- Overview of legal framework for the project
- Environmental and social surveys of project area to develop baseline environmental and social profile of project area
- Conducting consultation with project area communities and other stakeholders
- Analysis of project alternatives
- Risk assessment of project activities followed by identification of suitable mitigation measures to offset or otherwise reduce the scale and magnitude of impact
- Preparation of Environmental Management Plan (EMP) for the project
- Development of plan for emergency scenarios

- Submission of EIA report to EPD for approval

Follow up with EPD for issuance of environmental approval

1.6.2. Important issues and concerns raised during consultation

Details of the consultations with stakeholders is provided in section 6 of the report. Important issues highlighted during consultation are listed below:

- Land clearing should be done at minimum.
- The hazardous waste should be disposed of via EPA approved waste contractor
- No tree cutting is allowed.

The local residents shared no grievances with regard to this project. However, they expect uplift of the area's social profile through investment in its infrastructure and providing basic needs of day to day living e.g. clean water and health facilities

1.6.3. Significant impact and factors to be considered

Important issues and factors during different phases of the project that need to be considered include but not limited to;

- Project area's physical environment
- Waste generation
- Project's resilience towards natural disasters (floods)
- Safety Hazards

Detailed risk assessment is provided in **section 8.**

1.7. Methodology for Environmental Impact Assessment (EIA)

Various steps were undertaken in order to conduct, prepare and present this EIA report. Brief details of those steps are given below while their description is documented in the subsequent sections of this report.

1.7.1. Understanding of the Proposed Project

This step required collection of information from MOL Pakistan for the proposed project and understanding the activities to identify potential impacts.

1.7.2. Review of National Legislation and Guidelines

National legislation, international agreements, environmental guidelines and best industry practices were reviewed to set environmental standards.

1.7.3. Collection of Secondary Data

Available published and unpublished information pertaining to physical, biological and socio-economic micro & macro environment was obtained and reviewed. It includes previous environmental studies and baseline conducted for seismic activities in Punjab.

1.7.4. Collection of Field Data

This study is based on the findings from site visits conducted by the EMC Team. In November 2025, the team carried out a baseline survey at the project site to collect primary data on environmental (both physical and biological) and social aspects. The team also consulted with local

residents to gather area-specific information, including their views and concerns regarding the proposed project's activities. Both primary and secondary sources of information were used to develop the baseline for the area. Secondary data includes information taken from the literatures, reports and websites.

Dirt Access Road

Drainage pattern in area






Public consultation

Figure 1.2: Field survey and monitoring activities during EIA study

Source: Primary and secondary data

1.7.5. Baseline Environmental Profile of Project Area

The environmental profile of the project area was established through secondary data as well as primary data (field surveys). The information was collected and compiled on environmentally important areas (Ambient Air Quality, Surface and Groundwater Resources, community setup, Existing and Proposed Roads, Livelihood, Agriculture, Health, Public Services, and Sites of Archeological or Cultural Importance).

1.7.6. Stakeholder Consultation

Stakeholder consultations were held to involve the public in the decision making process and to have a fair interaction with all community groups and assuring them that every attempt would be made to reduce the negative impacts of the project, and that adequate remedial measures would be taken to recompense the loss of the affected persons, if any.

1.7.7. Impact Identification and Evaluation

Potential impacts which may arise from project related activities were identified. These include effects on physical, biological, socio-economic, archaeological and cultural environment. Impacts were identified and assessed on the basis of field data, secondary data, expert opinions and monitoring results of previous oil and gas exploration projects in Pakistan.

1.7.8. Recommendations to Mitigate Impacts

Keeping in view the baseline data collected and impacts identified; mitigation measures have been recommended to eliminate, minimize or compensate for the potential environmental and social impacts on the zone of influence of the project. Mitigation measures recommended here are based on past experience, best industrial practices, legislative requirements and professional judgments.

1.7.9. Environmental Management Plan (EMP)

Environmental Management Plan (EMP) is formulated for an effective and efficient implementation of the endorsed mitigation measures. EMP includes controls to lessen the identified impacts, and monitoring programs of residual impacts, if found any, during the operations. The EMP has been laid down with the procedures to be followed during the seismic activities and has catered all the identified roles and responsibilities for all concerned personnel.

1.7.10. Report Compilation and Review

This is the final stage of EIA study where all EIA activities and findings are documents, compiled and reviewed. At the end of the study, the report is reviewed and shared.

Structure of the EIA Report

The EIA report has been designed on the standardized format. The Report has been divided in the following sections:

Section 1: Delivers an introduction and overview of the Project and EIA process.

Section 2: Describes the proposed project i.e., the overall description of the project and its associated activities in detail.

Section 3: Describes the alternatives analyzed for the project

Section 4: Summarizes the national & international policies and legislation along with guidelines relevant to the project.

Section 5: Provides description of the microenvironment and macro-environment of the project area explaining its biological, physical environment along with the socio-economic conditions

Section 6: Provides details of the consultations and feedbacks received from the stakeholders.

Section 7: It includes screening of potential environmental and socioeconomic impacts arising from the proposed project site and incorporates mitigation measures. General and project specific guidelines are used to assess the potential environmental impacts at various phases of the project.

Section 8: Presents a comprehensive Environmental Management Plan (EMP) and Monitoring Program for the project.

Section 9: Summarizes the report and presents its conclusions and deliverables.

The main text of the report is supported by a series of Appendices and Annexures which provide added information.

2. DESCRIPTION OF PROJECT

2.1 Project Objectives and Overview

This document presents the findings of an Environmental Impact Assessment (EIA) carried out by EMC Pakistan (Pvt.) Limited for the project "Seismic Activities in Margalla Block, District Rawalpindi and District Attock (Punjab Portion), Punjab", proposed by MOL Pakistan. The proposed project includes 2D & 3D Seismic Surveys to acquire seismic data for the Exploration of Hydrocarbon in Margalla Block. The total area of the Margalla Block is approximately 1,847 km², of which only a small portion — 65.9 km² for 3D seismic acquisition and 100.7 line-kilometres (L-km) of 2D seismic lines — falls within the administrative jurisdiction of District Rawalpindi and District Attock. This portion of the block will be surveyed as part of the proposed seismic programme.

MOL Pakistan aims to explore new hydrocarbon reserves through seismic surveys on the basis of promising geological features and to enhance the production of fossil-fuels in order to reduce energy deficiencies of the Pakistan. This survey will help increase the prospects of finding new hydrocarbon resources in the Punjab.

2.2 Project Location

The proposed project includes 2D & 3D Seismic Activities which will be carried out in Margalla Block (Punjab Portion), District Rawalpindi and District Attock, Punjab. A 65.9 sq. km for 3D seismic acquisition and 100.7 L-km of 2D seismic lines will be surveyed as part of the proposed seismic programme.

Tentative location coordinates for proposed 2D 7 3D seismic survey are given below in Table-2.1 while project location map of Margalla Block (Punjab Portion) is given as Figure-2.1.

Table 2.1a: Tentative Location Coordinates of 3D Seismic Area

Description		GPS Coordinates	Area (sq.km)
3D	North East	33°39'51.02"N, 73° 5'20.71"E	65.9
	South West	33°33'3.37"N, 73° 5'53.26"E	
	South East	33°34'47.92"N, 73° 9'11.70"E	
	North West	33°38'11.52"N, 73° 2'7.56"E	

Table 2.1: Tentative Location Coordinates of 2D Seismic Lines

Seismic Line	Description	GPS Coordinates (X, Y)		Length L (km)
1	Start	33°39'1.80"N,	73° 5'40.97"E	39.89
	End	33°27'37.29"N	72°43'59.01"E	
2	Start	33°38'57.39"N	72°44'51.66"E	30.25
	End	33°38'56.86"N	72°25'16.35"E	
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Total Line Km				**≈100 L.km**

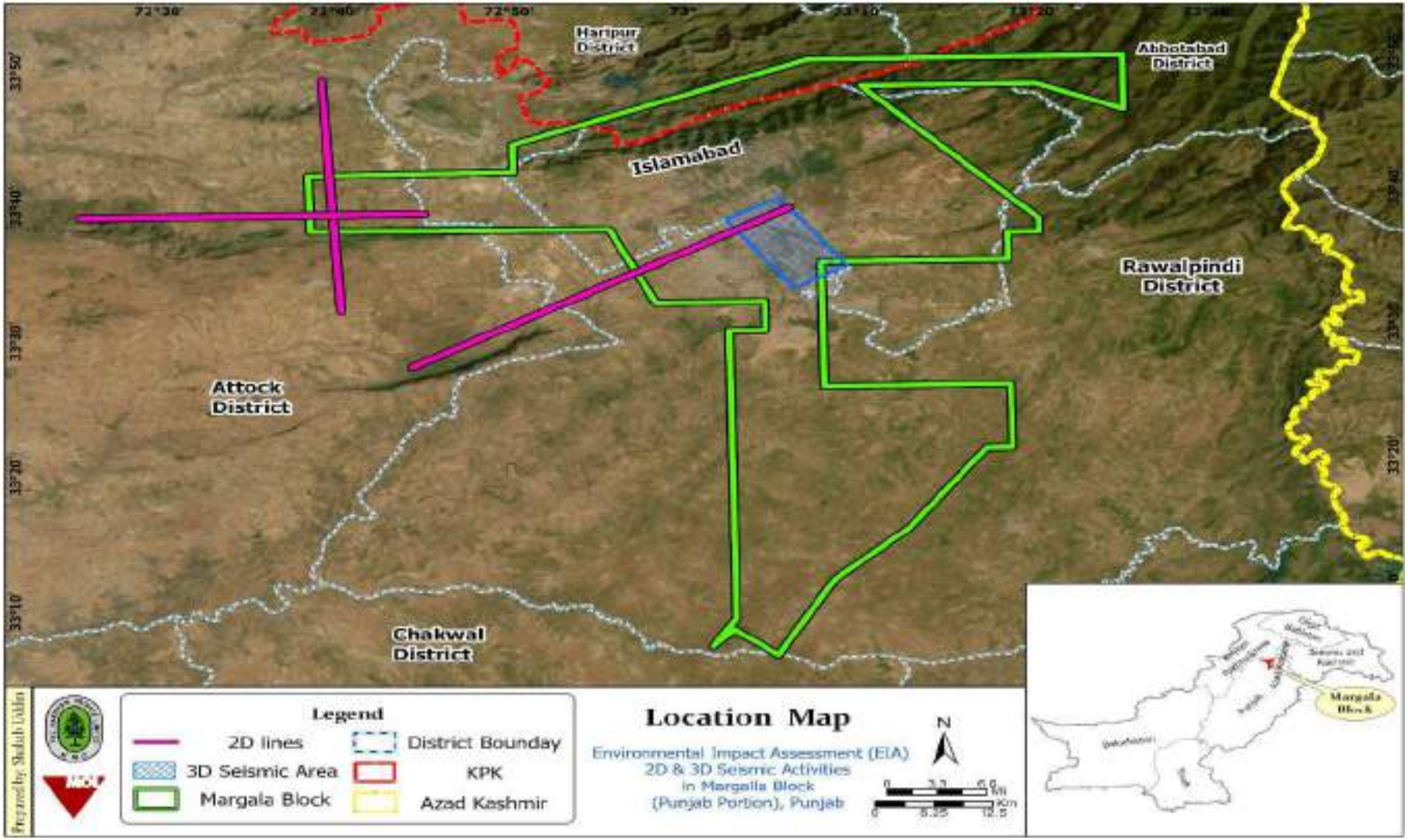


Figure 2.1: Location Map of the Proposed 2D Seismic Activities in Margalla Block, Punjab

It is noteworthy to highlight that the positioning of the seismic lines mentioned above may undergo deviations of 1 km at the time of the planning the execution of the exploration program. This may be needed to address a particular requirement e.g. protection of settlement, water body or other sensitive environmental feature or based on a technical requirement.

2.3 Site Layout

One Base Camps with accompanying fly camps (if required) may be established in the project area to house the seismic crew. Area of campsite (Base Camp) will be about 200m x 200m. A Magazine Camp may also be established for the storage of the explosives. The total area required for the Magazine Camp will be 9600 sq. m. The layout of the Base Camp and Magazine Camp is shown in Fig. 2.2 & 2.3.

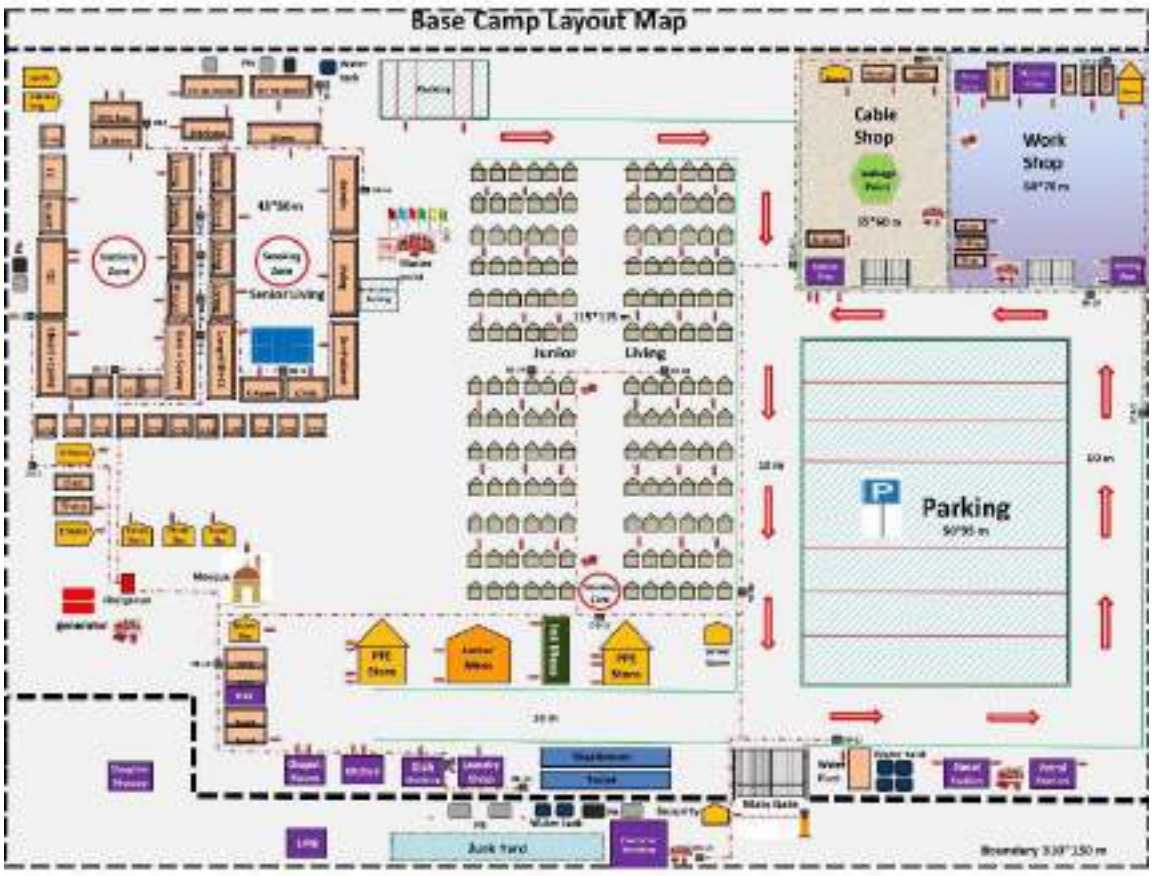


Figure 2.2: Generic layout of base camp

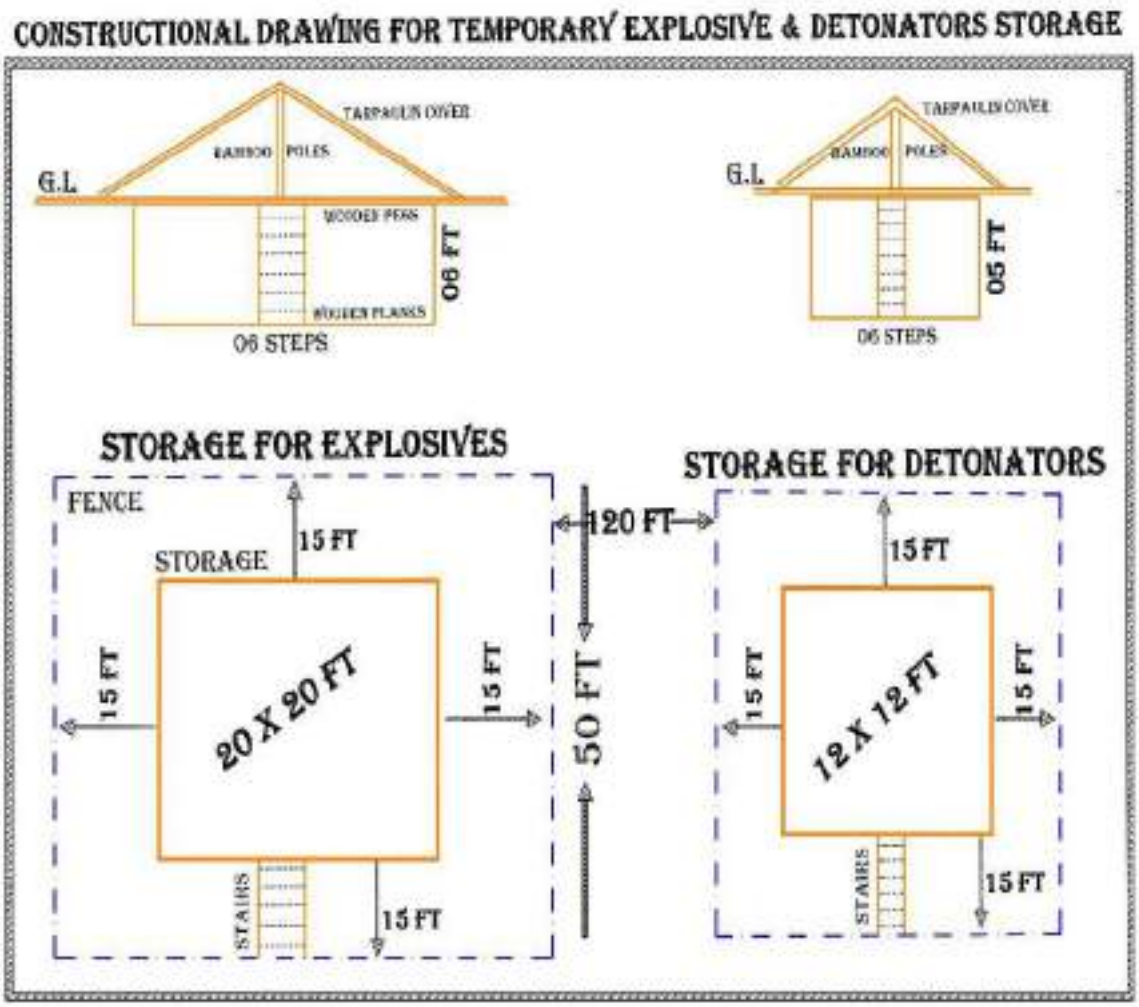


Figure 2.3: Proposed layout of Magazine camp

2.4 Land Use of the project area

The land surrounding the proposed seismic survey area is characterized by a diverse mix of urban development, agricultural land, and hilly terrain. In District Rawalpindi, the 2D and 3D seismic activities fall within predominantly plain to gently undulating areas that have largely been converted for housing, commercial use, and other infrastructural development. Vegetation density is generally low due to extensive urban expansion. Key landmarks within the vicinity include Ayub National Park, Lohi Bher Forest, and Rakh Takht Pari Forest.

In District Attock, the proposed seismic survey lines traverse moderately populated rural areas, where land is primarily utilized for agricultural activities. The topography is undulating, influenced by the presence of the Kala Chitta Range. Tree density is relatively low as a result of extensive land use for cultivation. Prominent natural features in the area include Kheri Murat National Park, Kala Chitta National Park, Kherimar National Forest, and Ajiwala National Forest.

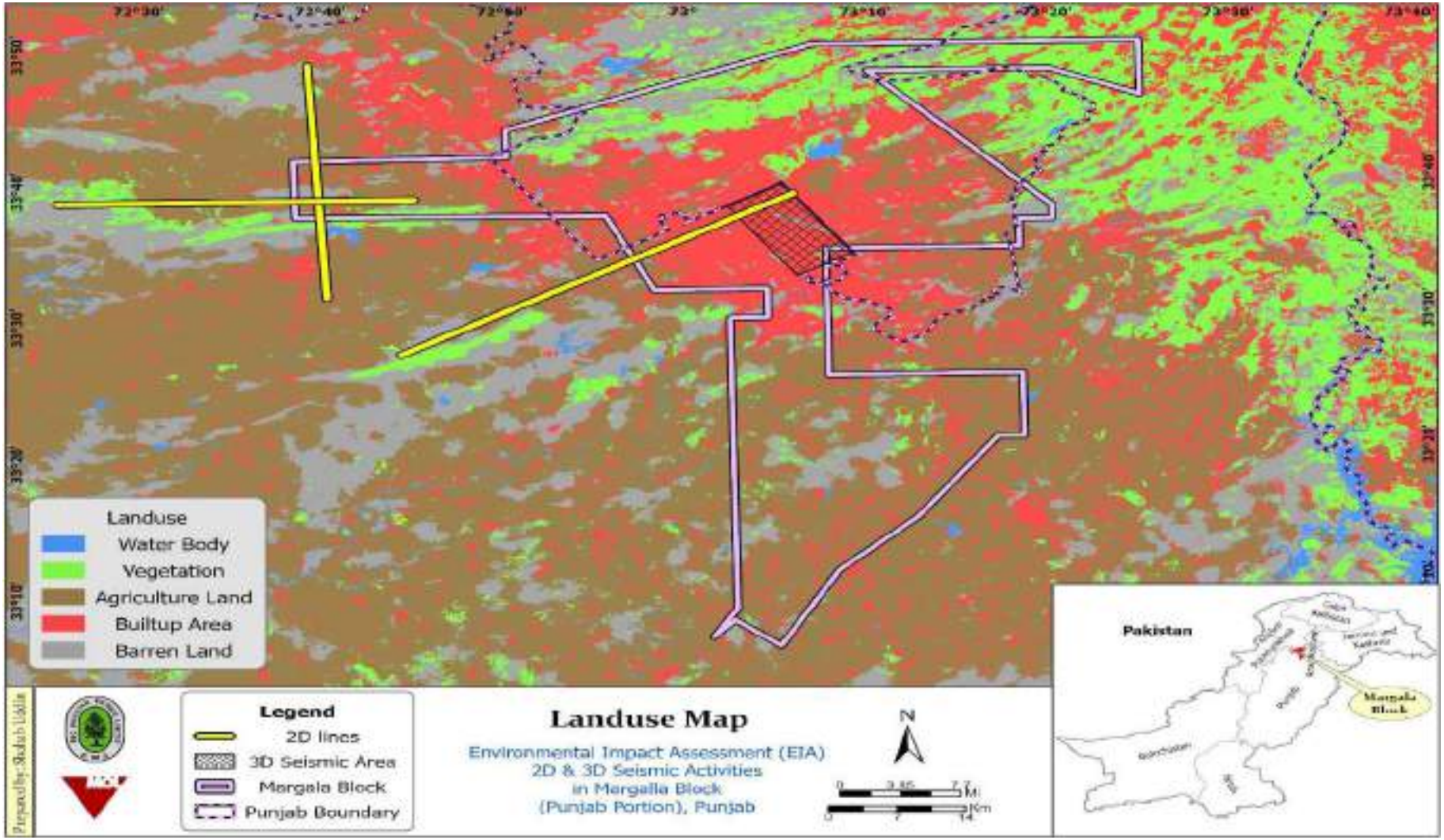


Figure 2.3: Land Classification of Margalla Block Punjab Portion

2.5 Road Access

The project will make maximum possible use of existing road infrastructure. However, if needed, temporary tracks will be setup for vehicle movement in the rural areas. For this purpose, the surface will be compacted and graveled if necessary for the movement of vehicles. Upon completion of activity, the tracks will be restored as part of site restoration activity.

The area situated in District Attock and District Rawalpindi can be accessed via N5. Some areas can also be accessed via M1 Motorway. The adjacent areas can be easily accessible via link roads that are in good condition.

Figure 2.4: Common condition of road network in project area

2.6 Vegetation feature of the site

The current seismic activities (2D & 3D) will be carried out in the densely populated areas of District Rawalpindi and extends towards the Dsitrict Attock where population density is very low. Tree density is very low in area selected for the seismic activities. The common floral species found in the areas are the Phulai (Acacia modesta), Shisham, (Dalbergia sissoo), Keekar (Acacia Nolitica), Shareen (Albizzia lebbck), Bari (Ziziphus Jujuba),Sanatha (Dodonaea viscosa). The invaise species found in the project area are Broussonetia papyrifera (Paper Mulberry), Parthenium hysterophorus (Booti), Lantana camara (Lalteen), Prosopis juliflora (Vilayati Kikar).

No tree cutting will be carried out during the survey. The proposed seismic survey activities will be carried out within the acquired land. No impact to the forest is anticipated.

Figure 2.5: Floral Diversity of Margalla Block (Punjab Portion)

2.7 Site Suitability

The Margalla Block has been awarded to MOL Pakistan by the Government of Pakistan for oil and gas exploration. The Block encompasses parts of the Islamabad Capital Territory (ICT), Rawalpindi and Attock districts of Punjab, and Haripur and Abbottabad districts of Khyber Pakhtunkhwa (KPK), covering a total area of approximately 1847.18 sq. km.

Within Punjab, 3D seismic surveys will be conducted over an area of 65.9 km² in District Rawalpindi. In addition, a 2D seismic line of 25.70 line-kilometers (L-km) falls within District Rawalpindi, while approximately 76.43 L-km of 2D seismic lines lie within the administrative jurisdiction of District Attock.

District Rawalpindi is densely populated and contains numerous settlements, parks, hospitals, cemeteries, and other infrastructure. Population density gradually decreases along the 2D seismic corridor extending westwards. In contrast, the seismic lines located within District Attock traverse moderately populated areas, comprising scattered villages, agricultural land, and hilly terrain.

All seismic operations will be undertaken while maintaining safe distances from sensitive receptors to ensure public safety and minimize disturbance.

2.8 Description of Project Activities

The project encompasses 2D & 3D seismic activities covering approximately 100 L.km for 2 D survey and approximately 65.9 sq. km for 3 D survey as depicted in Figure 2.1. It's important to note that the extent of 2D seismic coverage may be subject to adjustment on technical requirements arising from processing results. The details of the activities that will be carried out during the exploration activities are as under:

- Land permitting
- Construction of access track
- Development of campsites (Base Camp and Fly Camps (if required))
- Line Survey & Preparation
- Drilling shot holes
- Cabling
- Shooting and recording
- Restoration and rehabilitation

Key features of the project are given in Table 2.2 below.

Table 2.2: Key features of project

Location of the project	**District Attock & District Rawalpindi**
Seismic survey procedure	Conventional 2D & 3D land seismic data acquisition
Total land area for data acquisition	~100 L km for 2D and 65.9 sq.km for 3D
Data acquisition techniques	Seismic P-Wave data acquisition
Duration of seismic survey	10-12 months
Equipment and machinery	i. Recording Equipment- Wireless Geophones (nodes), Geophones with cables ii. Mixed Source mainly Vibroseis and some Dynamite iii. Refraction/Up-hole Logging Units iv. On-Site Processing Units and Planning & Designing Software v. GPS and Survey Equipment vi. Other Machinery like Dozers/Vehicles
Data collection in hilly terrain	Shot hole /dynamite technique
Data collection on surface water bodies	Marshphone
Source of energy for data Acquisition	Dynamite & Vibroseis
No. of up-holes	10-15 m single shot 08-12 m hole pop shots
Data collection in densely vegetated areas	In densely vegetated areas, use dynamite as source of energy to refrain from footprints
Explosives to be used during survey	Dynamite –2-6 Kg/shot will be used

Storage of dynamite	The dynamite storage is managed by the seismic contractor in line with MOL Pakistan contractual requirement to be following Explosive Rules and IAGC/IMAC guidelines.
Explosives storage arrangements	Magazine camp as per international safety standard
Safety arrangements/ precautionary measures during seismic survey	As per EMP and MOL Pakistan HSE Policy and Protocols

2.8.1 Seismic Survey

During the 2D & 3D seismic survey, subsurface geological information is collected by directing seismic (sound) energy into the ground and recording the time it takes for the energy to reflect off the underlying rock layers. Geophones or motion detectors (sensitive microphones) are employed to capture the reflected energy. These signals are generated either by a controlled impulsive source, such as seismic explosives, or by vehicle-mounted vibrator trucks.

Various methods can be utilized for seismic surveys, including deep holes, shallow holes (pop shot methods), or Vibroseis. The choice of a specific method is influenced by factors such as the type of land, economic considerations, and environmental considerations. In instances where minimal clearing of agricultural lands is needed or in hilly/mountainous terrain, dynamite technology will be employed as a source of energy. Key activities during the 2D & 3D seismic survey include:

- Land permitting
- Construction of access track (where required)
- Development of campsites (Base Camp and Fly Camps (if required))
- Survey team mobilization
- 2D & 3D Seismic Surveying /Data acquisition
- Restoration and rehabilitation
- Data Analysis

2.8.2 Equipment

Following equipment will be used during exploration activities. These are as under:

S#	Purpose	Equipment
1	***Land Survey***	• GPS receivers • Survey data processing system • Planning & Designing
2	***Energy Source***	• Vibroseis (dynamite with detonators) • Dynamite- detonator
3	***Recording & Processing***	• Recording truck • Wireless Geophones (Nodes) • Cable station units • Cables • Geophones strings • On-Site Processing Units Software
4	***Up-hole Equipment***	• Up-hole rig / truck • Water truck • Portable recording system • Manual energy source • Downhole detectors

5	***Miscellaneous***	• GPS and Survey Equipment • Other Machinery like Dozers/Vehicles • Communication Equipment • Miscellaneous/Camp Equipment

Wireless Geophones

Geophone with cable

Hydrophone

Vibrator truck

Explosives

2.8.3 Seismic Survey procedure

i. Land Permitting

The seismic contractor's team, along with the advance party, will arrive at the site. The team's early presence is crucial for initiating various activities, including engaging with local landowners and authorities to apprise them of the upcoming operations and coordinate necessary arrangements. The permitting team will be responsible for identifying land ownership within the areas earmarked for the seismic operation. Additionally, they will address matters such as establishing access roads, assessing potential crop damage, and determining compensation rates. This proactive approach ensures effective communication, collaboration, and resolution of logistical considerations before the commencement of the seismic activities.

ii. Access and Transport

Access to seismic lines will primarily utilize existing tracks whenever feasible. Given that four or six-wheel-drive vehicles will be employed during project activities, these existing tracks can be utilized with little to no improvement. In instances where there is no pre-existing access, new tracks will be prepared, however, efforts will be made to minimize the creation of new tracks to the greatest extent possible. This approach aims to balance the logistical requirements of the project with the goal of minimizing environmental impact and disturbance in areas without existing access.

iii. Mobilization and Camp Establishment

Once the access track to approach the camp location is complete, mobilization and camp establishment activities will begin. Camps will be located and constructed such that minimum clearing of vegetation or land is involved. Campsite will include accommodation area including tents and portable cabins, staff's kitchen and mess, laundry area, toilets, workshops, vehicle parking area, equipment storage areas, fuel and oil storage area, generator area, septic tanks and soak pits and a waste storage / garbage pit. Camps will be fenced for security reasons. It will take around 2 weeks to complete camp establishment. The rest of the seismic crew will be mobilized once the camp is fully operational. Survey work will start only after satisfactory set up of the base camp. Water will be required during the operation for domestic and seismic survey activities.

iv. Line Survey Preparation

In this activity, the seismic lines will be marked on the ground by survey teams, each team comprising of 4 to 5 people. The survey teams will use a global positioning system (GPS) to mark shot points on the seismic lines at around every 50-meter interval with whitewashed stones or wooden peg. Clearing of trees and dense patches of vegetation will be avoided by adjusting the location of seismic line as much as possible. Where, inevitable, vegetation will be cleared from the area only up to the extent required. A record of vegetation removal will be maintained along with species type and number. The material that is removed will be pushed to either side of the line creating low windrows along the length of the line.

v. Explosive and Drilling

In this method, an explosive such as Dynamite is loaded in a shot hole and covered by soil. The dynamite provides the energy source in this case. It is labor intensive for making shot holes. Explosive sources such as dynamite are the preferred seismic sources in rough terrains, in areas with high topographic variability or in environmentally sensitive areas e.g. marshes, farming fields, mountainous regions etc.

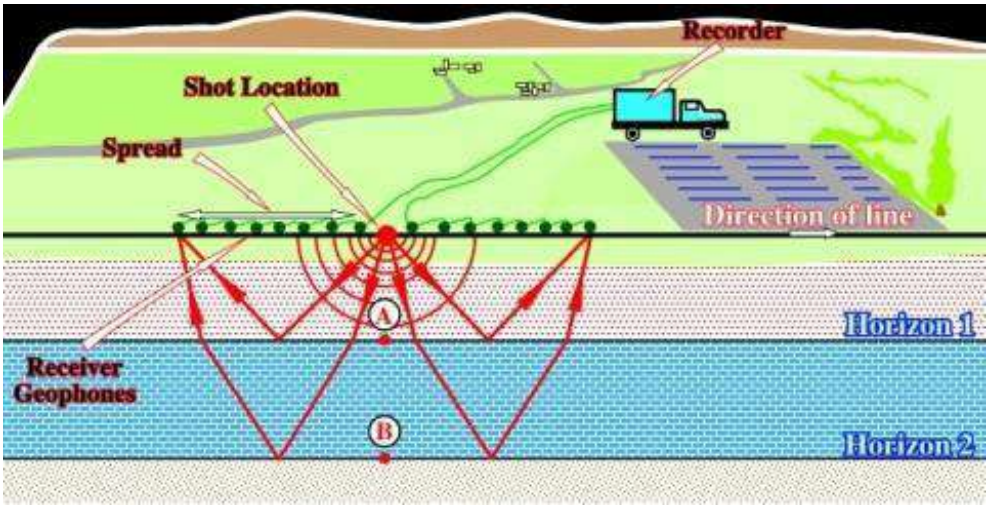
vi. Recording

There are two types of Geophones (sensitive motion detectors or microphones), wireless (nodes) and conventional geophones connected with cables. Wireless geophones are remotely connected with the recording truck without any cables with a minimum human footprint. This is a latest technology which is specifically designed to record data in urbanized and remote areas. Additionally, this reduces the human imprint on the surrounding environment, since it involves lesser human resource and effort. Second type of Geophones are conventional geophones which are connected with the cable. A cable is laid to join all geophones (buried just below the ground) and connect with the recording truck that has the main electronic hardware used to record the data coming from sub-surface. Approximately 70-80 laborers will be employed for lying and retrieving

of cables. The primary source of recording instrument will be wireless geophones (nodes) for seismic survey.

vii. Data Acquisition

Two methods are conventionally used for data acquisition, vibroseis and shot hole method using an explosive. Either of the two may be used depending on the location, geography, land use, and other technical aspects. In this current seismic survey, Shot hole methods will be used.



Wireless Geophones

Geophone with cable

Seismic Recording Truck

Data Center

viii. Decommissioning and Site Restoration

Upon the completion of the seismic survey in a given area, a dedicated 'green team' will be deployed for restoration and rehabilitation efforts to return the particular activity site to its original condition. This team will meticulously inspect all holes and pits to ensure thorough backfilling and confirm the absence of any debris or trash.

The restoration of seismic lines will encompass the demobilization of all equipment and machinery. Additionally, it will involve the removal of cables, geophones, station units, flags, stakes, and any associated waste from the lines. To provide a visual record for reference purposes, photographic documentation of selected sections of seismic lines will be captured both before and after the operation.

ix. Explosives Storage

A bulk stock of dynamite will be transported to the project area. It will be stored in dynamite and detonators storage area located at a 500 m away from communities and the seismic camps. Explosives will be stored in an excavated pit and covered with tarpaulins. Area will be fenced and guarded for security reasons. Seismic Contractor has in place the procedures required for the storage, handling and transport of the explosives. Same will be implemented during the project implementation.

2.8.4 Schedule of Implementation

The exploration activities are expected to take about 10-12 months. The tentative duration of key activities is provided below:

Mobilization (if base camp is established)	4 weeks
Seismic Survey	10-12 months
Site restoration	3 weeks
Demobilization	1 week

2.9 Staffing & Supplies

For seismic survey, Workforce of 100-150 will be required for total project General supplies transported will include camp (food, etc.), fuels, oils and chemicals, and equipment maintenance parts. Water supplies will be outsourced / procured from locals / owner of tube wells and transportation will be done through bowsers. Proper and justified compensation will be paid to the owners of water well/ source for water utilized. A summary of expected average resource usage during exploration activities is given below.

Table 2.3: Utilities, Staffing and supplies

Parameter	**Rate**
Utility water	~ 200 liter per day per capita
Drinking water	~ 1200 liters per day (for 400 POB)
Work Force	200-400

Power Generation	2 Diesel GenSet (450 KVA)
Electricity Requirement	500 KWh/day
Source of water for exploration	Local sources
Source of water for campsite	Local sources

2.10 Cost and Magnitude of the project

The volume of the project is 65 sqkm areal coverage of 3D seismic and 100 line km long 2D seismic (comprising of three 2D lines) surveys. Estimated cost of the 2D & 3D seismic activity in Punjab Portion is approximately 5.06 Million USD.

2.11 Restoration and Rehabilitation Plan

After work is completed in an area, a 'green team' for restoration and rehabilitation is mobilized to ensure that affected areas are left in a condition that is as close to the original state as possible. The team will inspect all holes and pits to make sure they are backfilled and that no debris or trash is left behind.

Restoration of seismic lines will include demobilization of all equipment and machinery, removal of all cables, geophones, station units, flags, stakes and wastes from the lines and back filling of all mud pits. For reference purposes a photographic record of selected sections of seismic lines could be taken before and after the operation.

2.12 Government Approvals

Petroleum Exploration License has been granted by Government of Pakistan to MOL Pakistan for Oil and gas exploration and production in Margalla Block. The License is attached as **Annex – I**.

3. PROJECT ALTERNATIVES

3.0 General

The objective of screening out alternatives during the EIA exercise, is to identify options that most effectively meet the project's environmental objectives, either by enhancing the environmental benefits of the proposed activity, or through reducing or avoiding potentially negative impacts. For the proposed project, alternatives considered include:

- No project option
- Site alternatives
- Design/Technology alternative
- Environmental Alternative
- Economic Alternative

3.1 Project Consideration-Project and No Project Alternative

The project involves 2D & 3D seismic investigation to ascertain the existence of an oil or gas reservoirs in the area. Considering the potential economic advantages for Pakistan in the event of a substantial hydrocarbon discovery, the no-project option is not regarded as a favorable alternative. The successful exploration and development of a reservoir in the area would contribute to reducing the country's reliance on imported energy sources, fostering greater self-reliance.

This self-sufficiency becomes especially crucial given that the proposed operation is anticipated to have limited large-scale environmental impacts, minimizing the risk of significant loss of valuable or irreplaceable ecological resources. The strategic importance of achieving energy independence and the positive economic implications further underscore the necessity and desirability of proceeding with the seismic survey.

3.2 Site Alternatives

Potential site alternatives may be considered in areas which hold sensitivity either due to settlements, dense vegetation, specific land use, or other factors. In such scenarios, the location of the seismic profile may be slightly adjusted to avoid the impact or alternate method of data acquisition may be adopted.

The proposed alignments for the exploration area signify regions of the highest potential. Given the project's assessment, which indicates low to medium significance of associated impacts, there is no need for altering the alignment of majority of the survey lines. Where the location adjustment will be needed to safeguard environmental (vegetation, water body, habitats etc.) or social sensitivity (settlements, infrastructure), the alternate location or method options would be considered. Additionally, proactive measures have already been taken to avoid ecologically sensitive areas within the block, further demonstrating the proponent's commitment to environmental conservation and responsible exploration practices.

3.3 Design / Technology Alternatives

Two conventional techniques for collecting seismic data are available i.e. Vibroseis and dynamite. The selection between these methods hinges upon the terrain features and land use type prevalent

in the project area. Vibroseis is generally suitable for urbanized areas and terrains with gentle slopes, salt plains, and flat sandy areas, while dynamite is preferable in hilly terrain, less populated areas, such as agricultural lands and others where access or operation of Vibroseis might be challenging.

3.4 Environmental Alternative

The Margalla Block (Punjab portion) lies within District Rawalpindi and Attock, where the majority of the seismic survey activities will be undertaken. The project area comprises a mix of settlements, mountainous terrain, protected areas, agricultural land, and water bodies, with scattered vegetation primarily consisting of shrubs.

Exploration activities are generally associated with minimal environmental impacts, which can be effectively managed through an Environmental Management Plan. Additionally, MOL Pakistan will adhere to a Health, Safety, and Environment (HSE) policy, including contingency plans to further mitigate potential impacts. By proactively monitoring and controlling environmental factors, the project aims to maintain environmental quality while safely managing hazardous material storage.

3.5 Economic Alternative

Pakistan relies on fossil fuels, particularly oil and gas, to fulfill the country's energy requirements. The transport industry stands out as the primary consumer of oil, whereas the gas is predominantly utilized by industries, with a significant focus on the fertilizer sector. To meet the nation's demands, Pakistan imports crude oil and liquefied natural gas (LNG), exerting pressure on the balance of payments (BOP). Given the challenges in Pakistan's balance of payments, there is a pressing need for the country to delve into indigenous resources within the energy sector. A dependable and self-sustaining energy supply is critical in alleviating some of the burden on Pakistan's balance of payments. Natural gas emerges as a particularly appealing option, not only for its energy potential but also due to its minimal environmental impact in comparison to other fossil fuels. As Pakistan strives to address its balance of payments difficulties, the exploration and utilization of indigenous natural gas resources stand out as a strategic and environmentally favorable avenue. Table 3.1 illustrates the sector-wise breakdown of oil and gas consumption.

Table 3.1: Sector wise Natural Gas, RLNG and Oil Consumption

Sector	July- March FY2024		
	Gas Consumption (MMCFD)	**RLNG (MMCFD)**	**Oil Consumption (000 MT)**
Power	461	433	520.70
Domestic	863	1	18.80
Commercial	43	6	1182.89
Transport	58	3	9764.55
Fertilizer	721	43	815.32
General Industry	366	209	
Total	**2515**	**695**	**12302.25**
Source: Ministry of Energy (Petroleum Division)[2]			

[2] https://finance.gov.pk/survey/chapter_24/14_energy.pdf

3.6 Alternative with respect to project schedule

The timing of the operation is flexible and can be adjusted to address potential issues such as monsoon spells, which may cause flash floods, or local crop harvesting within the block. The proponent is committed to carefully scheduling project activities to minimize disturbances to the environment and local communities while ensuring the health and safety of the community/crew. This adaptive approach demonstrates the proponent's dedication to responsible environmental management and community welfare.

4. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 Introduction

The success of development projects also depends upon the ability of regulatory institutions to effectively manage their environmental and social issues. Sustainable development is a concept that has emerged over the past three decades to explain a new framework intended at economic and social development whilst maintaining the long-term integrity of the ecological and social system. The philosophy of sustainable development is in the course of being included into national policies and legislation in Pakistan through various statutory instruments.

Before initiation of any project, the mandatory legislations enacted by government and other regulatory agencies need to be studied. Different governments from time to time have enacted several environmental rules, regulations, laws and guidelines specifying different requirements for a diverse kind of projects. Therefore, it would be necessary to study the environmental laws pertaining to different projects before its execution so that protection of environment can be ensured.

In this section, same methodology would be followed by studying those rules, regulations and laws as well as the institutional set-up that are relevant to the environmental and social aspects of the "Seismic Activities in Margalla Block (Punjab Portion) District Attock & Rawalpindi, Punjab". The assessment has been carried out to comply with local, provincial as well as MOL Pakistan's health and safety guidelines. The main among these are:

- Environment, Health and Safety (HSE) Policy of MOL Pakistan.
- National Environmental Laws & Legislations;
- Provincial Environmental Laws & Legislations;
- Environmental and Social Guidelines;
- International Treaties and Conventions;
- Institutional Setup for Environmental Management;

  MOL Pakistan's is commitment to the total integration of health, safety and social responsibility to environmental excellence in all aspects of its operations
- Protect the environment, preserve sustainable development;
- Ensure that all operations for the disposal of materials (both hazardous and non-hazardous) are conducted safely, minimizing any potential threats to health, the environment, and safety.
- Adopt appropriate industry and corporate standards where adequate laws or regulations do not exist;
- Stop any operation if the health, environment or safety is at risk; and
- Attain high level of preparedness to manage emergency situation.

4.2 MOL Pakistan's Policy and Commitment to Health, Safety and Environment

The MOL Group is committed to ensuring that its technologies, workplace practices, products, and services do not represent hazards to health and put the least possible load on environment. The MOL Group is actively working to decreasing health, safety, and environmental (HSE) risks

associated with its activities by creating safe working conditions and constantly improving its environmental performance.

The MOL Group, in order to implement its HSE policy, continuously develops its quality-based HSE management system, which provides a framework for setting up an Environment-focused Management System (EMS)–to be certified according to ISO 14001 norms and introducing the Health and Safety Management Systems (HSMS). Figure below shows the HSE Management System of MOL Group.

4.3 National Legislations and Guidelines

4.3.1 Self- Monitoring & Reporting Rules, 2001

Pakistan Environmental Protection Council constituted an Environmental Standards Committee in 1996 to devise realistic modalities for NEQS enforcement and simplified monitoring procedures with the consultation of representatives of industrial interest groups, non-governmental organizations (NGOs) and other stakeholders. Their efforts succeeded in the bringing up of "Self-Monitoring and Reporting System for Industry" in 2001. As per the rules set by this system, industries have to monitor effluents and emissions in compliance with the NEQS and report it to provincial or federal EPAs. This system classifies industry into three categories A, B and C each corresponding to a specified reporting frequency[3].

4.3.2 Pakistan Penal Code, 1860

Section XIV of PPC deals with the offences affecting the public health, safety, convenience, decency and morals. Person may be guilty of public nuisance if his act or omission causes common injury, danger or annoyance to the public or results in spread of infection of diseases dangerous to life. The section also deals with environmental pollution.

Provisions under this Act relating to environment are no longer being enforced after promulgation of the Pakistan Environmental Protection Act, 1997. However, pollution offences can still be tried under the Pakistan Penal Code, 1860[4].

4.3.3 Antiquities Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The Act is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest and national monuments etc. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain such articles of archaeological significance.

The proponent will ensure safety of the archeological sites that lie within or immediately neighboring the project site and will also immediately stop and report the concerned department if during the excavation process any such discovery is made in future[5].

[3] *National Environmental Quality Standards (Self-Monitoring and Reporting by Industries) Rule, 2001*
[4] *Pakistan Penal Code (XLV of1860)6th October 1860*
[5] *Act VII of 1976(Gazette of Pakistan, Extraordinary, Part 1, 14th January, 1976*

4.3.4 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been de facto policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties of development projects. It comprises of 55 sections pertaining to areas notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions[6]. Temporary land will be acquired on rent for the project to support oil and gas exploration activities.

4.3.5 The Biodiversity Action Plan, 2000

The Biodiversity Action Plan, 2000 has been the most significant direct step towards addressing the issue of biodiversity loss. It details the current status & trends and direct & indirect causes of biodiversity; its principles, goals and aims; proposals for action plan including planning & policies, legislation, identification and monitoring, in situ & ex situ conservation, sustainable use, research and training, public education and awareness, Environmental Impact Assessment, information extraction and financial resources etc.

The Wild Birds and Animals Protection Act 1992, the West Pakistan Wildlife Protection Ordinance 1959, the Wildlife Protection Rules 1972, provide for the protection of flora and fauna in the territory, including vegetation and protected forests. This EIA study has addressed all aspects of conservation, including wildlife, and forest[7].

4.4 National Legislation on Oil and Gas Exploration and Production

4.4.1 The Petroleum Act, 1934

This Act deals with the import, transport, storage, production, refining and blending of the petroleum products (chapter 1: Control over petroleum). Chapter 3 of this Act tells about the general penalties for the offenses under this Act, reports of accidents with petroleum and inquiries into serious accidents with petroleum. This Act specifies the nature and condition of pipelines in which the petroleum may be transported and the forms and conditions of licensing for the transport and storage of petroleum products[8].

4.4.2 The Regulation of Mines and Oilfields and Mineral Development (Government Control) (Amendment) Act, 1976

The Regulations of Mines and Oilfields and Mineral Development (Government Control) Act, 1948 and the Pakistan Petroleum (Production) Rules, 1949 and Pakistan Petroleum (Exploration and Production) Rules, 1986 empowers the Ministry of Petroleum to oversee the petroleum exploration, development and production operations. The Mines and Oil Field Act also specifies penalties including imposition of fines and/or imprisonment.

[6] *The Land Acquisition Act 1894 (Act of 1894)*
[7] *The Biodiversity Action Plan, 2000, www.iucn.pk*
[8] *The Petroleum Act, 1934*

4.4.3 The Model Petroleum Concession Agreement, 2013

As for safety, the Model Petroleum Concession Agreement implementing the 1986 Exploration and Production Rules, specifically required observance of the 1974 Safety regulations. The penalties imposed in the 1986 Exploration and Production Rules allow the Director General Petroleum Concession to revoke a license if the rules are not satisfied by the operator. The Mines and Oil Field Act also specifies penalties including imposition of fines and/or imprisonment.

4.4.4 The Pakistan Petroleum (Exploration and Production) Rules, 2013

In exercise of the powers conferred by section 2 of the Regulation of Mines and Oil fields and Mineral Development (Government Control) Act, 1948 (Amended 1976), the Federal Government Notified the following rules, namely: **The Pakistan Petroleum (Exploration and Production) Rules, 2013.**

The section 58 of the rule states "A holder of petroleum right shall undertake to execute all operations in a proper, prudent and diligent manner, in accordance with good international oilfield practices and shall not unreasonably obstruct or interfere with other activities such as navigation, fisheries and agriculture. All reasonable precautions shall be taken to prevent pollution or damage to the environment and surroundings.

4.4.5 Petroleum Exploration and Production Policy, 2012

The purpose of this Petroleum Exploration and Production policy 2012 (Policy) 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 though 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 secure 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.

4.4.6 The Pakistan Onshore Petroleum (Exploration & Production) Rules, 2013)

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.

4.4.7 The Oil and Gas (Safety in Drilling and Production) Regulations, 1974

The 1974 Safety Regulations requires operators to send to the Chief Inspector of Mines, Ministry of Labor and Manpower information on safety issues including provisions of protective equipment and identification of safety personnel and emergency measures, designation of safety personnel including Warfare and Safety Officer, and accident reporting.

The regulation identifies and explains issues that should be taken into consideration by the proponent for a project involving exploration or production of oil and gas.

4.4.8 Sectoral Guidelines for Environmental Reports – Oil and Gas Exploration and Production

These guidelines identify and explain issues that should be addressed for a proposal involving exploration for, or production of, oil and gas. It is important to focus on key issues for specific proposals. The matters identified in this guideline should provide guidance for the preparation and assessment of most exploration and production proposals. It is intended that Companies involved in Oil and Gas Exploration and Production will self-regulate and undertake monitoring to meet or exceed the provisions of the Package and these sectorial guidelines; the Responsible Authority reserves the right to spot check field operations from time to time.

4.5 Provincial and Local Environmental Laws and Legislations

4.5.1 Punjab Environmental Protection Act 1997, (Amended 2012 & 2017)

Punjab Environmental Protection Act, 1997 (amended 2012 & 2017) is the principal provincial legislation in Punjab for the:

- Protection, conservation, rehabilitation and improvement of the environment,
- Prevention and control of pollution, and
- Sustainable development.

The salient features of the Act are mentioned below:

1. Prevention of polluting discharges and Emissions: Section 11 of the Punjab Environmental Protection Act, amended 2012 & 2017 requires a person to ensure that no release is done to the environment in the form of harmful discharges / effluents or emissions which could cause degradation of the ambient environmental quality. However, release of effluents/air emissions is allowed if the concentration of its constituents is within the limits as prescribed in the National Environmental Quality Standards.
2. Environmental Quality Standards: The Act provides for fixing the Punjab Environment Quality Standards (PEQS) and their strict enforcement. For default, the Government has been empowered to levy a pollution charge.
3. IEE/EIA: Under Section 12, no project including construction activities or any change in the existing physical environment can be started unless the IEE or EIA has been conducted and its approval obtained from the Responsible Authority, in the present case from Punjab EPA.
4. The imports of hazardous waste into the country has been banned and the transport of hazardous substances and dangerous chemicals or toxic material or explosive substances etc. has been regulated, through licenses, under prescribed rules and procedure.
5. For the effective implementation of the provisions of the law, the Pakistan Environmental Protection Agency, headed by a Director General with other staff has been constituted. This Agency is responsible for enforcing the policy and implementing the provisions of the law. On the same pattern, Provincial Environmental Protection Agencies have been created in each province.

4.5.2 Environmental Protection Agency (Review of EIA/IEE) Regulations, 2022

These regulations were prepared by Punjab Environmental Protection Department. These regulations divide projects in different Schedules depending upon the severity of environmental impact of the project. The project would fall in Schedule I, if the project has lower environmental

impacts and thus requiring an IEE. And, the project would fall in Schedule II, if the project has significant environmental impacts and thus requiring an EIA. But, all projects located in environmentally sensitive areas would require an EIA under these regulations.

The project "Seismic Activities in Margalla Block (Punjab Portion)" falls in Schedule II requiring an EIA as the project is categorized as:

A. Energy

5. *Oil & gas extraction projects including exploration, production, gathering systems, separation and storage*[9].

4.5.3 Punjab Environmental Policy, 2015

The Punjab Environment Policy 2015 aims to promote sustainable development by integrating environmental considerations into economic planning and decision-making. Its vision is the "promotion and attainment of sustainable development in the province through integration of environmental considerations while achieving economic growth and development".

The policy sets key objectives, including raising environmental awareness, strengthening regulatory control on pollution, updating Environmental Quality Standards, building institutional capacity, promoting research, preventing pollution, and facilitating the adoption of environmentally friendly technologies.

The policy highlights that environmental protection is essential for long-term economic growth, as reducing pollution burdens improves public health, promotes sustainable resource use, and ensures a clean and safe environment for current and future generations.

Following the 18th Constitutional Amendment, the policy operates under the Punjab Environmental Protection Act (amended 2012), empowering the Environment Protection Department to protect, conserve, rehabilitate, and improve the environment, prevent pollution, and support sustainable development.

To implement its objectives, the policy outlines several strategic interventions, such as installing ambient air quality monitoring stations, upgrading EPA laboratories, assessing industrial pollution (e.g., Hudiara Drain), strengthening EPA's enforcement capacity, revising EQS and industry-specific standards, and introducing model clean-technology initiatives like the Vertical Shaft Brick Kiln.

4.5.4 Punjab Environmental Quality Standards, 2016

In exercise of the powers conferred under clause (c) of subsection (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the PEQS for Municipal and Liquid Industrial Effluents, Drinking Water, Motor Vehicle Exhaust and Noise, Ambient Air, Noise, and Industrial Gaseous Emissions, with Notification No. SO (G)/EPD/7-26/2013 which were issued in 2016[10].

Table 4.1: PEQS for Ambient Air

Pollutant	**Time-weight average**	**Concentration in ambient air**	**Method of measurement**

[9] *Pakistan Environmental Protection Agency (Review of EIA and IEE Regulation), 2022*
[10] *National Environmental Quality Standards, 10th February 2000, section 33 of the XXXIVS.R.O. 258-(1)/2000*

Sulfur dioxide (SO2)	Annual average*	80 µg/m^3	Ultraviolet Fluorescence method
	24 hours**	120 µg/m^3	
Oxides of nitrogen as (NO)	Annual average	40 µg/m^3	Gas phase Chemiluminescence
	24 hours **	40 µg/m^3	
Oxides of nitrogen as (NO_2)	Annual average	40 µg/m^3	Gas phase Chemiluminescence
	24 hours **	80 µg/m^3	
Ozone (O_3)	1 hours	130 µg/m^3	Non dispersive UV absorption method
Suspended particular matter (SPM)	Annual average	360 µg/m^3	High volume sampling (Average flow rate not less than 1.1 m^3 /min)
	24 hours**	500 µg/m^3	
Respirable particulate matter PM_{10}	Annual average	120 µg/m^3	Preferably β-Ray absorption method
	24 hours**	150 µg/m^3	
Respirable particulate matter $PM_{2.5}$	Annual average	15 µg/m^3	Preferably β-Ray absorption method
	24 hours**	35 µg/m^3	
Lead (Pb)	1 hours	15 µg/m^3	AAS method after sampling using EPM 2000 or equivalent filter paper
	24 hours**	1 µg/m^3	
	1 hours	1.5 µg/m^3	
Carbon Monoxide (CO)	8 hours	5 µg/m^3	Non dispersive infrared (NDIR) method
	1 hours	10 µg/m^3	

* annual arithmetic means of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval

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

Table 3.2 shows Punjab environmental quality standards for municipal and liquid industrial effluents (mg/l, unless otherwise defined)

Table 4.2: PEQS for Municipal and Liquid Industrial Effluents

No	**Parameter**	**Into in land water**	**In sewage treatment**
1	Temperature or temperature increase	≤3 C	≤3 C
2	pH value (H+)	6-9	6-9
3	Biochemical oxygen demand (BOD5) at 20 C (1)	80	250
4	Chemical oxygen demand (COD)(1)	150	400
5	Total suspended solids (TSS)	200	400
6	Total dissolved solids (TDS)	3500	3500
7	Grease and Oil	10	10
8	Phenolic compounds (as phenol)	0.1	1.3
9	Chloride (as Cl-)	1000	1000
10	Fluoride (as F-)	10	10
11	Cyanide (as CN-)total	1.0	1.0
12.	An-ionic detergents (as MBAs)(2)	20	20
13.	Sulfate (SO_4^{-2})	600	1000
14.	Sulfide (S^{-2})	1.0	1.0
15.	Ammonia (NH_3)	40	40
16.	Pesticides (3)	0.15	0.15
17.	Cadmium (Cd)(4)	0.1	0.1
18.	Chromium (trivalent and hexavalent)(4) (1)	1.0	1.0

19.	Copper(Cu)[4]	1.0	1.0
20.	Lead (Pb)[4]	0.5	0.5
21.	Mercury (Hg)[4]	0.01	0.01
22.	Selenium (Se)[4]	0.5	0.5
23.	Nickel (Ni)[4]	1.0	1.0
24.	Silver (Ag)[4]	1.0	1.0
25.	Total toxic metals	2.0	2.0
26.	Zinc (Zn)	5.0	5.0
27.	Arsenic (As)[4]	1.0	1.0
28.	Barium (Ba)[4]	1.5	1.5
29.	Iron (Fe)	8.0	8.0
30.	Manganese(Mn)	1.5	1.5
31.	Boron (B)[4]	6.0	6.0
32.	Chlorine (Cl_2)	1.0	1.0

Table 4.3: PEQS for Industrial Gaseous Emissions

No	**Parameter**	**Source of emission**	**Standard (PEQS Limits)**
1	Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann scale or equivalent smoke number
2	Particulate matter [1]	(a)boilers and furnaces	
		(i) Oil fired	300
		(ii) Coal fired	500
		(iii) Cement kilns	300
		(b) grinding crushing clinker coolers and related processes metallurgical processes converters blast furnaces and cupolas	500
3	Hydrogen chloride (HCl)	Any	400
4	Chlorine	Any	150
5	Hydrogen fluoride (HF)	Any	150
6	Hydrogen sulphide (H_2S)	Any	10
7	Sulphide oxides [2x3]	Sulfuric acid /sulfonic acid plants	5000
		Other plants except power plants operation on oil and coal	1700
8	Carbon monoxide (CO)	Any	800
9	Lead (Pb)	Any	50
10	Mercury (Hg)	Any	10
11	Cadmium	Any	20
12	Arsenic	Any	20
13	Copper(Cu)	Any	50
14	Antimony (Sb)	Any	20
15	Zinc (Zn)	Any	200
16	Oxides of nitrogen	Nitric acid manufacture unit 3000	
		Other plants except power plants operating on oil or coal	

Table 4.4: Sulfur Dioxide Background Levels Microgram per cubic meter (ug /m3) Standard

Background air quality (SO_2 Basis)	**Annual average**	**Max.24 hour interval**	**Criterion I Max. SO_2 emission (ton per day per plant)**	**Criterion II Max. allowable ground level increment to ambient (ug/m^3) (one year average)**
Unpolluted moderately polluted	<50	<200	500	50
Low	50	200	500	50
High	100	400	100	10
Very polluted**	>100	>400	100	10
* For intermediate value between 50 and 100 µg/m^3 linear interpolations should be used **No project with sulfur dioxide emission will be recommended				

Table 4.5: Standards for motor vehicle exhaust and noise (for in-use vehicles)

No.	**Parameter**	**Standards (PEQS Limits)**	**Measuring methods**	**Applicability**
1	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	Immediate effect
2	Carbon monoxide	6%	Under idling conditions: non-dispersive infrared detection through gas analyzer	
3	Noise	85 dB(A)	Sound-meter at 7.5m from the source	

4.5.5 Punjab Local Government Act, 2013

Under Clause 48 of the 8th Schedule of this Act, the local governments are empowered to restrict any project causing pollution to air, water or land. They may also initiate schemes for improving the environment vide this legislation. The local government offices at union council level are given the authority through this law, to monitor any polluting activity and issue instructions to the responsible person for undertaking pollution prevention measures.

MOL Pakistan's Exploration Dept. will be responsible to ensure that the proposed activities in Margalla Block (Punjab Portion) are undertaken in accordance with the environmental management requirements and recommendations given in this EIA as well as the NOC which will be issued for this project.

4.5.6 Punjab Hazardous Substances Rules, 2018

The Punjab Hazardous Substances Rules, 2018 provide a complete regulatory framework for the safe handling, storage, transport, import, use, and disposal of hazardous chemicals in Punjab. The Rules require all manufacturers, importers, transporters, and users of hazardous substances to obtain a license and maintain a detailed inventory of the chemicals they handle. They mandate proper labeling, safe storage systems, worker training, the use of protective equipment, and preparation of safety reports and waste-management plans. The Rules also specify that hazardous waste and empty containers must be safely treated and disposed of, and prohibit unsafe practices

such as using unlabeled chemicals or reusing chemical containers for food. In case of accidents, spills, leaks, or dangerous releases, operators must immediately report to the authorities and are held liable for environmental damage or loss of life. The Punjab EPD is authorized to inspect facilities, issue improvement notices, and enforce penalties, including suspension or cancellation of licenses for non-compliance. Overall, the Rules aim to protect human health, workplace safety, and the environment by ensuring that hazardous substances are managed responsibly and transparently throughout their lifecycle.

4.5.7 The Punjab Forest (Amendment) Act, 2016

The Punjab Forest (Amendment) Act, 2016 updates and strengthens the Punjab Forest Act of 1927 to improve forest protection, conservation, and governance in the province. The amendment broadens the legal definition of forest to include reserved forests, protected forests, and all government-notified forest areas, ensuring stronger legal coverage. It enhances penalties for illegal cutting, encroachment, grazing, removal of forest produce, and damage to forest land, introducing harsher fines and imprisonment to deter forest-related crimes.

The Act empowers the Forest Department with greater enforcement authority, including the power to arrest without warrant, seize illegally obtained timber, and remove encroachments more effectively. It also authorizes the government to declare new forest areas, regulate private forests, and promote sustainable forest management. Additionally, the amendment introduces stricter controls on the use of forest land for non-forest purposes and strengthens provisions related to biodiversity conservation, wildlife protection, and prevention of deforestation.

4.5.8 Punjab Forest Policy, 2019

The Punjab Forest Policy, 2019 aims to “protect, conserve, expand and sustainably manage forest resources in Punjab” by promoting ecological stability, biodiversity conservation, and climate resilience. It emphasizes increasing forest cover, restoring degraded ecosystems, promoting community-based forest stewardship, and strengthening institutional capacity for sustainable forest governance. The policy calls for strict protection of natural forests, rehabilitation of watersheds, prevention of illegal encroachments, and the promotion of private forestry and agroforestry to meet rising timber and fuelwood demands. It aligns provincial forest management with Pakistan’s national climate commitments and encourages partnerships with communities, the private sector, and civil society.

4.5.9 The Punjab Plantation and Maintenance of Trees Act, 1974

The Punjab Plantation and Maintenance of Trees Act, 1974 is a provincial legislation designed to promote the plantation and maintenance of trees in the province of Punjab. It extends to the whole of Punjab. The Punjab Plantation and Maintenance of Trees Act, 1974 aims to enhance the green cover of the region. It consists of provisions such as defining key terms, including the responsibilities of the Forestry and Wildlife Department, government, land occupiers, and the rules related to the plantation and maintenance of trees. The Punjab Plantation and Maintenance of Trees Act, 1974 requires the planting and maintenance of three trees per acre by land occupiers, with penalties for non-compliance. The penalty is determined as a fine and can be recovered as arrears of land revenue. The Act also empowers the government to make rules for implementing its provisions, specifying matters such as the types of trees to be planted in various areas and the

procedure for maintaining tree records. Additionally, the government may exempt specific lands or occupiers from the Act's requirements through official Gazette notifications.

4.5.10 The Punjab Wildlife (Protection, Preservation, Conservation, and Management) Act, 1974 (Amended January, 2025)

The Punjab Wildlife (Protection, Preservation, Conservation, and Management) Act, 1974 (Amended October, 2007) caters to the protection of wildlife resources in the province. Besides ensuring an environment conducive for their rearing and livelihood, the Act also regulates hunting, poaching, possession, and trade in birds and animals. Government can notify and amend lists of protected ecosystems, national parks, wildlife sanctuaries, safari parks, and game reserves. The updated lists of the protected and special areas can be obtained from the National Council for Conservation or alternatively from the Forest and Wildlife Department, Government of Punjab.

Key features of the Punjab Wildlife Protection Act include:

- Ban on hunting of protected animals unless permitted otherwise in accordance with the requirements of the Act.
- Prohibition of any activity (residence, cultivation, land use that could damage vegetation, hunting, killing or capturing of any wild animal etc.), inside a wildlife sanctuary or National Park.
- Prohibition of any activity (hunting and shooting etc. of a wild animal) in the game reserve, except under a special permit.
- Penalties for those who contravene the provisions of the law.

Under the powers conferred to the government of Punjab through this Act, the government can declare certain areas reserved for the protection of wildlife and control activities within in these areas. In Punjab, currently there are 58 wildlife protected areas which include national parks, game reserves and wildlife sanctuaries. In Magralla Block (Punjab Portion), Ayub National park, Kheri Murat National park, Kala Chitta National park, Lohi Bher Park (Zoo) and Kherimar Reserved Forest falls in the data acquisition sites and MOL Pakistan will coordinate before initiation of project activities in protected areas.

4.5.11 The Punjab Protected Areas Act, 2020

The Punjab Protected Areas Act, 2020 provides a comprehensive legal framework for the protection, conservation, and management of ecologically important areas within the province. The Act enables the Government of Punjab to declare wildlife sanctuaries, national parks, nature reserves, and other conservation zones, while establishing regulations to prevent activities that may degrade biodiversity, wildlife habitats, or ecological integrity. It outlines the responsibilities of management authorities, prescribes mechanisms for sustainable use, and sets penalties for violations to ensure long-term conservation of natural resources. The Act serves as a key environmental safeguard by regulating potentially harmful activities and promoting ecological preservation through structured oversight and enforcement.

For the planned seismic activities in Punjab, the Punjab Protected Areas Act, 2020 regulates operations within designated protected areas. Before project execution, it must be ensured that survey lines, access routes, equipment placement, and shot-point locations do not fall within or negatively affect declared protected ecosystems or wildlife habitats. If any portion of the project

area overlaps with protected lands, additional clearances, mitigation measures, and compliance with site-specific management guidelines will be required. Adherence to the Act helps minimize ecological disturbance and ensures the project proceeds in an environmentally responsible and legally compliant manner. In Magralla Block (Punjab Portion), Ayub National park, Kheri Murat National park, Kala Chitta National park, Lohi Bher Park (Zoo) and Kherimar Reserved Forest falls in the data acquisition sites and MOL Pakistan will coordinate before initiation of project activities in protected areas.

4.5.12 Punjab Irrigation, Drainage and Rivers Act, 2023

The Punjab Irrigation, Drainage and Rivers Act, 2023 establishes a comprehensive legal framework for the management, regulation, development, and protection of irrigation systems, drainage networks, and river infrastructure in Punjab. The Act formalizes the roles of the Punjab Irrigation Department and designates the Secretary Irrigation as the Inspector-General of Irrigation, responsible for system-wide supervision, assessment, and control of irrigation, drainage, and river works, including structures, embankments, distributaries, minors, and drainage channels.

The legislation grants the government authority to construct, maintain, and operate irrigation and river-related infrastructure; regulate water distribution; protect canals, riverbanks, drainage lines, and flood protection structures; and prevent unauthorized activities that may damage irrigation or river systems. It empowers the Irrigation Department to enforce penalties, remove illegal obstructions, regulate water usage, prevent pollution of irrigation channels, and protect government land associated with river and canal networks.

The Act also outlines procedural requirements for land acquisition, compensation, inspections, emergency actions during floods, and enforcement of safety measures. It modernizes water governance by clearly defining institutional responsibilities, enhancing monitoring and enforcement powers, and ensuring the safe, equitable, and sustainable management of Punjab's water resources.

4.5.13 The Punjab Special Premises (Preservation) Ordinance, 1985

The Punjab Special Premises (Preservation) Ordinance, 1985 provides a legal framework for preservation of premises of historical, cultural, archaeological, and architectural value in the province. The Ordinance specifically prohibits implementation of developmental schemes or new constructions within a radius of two hundred feet from notified special premises. The number of protected sites notified under the Punjab Special Premises Ordinance is 246. The proposed activities in project area will be in compliance with the requirements of this ordinance; no activity will be initiated by MOL Pakistan in the premises of any site protected under this Ordinance. There are no such sites at or near the proposed project area.

4.6 Punjab Heritage Foundation Act, 2005

The Punjab Heritage Foundation Act 2005 establishes the Punjab Heritage Foundation, an autonomous body responsible for preserving, promoting, and managing the cultural, historical, and architectural heritage of Punjab. The Act defines the structure, powers, and functions of the Foundation, including conservation of heritage sites, museums, artifacts, folk traditions, and cultural assets. It also authorizes the Foundation to conduct research, organize cultural programs, raise funds, collaborate with national and international institutions, and advise the government on

heritage-related policies. The Act provides mechanisms for registration, protection, and documentation of heritage and enables penalties for unauthorized damage or misuse of heritage sites. Overall, it ensures a systematic and professional approach to safeguarding Punjab's cultural legacy.

4.7 Environmental and Social Guidelines

The environmental as well as social guidelines related to the proposed project are as discussed under:

Policy & Procedures for the Filing, Review and Approval of Environmental Assessments, 2000[11]

The Policy & Procedures for the Filing, Review and Approval of Environmental Assessments, 2000, prepared by the PEPA under the powers conferred upon it by the Pakistan Environmental Protection Act, provide the necessary details on the preparation, submission, and review of the Initial Environmental Examination (IEE) and the Environmental Impact Assessment (EIA).

This EIA Study has followed the procedures defined in the PEPA, 1997 and Review guidelines, 2000, and the EIA will be submitted to the Punjab EPA in whose jurisdiction the project will be implemented. The PEPA has, however, been given the right to review any environmental report at any time and the power to revoke the decision of the provincial EPA, if it deems this to be necessary.

Guidelines for Preparation & Review of Environmental Reports

These guidelines require proponents to prepare terms of reference for the environmental assessment reports. It requires that all studies should contain baseline data on the area and must contain an assessment of the potential environmental impacts and the recommended mitigation measures[12].

Guidelines for Operational Health, Safety and Environmental Management, 1996[13]

These guidelines are the outcome of a study commissioned by the Directorate General Petroleum Blocks, Ministry of Petroleum and Natural Resources, Government of Pakistan. The guidelines list down the relevant laws related to the operational health, safety and environmental management and also recommends environmental controls and management practices to be adopted in Oil & Gas exploration projects. These guidelines are extensive and fully supportive of the Environmental Protection Act of 1997.

Guidelines of the American Petroleum Institute (API) and Louisiana Statewide Order 29-B (LSO 29-B)

The American Petroleum Institute (API) guidelines for disposal of oil and gas exploration and production wastes and the Louisiana Statewide Order 29-B (LSO 29-B) deal with the disposal of oil and gas exploration and production wastes. Both API and LSO 29B standards recognize land treatment techniques, which include land spreading i.e. spreading of the waste over a land area and dilution by mixing with native soil, land farming i.e. mixing of the waste with soil and encouraging natural remediation and burial on-site i.e. burial of the waste into unlined waste pits

[11] *Policy and Procedure for the Filing, Review and Approval of Environmental Assessments, Government of Pakistan, November 1997*
[12] *Guidelines for Preparation & Review of Environmental Reports*
[13] *Guidelines for Occupational Health, Safety and Environmental Management, 1996*

after dilution with native soil, as feasible options for the treatment and disposal for drilling wastes. The two standards also specify maximum permissible levels (MPL) for various parameters (including pH, metals, oil and grease, sodium adsorption ratio etc.) in the waste or the waste soil mixture[14].

4.8 National Fire Protection Association (NFPA)

NFPA 30 is applied for the safe storage, handling, and use of flammable and combustible liquids by the manufacturers, producers, distributors, and end users and is enforceable under OSHA and many state & local regulations. Design, material of construction, installation, ventilation, drainage, inspection of tank building, detection and alarm for tank building, piping system, etc. are prescribed to safeguard against fire hazards and explosion. In case of emergency caused by eruption of fire, training to employees is also recommended.

NFPA 58 helps to mitigate risks during safe installations, failures, leaks, storage, handling, transportation, and use that could lead to fires and explosions.

4.9 International Treaties

International environmental treaties and conventions, endorsed by Pakistan are mentioned below;

4.9.1 Climate Change

- United Nations Framework Convention on Climate Change, 1992
- Paris Agreement 2015 on Climate Change aimed at combating global warming by limiting temperature rise to well below 2°C (preferably 1.5°C) above pre-industrial levels.

4.9.2 Waste and Pollution

- Basel Convention on the Control of Trans boundary Movement of Hazardous Wastes and their Disposal, 1989.

4.9.3 The Convention on Biological Diversity

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 biological diversity.

4.9.4 The Convention on Conservation of Migratory Species of Wild Animals, 1979

The Convention on the conservation of Migratory Species of Wild Animals (CMS), 1979, requires countries to take action to avoid endangering migratory species. The term “migratory species refer to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. These parties are also required to promote or co-operate with other countries in matters of research on migratory species.

[14] *Guidelines of the American Petroleum Institute (API) and Louisiana Statewide Order 29-B (LSO 29-B)*

The Convention contains two appendices. Appendix I contain the list of migratory species that are endangered according to the best scientific evidence available. For these, species the member states to the Convention are required endeavor to:

- Conserve and restore their habitats
- Prohibit their hunting, fishing and capturing, harassing and deliberate killing.
- Remove obstacles and minimize activities that seriously hinder their mitigation.
- Control other factors that might endanger them, including control of introduced exotic species.

Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II of the Convention. These species, either individually or by taxonomic group, are the basis for establishing instruments – regional or global – under CMS. For this reason, the Convention encourages the Range States to conclude global or regional Agreements.

4.9.5 Cultural Heritage

Convention concerning the Protection of the World Cultural and Natural Heritage, 1972 obligates the states to ensure identification, protection and transmission of natural heritage to future generations.

4.9.6 ILO Conventions

Pakistan has been a member of the ILO since 1947 and has thus far ratified 36 conventions. Of these, 33 are in force, whereas 3 have been denounced. The fundamental conventions which are being implemented across Pakistan through applicable labor laws include:

- C029 - Forced Labor Convention, 1930 (No. 29);
- C100 - Equal Remuneration Convention, 1951 (No. 100);
- C105 - Abolition of Forced Labor Convention, 1957 (No. 105);
- C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111);
- C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 14 years;
- C182 - Worst Forms of Child Labor Convention, 1999 (No. 182)

5. ENVIRONMENTAL AND SOCIAL BASELINE

5.1 General Introduction

This section details the physical, biological and socioeconomic environmental conditions of the microenvironment and macro environment of the project area. Discussion on the natural environment covers the area's physical and meteorological features, geography, topography, hydrology and climate and meteorology. Overview of Flora and Fauna is included in the Biological section. Description of socio-economic environment include history, demography, agriculture and livestock, education and popular places.

The physical, biological and socioeconomic environment of the project is described with respect to watershed, air shed, geology, soil characteristics and seismicity. The air shed describes the climatic conditions and quality of the air, the water shed describes the water quality of surface and ground water. The terrestrial environment is described by its geology, geomorphology, wild life habitat, vegetation and soil characteristics in terms of stability and seismicity. Description of the socioeconomic condition includes details of the area's population, demography and households, education and health institutes present in the area, water supply and sewage system, agriculture, transport and communications facilities available and major occupations and source of income.

5.2 Study Area

The study area for the EIA comprised the district Attock and Rawalpindi where the proposed exploration activities will be carried out. Microenvironment has been studied as location of exploration activities and their surrounding areas.

5.3 Methodology

The information for the baseline was collected using both primary and secondary information sources. Primary data was acquired through field surveys using checklist and questionnaire as well as focus group discussions with the local communities to obtain first hand data on the environmental and social aspects of project area. Information was also collected from relevant department’s e.g. local government, EPA offices etc. to identify sensitive issues of project require that may necessitate special attention during EIA. Secondary data sources encompassed literature review including reports from print and electronic media, as well as published maps from the Geological Survey of Pakistan and Soil Survey of Pakistan. It also involved review of District Census Reports (DCRs), previous district-specific studies, and other studies conducted by EMC in the region.

5.4 Project Location

The proposed project comprises 2D and 3D seismic survey activities to be undertaken within the Margalla Block (Punjab portion), covering areas in District Attock and District Rawalpindi, Punjab. MOL Pakistan will carry out seismic survey activities within District Attock, covering an area of approximately 84 sq.km, while around 64.6 sq.km fall within District Rawalpindi. The purpose of these seismic operations is to identify potential hydrocarbon (oil and gas) resources within the Margalla Block (Punjab portion).

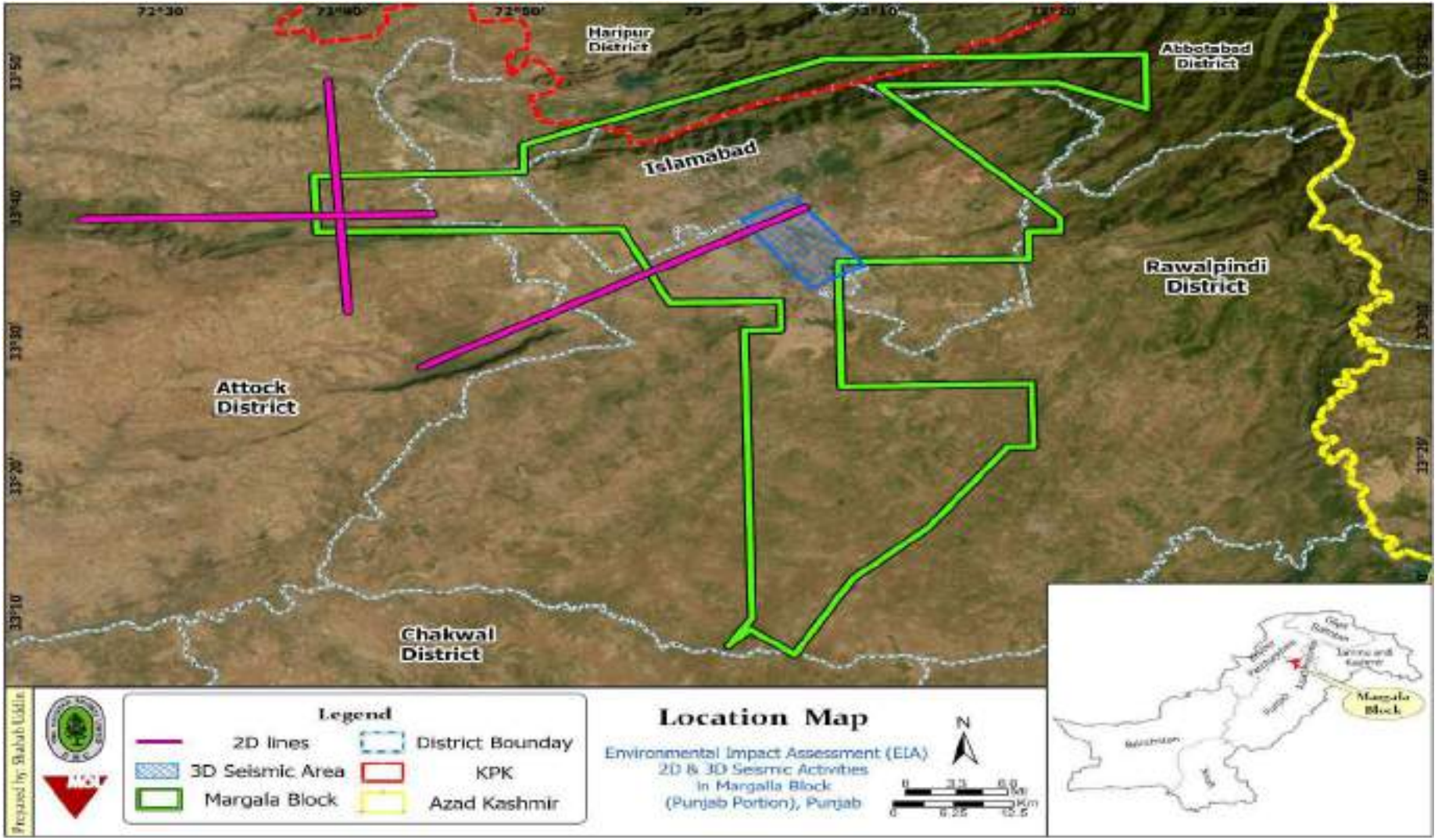


Figure 5.1: Location map of project area

5.5 Suitability of the Site

The selected area is suitable to undertake the project for following features:

- The site is hilly terrain, barren and mostly consists of the loose and eroded material.
- The exploration activities will not affect any protected and environmentally sensitive area.
- No form of resettlement or removal of business is required for project execution.

5.6 Physical Environment

5.6.1 Topography

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 2 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 Fatehjang, 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 Fatehjang 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. Fatehjang and Pindi Gheb tehsils are upland plains which are dissected by numerous streams and hills.

The northern extremity of Attock district falls into 2 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.

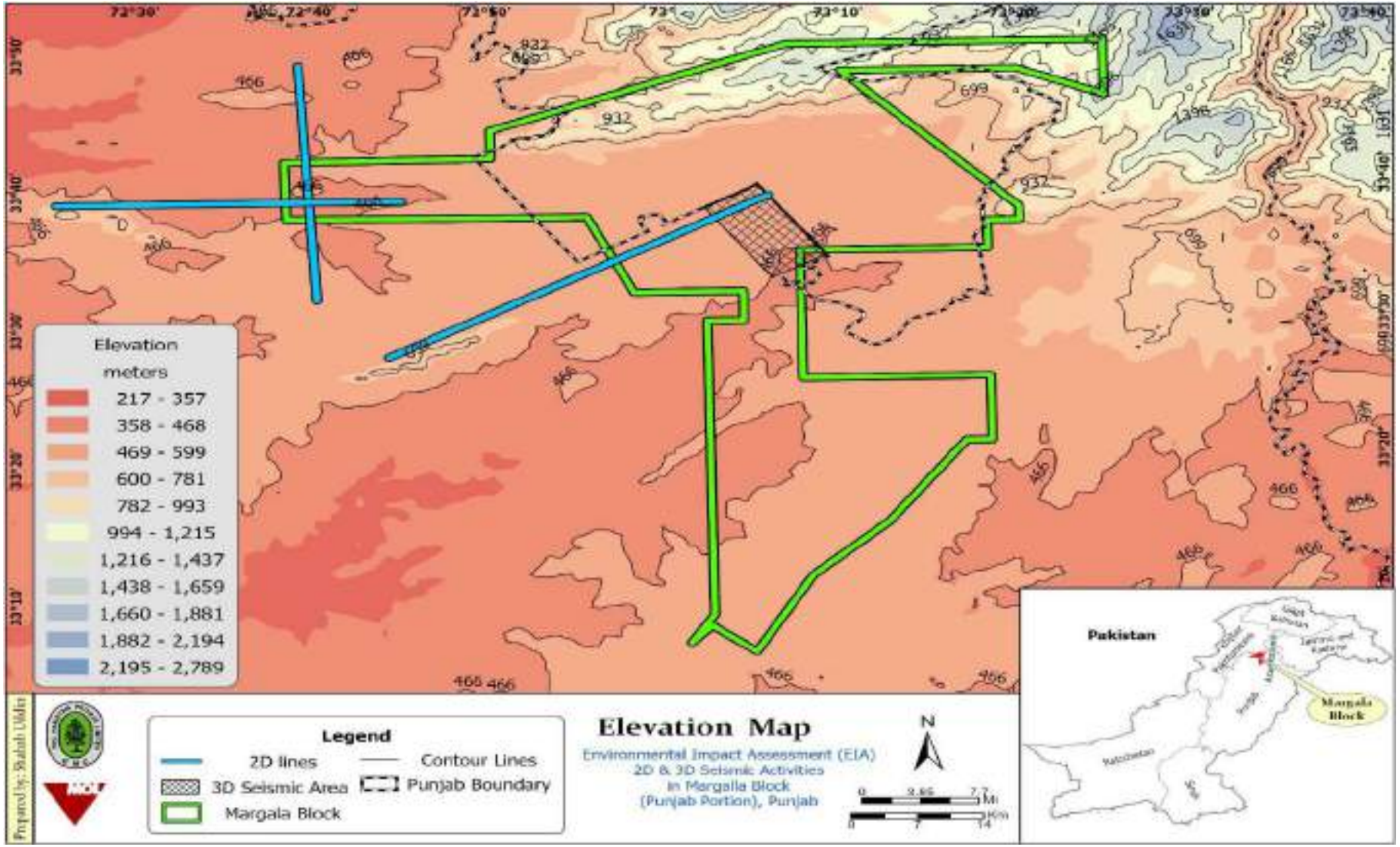


Figure 5.2: Elevation Map of Project Area

The districts of Rawalpindi and Attock lie in the northern part of Punjab Province, forming part of the Potohar Plateau. Attock District is bounded by Khyber Pakhtunkhwa (KP) to the north and west, Rawalpindi District to the east, and Mianwali and Chakwal to the south. The district features a mix of plains, rolling hills, rangelands, and riverine belts along the Indus and Haro rivers. Its land cover is dominated by rainfed agriculture, extensive scrub forests, and barren rocky terrain, with irrigated agriculture mainly present along canal-fed pockets and perennial rivers.

Rawalpindi District, located to the east of Attock and adjoining Islamabad to the northeast, has a highly diverse landscape ranging from semi-arid plains (Gujar Khan, Kallar Syedan) to sub-humid hill forests (Murree, Kotli Sattian, Kahuta). The district's land cover includes a mix of cultivated land, forested hills, rangelands, and rapidly expanding urban and peri-urban settlements. Irrigation is limited due to the absence of large canal systems, and agriculture is predominantly barani (rainfed), supplemented by tube wells and small dams. Forest cover is significantly higher than in most Punjab districts, especially in the Murree–Kotli Sattian region.

The detailed land-use statistics for both districts are presented in Table 5.1 below.

Table 5.1: Land Use Statistics for Rawalpindi and Attock (Acres)[15] [16] [17]

District / Tehsil	Total Area (Acres)	Uncultivated	Cultivated	Irrigated	Unirrigated	Orchards
Attock District	2,130,000	1,305,000	825,000	185,000	640,000	12,500
Rawalpindi District	1,156,000	745,000	411,000	78,000	333,000	17,800

[15] https://suparco.gov.pk/products-services/forestry/#:~:text=Pakistan%20Space%20and%20Upper%20Atmosphere,component%201%20as%20input%20variables.
[16] https://www.pbs.gov.pk/
[17] https://bos.punjab.gov.pk/system/files/PAS%202024.pdf

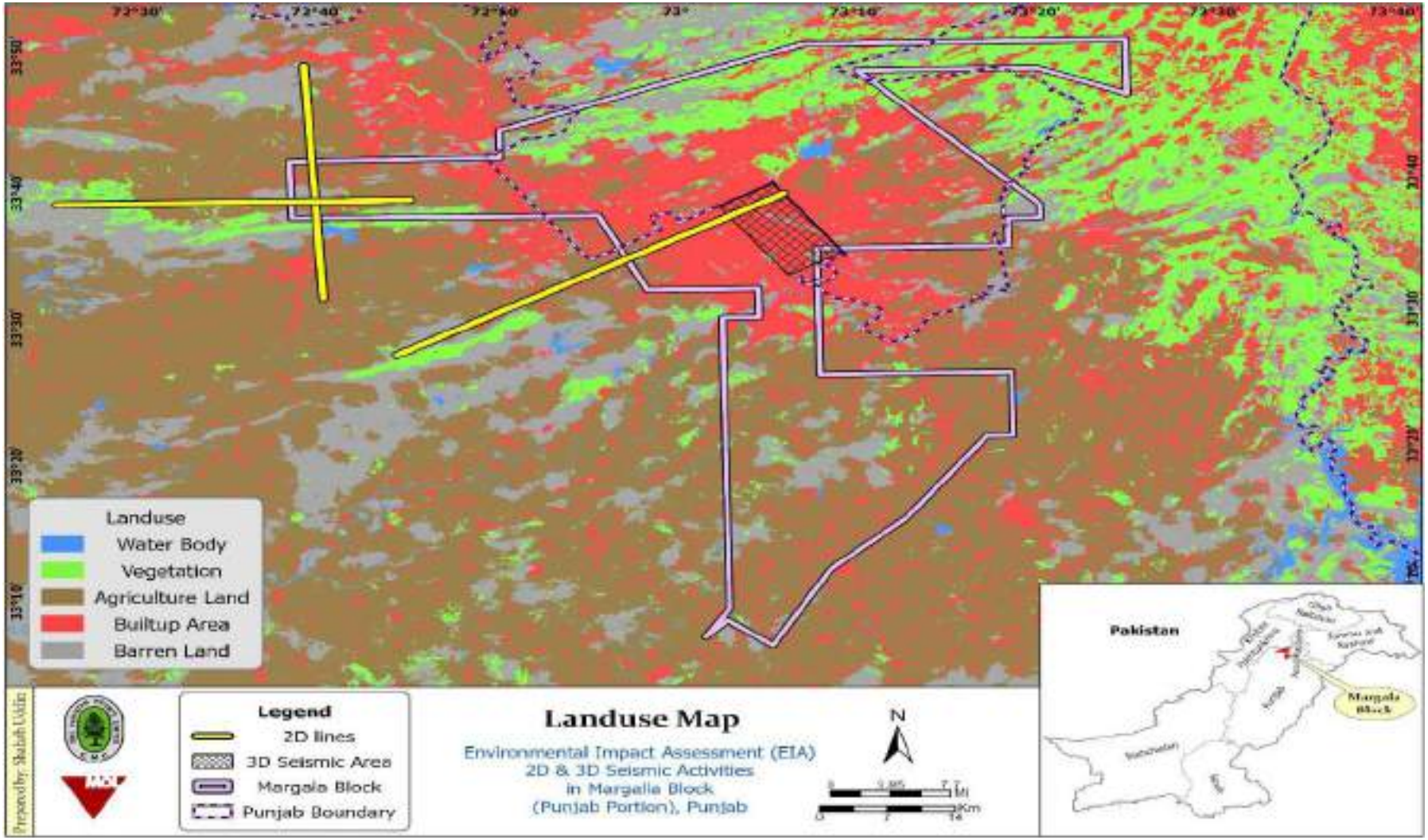


Figure 5.3: Land use map of the Margalla Block (Punjab Portion)

5.6.2 Geology

The Attock-Cherat Range is exposed in an area of about 50 square miles in Attock district and 360 square miles in the Peshawar district, on both sides of the Indus River. Around Attock the relief is low; the elevations: range from 1300 to 2079 feet which on the other side of the Indus culminate to 4546 and 5033 feet .at Cherat .and Jalala Sar respectively, which are the commanding heights in the Peshawar Plain. Between. Attock and Mir Kalan village, the general trend of the range is east-west which coincides with the strike of the rocks. Beyond this point, the range swings to the south west and ultimately merges into Nizampur-Kohat mountains in Darra Adam Khel tribal territory. In the Attock plain, the slats are lost beneath the alluvium beyond Kamra hillock till they crop out again in southern Hazara. In the west, the last slate outcrop mapped is exposed near Dag village, beyond which the slates are covered by thick alluvium till they crop cut in the Khyber mountains.

Two types of lithological elements, with a tectonic contact, are exposed in the Attock-Cherat Range. On comprises the Palaeozoic metasediments (phyllite, phyllite slate, slate and crystalline limestone) forming the northern face of the range.

They are correlated with the rocks of Khyber in the west, Hazara in the east and Swabi-Lower Swat in the north. The dominantly sedimentary rocks belo11ging to the Mesozoic Tertiary eras, developed along the southern face of the Attock-Cherat Range, may be correlated with the rocks of Samana Range, Kala Chitta hill, Salt Range and Hazara.

The pelites of the Attock-Cherat Range are divided into two-part s on the basis of fossil evidences. The older, Mallki Slate, is of Lower Silurian age and the younger, Attock Shale, has been placed in the middle Jurrasic-Cretaceous. Altogether, thirteen mappable lithological have been distinguished in the Attock cherat Ranges. Of these, four have been placed in Palaeozoic, four in the Messozoic and five in the Tertiary.

Two major thrust faults, running along the northern and southern fronts of the range, traverse the area in the east-west direction. The northern thrust is the results of overthrusting of the southern flank of an anticlinal fold. Another anticlinal fold strikes the Attock-Cherat Range on the south in the Nizampur valley. The northern limb of this fold is intact. The southern limb is eroded away and is buried under the alluvium. The Attock shales are folded into asymmetrical parallel isoclinal folds with their axes dipping towards the north. The faulting pattern in the Attock-Cherat Range yielded imbricate type structures which are conspicuously observed all over the area.

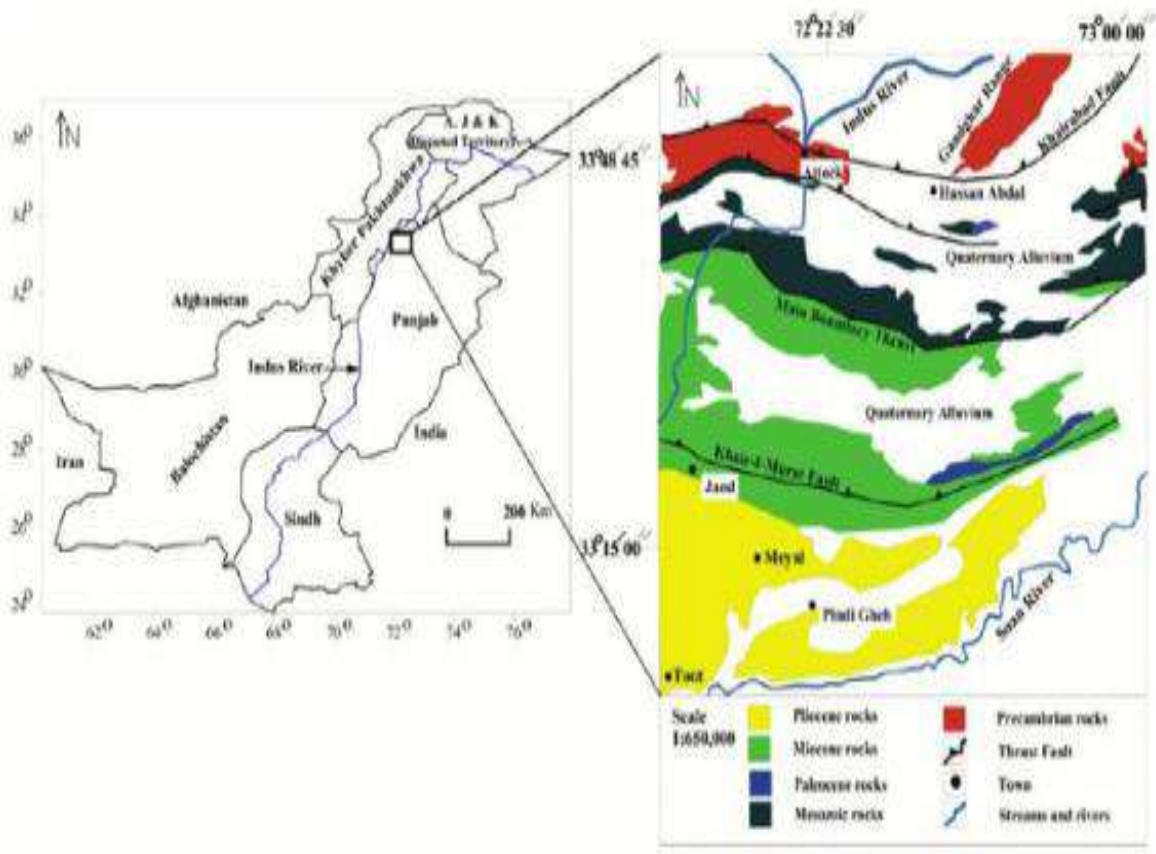


Figure 5.4: Tectonic Map of Pakistan

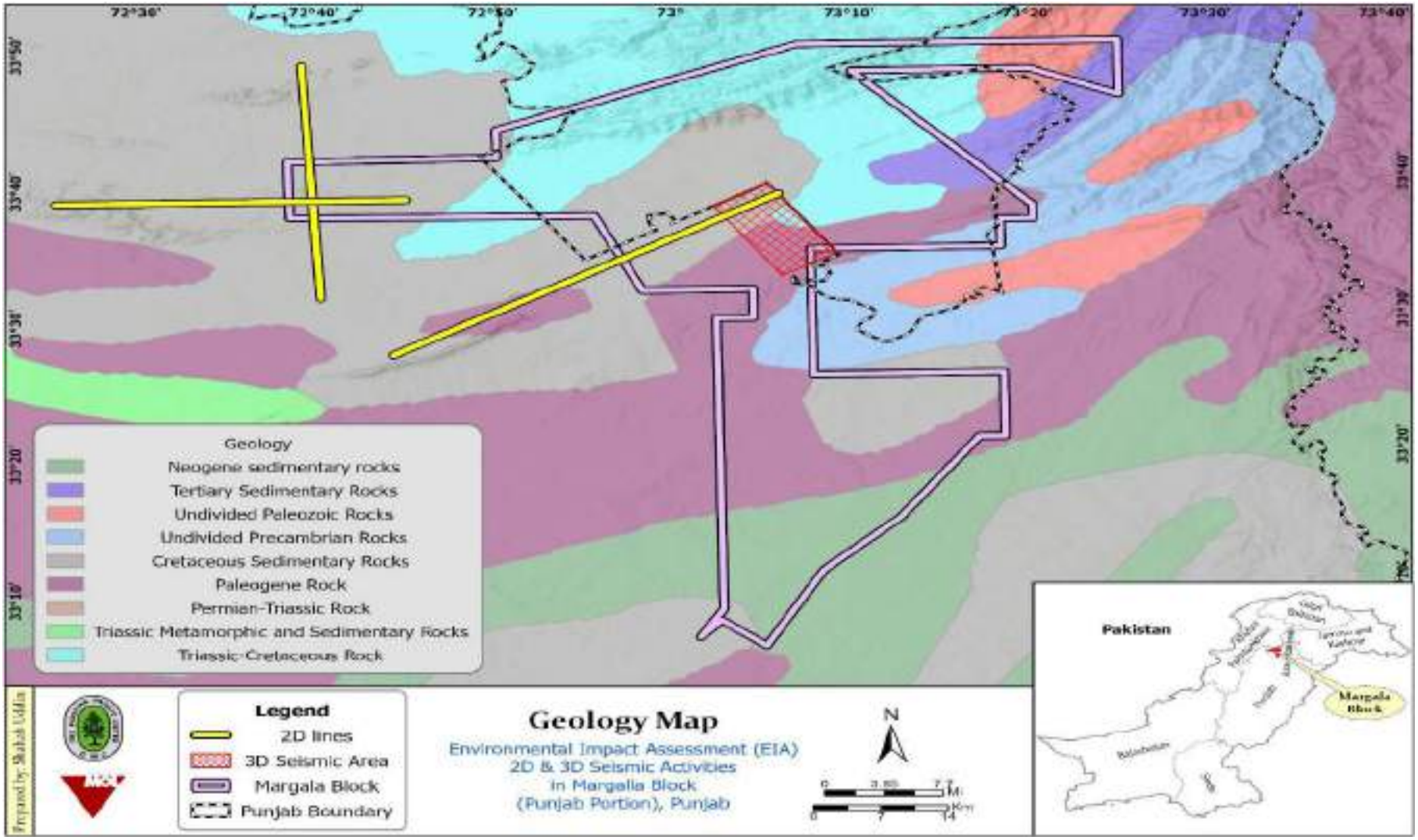


Figure 5.5: Geological Map of project area

5.6.3 Soil Characteristics

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. The Lithosol predominantly dominates the block, while the western side contains Haplic Yermosols (see Figure 5.6).

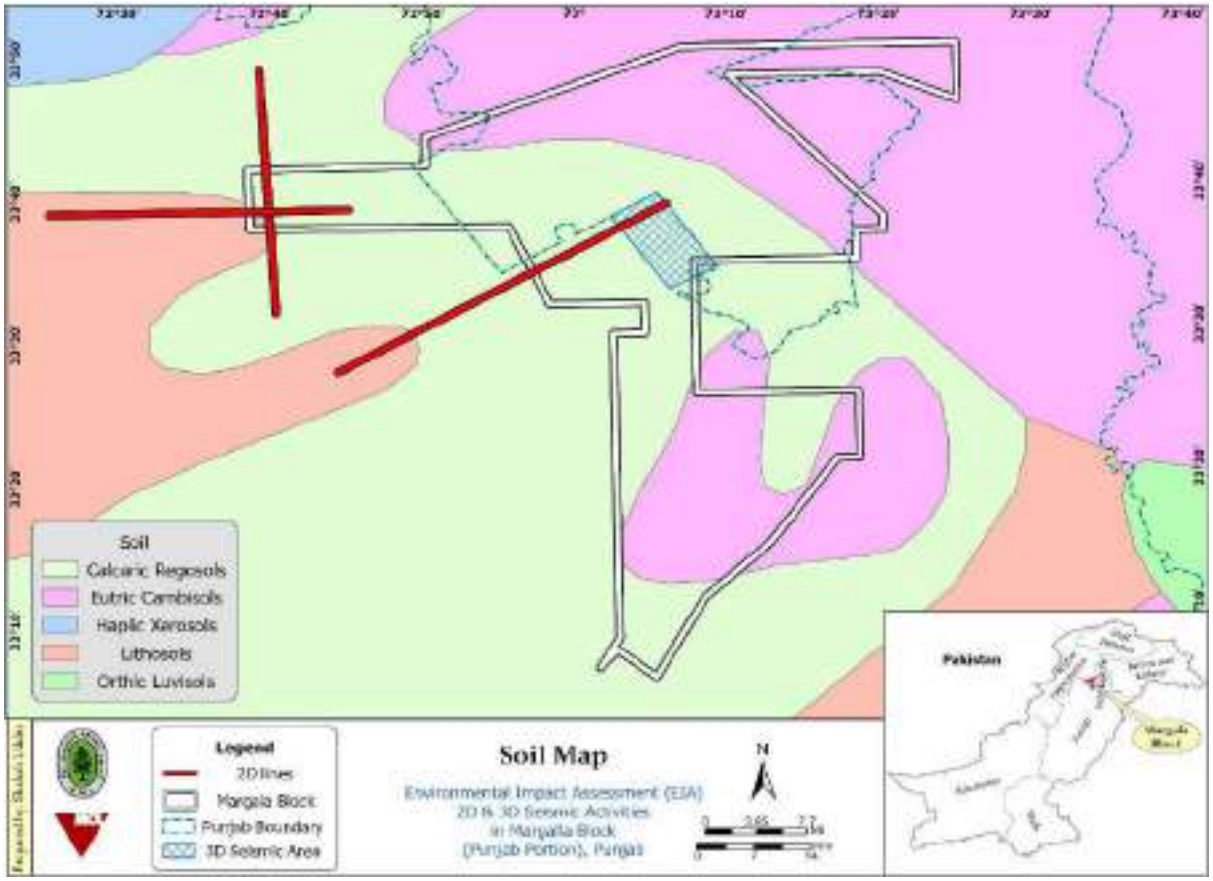


Figure 5.6: Soil Map of project area

5.6.4 Seismicity

Pakistan has been divided into 5 distinctive zones concerning the seismic hazard including; Zone 1, Zone 2A, Zone 2B, Zone 3, and Zone 4. Each of these zones represents a different level of seismic hazard with respect to the peak ground acceleration (PGA) values, and potential damage to the elements at risk. The district Attock & Rawalpindi both falls under seismic zone i.e., Zone 2B.

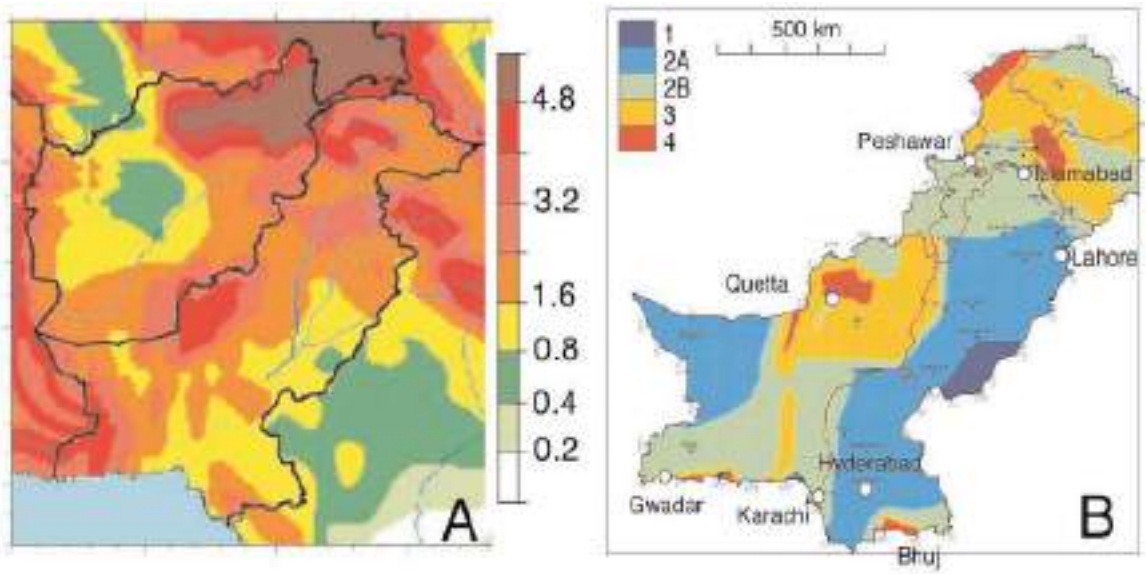


Figure 5.7: Seismic Zoning Map of Pakistan (Source: Pakistan Metrological Department)

5.6.5 Climate

A. Temperature

The temperature regime of District Attock and Rawalpindi demonstrates a typical subtropical continental climate with pronounced seasonal variations.

Winter Season (December–February):

Temperatures range between 4°C and 16°C, with occasional frost days observed in January. The period remains cool and dry.

Pre-Monsoon Season (March–June):

A gradual rise in temperature occurs from 12°C to above 40°C, peaking during May and June, which are the hottest months of the year.

Monsoon Season (July–September):

Temperatures moderate slightly, ranging between 24°C and 36°C, due to increased cloud cover and precipitation.

Post-Monsoon and Autumn (October–November):

A noticeable decline in temperature is observed, with averages between 16°C and 28°C, marking a transition towards cooler conditions.

Overall, the climate is hot and dry during the summer months and mild to cool during winter, with significant diurnal temperature variation.

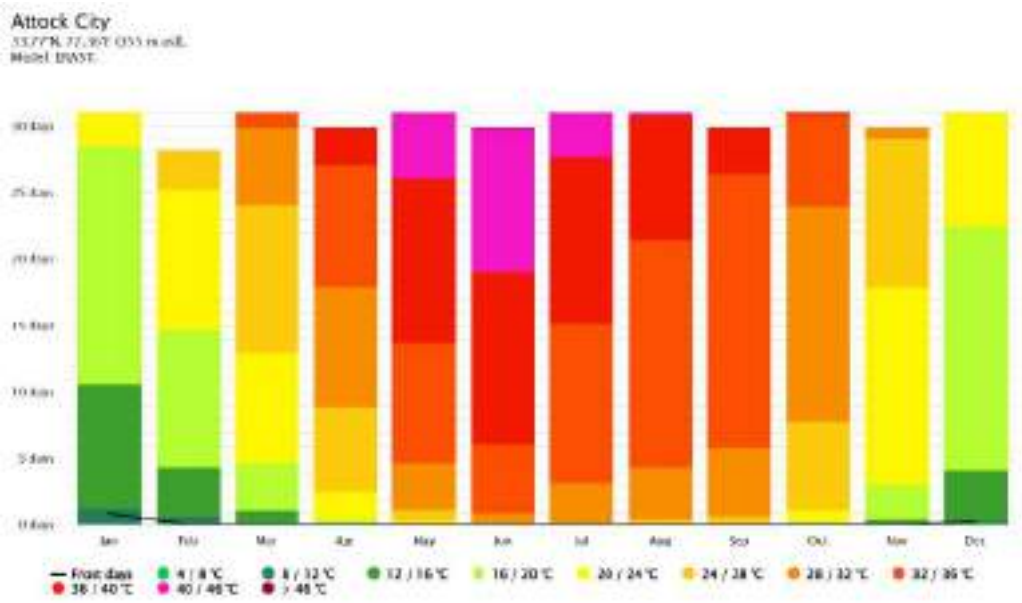


Figure 5.8 (a): Average High and Low Temperature in District Attock

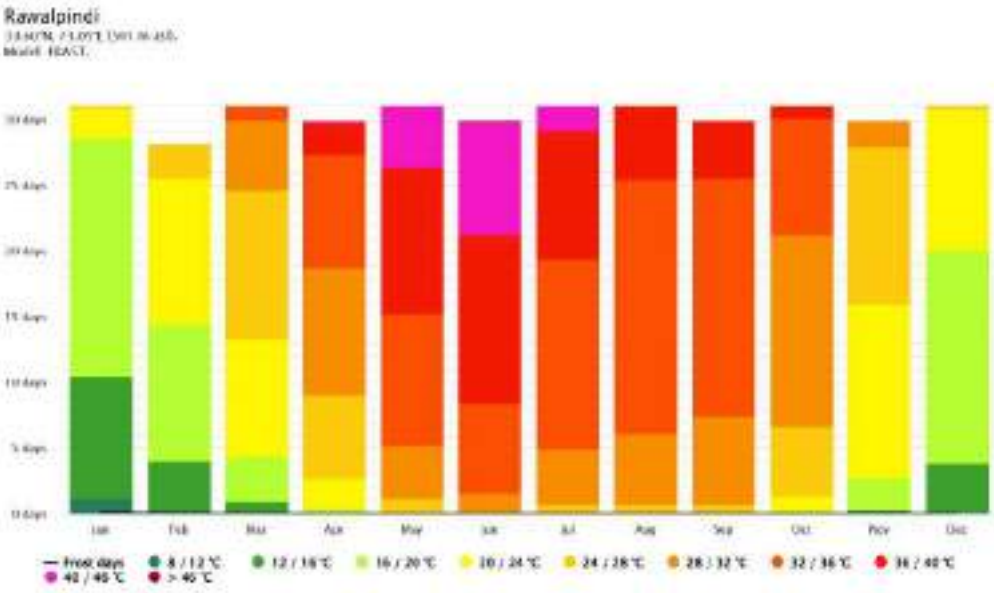


Figure 5.8 (b): Average High and Low Temperature in District Rawalpindi

B. Precipitation

The rainfall pattern of Attock City exhibits distinct seasonal variability, typical of a semi-arid to sub-humid climate influenced by the South Asian monsoon.

- Dry conditions prevail during October to April, with most days recording no rainfall.
- Light rainfall (<5 mm/day) is observed intermittently in February, March, and May.
- The monsoon period (July to September) receives the highest precipitation, with several days recording rainfall in the range of 20–50 mm, and occasional events exceeding 50 mm.
- July and August are the wettest months, experiencing the greatest frequency and intensity of rainfall.
- December to February generally remain dry to mildly wet, with minimal rainfall events (<5 mm).

Overall, the annual rainfall pattern shows that precipitation is concentrated during the summer monsoon months, while winter and post-monsoon periods.

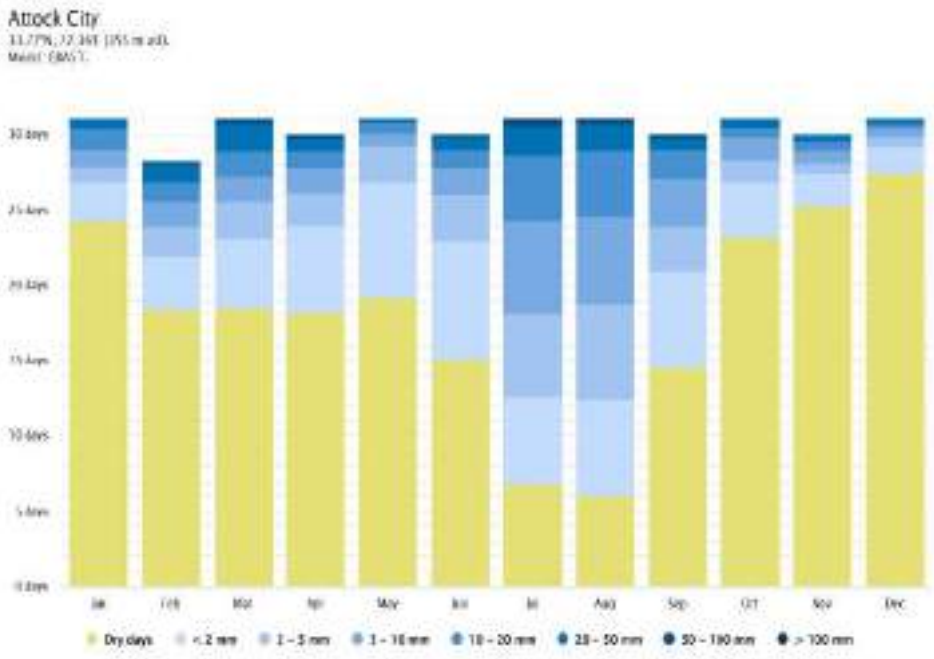


Figure 5.9 (a): Daily Chance of Precipitation in District Attock

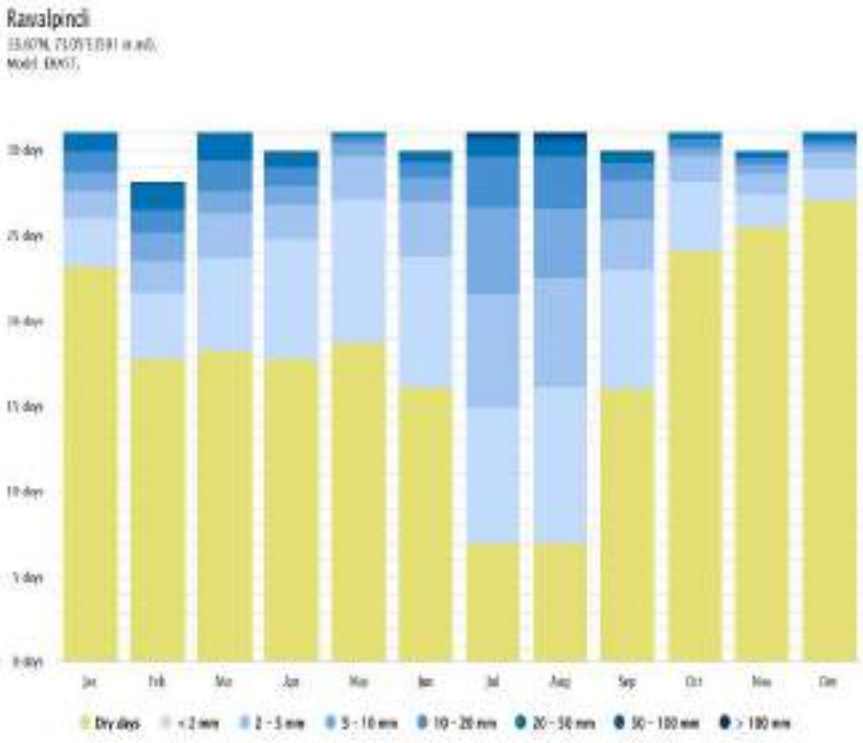


Figure 5.9 (b): Daily Chance of Precipitation in District Rawalpindi

C. Wind

The wind speed data for Attock City indicate that throughout the year, the average wind velocities generally range between 2–20 km/h, with occasional increases up to 30 km/h during specific months.

- Moderate winds (10–20 km/h) are more frequent during April to July, reaching a peak in May and June.
- Lower wind speeds (2–10 km/h) dominate the cooler months from November to February.
- Higher wind speeds (20–30 km/h) occur occasionally during the summer months (May–July), while winds above 30 km/h are rare.

Overall, the wind regime in Attock City is characterized by moderate and steady airflow, favorable for seismic and environmental field operations, with minimal risk of dust storms or strong wind disturbances..

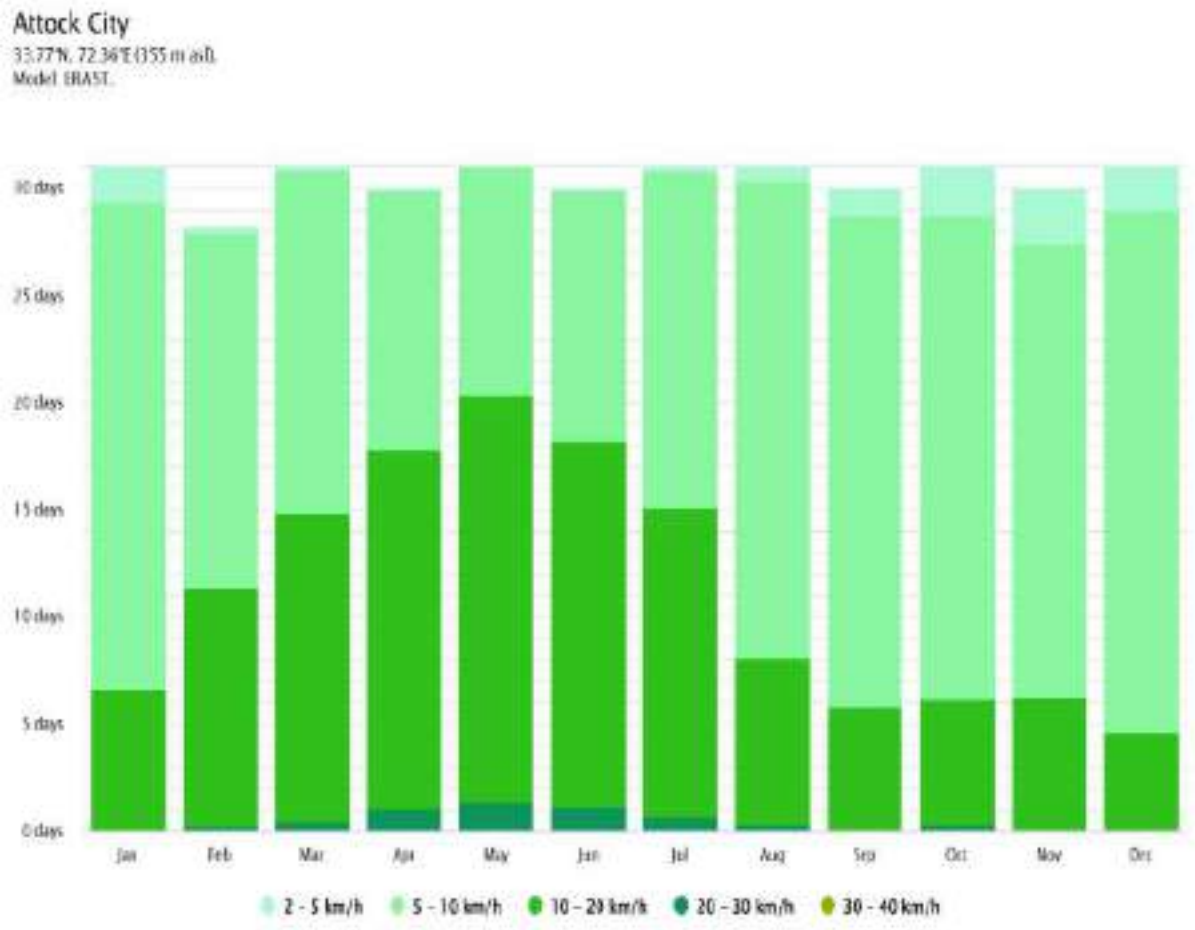


Figure 5.10 (a): The average of mean hourly wind speed in District Attock

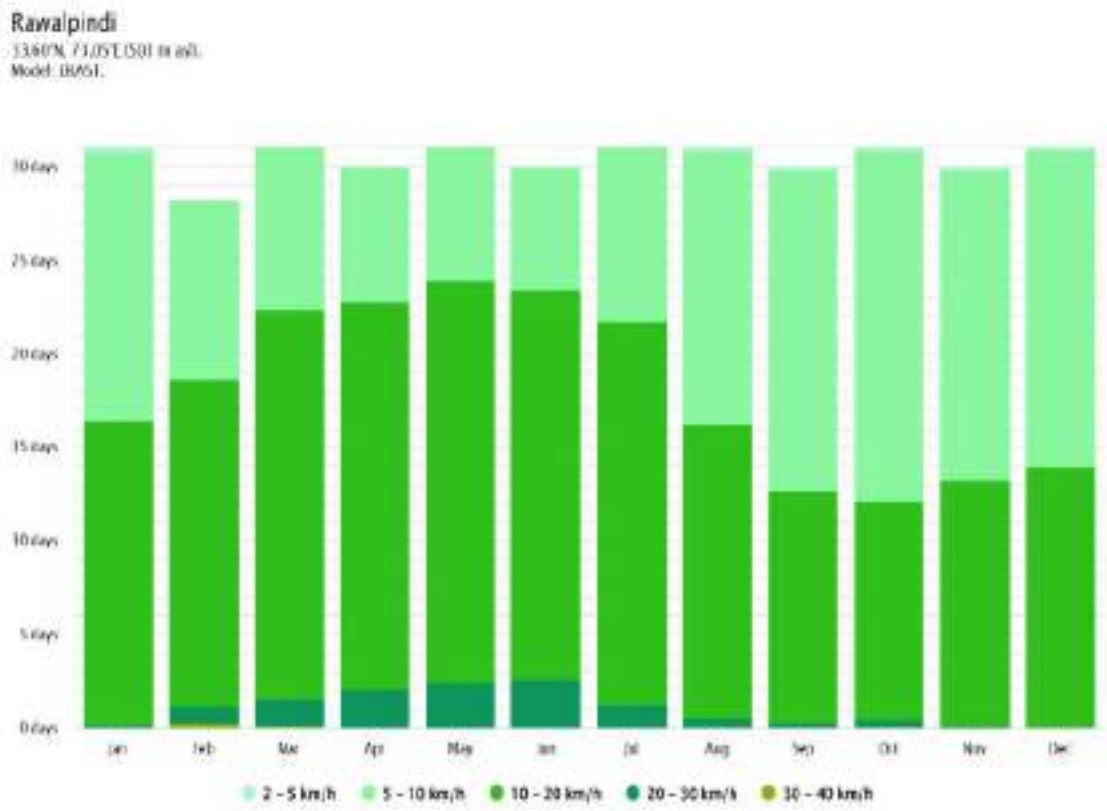


Figure 5.10 (b): The average of mean hourly wind speed in District Rawalpindi

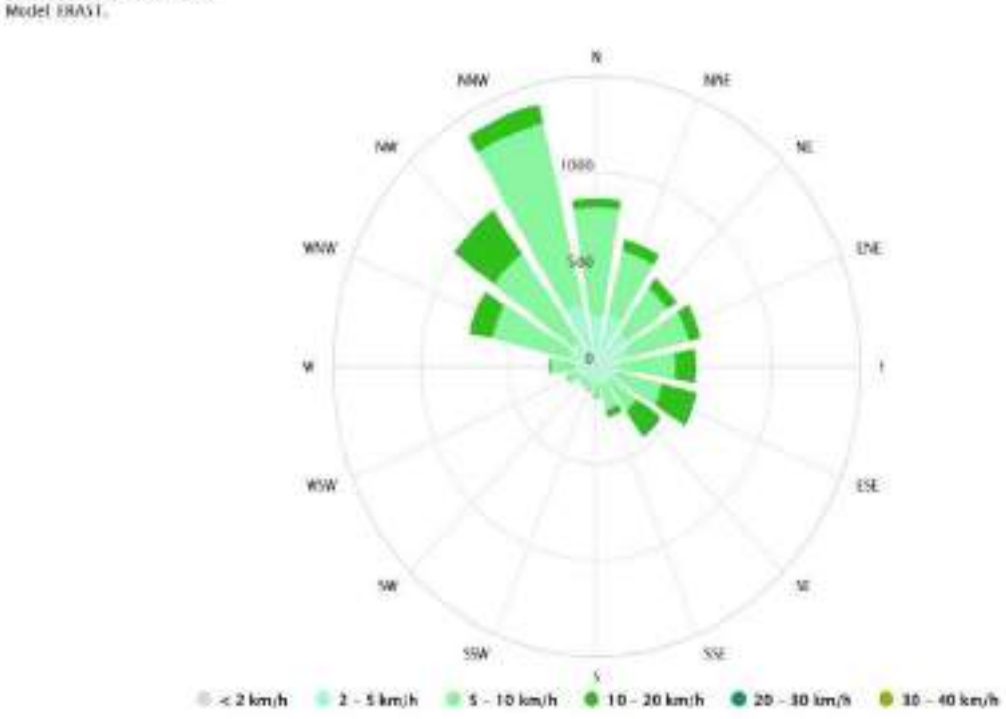


Figure 5.11 (a): Annual wind directions in District Attock

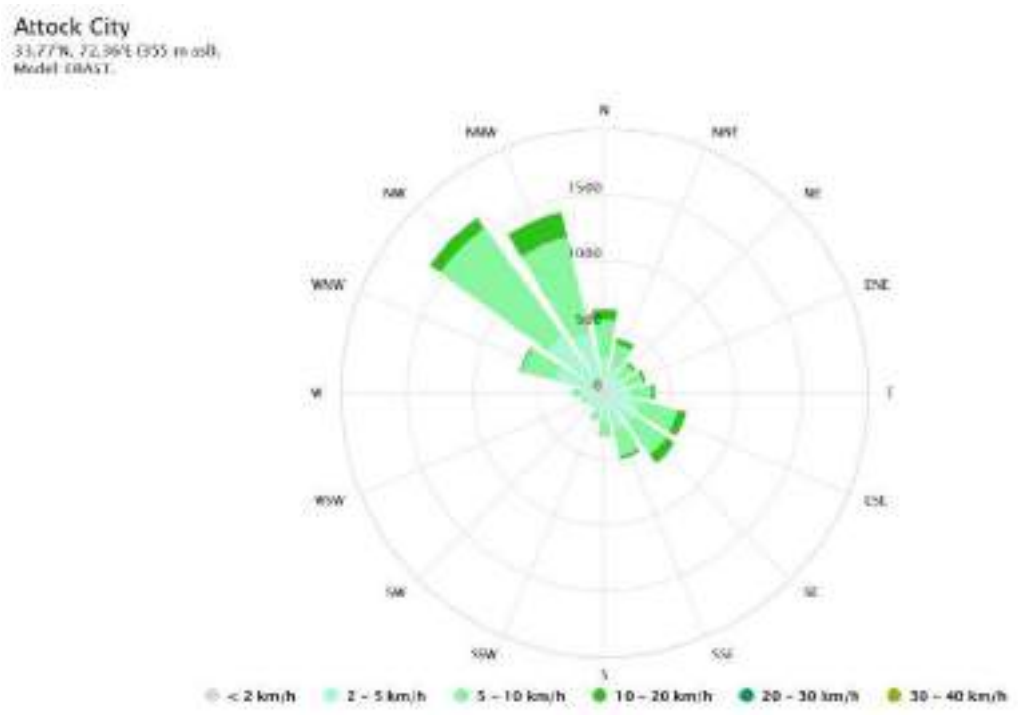


Figure 5.11 (b): Annual wind directions in District Rawalpindi

5.6.6 Ambient Air Quality & Noise Level Monitoring

The project area falls within the administrative jurisdictions of Districts Rawalpindi and Attock and comprises a mix of urbanized and rural settings. Ambient air quality and noise levels are generally higher in urbanized areas due to intensive economic and commercial activities, whereas comparatively lower levels are observed in rural areas.

Based on available data, particulate matter concentrations within the project area vary across locations. In areas under the relevant administrative jurisdictions, $PM_{2.5}$ concentrations range between 60–100 µg/m³, while PM_{10} concentrations range between 80–100 µg/m³. In more densely urbanized locations, $PM_{2.5}$ concentrations range between 80–160 µg/m³, and PM_{10} concentrations range between 100–160 µg/m³[18].

5.6.7 Noise Level Monitoring

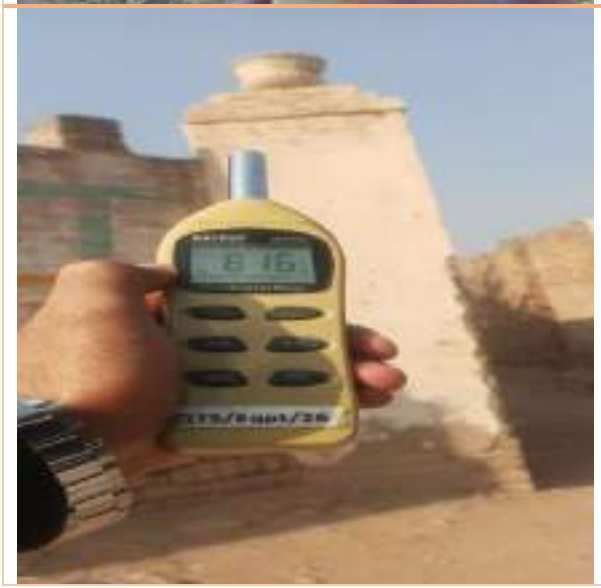
To determine baseline noise values of project area, noise monitoring was also conducted at selected location within project area. Instant noise monitoring was done via noise meter. The details are shown in table below.

Table 5.2: Noise Monitoring

Sr. No	Coordinates/Location	Noise Level (dB)	PEQs Residential
1	33°38'59.31"N 72°43'33.05"E	53.0 at 09:58 AM	50 Day Time 45 Night Time
2	33°38'59.58"N 72°42'12.95"E	53.5 at 10:18 AM	
3	33°40'55.35"N 72°39'23.42"E	48.3 at 11:15 AM	
4	33°38'26.55"N 72°39'23.89"E	55.3 at 10:52 AM	
5	33°38'12.89"N 73° 2'48.09"E	61.6 at 09:57 AM	

18 https://www.meteoblue.com/en/weather/maps/islamabad_pakistan_1176615#coords=9.57/33.6304/72.8282&map=particulateMatter~pm2.5~auto~sfc~none

6	33°30'34.15"N 72°50'6.41"E	55.5 at 13:10 PM	
7	33°31'50.89"N 72°51'59.88"E	62.5 at 08:20 AM	
8	33°34'43.05"N 72°57'28.47"E	55.3 at 11:40 AM	
9	33°38'10.85"N 73° 4'28.89"E	81.6 at 12:14 PM	
10	33°39'1.16"N 73° 3'51.97"E	61.1 at 13:00 PM	
11	33°34'42.44"N 73° 7'40.87"E	55.9 at 10:58 AM	
12	33°35'1.02"N 73° 5'45.64"E	77.2 at 14:04 PM	
13	33°38'28.62"N 73° 3'49.15"E	61.5 at 11:04 PM	


5.6.8 Hydrology

A. Surface Water

The surface water network in Rawalpindi and Attock districts is shaped by the undulating topography of the Potohar Plateau and the foothills of the Lesser Himalayas. The hydrology of the region is dominated by seasonal hill-torrents, perennial rivers, and a series of dams and barrages that regulate water availability. In Attock District, the major perennial watercourse is the Indus River, which forms the western boundary of the district, while the Haro River flows from Abbottabad through Hazro and joins the Indus near Ghazi. Numerous seasonal streams such as Nandna Kas, Chhachh Kas, Ling Stream, and Sohan River tributaries generate flash flows during monsoon rains. In Rawalpindi District, the main watercourses include the Sohan River, which drains a large portion of the district, and the Korang River, which flows from Murree and enters the Rawal Lake. The upper hilly region, including Murree, Kotli Sattian, and Kahuta, contains dense networks of perennial and seasonal streams such as Soan Kas, Tamizuddin Kas, Neela Sandh, and Shahpur Kas, which contribute to major reservoirs like Simly Dam and Rawal Dam. Both districts experience intense hill torrents during monsoon, causing rapid runoff, soil erosion, and downstream flooding. The drainage network supports irrigation channels, groundwater recharge, and drinking-water storage systems essential for local communities.

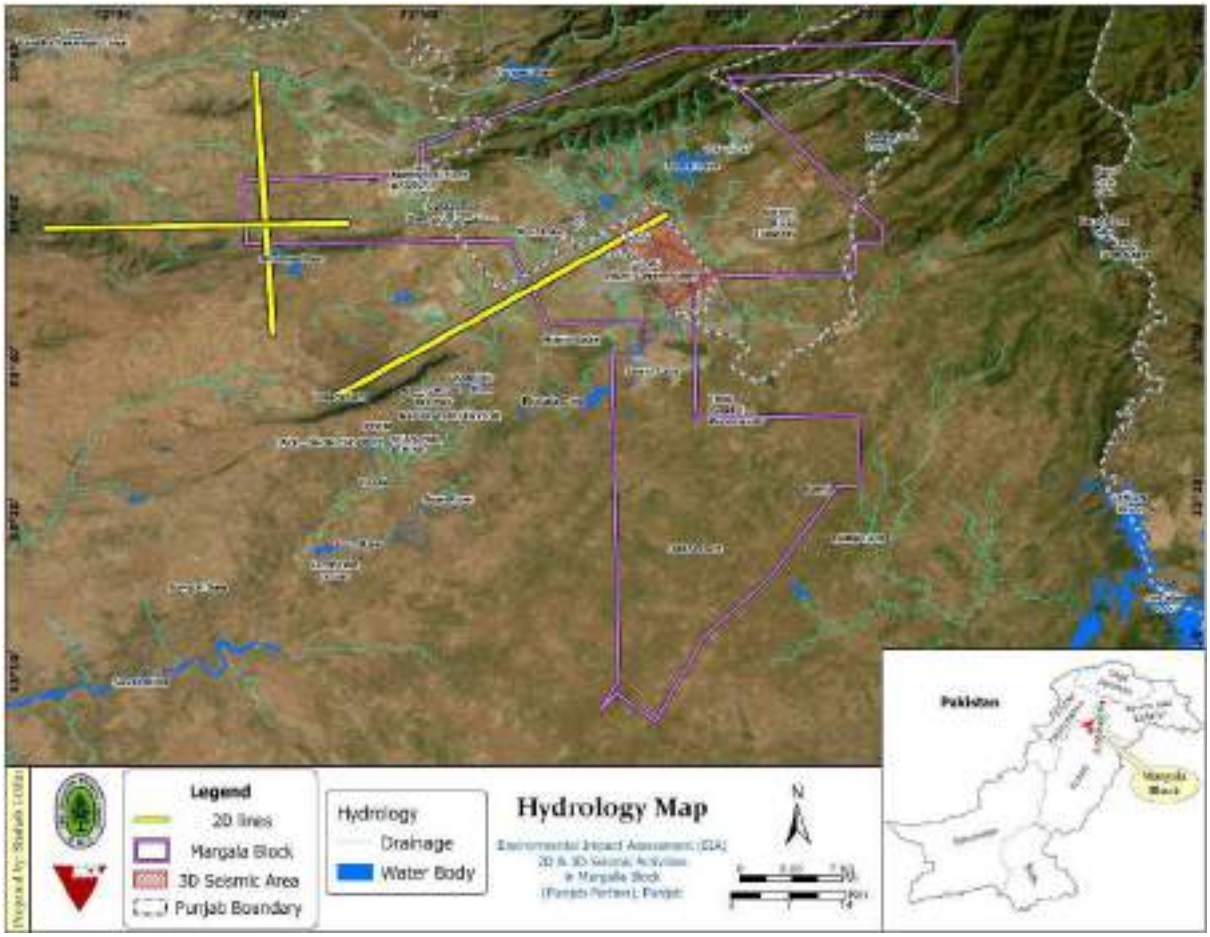


Figure 5.12: Drainage patterns in the project area

Korang River

Nullah Leh

B. Ground Water Quality

The scarcity of drinking water in the area is a significant concern, compounded by the fact that underground water resources are available at depths ranging from 350 to 500 feet. In some villages, clean drinking water is not available and the water is saline.

Table 5.3. Depth of the water table in the survey villages

Villages	**Water table (ft)**
Boota	80-100
Akhori	100-120
Nawa	70-100
Korang	160-190
Ghariabad	120-190
Chaklala	165-200
Iqbal Colony	125-195
Satellite colon	150-170

Three groundwater samples were obtained from the project area for analysis. The results indicate that the samples meet the drinking water parameters as specified in the PEQs. The reports are attached as Annex II.

Table 5.4: Groundwater Analysis of Project Area

Nature of Sample:		Groundwater					
Location: Project sites in Margalla Block Punjab Portion		**Sample 1:** 33°31'43.29"N 72°52'4.42"E		**Sample 2:** 33°37'22.56"N 73° 3'33.54"E		**Sample 3:** 33°35'17.09"N 72°58'32.69"E	
Parameter	**Analysis Method**	**PEQS**	**Sample 1**	**Sample 2**	**Sample 3**	**MU (CL95 %)**	**Remarks**
Laboratory Analysis							
Color*	SMWW 2120 C	≤ 15 TCU	0	0	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	Non-Objectionable	Non-Objectionable	N.A.	Optimal

Turbidity*	SMWW 2130 B	< 5 NTU	0	0	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	284	324	388	± 1.40	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	380	535	**1010**	± 2.77	Optimal
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.4	8.1	7.4	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	BDL	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	BDL	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	BDL	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	BDL	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	BDL	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	BDL	BDL	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500-Cl^- B	< 250 mg/L	83	132	150	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	BDL	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	BDL	0.164	0.165	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500-CN^- F	≤ 0.05 mg/L	0	0	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500-F^- C	≤ 1.5 mg/L	0.25	0.56	0.95	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	BDL	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	BDL	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	BDL	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	BDL	BDL	BDL	N.A.	Optimal
Nitrate (NO_3^-) **	SMWW 4500-NO_3^- D	≤ 50 mg/L	2.35	3.1	4	± 0.02	Optimal
Nitrite (NO_2^-) *	SMWW 4500-NO_2^- B	≤ 3.0 mg/L	0	0	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	BDL	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl^- B	0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L	0	0	0	N.A.	Optimal
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	0	0	N.A.	Optimal
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.025	0.03	0.033	N.A.	Optimal
Microbiological Analysis							
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	0	0	N.A.	Optimal

Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	0	0	N.A.	Optimal

Figure 5.15: Collection of ground water samples from the project area

5.6.9 Biological Environment

This sub section contains information regarding the biological environment of the project area. The project area falls Tehsil fateh Jung District Attock and Tehsil and District Rawalpindi having ecological zone having Arid Subtropical Climate. The tree density in the area is low to moderate due to intensive agricultural and settlements.

5.6.10 Floral Attributes of the Project Area

The main flora of district Attock 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 polmata), bakain (Melia azerdorach), kikar (Acacia nilotica), pipal (Ficus religosa), poplar (Populus alba), 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 (Cucumus melo var. agrestis), khabal grass (Cynodon dactylon), Stapf or murga ghas (Datura innoxia), sanatha (Dodonaea

viscose), globe thistle or untkatara (Echinops echinatus), and snake weed or chatri dudhak (Euphorbia helioscopia).

The district Rawalpindi is rich in flora. In the upper reaches of Murree Hills, the most common flora is deodar (Cedrus deodara), spruce (Picea), chir (Pinus roxburghii), fir (Abies balsamea), blue pine (Pinus walliciana), biar (Pinus excels), paludar (Abiess mithiana), barangi or Mexican oak (Quercus crassifolia), amaltas (Cassia fistula), kamila or kum kum tree (Mallotus philippenesis), dhavi or fire flame bush (Woodfordia floribunda), and ban-akrot or horse chestnut (Aesculus indica).

Shrubs in Murree Hills include sanatha (Dodonea viscosa), granda or bush plum (Carissa spinarum), bhaikar or malabar nut (Adhatoda vasica), kahu or wild olives (Olea cuspidate), and phulai (Acacia modesta).

Some of the grasses in Murree Hills include khabal (Cynodon dachtylon), kanhi (Saacharum spontaneum), lamb (Aristida depressa), and dab (Desmostachya bipinnata).

In the lower hills, the most common flora is phulai (Acacia modesta), Kao (Olea ferruginea), chestnut (Aesculusindica), juniper (juniperous), walnut (juglans), oak (Quercus), maple (acer), poplar (populus), wild olives (Olea), chir (Pinus roxburghii), drek (Melia semper virans), and sanatha (Dodonaea viscosa).

In the Plains, the most common trees are shisham (Dalbergio sissoo), toot (Morus alba), drek (Melia semper virens), phulai (Acacia modesta), ber (Zizyphus jujube), pipal (Ficus religosa), kikar (Acacia Arabica), lasura (Cordiamyxa), shamshad or boxwood (Buxus wallichiana), puran or punna (Ehretia serrate), sohanjna or horse radish (Moringa pterygosperma), amla (Phyllunthus emblica), kakar singhi or zebrawood (Pistacia integerrima bunge), kali mirch or pepper tree (Schinus molle Linn), and kain (Ulmus wallichiana).

Some of the herbs and shrubs of the district include puthkanda (Achyranthes aspera Linn), cholai (Amaranthus Viridis L.), bathu (Chenopodium album L.), saunf (Fomecal vulgaris L.), dhamini buti (Malvestrum coromendelianum Garcke), wild olives (Olea cuspidate), piazi grass (Asphodlelus tenuifolium), jangli jal grass (Avena Fatua L.), rose (Rosa indica), datura or thorn apple (Datura inoxia), kainch mainch or night shade (Solanum nigrum), and bhakra or puncture vine (Tribulus terrestris).

Commonly found flora in project area and in the overall district is listed below.

Table 5.5: Commonly Found Flora in Project Area

S. No	Biological Name	Local Name
1	Acacia modesta	Phulai
2	Acacia nilotica	Babul / Kikar
3	Achyranthes aspera	Puth Kunda / Prickly Chaff Plant
4	Aerva javanica	Sufaida / Snow Bush
5	Ficus palmata	Wild Fig
6	Melia azedarach	Bakain
7	Ficus religiosa	Pipal
8	Populus alba	Poplar
9	Morus alba	Mulberry / Toot
10	Bombax ceiba	Simal
11	Dalbergia sissoo	Shisham
12	Albizia procera	White Sirin
13	Albizia lebbeck	Siris / Shirin
14	Aloe vera	Aloe / Kanwar Gandal

15	Amaranthus spinosus	Amaranth / Khardar Chulari
16	Amaranthus viridis	Amaranth / Chulai
17	Anisomeles indica	Kuntze / Gulabi Booti
18	Arachis hypogaea	Peanut / Moong Phali
19	Asparagus adscendens	Musli
20	Azadirachta indica	Neem
21	Brassica nigra	Koch / Black Mustard / Kali Surson
22	Calotropis procera	Swallow Wort / Aak
23	Cucumis melo var. agrestis	Naudin / Chibar
24	Cynodon dactylon	Khabal Grass
25	Datura innoxia	Stapf / Murga Ghas
26	Dodonaea viscosa	Sanatha
27	Echinops echinatus	Globe Thistle / Untkatara
28	Euphorbia helioscopia	Snake Weed / Chatri Dudhak
30	Picea sp.	Spruce
31	Pinus roxburghii	Chir
32	Abies balsamea	Fir
33	Pinus wallichiana	Blue Pine
34	Pinus excelsa	Biar
35	Abies mithiana	Paludar
36	Quercus crassifolia	Barangi / Mexican Oak
37	Cassia fistula	Amaltas
38	Mallotus philippenesis	Kamila / Kum Kum Tree
39	Woodfordia floribunda	Dhavi / Fire Flame Bush
40	Aesculus indica	Ban-Akrot / Horse Chestnut
41	Carissa spinarum	Granda / Bush Plum
42	Adhatoda vasica	Bhaikar / Malabar Nut
43	Olea cuspidata	Kahu / Wild Olives
44	Saacharum spontaneum	Kanhi
45	Aristida depressa	Lamb
46	Desmostachya bipinnata	Dab
47	Olea ferruginea	Kao
48	Juglans sp.	Walnut
49	Quercus sp.	Oak
50	Acer sp.	Maple
51	Melia sempervirens	Drek
52	Buxus wallichiana	Shamshad / Boxwood
53	Ehretia serrata	Puran / Punna
54	Moringa pterygosperma	Sohanjna / Horse Radish
55	Phyllanthus emblica	Amla
56	Pistacia integerrima bunge	Kakar Singhi / Zebrawood
57	Schinus molle Linn	Kali Mirch / Pepper Tree
58	Ulmus wallichiana	Kain
59	Chenopodium album	Bathu
60	Fomecal vulgaris	Saunf
61	Malvestrum coromendelianum	Dhamini Buti
62	Asphodelus tenuifolium	Piazi Grass
63	Avena fatua	Jangli Jal Grass
64	Rosa indica	Rose
65	Solanum nigrum	Kainch Mainch / Night Shade
66	Tribulus terrestris	Bhakra / Puncture Vine

	
Acacia Modesta	Acacia Nolitica
	
Achyranthes aspera	Aerva javanica
	
Ficus palmata	Melia azedarach
	
Ficus religiosa	Populus alba

	
Cassia fistula	Albizia lebbeck

5.6.11 Faunal attributes of the Project Area

The project area encompassing Attock and Rawalpindi districts hosts a diverse range of fauna, reflecting its varied topography, vegetation, and climate. In the Attock District, the scrub-forest and semi-arid landscapes of the Kala Chitta and Kheri Murat regions support mammals such as Indian leopard, chinkara, wild boar, jackal, porcupine, and fox, while avifauna includes partridges, houbara bustards, migratory waterfowl, and raptors. Reptiles like monitor lizards, snakes, and turtles are also common in dry plains and riverine habitats. In Rawalpindi District, the hill forests of Murree, Kahuta, and Kotli Sattian, along with urban green spaces like Ayub National Park, provide habitats for mammals such as leopards, rhesus macaques, wild boar, and civets, and a wide variety of birds including pheasants, parakeets, kingfishers, and migratory species. Aquatic and semi-aquatic fauna are found in streams, dams, and wetlands, including fish, amphibians, and freshwater turtles. Overall, the faunal composition demonstrates a mix of terrestrial, avian, and aquatic species, with several species of ecological and conservation importance, highlighting the biodiversity value of the project area.

5.6.12 Protected Areas

There are several protected areas in both districts Rawalpindi and Attock i.e. Lohi Ber, Ayub National Park, Kala Chitta National Park, Kheri Murat National Park, Rakh Takht Pari Forest. Ayub National Park in Rawalpindi and Kala Chitta and Kheri Murat National Parks in Attock are the major officially recognized protected areas in the region, conserving diverse scrub-forest ecosystems and providing important habitats for wildlife such as partridge, chinkara, Punjab urial, and various migratory birds. Ayub National Park serves both ecological and recreational purposes within the urban landscape of Rawalpindi, while Kala Chitta and Kheri Murat safeguard large tracts of dry-forest hills across the Pothohar plateau. Lohi Bher and Rakh Takht Pari are also known locally as green and recreational spaces.

Kheri Murat National Park

Lohi Bher Park

Kala Chitta National Park

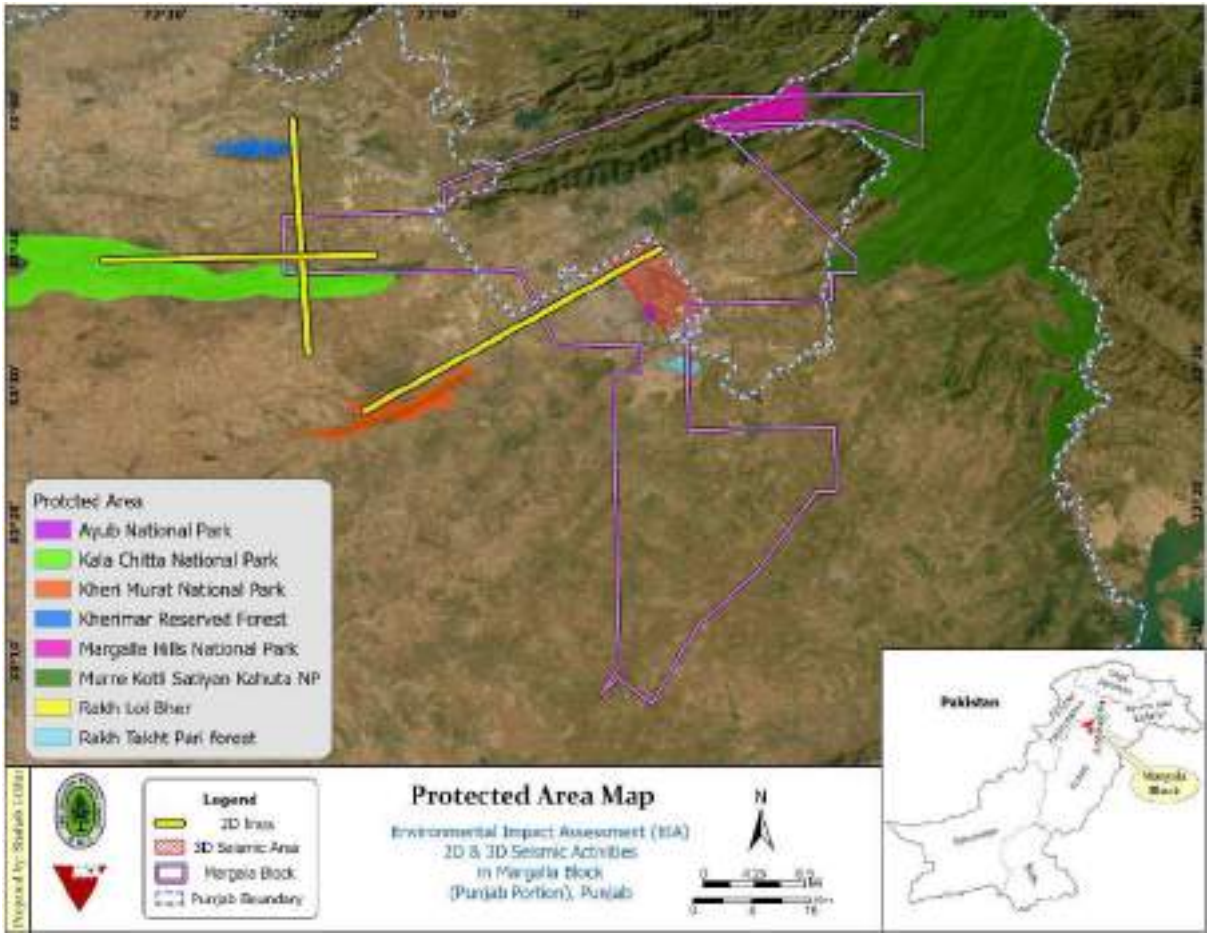


Figure 5.13: Map of Protected Areas

5.7 Socio- Economic Environment

5.7.1 Population

According to the 2023 Population and Housing Census, Attock District has a total population of approximately 2.17 million, with the majority residing in rural areas and around 624,000 people living in urban settlements. The district continues to experience steady growth, influenced by natural population increase and its proximity to major urban centers. In contrast, Rawalpindi District has a significantly larger population, recorded at about 6.12 million, making it one of the most populous districts in Punjab. Rawalpindi's population is predominantly urban due to its role as a major administrative, commercial, and residential hub adjacent to Islamabad. The demographic contrast between the two districts reflects differing levels of urbanization, with Rawalpindi displaying dense metropolitan growth and Attock maintaining a predominantly rural demographic structure.[19] [20]

[19] https://en.wikipedia.org/wiki/Attock_District
[20] https://www.citypopulation.de/en/pakistan/admin/punjab/728__rawalpindi/

5.7.2 Tribes and languages

Both Attock and Rawalpindi districts exhibit rich cultural diversity, reflected through their tribal composition and linguistic patterns. In Attock District, major tribes include the Awan, Khattak, Pathan, Jat, Gakhar, Gondal, Maliar, and Rajput communities, along with pockets of Mashwani, Saghri, and Niazi tribes in different tehsils. The most widely spoken languages in Attock are Hindko, Pashto, Punjabi, and Potohari, with Hindko dominating the Hazro–Attock belt, Pashto spoken near the KPK border, and Punjabi/Potohari prevalent in the central and southern parts. In Rawalpindi District, the population is largely composed of Rajputs, Awans, Gakhars, Gujjars, Jats, Dhund Abbasis, Sattis, and Syeds, especially in the Potohar and Murree regions. The dominant language is Potohari, while Punjabi and Urdu are widely understood and spoken across urban areas.

5.7.3 Agriculture and Irrigation

Agriculture in Attock and Rawalpindi districts is predominantly rainfed, forming an essential part of the rural economy and supporting a large proportion of households. In Attock District, farming is more extensive due to wider plains and cultivable lands, with major crops including wheat, maize, groundnut, barley, fodder crops, and various pulses, while orchards of citrus, guava, and olives are also common. Irrigation is limited and primarily supported through tube wells, small dams, and lift-irrigation schemes, as canal irrigation is scarce due to the district's topography. The Ghazi Barotha Canal and several minor perennial channels provide supplementary irrigation in specific areas. In Rawalpindi District, agriculture is mostly barani (rainfed), with farmers depending heavily on monsoon rainfall. Key crops include wheat, maize, sorghum (jowar), millet (bajra), and oilseeds, while the Potohar region is known for olive cultivation and orchards of citrus, loquat, and apricot. Irrigation in Rawalpindi relies mainly on small dams and reservoirs such as Simly, Rawal, and Khanpur Dams, along with tube wells that support limited supplemental watering. Overall, both districts exhibit a mixed agricultural system dominated by rainfed farming, with irrigation infrastructure providing only partial support due to the region's hilly terrain and semi-arid climate.

Figure 5.15: Agriculture and irrigation in Area

5.7.4 Occupation

The primary occupations in Attock and Rawalpindi districts reflect a mix of rural and urban economic activities. In Attock District, a large share of the population is engaged in agriculture, livestock rearing, and small-scale farming, particularly in the rural tehsils. Many residents are also employed in daily wage labor, construction work, transport services, and small businesses, while a significant number work in public sector jobs, including education, health, and administrative services. Attock's proximity to major industrial areas and military installations also creates employment in manufacturing, oil and gas, ordnance factories, and services. In Rawalpindi District, occupations are more urbanized, with many people employed in government services, private-sector jobs, trade, retail businesses, banking, education, and healthcare. Rawalpindi's role as a

commercial and administrative hub, coupled with its linkage to Islamabad, leads to high employment in IT services, hospitality, transportation, and professional sectors.



5.7.5 Housing

Housing conditions in Attock and Rawalpindi districts vary significantly between rural and urban areas, reflecting differences in income levels, construction practices, and access to building materials. In rural parts of Attock District, a considerable proportion of households live in kacha houses, which are typically made of mud, unbaked bricks, or thatch and are more vulnerable to weather conditions. Semi-pakka structures, combining mud walls with brick foundations or tin/wood roofing, are also common in villages where families gradually upgrade their homes based on available resources. Pakka houses, constructed with baked bricks, cement, and reinforced roofing, are more prevalent in Attock's towns such as Attock City, Hazro, and Fateh Jang. In Rawalpindi District, the majority of housing in urban areas such as Rawalpindi City, Cantonment, and surrounding towns consists of pakka houses, reflecting higher urbanization and better access to construction materials. However, in peri-urban localities and rural tehsils like Gujar Khan, Kahuta, Kotli Sattian, and Murree, semi-pakka and kacha houses still exist, especially among low-income groups. Overall, Rawalpindi exhibits a predominantly urban, pakka housing profile, while Attock demonstrates a mixed pattern with a larger share of rural kacha and semi-pakka dwellings.

5.7.6 Common Social Issues

The area faces several basic challenges, including limited access to healthcare, clean drinking water, and solid waste management. Public education is available, but higher education opportunities are often far from rural communities, making it difficult for students, especially girls, to continue their studies. Natural gas is unavailable in many villages, and electricity shortages and

frequent load shedding force some households and farmers to rely on solar-powered pumps and panels. Poverty is prevalent due to limited industry and job opportunities, leading to a simple lifestyle in most rural areas. The absence of small dams, check dams, and retention ponds in hilly and plain areas makes communities vulnerable to flooding during the monsoon season. Public transportation is inadequate, which further restricts mobility and access to essential services.

5.7.7 Road Network

The road network in Attock and Rawalpindi districts is extensive and strategically important, linking rural areas with major urban and regional centers. Attock District is traversed by key national highways, including the National Highway N-5 (GT Road) and the Karakoram Highway (N-35) near Hassanabdal, providing connectivity to Khyber Pakhtunkhwa and northern Pakistan. The district is also served by the M-1 Motorway, with access through the Burhan and Hakla interchanges, while a network of provincial and rural roads connects tehsils such as Hazro, Jand, Fateh Jang, and Pindi Gheb with the district headquarters. Rawalpindi District, being more urbanized, has a highly developed and dense road system that includes the M-1 and M-2 Motorways, N-5 (GT Road), Murree Expressway (N-75), Rawalpindi Ring Road (under development), and major urban arteries such as Murree Road, Airport Road, Peshawar Road, and the Islamabad Expressway that link Rawalpindi with Islamabad. Internal connectivity is supported by a network of well-maintained metropolitan, link, and service roads. Overall, the road network in both districts ensures efficient inter-district, inter-provincial, and urban connectivity, with Rawalpindi featuring more advanced urban infrastructure while Attock maintains strong regional linkages.

Figure 5.13: Common condition of road network in project area

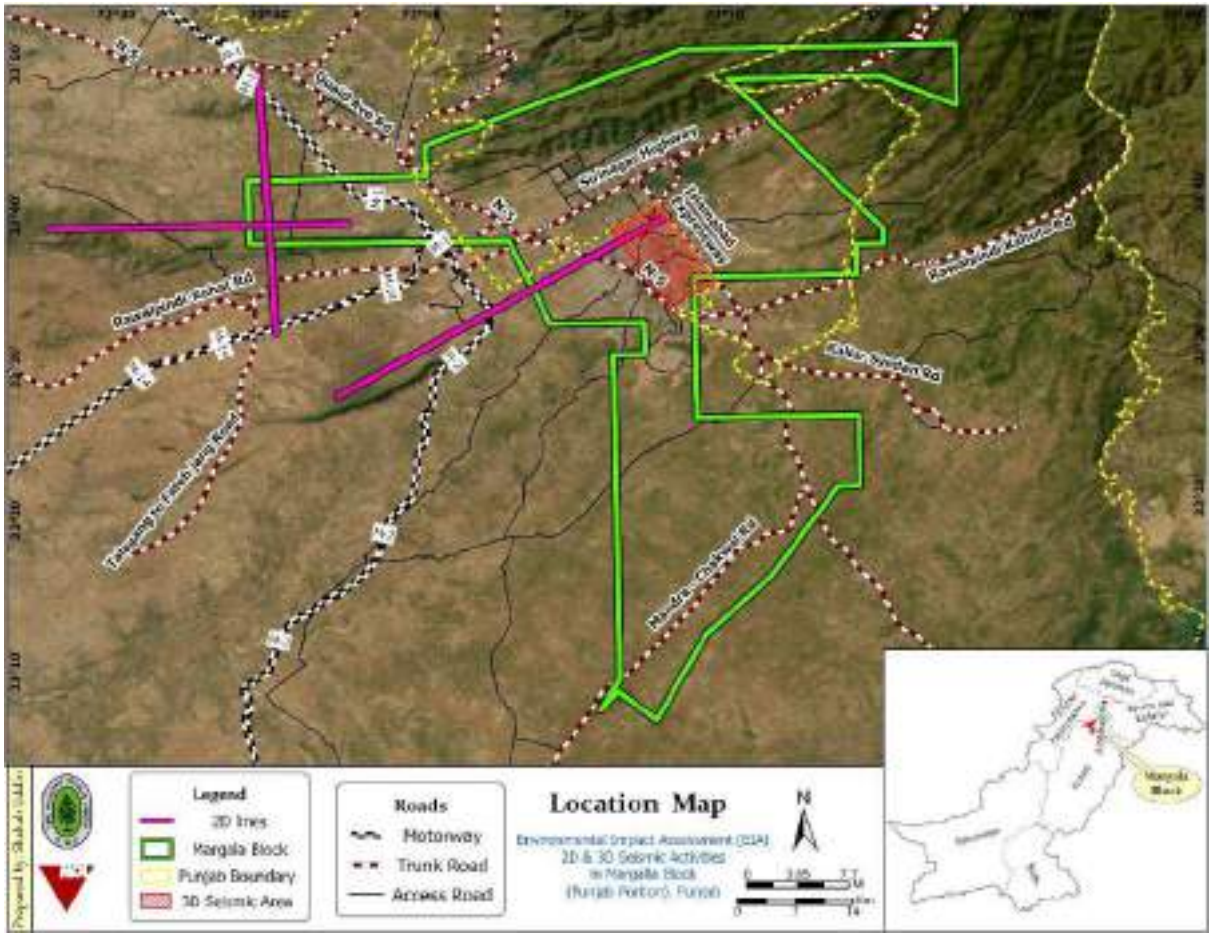


Figure 5.14: Map of Access Roads

5.7.8 Health

The health infrastructure in Attock and Rawalpindi districts comprises a mix of public and private facilities that provide essential medical services to both urban and rural populations. In Attock District, the primary facility is the District Headquarters (DHQ) Hospital Attock, supported by Tehsil Headquarters (THQ) Hospitals in Hazro, Fateh Jang, Hassanabdal, Jand, and Pindi Gheb. These facilities are complemented by several private health centres such as Ameer Abdullah Memorial Hospital, Medi Care Hospital, POF Hospital, and Wajahat Surgical Hospital, collectively extending general medical, surgical, maternal, and child health services across the district. In contrast, Rawalpindi District hosts some of the region's largest and most specialized medical institutions, including Holy Family Hospital, Benazir Bhutto Hospital, District Headquarters Hospital Rawalpindi, and advanced facilities like the Rawalpindi Institute of Cardiology (RIC) and the Armed Forces Institute of Cardiology (AFIC/NIHD). These are supported by a wide network of private hospitals and clinics such as Maryam Memorial Hospital, Nisar Hospital, and Attock Group's Attock Hospital Ltd. which together form an extensive healthcare system. Overall, Rawalpindi offers a more diverse and specialized health-care network, whereas Attock's health services are primarily district-level but adequately supported by THQs and local private clinics.

5.7.9 Education

The districts of Attock and Rawalpindi host several notable educational institutions spanning secondary, higher-secondary, and tertiary levels. In Attock, key institutions include Cadet College Hasan Abdal and Cadet College Fateh Jang, offering residential and pre-university education, along with Federal Government Degree College Attock Cantt and regional campuses of Allama Iqbal Open University, providing undergraduate and distance-learning programs. Rawalpindi District, as a major urban center, has a broader spectrum of institutions such as Pir Mehr Ali Shah Arid Agriculture University, National University of Medical Sciences (NUMS), and the National University of Modern Languages (NUML) Rawalpindi campus, alongside numerous public and private colleges serving intermediate and undergraduate students. Together, these institutions reflect the districts' roles as important educational hubs in northern Punjab.

5.7.10 Archeological and Cultural Sites

No cultural and archeological important sites are present near project site.

6. STAKEHOLDER CONSULTATION

6.1. Overview and Objectives

This section provides an overview of the stakeholder and public consultation process adopted by the consultant team and presents the findings of the stakeholder consultation activity conducted during the EIA. Public involvement is one of the key features of environmental assessment, which ensures better and more acceptable decision-making.

The overall objective of the consultation with stakeholders is to identify the environmental and social concerns of the stakeholders and to identify those which are not known or are unique to the project area. Stakeholder consultation presents an opportunity for mutual information-sharing and dialogue between the project proponent and stakeholders. An effective public consultation process provides concrete suggestions that can help improve project design, resolve conflicts at an early stage, identify management solutions to mitigate potentially adverse consequences and enhance positive impacts, and develop guidelines for effective monitoring and reporting of project activities throughout the project cycle. Providing the public with adequate reliable information of the planned project is of significant importance in creating public trust and acceptance. Moreover, experience reveals that unexpected project impacts on the local community generally give rise to significant issues and concerns. Such problems can be avoided if people are properly informed and consulted about the project and given the opportunity to raise their concerns.

6.2. Primary and Secondary Stakeholders

Stakeholders are individuals, groups, or institutions that may be affected by and can significantly influence the project activities, or are integral to the achievement of the objectives of a project. Stakeholders can be divided into 2 broad categories; primary and secondary; Tables 6.1(a) and (b).

Primary stakeholders are those who have a direct interest in the project which includes residents, commercial entities and institutions falling in the project area. Secondary stakeholders include the relevant government agencies and public interest groups which may indirectly influence or be influenced by the project. The concerns and input from both primary and secondary stakeholders are important to identify the issues arising from the construction and/or operation phase of the project and propose mitigation measures that minimize the negative project impacts and enhance the positive ones.

Table 6.1a: Primary Stakeholders

S. No.	Stakeholder Groups	Stakeholders
1	Proponent	MOL Pakistan
2	Settlements near the project area	• Rural and urban areas of District Attock and Rawalpindi
3	Commercial entities	• Small business such as shops, hotels

Table 6.1b: Secondary Stakeholders			
S. No.	**Stakeholder Groups**	**Department**	**Name and Designation**
1	*Government Departments*	*Environmental Protection Agency, Attock*	Muhammad Rafique, Inspector EPA Attock
		Environmental Protection Agency, Rawalpindi	Syed Mohsin Hamdani, Inspector EPA
		Forest Department, District Attock	*Syed Nadeem Abbas, DFO Attock Forest Division, Attock*
		Wildlife Department, District Attock	Yasir Ali, Wildlife Ranger, Punjab Wildlife Ranger, District Attock
		Wildlife Department, Lohi Bir, Rawalpindi	*Zeeshan Yousaf Jatoi Assistant Director Wildlife Department*
2	Environment practitioners and experts	*NUST Islamabad*	*Dr. Zeshan Professor SCEE (IESE)*

6.3. Consultation Methodology

Consultation meetings were conducted with the identified stakeholders. The stakeholders were briefed about background and scope of project. Concerns and suggestions of the respondents were noted down by the consultant's team and pictures of the session were taken with the consent of the stakeholders. If the villagers had any queries regarding the project, the team responded to their queries during the session.

6.4. Consultation with Proponent

Starting from the project award to site visits, project understanding, data acquisition, report preparation, review and finalization and report submission, MOL Pakistan's project team and HSE team was in contact with consultant through meetings, telecoms and emails. Information was provided by the proponent on the MOL's HSE Management system and proposed plans for environmental management during the project. The project activities were discussed w.r.t environmental management and relevant measures, during the meeting with proponent.

6.5. Consultation with Government Departments

A meeting was held with the government stakeholder department and were briefed about the project purpose and project location. The department consulted at district Attock & district Rawalpindi for the feedback on the proposed activities are as under.

Table 6.2: Departmental feedback from the concerned departments

Sr. No	Departments	Date:	Feedback	Pictorial Evidence
1.	EPA Attock	26th Nov, 2025	• Environmental disturbance should be strictly avoided during all phases of seismic survey activities. • No survey activities should be conducted near residential communities or sensitive settlements to avoid noise and social disturbance. • No tree cutting is allowed under any circumstances during project implementation. • If any vegetation damage occurs unintentionally, compensatory tree plantation must be carried out as per environmental regulations and EPA guidelines. • The proponent shall not dispose of waste outside the campsite. • Jobs shall be provided to local residents.	

2.	Wildlife Department, district Attock	26th Nov, 2025	• Seismic survey activities are strictly prohibited in game reserves and national forests. • Prior to the initiation of any field activities, a No Objection Certificate (NOC) must be obtained from the Ministry of Defence, especially due to security and restricted area concerns. • Project activities should avoid sensitive wildlife habitats and protected zones. • In the event that the area is designated as a protected area, the proponent will require an NOC (No Objection Certificate) from the department to conduct Seismic Survey. • No hunting or poaching activities shall be carried out in the area.	
3.	Forest Department, district Attock	26th Nov, 2025	• No tree cutting or clearing of vegetation is permitted in any forest areas. • There is only one National Park located within their jurisdiction. • If any project activity is to be conducted in a community game reserve, prior approval and consent from the local community must be obtained before commencement of operations.	

4.	EPA Rawalpindi	28th Nov, 2025	• Waste shall not be disposed off openly Tree plantation shall be carried out at the end of project	
5.	Punjab Wildlife Department	25th Nov, 2025	• The Wildlife Department informed that while general guidance for wildlife protection is available within existing laws and regulations, no additional SOPs or project specific implementation plans have been developed by the department. • The officials confirmed that project activities within the district will require formal approval from the Wildlife Department prior to commencement. • The approval process involves submission of a complete application through the proper administrative channel, ensuring that all necessary project details and supporting documents are provided. • The department stated that approvals are typically processed without significant delay, provided that the submitted documents are complete and meet regulatory requirements. • The Wildlife Department expressed concerns regarding the potential impacts of project activities on local wildlife, highlighting that wildlife in the region is highly sensitive to human disturbance. The use of explosives was particularly mentioned as a high-risk activity that may adversely affect wildlife movement, breeding, and habitat conditions.	

6.6. Consultation with environment practitioners and experts

Consultation was conducted with academic expert to gather feedback on the proposed project. A meeting was held with Dr. Zeshan (Professor), Institute of Environmental Sciences and Engineering, NUST, Islamabad. The feedback and recommendations provided include:

- The exploration activities may have adverse environmental effects if not managed properly. To mitigate these impacts, it is recommended to properly implement and monitor Environmental Management Plan (EMP).
- The project proponent must ensure that no waste will be left behind after the completion of activities.
- The project area features various perennial and non-perennial drainage patterns. It is advised to avoid using these drainage patterns for the disposal of waste materials, including gravels and other solids.

6.7. Public Consultation

The area was surveyed, and consultations with the locals were carried out to obtain their feedback on the proposed project. The locals welcomed the project, seeing it as an opportunity for employment and economic development. The feedback from the locals is as follows:

- Limited healthcare facilities such as clinics and hospitals, only small dispensaries are available in some villages.
- Inadequate supply of clean drinking water.
- Poor waste management and sanitation systems.
- Schools and colleges are far, making it difficult for children, especially girls, to continue education.
- Dependence on agriculture, livestock, or small businesses for livelihoods.
- Challenges in irrigation, crop productivity, and access to markets.

- Frequent electricity load shedding and limited access to natural gas, where people use solar-powered tube wells and solar panels in some villages.
- Poor road conditions and limited public transportation.
- Difficulty accessing towns, markets, and essential services because of no proper transport system in some villages.
- Poverty due to lack of industry and limited economic opportunities.
- Security concerns in some remote villages.
- Requests for construction of small dams, check dams, and water retention structures.
- Need for healthcare centers, schools, and vocational training.
- Desire for improved waste management and sanitation systems

Written feedback form – Consultation with local people

Project: EIA 2D & 3D Seismic Activities in Margalla Block (Punjab Portion), Punjab

Sr No	Name	Occupation	Area/Residence	Feedback	Signature
1.	کامران علی	مزدور	کھوڑ	بہتر سہولیات فراہم کی جائے	کامران
2.	منیب احمد	دکاندار	کھوڑ	کاروباری مواقع فراہم کیے جائے۔	[illegible]
3.	اسماعیل	دکاندار	کھوڑ	ہسپتال بنایا جائے۔	[illegible]
4.	وحید الرحمن	پراپرٹی ڈیلر	کھوڑ	سکول اور کالج بنائے جائیں۔	[illegible]
5.	فیاض احمد	پرائیویٹ نوکری	کھوڑ	انڈسٹری لگائی جائے۔	[illegible]
6.	وقاص احمد	الیکٹریشن	کھوڑ	روزگار کے مواقع فراہم کیے جائے	[illegible]
7.	رمضان	ڈرائیور	کھوڑ	سڑکیں ٹھیک کی جائے۔	رمضان
8.	رومان شاہ	مستری	کھوڑ	نالے اور نکاسی ٹھیک نہیں ہے۔	[illegible]
9.	غلام محمد	کسان	کھوڑ	بہتر نظام آبپاشی بنایا جائے	غلام محمد
10.	شبیر احمد	مزدور	اکھوڑی	مہنگائی کو ختم کیا جائے۔	[illegible]
11.	نور احمد	سروس	اکھوڑی	روزگار کے مواقع فراہم کیے جائیں۔	[illegible]
12.	شریف الدین	مزدور	اکھوڑی	پراجیکٹ کے حوالے سے لوگوں کو روزگار فراہم کیا جائے	شریف الدین
13.	محمد فہیم	دکاندار	اکھوڑی	بجلی اور گیس کی فراہمی کو بہتر بنایا جائے	فہیم
14.	عرفان اکبر	مزدور	اکھوڑی	روزگار کے مواقع فراہم کیے جائے۔	عرفان
15.	محمود خان	ڈرائیور	اکھوڑی	سڑکیں خراب ہیں۔	
16.	محمد کامران	الیکٹریشن	اکھوڑی	پینے کا پانی کا فلٹریشن پلانٹ لگایا جائے	[illegible]
17.	حسنین حیدر	پرائیویٹ نوکری	اکھوڑی	سکول کالج کا قیام [illegible]	حسنین
18.	ارشد خان	کاروبار	اکھوڑی	بجلی لوڈشیڈنگ ختم کی جائے	[illegible]
19.	عمران علی	دکاندار	اکھوڑی	خوردونوش کی اشیاء کو سستی کیا جائے	عمران

22.	محمد شہباز	کمپیوٹنگ سروس	نوٹ	ٹرانسپورٹ سسٹم کو بہتر بنایا جائے۔	Shahzaib
21.	اظہر حسین	ٹیچر	نوٹ	لڑکیوں کے لیے ہائی سکول بنایا جائے۔	Azhar
22.	خرم جاوید	پرائیویٹ نوکری	نوٹ	نوکریوں کے مواقع فراہم کی جائے۔	Khurram
23.	وہاج علی	مزدور	نوٹ	پراجیکٹ میں لوگوں کو مزدوری کے مواقع	وہاج
24.	علی حیدر	سرکاری ملازم	نوٹ	سکول سسٹم کو بہتر بنایا جائے۔	Ali Haider
25.	زبیر اختر	کاروبار	نوٹ	ٹرانسپورٹ نظام کو بہتر بنایا جائے	Zubair
26.	محمد رمیز	پرائیویٹ نوکری	نوٹ	سیوریج سسٹم کو بہتر بنایا جائے تاکہ بیماریاں	MRaz
27.	امین خالد	ڈرائیور	نوٹ	سڑکوں کو کھلی اور بہتر کی جائے۔	امین
28.	نذیر اکبر	کسان	نوٹ	کھاد سستی کی جائے۔	
29.	اظہر علی	پرائیویٹ نوکری	نوٹ	سیوریج سسٹم گرانڈر بنایا جائے۔	Azhar Ali

Figure 6.1: Feedback forms








Figure 6.2: Consultation with the Locals

7. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

7.1 Introduction

This section discusses the potential environmental and socioeconomic impacts that would result due to 2D & 3D seismic survey, access tracks, waste management (e.g. wastewater and solid waste); and restoration of sites after completion of proposed activities in Margalla Block Block (Punjab Portion), district Attock & district Rawalpindi, Punjab and suggests appropriate mitigation measures in order to reduce, overcome or compensate negative impacts associated with the proposed project.

The likely impacts of the proposed activities on the area, its water (surface & ground), air quality, ecological resources (flora & fauna), noise level, and socio-cultural environment that may affect employment, agricultural land, health, etc. have been described in the following subsections.

7.2 Methodology for Risk Assessment

The potential environmental and socioeconomic impacts related to the proposed project have been identified through literature review, scrutinizing baseline data, professional opinions, experience, understanding of the proposed 2D & 3D seismic activities and field observations. The risks then identified have been addressed by recommendations of various mitigation measures to reduce the severity of each impact. A systematic strategy was developed to provide an assessment of the likely impacts on the micro and macro environment of the Project area. The strategy included:

- Review of General Guidelines.
- Identification of potential environmental impacts by conducting survey, public consultation.
- Assessment of the intensity and significance of potential impacts by obtaining expert opinion and carrying out environment analysis.
- Defining mitigation measures to reduce impacts to as low as practicable

Method for impact identification and assessment: Checklist method was used for impact assessment and guidelines were referred for the verification of permissible levels of environmental parameters during project operation and classification of the site with respect to its pollution status, soil, and ecology including fauna, flora and wildlife, historical and archaeological sites.

The environmental aspects of the project were identified by situation analysis related to present land use, damage to vegetation, noise and other forms of nuisance during construction at site, air pollution due to fugitive dust emission and operation of equipment during construction, and air pollution due to generators.

The entire screening procedure was designed in such a way so as to provide a complete assessment of the impacts on the macro-environment and microenvironment of the project. Impacts may arise during different stages of project phases which are summarized below. The process for identification of potential impact involves understanding of source of effect in

relationship between an activity and environmental parameters. The impact assessment criteria is summarized in table 7.1, which as follows:

Table 7.1: Impact Assessment Criteria	
Nature of Impact	**Positive or negative**
Extent	Localized or Regional/Expanded
Significance	**Low significance**-That the impact would not have an effect on the decision to approve the project (or a particular project alternative), **Medium significance**- The assessed impact should have an effect on the decision unless it is effectively mitigated. **High significance**- The decision would be influenced regardless of any mitigation.
Further investigation or monitoring	A recommendation for further investigation (prior to the commencement of the activity) or monitoring (prior to commencement and/or during operations or even post closure).

Table 7.2: Checklist for screening of potential environmental impact

Screening Questions	Yes	No	Remarks
A. Project Siting: Is the project area…			
Densely populated?	X		Although the project area is densely populated, the seismic activities will be carried out in close consultation with the local administration to effectively manage the timing and duration of operations. In order to address local concerns and grievances, a Grievance Redress Mechanism (GRM) will be established to ensure timely and transparent resolution of community complaints.
Heavy with development activities?	X		The project area spans a wide section of the Pothohar region and encompasses urban settlements, parks, mountainous tracts, and agricultural land.
Adjacent to or within any environmentally sensitive areas?	X		Sensitive areas, including protected areas and settlements, are located within the project's area of influence; however, potential impacts will be effectively managed through the implementation of the Environmental Management and Monitoring Plan (EMMP).
Cultural heritage site		X	There are no cultural heritage sites in the project vicinity.
Protected area	X		Protected areas are located within the project's area of influence; however, potential impacts will be managed through the effective implementation of the Environmental Management and Monitoring Plan (EMMP)..
Wetland or water body	X		The project area contains numerous drainage channels and small dams. No project activities will be conducted directly on these water bodies.
Estuarine		X	Not Applicable
Buffer zone of protected area		X	Not Applicable

Bay		X	Not Applicable
B. Potential environmental impacts: Will the project cause…			
Dislocation or involuntary resettlement of people?		X	No resettlement will be required.
Deterioration of environmental conditions of surrounding of project site.		X	The impact of the exploration activities would be localized within the microenvironment immediate vicinity. The activities being temporary in nature will have short term impacts.
Degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		X	Ecosystem degradation not envisaged by the project activities as the activity is short duration and no waste production is associated with the activity.
Degradation of cultural property, and loss of cultural heritage?		X	Not envisaged. No such sites are found in the project area.
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Not envisaged.
Pollution of receiving waters resulting in impact on residential area, agriculture land, and land resource?		X	Not envisaged. No runoff generating activities are planned.
Water resource problems (e.g. depletion / degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?		X	Project is not water intensive. Water resource depletion is not envisaged from the project.
Air pollution due to emissions?	X		Temporary and localized impact is anticipated.
Social conflicts between construction workers from other areas and local workers?	X		Local workforce deployment for the project will reduce the risk of social conflicts. This can be further avoided by training of workers on social issues and grievance redressal mechanisms.
Noise and dust from construction activities?	X		Temporary and less significant, can be further minimized through better management practices.
Contamination of surface and ground waters due to improper waste disposal?	X		Possible if waste management is not adequately done.
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high	X		The area is poverty struck and flood prone. Recent floods have significantly affected the livelihood of local population. The project area is not vulnerable with

incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?			respect to any demographic or socioeconomic aspects.

7.3 Screening of Potential Environmental and Social Impacts at Project Siting / Location Stage

Screening of potential environmental and socioeconomic impacts resulting from seismic survey activity reveals that majority of the impacts will be temporary and will be reduced with adaptation of good practices, mindful planning, design and control of operations in each phase.

Various impacts from seismic survey operations along with their mitigation measures are as discussed under:

7.3.1 Impacts from Project Siting/Location

7.3.1.1. Impacts on Land Use

Land use impacts are linked with land disturbance, habitat damage, possible temporary fragmentation, and soil erosion due to proposed project activities e.g., construction of an access road (if required), and preparation of shot holes etc. The impacts on the land use can be avoided/ reduced by implementation of suggested mitigation measures.

Construction of Access Track

Already available road network will be used as much as possible during the project activities. However, it may be needed to construct access tracks at some locations to access the seismic lines, where an existing road connection is unavailable. Construction of the access tracks will involve cutting and filling. Potential impacts during the activity may include loss of vegetation, soil erosion or land slippage. This will primarily be due to wind erosion from earth-fill stockpiles and loose road surface during construction.

Since the project activities are temporary in nature lasting about few months. The anticipated change in land use will also be short lived. After completion of activities, the areas will be reinstated and restored to their former conditions.

Mitigation Measures

- Land uptake for the project will be kept to minimum.
- Need of construction will be reduced by considering use of pre-fabricated materials and portable units e.g. cabins, etc.
- Site restoration plan will be implemented upon project completion.
- Dense patches of vegetation will be avoided by adjusting the location of campsites, base camps, fly camps, explosive camp and access tracks etc.
- Total land uptake by the camps and access tracks will be kept to the minimum required.
- Clearing of vegetation will be kept to a minimum. Cutting of trees will be avoided.

- Selection of route shall be carefully done to avoid dense patches of vegetation.
- The preparation of tracks will be carefully planned and done. Where an access track can be prepared through compaction alone, it be considered accordingly.
- It will be ensured that the selected route does not affect any habitats and cause habitat fragmentation or damage.
- During the project, movement of survey vehicle/equipment will be restricted to work areas only to avoid unnecessary disturbance of soils in the project area.
- Access tracks will move around patches of vegetation and trees to avoid unnecessary clearing of vegetation.
- Preparation of new access tracks will be minimized and use of existing routes will be preferred as much as possible. Where improvement of existing tracks or development of short lengths of new tracks is unavoidable the width of the access track will not exceed 5 m.
- Vehicle speed will be regulated and monitored to avoid excessive dust emissions.
- Seismic camps will be located in existing clearing and levelled land, if possible. If this is unavoidable then the campsites will be located where minimum, land clearing is required.
- While travelling on banks of streams and watercourses slow speeds (not exceeding 20 km per hour or even lesser) will be maintained to avoid damage to the banks.
- Photographs will be taken before any activity to record the conditions of campsites, roads and seismic lines at locations that are likely to undergo soil erosion. Similar photographs will be taken at intervals throughout the survey to monitor any changes and soil conditions.
- Good engineering practices will be adopted during construction activities to ensure that unnecessary clearing of vegetation and disturbance to soils outside work areas are avoided.
- Seismic lines in undulating areas will be planned such a way to minimize disturbance to natural topography.
- During the construction phase, a single track shall be identified and approved along sections of the main track on which work is in progress. Vehicles shall be allowed to travel only on the approved track.
- During construction stage, gravel should not be dumped on or close to the access track being improved or constructed such that it causes a hindrance in the movement of local vehicles (if any) and pedestrians.

7.3.1.2. Sensitive Areas

The proposed exploration locations do not include any designated protected areas within their immediate vicinity. However, several seismic survey locations are near sensitive features, including dense settlements, public infrastructure, water resources, and wildlife habitats. Potential impacts on these sensitive receptors can be minimized through the implementation of the following mitigation measures:

Mitigation Measures

- MOL Pakistan will develop a crew mobilization plan to ensure safe and efficient operations.

- The project will mobilize a minimum number of crew members and vehicles to avoid obstruction and minimize disruption.
- All mobilized machinery and equipment will carry valid fitness and certification documents.
- In the event of any damage to property, MOL Pakistan will provide compensation in accordance with prevailing rates.
- No hazardous materials will be stored near settlements or other sensitive areas.
-

7.3.1.3. Social Amenities and Public Infrastructure

The selected locations of exploration activities mostly fall in remote abandoned areas where there are no anthropogenic interventions. Local infrastructure is limited. Hence, impact from the project on same is not envisaged.

7.3.2 Impacts from Project Design

7.3.2.1 Exploration Program

The planned exploration activities shall comprise 2D and 3D seismic data acquisition covering an approximate volume of 100 line km (L.km) and areal coverage of 65 sqkm respectively. Dynamite and vibroseis methods will be utilized for data acquisition, depending on the topography and terrain of the project area.

Dynamite is the most commonly used seismic source on land. It is labour intensive as it requires the preparation of shot holes for explosive charges. This method may cause temporary physical disturbances, such as ground scarring, soil erosion, vegetation loss, and minor waste generation. However, these impacts are short-term and reversible, as the shot holes are backfilled and restored upon completion of the activity. The explosive storage Explosive Storage and Handling Procedure is attached as Annex-IV.

The vibroseis method, on the other hand, is a non-explosive seismic source that generates controlled ground vibrations using vibrator trucks equipped with metal plates (vibrator pads) that transmit acoustic energy into the subsurface. This technique is generally used in accessible and relatively flat terrains and has minimal environmental impacts, as it does not require drilling or the use of explosives. The method significantly reduces the potential for soil disturbance, vegetation damage, and noise pollution, making it a safer and environmentally preferable alternative where feasible.

The overall impact from the project design is anticipated as temporary and highly localized and can be further controlled through implementation of EMP.

Mitigation Measures

- Implementation of EMP shall be ensured.
- Regular monitoring of project activities for compliance will be carried out.

7.3.3 Impacts from Construction Activities

7.3.3.1 Soil and Water Contamination

Fuel or oil stains, leakage or spill during seismic activities can result in contamination of soil and water. From a management perspective these have been categorized as minor, moderate or major and detailed below along with the recommended mitigation measures.

Minor Spills: Leaks from vehicles, equipment, or storage containers at campsites or work areas outside the campsite or oil or fuel stains produced during handling and transfer operations such that the area and depth of soil contaminated is less than 1 square meter and 0.3 m respectively.

Moderate Spills: Oil spills during transfer or handling operations resulting in spillage of no more than 200 liters of fuel or oil.

Major Spills: These may occur during transportation of oil to the camp sites or failure of the oil containment arrangement at the camp sites resulting in spillage of oil significantly more than 200 liters in volume.

Mitigation Measures

- All vehicles will be inspected before clearing them for use during the project. Only fit and well-tuned equipment and machinery will be used during the project.
- Fuel storage areas (if provided) will be built with secondary containment. All fuel containers will have adequate capacity and provided with liner sheets at the bottom.
- Regular monitoring of all fueling activities including fuel storage.
- Any leakage will be immediately repaired and vehicle will be retained until the issues is rectified.
- All fuel tanks will be properly marked to highlight their contents.
- Fuel and oil storage areas shall have secondary containment in the form of cemented or brick masonry bunds with plastered to prevent soil contamination in case of leaks or spills. The volume of the containment area will be equal to at least 110% of the total volume of fuel/oil stored or 110% of the volume of one largest tank. Secondary containment shall also have sump pit for collection of spillage material.
- Fuels tanks will be regularly checked for leaks and all such leaks will be plugged immediately.
- The soil contaminated from spills will be collected and handed over to Punjab EPD approved waste contractor for disposal.
- A spill prevention and contingency plan will be prepared to deal with moderate and major spills.
- Shovels, plastic bags, and absorbent material should be present near fuel and oil storage or handling areas to attend spills and leaks.
- During fuel and oil transfer operations such as refueling bulldozers through a dedicated fuel vehicle, drips and spills will be avoided and drip pans will be used.
- Vehicles will only be serviced in designated cemented paved washing areas within campsites.

- Bentonite mud used for the purpose of up-hole and deep-hole drilling will be prepared in earthen pits. The used mud will be disposed of in the same pit and left to dry. After the mud has dried the pit will be backfilled.

7.3.3.2 Impacts on the Ambient Air Quality

Impacts would depend upon the amount, duration, location, and characteristics of the emissions and the meteorological conditions (e.g., wind speed and direction, precipitation and relative humidity).

Impacts on air quality during seismic activities would include emissions and dust from earth-moving equipment, vehicles, generators, etc. Pollutants include particulates, oxides of nitrogen, carbon monoxide & sulphur dioxide. Emissions during seismic survey would not have a quantifiable impact on climate change.

Mitigation Measures

- Dust emissions during construction activities should be minimized by good management practices such as locating stock piles out of the wind direction, keeping the height of the stock piles to a minimum, keeping earthwork areas damp, etc.
- During construction, levelling or widening (for the access road) will be done in sections, immediately followed by sprinkling of water and also preferably compaction (where required).
- During operation dust emissions due to road travel will be minimized by regulating vehicle speeds and watering of the access track (where required).
- Minimize the amount of disturbance and areas cleared of vegetation.
- Burning of waste and combustible material at the project site will be strictly prohibited.
- Generators, compressors and vehicles used during the operations will be maintained in a good condition to ensure that emissions are kept to a minimum level (compliant with PEQS standards).
- Cover construction materials and stockpiled soils if they are a source of fugitive dust.
- During seismic operations vehicle speeds will be regulated and monitored to minimize dust emissions.
- Keep soil loads below the freeboard of the truck.
- Minimize drop heights when loaders dump soil into trucks.
- Campsites will be located preferably at 500 m away from major residential communities.
- Keep soil moist, if it is a source of fugitive dust, while loading into dump trucks and cover it with tarpaulin during transportation.
- During operation phase, emissions from all point sources should also be monitored to check compliance with PEQS.

7.3.3.3 Impacts due to noise pollution

The primary impacts of noise pollution generated during seismic activity will result in localized disturbances to wildlife and nearby communities .Primary sources of noise related with exploration comprises earth-moving equipment, vehicle traffic, generators etc. Detonation of dynamite in shot holes will only be heard at the surface like a muffled thud. According to the

Inverse Square Law of noise dissipation, a doubling of the distance from a noise source will reduce the sound level by 6 decibels. As the temporary campsite will be located at distances preferably 500 m from communities, the impact of noise emission from activity areas or the campsite on the settlements will not be considerable.

Mitigation Measures

- Camp site will be located preferably at 500m away from the major residential community.
- The use of horns by project vehicles shall be minimized. The use of pressure horns shall not be allowed.
- Generators will be kept within enclosures to minimize dispersion of noise.
- During all operations generators, vehicles and other equipment and machinery will be maintained in good condition to ensure that noise from them is kept to a minimum level.
- Position all stationary sound-generating equipment (i.e. pumps and generators) as far as possible from nearby residences and other sensitive receptors.
- Whenever feasible, schedule diverse noisy activities (e.g. excavation, earthmoving) to occur at the same time, since less-frequent noisy activities would be less irritating than frequent less noisy activities.
- All equipment should have sound-control devices.
- Route heavy truck traffic away from residences and other sensitive receptors.
- It shall be assured that generators, vehicles and other potentially noisy equipment used will be in good condition.
- In areas with higher noise levels or longer shifts, use of ear plugs and earmuffs will be ensured among the workers.
- Noise levels at communities nearest to the campsites and access tracks shall be monitored by contractor. In case these are found to exceed safe acceptable limits appropriate mitigation shall be taken.
- Movement of all project and personnel vehicles shall be restricted within work areas.

7.3.3.4 Wastewater

Generation of wastewater during construction of campsite, access road and seismic activities are not anticipated. Domestic wastewater will be produced from the campsites and shall be managed accordingly. Site runoff from rainfall may be generated which will be require careful correction and routing to prevent the runoff from entering into surface water bodies and other lands.

Mitigation Measures

- All wastewater streams (greywater and Blackwater) from campsite will be collected onsite in septic tank system comprising of septic tanks and soak pits.
- The collected storm water can be used for activities e.g. dust suppression.
- If not contaminated, the runoff may be released from site.
- Black water shall be stored in the septic tanks and excess wastewater shall be disposed off after treatment in septic tank/ soak pit (within permissible limits as per PEQs) in the local drains after taking approval from concerned TMA.

7.3.4 Potential Impacts from Exploration and Associated Activities

7.3.4.1 Land Use Changes

Temporary land use change due to vehicle movement and seismic data acquisition activity is anticipated which will be short term and lasting until end of exploration activities. Considering the current land uses of project area which are insignificant, the impact is envisaged to be small scale.

7.3.4.2 Noise

Primary sources of noise related with exploration comprises earth-moving equipment, vehicle traffic, generators etc. Detonation of dynamite in shot holes will only be heard at the surface like a muffled thud. According to the Inverse Square Law of noise dissipation, a doubling of the distance from a noise source will reduce the sound level by 6 decibels. As the temporary campsite will be located safely away from communities, the impact of noise emission from activity areas or the campsite on the settlements is not envisaged. Impact on workforce may occur during the seismic survey activities.

Mitigation Measures

- During all operations generators, vehicles and other equipment and machinery will be maintained in good condition to ensure that noise from them is kept to a minimum level.
- Seismic camps will be located preferably 500 m away from nearest communities.
- The use of horns by project vehicles will be minimized. The use of pressure horns shall not be allowed.
- Generators will be kept within enclosures to minimize dispersion of noise.
- Movement of all project vehicles and personnel will be restricted to within work areas.
- Whenever feasible, schedule diverse noisy activities (e.g. excavation, earthmoving) to occur at the same time, since less-frequent noisy activities would be less irritating than frequent less noisy activities.
- Route heavy truck traffic away from residences and other sensitive receptors.
- Noise levels at communities nearest to the campsites and access tracks shall be monitored by contractor. In case these are found to exceed safe acceptable limits appropriate mitigation shall be taken.
- In areas with higher noise levels or longer shifts, use of ear plugs and earmuffs will be ensured among the workers.

7.3.4.3 Impacts on water resources (surface water, ground water and natural drainage)

Ground Water

The extraction of water for project activities can affect groundwater availability in the short term, which implies that the groundwater immediately available to the communities may fall. This should not, however, affect the long-term availability of the area's water resources. Since the area is sparsely populated and human settlements are away from the seismic lines (>500m), the scale of the impact is low.

Mitigation Measures

- Water from a local well will only be used after ensuring that the available capacity at the tube well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the tube wells will be regularly monitored to supervise any changes in the yield of the wells. If a single well fails to meet this requirement, water will be obtained from multiple wells such that each well meets the above-mentioned requirement.
- For all water obtained from local wells, the owner will be paid for water abstracted at the market rate.
- A complete record of water consumption during seismic and construction of camps will be maintained.
- The use of new water wells installed or to be installed by MOL Pakistan for community benefits will be allowed.
- The quantity of water used during seismic and camp construction operation will be kept to the minimum required by taking prudent water conservation measures on site.
- Contamination of surface and groundwater resources will be avoided.
- MOL Pakistan may develop a new well in case commercial hydrants are not available. In such a case, MOL Pakistan will establish the well away from the existing community well and will ensure that groundwater extraction does not adversely affect the local community's ability to meet its water requirements.
- In such case complete record of water abstraction will be maintained.

Surface Water

Impacts on surface water resources are related to land disturbance, erosion, changes in runoff patterns, campsite wastewater and resource use (e.g., water extraction) during seismic surveys. There are however, no perennial water bodies along proposed seismic lines in Punjab portion. Due to the desolate nature of project area, the risk of negative impacts on surface water resources is low.

Mitigation Measures

- Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structures, etc.).
- Use special construction/seismic techniques in areas of steep slopes, erodible soils and stream crossings.
- Activities with potential of contaminating surface water bodies e.g. fueling, waste storage/disposal shall be done with proper containment systems.
- Do not alter or restrict existing surface drainage patterns, especially in sensitive areas such as erodible soils or steep slopes. Cross water bodies at right angles to the channel and/or at points of minimum impact.
- Apply erosion controls relative to possible soil erosion from vehicular traffic and during project activities. The purpose is to retain the soil on disturbed land until the activities disturbing the land are sufficiently completed to allow revegetation and permanent soil stabilization to begin.

- Regularly monitor rights-of-way (ROWs), access roads, and other project areas for indications of erosion.
- Use drip pans during refueling to contain accidental releases and under fuel pump and valve mechanisms of any bulk fuelling vehicles parked at the project site.
- Reestablish the original grade and drainage pattern to the extent practicable.

Natural Drainage

The terrain of the project microenvironment is hilly and undulating. This suggests that there would be non-perennial streams/water channels in the seismic area and route leading to it. Therefore, the likelihood of possible blockage of natural drainage from either the construction of access track, land clearing/preparation, establishment of campsite, is not expected. So, there is no mitigation measure required for the project activities. However, in order to carry out the seismic operations in a responsible manner, following measures should be implemented.

Mitigation Measures

- Natural drainage will be protected as much as possible during the project activities.
- Natural drainage should not be blocked by the construction of campsite.
- Bridge Crossings for access route shall be provided at all stream crossings to avoid blocking of natural drainage. Pipe culverts shall be provided at small drainage channels if any.
- No dumping of the construction materials, soft soil, gravels shall be made in any drainage channel

7.3.4.4 Occupational Health and Safety Hazards

During the seismic survey, the workers may be exposed to occupational and health hazards from noise, vibration, use of explosive, movement of vehicles and use of equipment. Work place hazards in the field like accidents and incidences as a result of use of vehicles and explosives may occur.

Mitigation Measures:

- All operations will be conducted in compliance with MOL Pakistan's HSE policy as well as industry best practices.
- Appropriate and well-stocked first aid kits and firefighting equipment will be available to all crew, and specific crew members should be trained on first aid administration and handling of firefighting equipment.
- Risk Assessment/ JSAs will be carried out for each activity.
- Job-specific personal protective equipment to be provided to the workers, training should be given, and their use made mandatory in designated areas.
- A Base Camp Clinic will be provided, manned by suitably qualified field medical staff equipped with equipment and medication as appropriate, including ambulance vehicle(s).
- Adequate warning or cautionary signage will be posted as required.
- All electrical equipment shall be properly installed, earthed and regularly inspected.

- Only properly trained and authorized employees shall operate equipment or machinery.
- Provision of an Emergency Response Plan, Evacuation Plan, Medevac Plan, and Flood Management Plan will be implemented in all concerned situations.
- Adequate site induction of all new personnel shall be done before starting with project.
- No residual impacts are expected in this case.

7.3.4.5 Security and Public Safety

The project area is located in an urbanised region, while the project campsite will be established in an area with low population density. Given the prevailing law and order situation, security is a significant concern. During project execution, security risks may escalate due to the increased movement of personnel and local populations. The rise in human activity, including vehicle movements and seismic exploration operations, could further exacerbate security concerns. Therefore, it is essential to provide adequate security measures and surveillance at the activity sites, the base camp, and other related locations to ensure the safety of personnel and assets.

Mitigation Measures

- Adequate security measures should be provided, e.g. perimeter fencing, safe havens and security manning at the campsites
- The company should liaise with security agencies to provide adequate security during the seismic survey operation;
- Barriers and guards will be installed as necessary to protect employees and visitors from physical hazards and criminal activity;
- Site lighting will be configured not to spill into community areas or into oncoming vehicles;
- Camp will be located at a significant distance from any local communities;
- Journey management policy and monitoring to be enforced
- Worker will use LPG cylinders on site for tea making and other stuff
- Smoking will only be permitted in designated areas.

7.3.4.6 Impacts on Ecological Resources

Seismic survey activity involves mobilization of workers, vehicles and also removal of vegetation to lay the lines or dig shot holes. These activities can disturb the wildlife in the project area. Small animals, birds and reptiles can be forced to move to other places due to increased human intervention, destruction of burrows and nests and indirectly by noise and vibrations due to operation of equipment and heavy vehicles.

In general, the impact on wildlife is insignificant except for reptiles, mammals and local birds. Seismic deep holes and up-holes will be located so as to avoid disturbing live bird nests and small mammals and reptile holes.

Mitigation Measures

- Seismic camps will be located in existing cleared and levelled land, if possible.
- The camp site areas will be kept to a minimum required.
- Crew personnel while working along seismic lines will be confined to a corridor of 5 m.

- Use of local wood as fuel will be prohibited.
- The number of access routes used will be kept to a minimum and road travel will be minimized.
- Preparation of new access tracks will be minimized. Where improvement of existing tracks or development of short lengths of new tracks is unavoidable the width of the access track will not exceed 5 m.
- Off-road travel will be strictly prohibited and observance of this will be monitored during the operation.
- The cutting of trees will be avoided. Where it is necessary to cut down trees in government land, relevant departments will be taken on board before cutting of trees. In case of private land, compensation will be paid to the land owner.
- If clearing of vegetation is unavoidable, the rootstock will be left in place to encourage better regeneration of vegetation.
- Hunting, feeding, trapping or harassment of wildlife will be strictly prohibited.
- Vegetation clearing and land uptake during all operations will be minimized.
- Camp sites for seismic will be located preferably 300 m from surface water bodies.
- Drivers will be instructed to keep a watch for domestic animals or wildlife in order to minimize the risk of road accidents.
- Seismic deep holes and up-holes will avoid disturbing live bird nests and small mammal and reptile holes.
- Food wastes will not be left in the open.
- All mitigation measures recommended for waste management, noise and air emissions will be implemented.
- Compressors and vehicles will be maintained in good condition and provided with muffles to reduce noise.
- For preparation of access tracks, routes involving minimum clearing of vegetation will be selected.
- Clearing of dense patches of vegetation will be avoided.

7.3.4.7 Impacts due to Hazardous Materials and Solid Waste Generated

Hazardous materials and solid waste impacts are related to the types and amount of equipment and machinery used for the project, chemicals used in various processes, training and the methods being employed.

Project activities generate wastes such as plastic, paper, containers, fuel leaks/spills, food waste, human waste, used oils, filters and metal scrap. Bentonite (non-hazardous in nature) mud will be used during seismic operations for drilling of upholes and deep holes to avoid the holes from collapsing. The use of the mud and its preparation and disposal in earthen pits will therefore have no impacts on groundwater or soil quality.

Mitigation Measures

- Prepare a comprehensive list of all hazardous materials to be used, stored, transported and disposed of during all phases of activity.
- Include a recycling strategy to be practiced by workers during all project phases.

- Develop a spill prevention and response plan for addressing spill prevention measures, training requirements, waste-specific spill response actions, spill response kits.
- Train employees to promptly contain, report and/or clean up any oil or hazardous material spill.
- Provide secondary containment around all the fuel storage tanks and chemical storage area of suitable size (110% of the fuel storage area/largest tank capacity). Fuel storage should be a temporary activity and fuel storage facilities should be removed upon completion of the required activities.

7.3.4.8 Impacts on Cultural Resources/Sites of Archaeological Significance

No site of archaeological, cultural or historical value is known to exist in the proposed seismic area. However, all contractors hired for seismic activities will be instructed to notify MOL Pakistan immediately if any artefacts, or sites of archaeological or cultural value, is found while working in the area, so that relevant departments can be informed.

7.3.4.9 Positive Impacts on Socio-economic Environment

Project activities would add to the local economy by providing employment opportunities to the neighboring communities and money to local contractors. Indirect impacts could occur as a result of the new economic developments (e.g., purchase of raw and other materials from the local market, etc).

7.4 Site Restoration

Site restoration after seismic survey operation

After completion of the seismic survey activities, the campsite, up-holes, etc. will be restored to as similar to original condition as possible. For reference purpose a photographic record of the campsite prior to the set-up will be taken.

Mitigation measures

- Demobilization of all equipment and machinery
- Disposal of any waste material remaining at the time of completion of the operation.
- Restoration of seismic lines will include removal of all cables, geophones, station units, flags, stakes and wastes from the lines and back filling of all mud pits.
- All the fencing or barriers surrounding the seismic base camp area will be removed, and the area will be levelled. The concrete structures if desired by the land owner will be left intact. If not, the concrete will be broken up and disposed, or reused for backfilling of pits/septic tank (below main rooting zone, 1 - 1.5 m) or provided to locals for re-use.
- Dispose wastewater of septic tanks in an environmentally friendly manner and restore it after dismantling in place (top roof and at least 1 meter wall or more if easily possible) and backfilling with at least 1 meter of native soil cover.

- Dispose wastewater of soak pits in environmentally friendly manner and restore soak pit after removing / handling of wastewater & cover and backfilling it with at least 1 meter of native soil cover.
- Contaminated bricks of black/grey water pits and others shall not be given to locals for any purpose.

Table 7.3: Environmental Impacts & Characterization Matrix

Activity & Source	Nature of Impact	Duration	Extent	Reversibility	Likelihood	Severity	Significance
1. Landscape & Soil Erosion							
• **Camp siting** • **Construction of access tracks where required.**	Direct	Short-term	Local	Reversible	Possible	Moderate	Low
2. Noise pollution							
• **Transportation of heavy machinery, materials, equipment & personnel.**	Direct	Short term	Local	Reversible	Unlikely	Negligible	Low
3. Dust Emission							
• **Dirt tracks by project related vehicles.** • **Earthworks and construction for campsite.** • **Combustion products (NOx, SO_2, PM and CO) from diesel generators used in the camps to generate electricity.**	Direct	Short term	Local	Reversible	Possible	Minor	Medium
4. Air Emissions							
• **Exhaust emissions produced by generators.** • **Exhaust fumes from vehicles and construction machinery.**	Direct	Short term	Local	Reversible	Unlikely as mitigation measures will ensure that air pollution remains within acceptable limits.	Minor	Medium
Soil and Water Contamination							

• **Domestic waste (sanitary and kitchen discharge).** • **Oil and grease from vehicles and machinery.** • **Sediments from altered land surfaces (campsite).** • **Stored fuel, oil and other chemicals.**	Direct	Short term (after implementation of mitigation measures)	Local	Reversible	Unlikely	Minor	Medium
5. Impacts on Wildlife & flora							
• **Improvement and construction of the access road.** • **Removal of vegetation only where required.**	Direct	Short term	Local	Reversible	Possible	Minor	Medium
6. Impact on Sensitive area							
Disruption due to crew mobilization and activity	Direct	Short Term	Local	Reversible	Possible	Moderate	Medium

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1 General

Environmental management is an integral component of overall planning and implementation of projects that includes policy development, organizational structure, planning activities, responsibilities, procedures and resources for development, implementing, achieving, reviewing and maintaining the environmental program and achieving environmental goals.

The present EIA document has been prepared in accordance to environmental management guidelines. Several aspects have been identified in this EMP to prevent or mitigate that environmental impact of proposed activities in Margalla Block (Punjab Portion).

8.2 Purpose of EMP

MOL Pakistan's has been committed to implementing a comprehensive EMP to ensure the environmental protection through the project. The purpose of EMP is to:

- Ensure implementation of mitigation measures proposed in the EIA report;
- Provide a mechanism for taking timely actions for unanticipated environmental situations;
- Define the various roles, responsibilities and provide a means of effective communication regarding environmental issues among them;
- Provide concise and clear instructions to project personnel and contractors regarding procedures for protecting the environment and minimizing environmental impact;
- To prevent or minimize emissions, effluents, spills and dumping, etc. into air, water and soils for protecting the environment;
- Communicate changes in the program through the revision process;

8.3 Environmental Management Framework

Due to the nature and scale of activities, some environmental risks are associated with the proposed activities. In order to manage these risks as low as reasonably practical, various control measures will be adopted. MOL Pakistan's endeavors to perform its activities in a manner to either eliminate or minimize the risks to the lowest possible level.

Environmental management of the project activities will be undertaken within a comprehensive framework comprising:

- MOL Pakistan's Health, Safety and Environmental Policy Statement;
- Operational controls and specific environmental procedures within the project Environmental Management Plan (EMP); and
- Implementation of Environmental Management and Monitoring Plan.

8.4 Structure of EMP

The environmental management plan is divided into the following core components:

- Organizational Structure and Roles and Responsibilities;
- Implementation of EMP
- Mitigation Matrix
- Environmental Monitoring Plan
- Waste Management Plan
- Emergency Response Plan;
- Site Restoration Plan
- Change Management Plan
- Flood Contingency Plan

8.5 Organizational Structure and Roles and Responsibilities

8.5.1 Organizational Structure

The proposed project includes the following organizations:

- MOL Pakistan as the project proponent and owner of the EMP
- Contractors and Subcontractors
- Punjab EPD as regulatory body

The general roles and responsibilities of MOL Pakistan and the Contractors are detailed in the following sections.

8.5.2 Contractors and Subcontractors

Contractor(s) will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other codes of conduct required by MOL Pakistan. Site Manager of the contractor(s) will be responsible for the effective implementation of the requirements of EIA and EMP. However overall responsibility for implementation of EIA recommendations and the EMP will rest with MOL Pakistan.

The responsibilities of MOL Pakistan's Site Management and Exploration Dept. at HO would be:

- Carry out project activates in environmentally friendly manner;
- Coordination with the HSE officer to resolve issues arising during project execution;
- Manage seismic crew and reduce the environmental impacts;
- Discuss weekly progress report with their management and issues concerned to environmental management.

8.5.3 Environmental Protection Agency

Punjab EPD as regulatory body is to oversee compliance with compliance with local environmental laws. According to Punjab environmental protection act, Punjab EPD has the powers to conduct surprise inspections or visits of the project area to observe the status of environmental compliance of the project.

8.5.4 Roles and Responsibilities of the proponent

For the proposed project, MOL Pakistan will appoint contractor(s) for the project activities. The contractor(s) will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other codes of conduct required by MOL Pakistan. However overall responsibility for implementation of EIA recommendation and the EMP will rest with MOL Pakistan.

The responsibilities of MOL Pakistan's Site Incharge and MOL Pakistan's Exploration Department would be to;

- Maintain ongoing liaison with the personnel involved in the project;
- Ensure that requirements of EIA and EMP are met during project execution.
- Ensure that prior to commencing work in the project area; all field personnel receive a formal induction;
- Ensure that employees are adequately supervised so that the environmental objectives are achieved;
- Ensure that no pets, firearms, traps and nets are kept by the contractors and their employees whilst in the project license area; during project activities.
- Ensure that regulatory requirements, including any specific conditions contained in the approval, are complied with;

8.5.5 Approvals

Obtaining NOC from PEPA does not relieve the proponent of other obligations and hence MOL Pakistan and its Contractors will obtain all relevant clearances and necessary approvals required by the government prior to commencing the operations.

8.5.6 Contractual Provisions

The requirements of this EIA in terms of environmental mitigation will be incorporated into the operational plans and procedures with contractors.

8.5.7 Training

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

Contractor's HSE Advisor in coordination with MOL Pakistan's site incharge will determine the training requirements necessary for understanding and effective implementation of the EMP and the EIA. Contractor(s) will be responsible to disseminate the necessary training to relevant personnel.

Project personnel will be trained on various aspects of job safety to ensure sound management of occupational safety issues. They will also be trained on practices of protection of environmental aspects likely to be found susceptible to project activities such as indigenous flora and fauna, wildlife, water bodies and ecological resources etc. It will make sure that employees / workers understand the issues associated with the proposed activities. Trainings

will be arranged on regular basis with notification that it must be attended by all employees / workers.

Trainings identified in EMP are given below:

- Site orientation course
- Training for emergency response and preparedness
- Training for familiarization with site environmental controls.
- Specific environmental training for relevant employees

A firefighting system shall be installed which will include firefighting water, foam generators and portable fire extinguishers. The personnel shall be trained on the use and operation of these systems. Equipment such as firefighting equipment, medical equipment, ambulances and environmental protection and spill control equipment shall also be provided so that they are available in the event of an emergency. The aim is to instruct all personnel on the operation of this equipment and on the procedure to be followed in the event of spills, fire or explosions.

8.5.8 Proposed EMP reporting and reviewing procedures

For effective implementation of Environmental Management Plan, HSE matters will be discussed during daily meetings held on-site. Environmental concerns raised during the meetings will be mitigated after discussions between the MOL Pakistan's Site Incharge, and relevant staff of contractor(s). Any issues that require attention of MOL Pakistan's higher management will be communicated to them for action. The contractor will also prepare a weekly HSE report.

a) Weekly Reports

The purpose of these reports will be to review the performance of the operation by reviewing the number of non-conformances and the environmental incidents that occurred during the reporting period, progress on daily action items and to list recommendations for additional controls, mitigation measures or monitoring requirements. The main contents of weekly report will include the incident details, resource use, environmental non-compliances, H&S records, socioeconomic issues (if any), photographic records, inspection and audits, change managements (if any) and trainings etc.

b) Social Complaints Register

The MOL Pakistan's site representatives will maintain a register of complaints received from local communities and measures taken to mitigate these concerns. Liaisons with community members including particularly the land owners/occupiers will be maintained throughout the project to identify and address the concerns of locals. Appropriate compensations will be provided to the grieved residents of the project area.

8.6 Mitigation Management Matrix

Mitigation Management Matrixes are provided in Table below. The Mitigation Management Matrix will be used as a management and monitoring tool for implementation of the mitigation measures.

It is highlighted that although responsibilities for executing and monitoring mitigation measures have been delegated to different persons/organizations, MOL Exploration Depts. will hold the primary and overall responsibility for ensuring full implementation of the EMP.

8.7 Environmental Monitoring

The Monitoring of different activities will be required to assess the impacts of activities on the environment. For this purpose;

- Follow the monitoring frequency of selected parameters as per the monitoring plan given in the Table below.
- Record all non-conformities observed and report them.
- Report any impact anticipated along with recommendations for further action.

Contractor(s) shall take note of the recommendations relating to issues arising during monitoring of proposed activities.

Table 8.1: Mitigation Management Matrix for Seismic Activities

No.	Impact and Mitigation Measures	Responsibility	Action/Monitoring Parameter/Monitoring Method	Timing
1.	**Changes in Landscape and Soil Erosion**			
1.1	Seismic lines in the hilly region will be planned such a way to minimize disturbance to natural topography.	SC/MOL	Check line preparation and monitor land clearing activities	Before land clearing
1.2	Clearing of vegetation will be kept to a minimum. Access tracks will move around patches of vegetation and trees to avoid unnecessary clearing of vegetation.	SC / MOL	Monitor land clearing activities	During land clearing
1.3	The number of access routes used will be kept to a minimum and road travel will be minimized.	SC/ MOL	Approve access tracks	Prior to track preparation
1.4	Existence tracks will be used for the movement and new dirt track or upgradation of existing track will be carried out as per requirement. The width of the access track will not exceed 5 m.	SC/ MOL	Supervise preparation of access tracks and randomly check width of access track.	Prior to and during track preparation
1.7	Seismic camps will be located in existing clearing and levelled land, if possible. If this is unavoidable then the campsites will be located where minimum, land clearing is required.	SC / MOL	Identify location of the campsite to the SC and CC	At the time of site selection for camp site
1.9	While travelling on banks of streams and watercourses slow speeds (not exceeding 20 km per hour or even lesser) will be maintained to avoid damage to the banks.	SC/ MOL	Check compliance	During entire project

1.10	Photographs will be taken before any activity to record the conditions of campsite, roads and seismic lines at locations that are likely to undergo soil erosion. Similar photographs will be taken at intervals throughout the survey to monitor any changes and soil conditions.	SC/ MOL	Supervise and ensure compliance	During the entire operation
2.	**Soil & Water Contamination**			
2.1	Sewage will be disposed off into the septic tank system comprising of septic tank and soak pit.	SC / MOL	Check the location of septic tank and soak pit	During the construction of the camp site
2.2	Soak pits will be built in absorbent soil and located preferably 300 m away from a surface water body or water well.	SC/MOL	Check soil condition and distance between the soak pits and the nearest water body	During the construction of the camp site
2.3	Soak pits will be constructed such that surface runoff cannot enter the pits.	SC/MOL	Check design of the soak pit and monitor construction	During the construction of the camp site
2.4	Soak pits will be designed to accommodate wastewater generated during the total duration of the operation.	SC/MOL	Check design of soak pit	Before construction
2.5	In case the soak pits get filled up, grey water can be sprinkled over access tracks if grey water meeting PEQS limits. Sprinkling of grey water will be done in a manner such that accumulation of water is avoided.	SC/MOL	Supervise sprinkling of grey water	During the entire Operation
2.6	Sprinkling of sewage will not be allowed; in case the soak pits get filled up, the excess wastewater from	SC/MOL	Check compliance	During the entire operation

	soak pit will be disposed of into the nearest municipal drains (Within permissible limits of PEQs) after taking written approval from TMA.			
2.7	Food waste will not be disposed off in an open land. Food waste collected in waste segregation units will be buried on the site or disposed off through contractors. Combustible packaging wastes that have no re-use will be stored temporarily within designated waste segregation areas and will be handed over to waste contractor / vendor for appropriate disposal.	SC/MOL	Check provision of waste bins	During the entire operation
2.8	Recyclable wastes including glass, tin and metal scrap will be recycled.	SC/MOL	Check compliance	During the entire operation
2.9	Medical wastes will temporarily be stored onsite separately and incinerated at a suitable location through Punjab EPA approved waste contractor.	SC	Check compliance	During entire operation
2.10	Vehicles will be checked daily for fuel or oil leaks. Vehicles with leaks will not be operated until repaired.	SC/ MOL	Check maintenance logs and ensure daily inspection of vehicles for leaks	During the entire operation
2.11	All fuel tanks will be properly marked to highlight their contents.	SC/ MOL	Check signs	During the entire Operation
2.12	Fuel and oil storage areas shall have secondary containment in the form of cemented or brick masonry bunds with plastered to prevent soil contamination in case of leaks or spills. The volume	SC / MOL	Check containment volume of the banded area	At the time of construction

	of the containment area will be equal to at least 110% of the total volume of fuel / oil stored or 110% of the volume of one largest tank. Secondary containment shall also have sump pit for collection of spillage material.			
2.13	Fuels tanks will be daily checked for leaks and all such leaks will be plugged immediately.	SC/MOL	Inspect fuel tanks for leaks	During the entire Operation
2.14	The soil contaminated from spills will be collected and handed over to PEPA approved waste contractor for disposal.	SC/MOL	Monitor and supervise special treatment, if any	During the entire Operation
2.15	Spill kits will be available at prominent location at camp site to tackle any accidental spill. A spill prevention and contingency plan will be prepared to deal with moderate and major spills.	SC/MOL	Study and examine the plan and identify any flaws if any before its approval	Before the commencement of the project.
2.16	Used oil shall be provided to OGRA reclamation license holder Lubricating Plant for reclamation or disposed off through PEPA approved waste contractor. Handover vehicle-related waste (excluding hazardous waste) to local contractors for recycling.	SC/ MOL	Check compliance	During the entire Operation
2.17	During fuel and oil transfer operations such as refueling bulldozers through a dedicated fuel vehicle, drips and spills will be avoided and drip pans will be used.	SC / MOL	Ensure provision of drip pans provides training on safe refueling practices, monitor oil or fuel stains	During the entire Operation

2.18	Bentonite mud used for the purpose of uphole and shot hole drilling will be prepared in earthen pits. The used mud will be disposed of in the same pit and left to dry. After the mud has dried, the pit will be backfilled with 1m cover of soil.	SC/ MOL	Monitoring preparation and disposal	During deep hole and uphole drilling
3.	**Use of Water**			
3.1	Water from a local well will only be used after ensuring that the available capacity at the tube well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the tube wells will be regularly monitored to supervise any changes in the yield of the wells. If a single well fails to meet this requirement, water will be obtained from multiple wells such that each well meets the above-mentioned requirement	SC/ MOL	Check local demand and water abstraction	During entire operation
3.2	For all water obtained from local wells, the owner will be paid for water abstracted at the market rate	SC/ MOL	Check compliance	During entire operation
3.3	If a new water well is to be installed, the well will be located preferably away from existing local wells.	SC/ MOL	Check compliance	Before the start of the operation
3.4	The quantity of water used during seismic operation will be kept to the minimum required by taking prudent water conservation measures on site.	SC/ MOL	Monitor water consumption and advise water conservation measures	During the entire operation
3.5	A complete record of water consumption during seismic and construction of camps will be maintained.	SC/ MOL	Check compliance	During the entire Operation

	MOL Pakistan may develop a new well in case commercial hydrants are not available. In such a case, MOL Pakistan will establish the well away from the existing community well and will ensure that groundwater extraction does not adversely affect the local community's ability to meet its water requirements.	SC/ MOL	Check local demand and water abstraction	During entire operation
	In such case complete record of water abstraction will be maintained.	SC/ MOL	Record Keeping of water abstraction	During entire operation
4.	**Climate & Ambient Air Quality**			
4.1	Generators, compressors and vehicles used during seismic operations will be maintained in a good condition to ensure that emissions are kept to a minimum level (compliant with PEQS standards).	SC/ MOL	Check maintenance logs	During the entire operation
4.2	During seismic operations vehicle speeds will be regulated and monitored to minimize dust emissions.	SC/ MOL	Set and monitor speed limits	During the entire operation
4.3	Campsites will be located preferably 500 m away from communities and any other sensitive receptors.	SC/ MOL	Check distances of camp site from communities	Prior to construction of camp sites
4.4	During operation dust emissions due to road travel will be minimized by regulating vehicle speeds and watering of the access track (where required).	SC/ MOL	Set and monitor speed limits. Monitor sprinkling of access track	During the entire operation
5.	**Noise Pollution**			
5.1	During all operations generators, vehicles and other equipment and machinery will be maintained in good	SC/ MOL	Monitor noise levels	During the entire operation

	condition to ensure that noise from them is kept to a minimum level.			
5.2	Seismic camps will be located preferably 500 m away from nearest communities.	SC/ MOL	Check distances from the community	Prior to construction of the camp sites
5.3	Generators will be kept within enclosures to minimise dispersion of noise.	SC/ MOL	Check compliance	During the entire operation
6.	**Flora**			
6.1	Seismic camps will be located in existing cleared and levelled land, if possible.	SC/ MOL	Suggest campsite to the SC	At the time of site selection for camp site
6.2	The camp site areas will be kept to a minimum required.	SC/ MOL	Check areas	Prior to camp setup or construction
6.3	Crew personnel while working along seismic lines will be confined to a corridor of 5 m.	SC/ MOL	Supervise line clearing operation	Before and During land clearing operation
6.4	Use of local wood as fuel will be prohibited	SC/ MOL	Check compliance	During entire operation
6.5	The cutting of trees will be avoided. Where it is necessary to cut down trees in government land, relevant departments will be taken on board before cutting of trees. In case of private land, compensation will be paid to the land owner.	SC/ MOL	Supervise land clearing activities	During land clearing
6.6	Earthen pits for preparation and disposal of bentonite mud will be located in an area where minimum vegetation clearing is involved.	SC/ MOL	Check compliance	During the entire operation
7.	**Fauna**			

7.1	Hunting, feeding, trapping or harassment of wildlife will be strictly prohibited.	SC/MOL	Check compliance	During the entire operation
7.2	Off-road travel will be strictly prohibited and observance of this will be monitored during the operation.	SC/MOL	Approve access track and monitor off road travel	During entire operation
7.3	Drivers will be instructed to keep a watch for domestic animals or wildlife in order to minimize the risk of road accidents	SC/MOL	Train the drivers and check compliance	During the entire operation
7.4	Seismic deep holes and up-holes will avoid disturbing live bird nests and small mammal and reptile holes.	SC/MOL	Check compliance	During seismic
7.5	All mitigation measures recommended for waste management, noise and air emissions will be implemented.	SC/MOL	Check compliance	During the entire operation
7.6	Clearing of dense patches of vegetation will be avoided	SC/MOL	Check development and clearance of access track	During the entire operation
8.	**Socio-economic Environment**			
8.1	All community grievances will be recorded and maintained in a Community Complaint's Register. In addition to this, close liaison will be maintained between the community and the site representatives of SC throughout the project activity.	SC / MOL	Check the provision of complaint register and its access for communities	During the entire operation
8.2	Compensation amounts for land leased will be disbursed in an equitable and transparent manner.	SC / MOL	Check compensation records	During the entire operation

8.3	Loss of standing crops, traditional land rights and community ownership will be given due consideration while determining compensation amounts.	SC / MOL	Check compensation records	During the entire operation
8.4	Compensation amounts will be settled as per prevailing market rates & will be settled after an agreement is reached between the local residents & the seismic contractor.	SC / MOL	Check compensation records	During the entire operation
8.5	All mitigation related to management of wastes, noise & dust emissions suggested in the EIA will be adhered to.	SC / MOL	Check compliance	During the entire operation
8.6	In order to keep nearby local communities informed of the progress of the operation, communication channels will be maintained between local spiritual leaders and community elders and MOL	SC / MOL	Check compliance	During the entire operation
8.7	MOL Pakistan and its contractors will employ local residents during the project activities if possible.	SC / MOL	Check employment records	During all operations
8.8	Project personnel will respect local cultural norms.	SC / MOL	Train project staff on social norms and sensitivities	During the entire Operation
8.9	Water from a local well will only be used after ensuring that the available capacity at the tube well (safe yield minus local demand) is at least 50% greater than the project demand. Discharge from the tube wells will be regularly monitored to supervise any changes in the yield of the wells. If a single well	SC / MOL	Check compliance	During the entire operation

	fails to meet this requirement, water will be obtained from multiple wells such that each well meets the above-mentioned requirement			
8.10	All project facilities, seismic lines & access roads will maintain the following minimum distances from cultural, religious & archaeological sites; unless community demands greater distance from graveyards or place of worship, etc[21]. —Seismic lines – 100 m —Access roads – 100 m —Camp sites – 500 m	SC	Check distances	During the entire operation
9. Site Restoration				
9.1	Demobilization of all equipment and machinery.	SC / MOL	Check compliance	During site restoration
9.2	Disposal of any waste material remaining at the time of completion of the operation.	SC / MOL	Check compliance	During site restoration
9.3	Restoration of seismic lines will include removal of all cables, geophones, station units, flags, stakes and wastes from the lines and back filling of all mud pits.	SC / MOL	Check compliance	During site restoration
9.4	All the fencing or barriers surrounding the seismic base camp area will be removed, and the area will be levelled. The concrete structures if desired by the land owner will be left intact. If not, the concrete will be broken up and disposed or reused for backfilling of pits /	SC / MOL	Check compliance	During site restoration

[21] Source: PPEPCA Sectoral for Upstream Petroleum Sector – Onshore Guidelines – Volume 2 of 2

	septic tank (below main rooting zone, 1 - 1.5 m) or provided to locals for re-use.			
9.5	Dispose the waste water of septic tanks in environmental friendly manner and restore it after dismantling in place (top roof and at least 1 metre wall or more if easily possible) and backfilling with at least 1 metre of native soil cover. Dispose sludge from septic tank in an environment-friendly manner.	SC / MOL	Check compliance	During restoration
9.6	Restore soak pit after removing / handling of wastewater & cover and backfilling it with at least 1 metre of native soil cover. Dispose wastewater of soak pit in an environment-friendly manner.	SC / MOL	Check compliance	During restoration
9.7	Contaminated bricks of black / grey water pits and others shall not be given to locals for any purpose.	SC / MOL	Check compliance	During restoration
Note: SC: Seismic Contractor				

Table 8.2: Environmental Monitoring Plan for Seismic Activities in Margalla Block (Punjab Portion)

S. No.	Monitoring Aspects	Monitoring locations	Parameters	Frequency	Responsibility	Documentation
1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Annually	Contractor	Laboratory test Reports
2	Waste water	Campsite	Effluent Flow, Temperature, pH, COD, BOD_5, TSS, TDS, Oil & Grease, Chloride & Phenolic Compounds	Quarterly (if wastewater discharged into any nullah)	Contractor	Laboratory test Reports
3	Noise level	Boundaries of the camp sites	Noise level (dBA)	Quarterly	Contractor	Internally / externally
4	Solid Waste	Project site	Solid waste collection, storage, transportation and disposal	Daily	Contractor	Complete record waste generation record, waste disposal record & disposal certificate)
5	Occupational Safety	Campsite, project roads	HSE Records, Incidents and injuries	Daily	Contractor	Record of observations.

8.8 Waste Management

Sources of Wastes

Waste is classified as Hazardous and Non-hazardous by identifying the physical, chemical and toxicological properties. Designated drums, containers, bins etc. with specific labels for various types of wastes are placed at the designated locations Waste is disposed off in an environmentally friendly manner.

Waste Management Methods

There are different capabilities and limitations of different Waste Management Options for the various types of wastes generated in order to make cost-effective Waste Management Decisions that are protective of human health and the environment. As a general matter, a Waste Management Hierarchy (as recommended by EPD) should be adopted for domestic waste, with a preference for reduction, reuse and recycling options. For the contaminated and hazardous waste produced during the activity, such waste will be handed over to an EPD-approved waste management contractor for disposal in accordance with industrial best practices.

These methods would apply to atmospheric emissions, chemical wastes, contaminated soil from oil / fuel spills, drums/containers, garbage (inert solid wastes); sanitary; clinical; produced water; and, rainwater drainage etc.

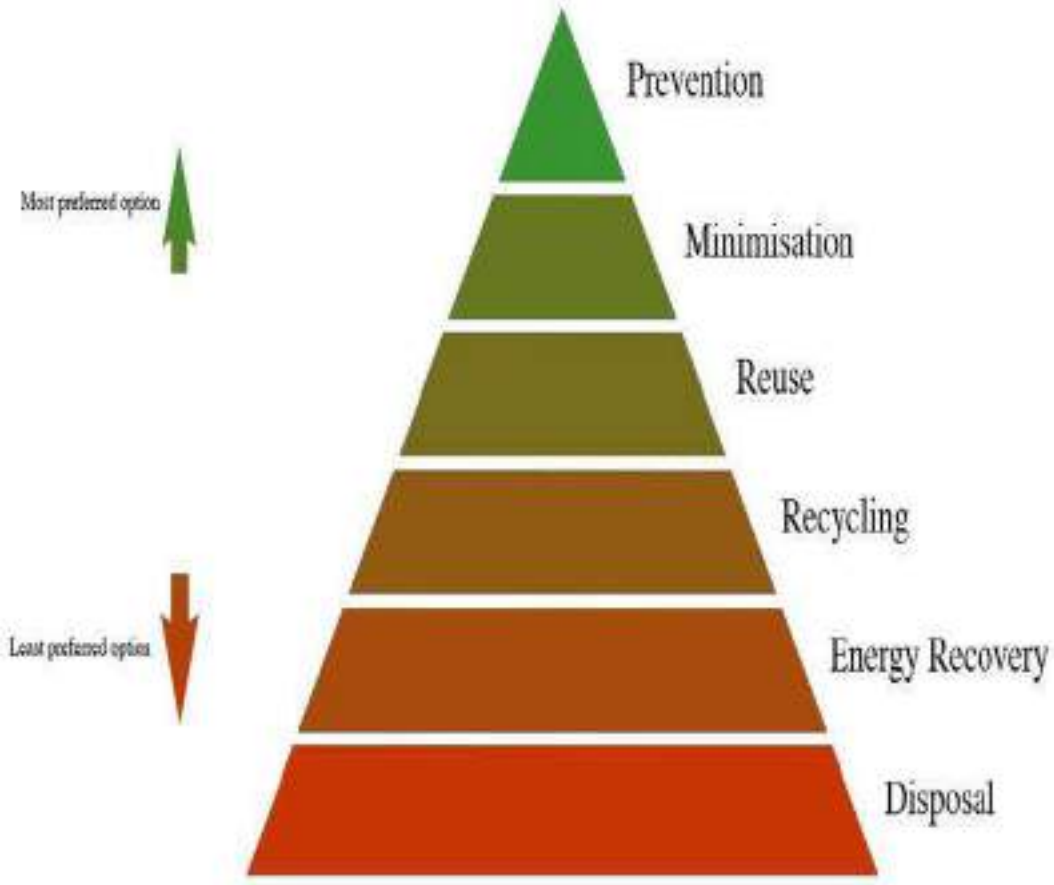


Table 8.3: List of Different Types of Waste and Disposal Options

Type of Waste	Description	Disposal Options
Food Waste (decay-able waste)	Animal, fruit or vegetable residues	▪ Food waste to be buried safely or handed over to waste contractor
Packaging Waste	Paper, plastic, glass, textiles, cardboard, rubber, wood, tin cans, aluminum cans	▪ Combustible material that has no reuse will be handed over to waste contractor / vendors for appropriate disposal ▪ Recyclable and reusable wastes will include glass, metals, aluminum cans, etc. These wastes will be sent to a waste contractor, in order to ensure the wastes are recycled or reused properly, without having any effect on the environment.
Medical Waste	Syringes, glass bottles, soiled bandages, expired drugs, dressings	▪ Syringe needles to be cut with cutter and sent for incineration through Punjab EPD approved waste contractor. ▪ Soiled bandages and dressings and needles to be sent for incineration through EPD approved waste contractor. ▪ Expired drugs to be taken by the contractor for disposal/incineration through EPD approved waste contractor.
Workshop Waste	Used oil, ferrous/non-ferrous materials, batteries,	▪ Handover vehicle-related waste (excluding hazardous waste) to local contractors for recycling[22] ▪ Used lubricating oil shall either be provided to OGRA reclamation license holder lubricant reclamation plant for reclamation or disposed off through EPD approved waste contractor. ▪ Batteries to be hauled away by contractor for recycling
Demolition Waste	Dirt, concrete, plaster, plumbing, heating & electrical parts	▪ Dirt, concrete and plaster to be buried at the site; and ▪ Plumbing, heating and electrical parts to be hauled away by contractor for recycling

[22] PPEPCA Sectoral for Upstream Petroleum Sector – Onshore Volume 2 of 2

Liquid Waste	Wastewater from kitchen and washing areas, sewerage	▪ All liquid wastes from the kitchen, washing areas and sewage are collected and disposed of into septic tank system.
Oil spills /soil contaminated by oil leakages or spills	Contaminated soil	▪ Oil spills will be contained and controlled using shovels, sands, and native soil. The equipment and materials will be made available at camp sites and during the operation. ▪ The contaminated soil will be excavated and temporarily stored in a metal drum or a bonded area lined with an impermeable base. ▪ Finally, the contaminated soil will be disposed of through Punjab EPD certified waste contractor.

8.9 Change Management Plan

Change in Operations

Any change in the project design or project operation if required will be made in relevance to the EMP and all the impacts associated with changed process will be either similar to the existing impacts and if different will be assessed and included in the mitigation management plan.

Change in Record Register

A record register will be maintained at the project site at the start of project activities. All the changes to be made will be recorded in this register. This will assist in the step-by-step environmental monitoring and decision-making. Record register will be the responsibility of MOL Exploration Dept. and will be used internally.

Change in EMP

Changes in project design necessitate changes in the EMP. In this case, following actions will be taken:

- A meeting will be held between Site MOL Pakistan's Incharge and staff of the contractor, to discuss and agree upon the proposed change to the EMP.
- Based on the discussion during the meeting, a report will be produced, which will include the additional EMP clauses.
- Additional EMP clauses will be added to the original EMP as a second volume which will be distributed to the relevant staff of MOL Pakistan's and contractor.

8.10 Emergency Response Plan

Contingency planning requires those emergency plans and procedures that can be put into action quickly as soon as unexpected events occur. Poor contingency planning can result in delayed or ineffective response to unexpected events. In turn, this delay could result in short-

term and long-term environmental impacts and threats to public safety and convenience. Possible emergency situations during proposed activities include:

- Possible risks arising from operational conditions or human error that could result in accidents, such as
  - Uncontrolled material leak into the environment
  - Fire/explosions.
  - Occupational accidents (serious or fatal), due failure to comply with operating rules and procedures, negligence of the personnel, falls, onsite accidents caused by equipment, burns, inappropriate use of equipment and personal protection items.
  - Environmental Contamination (due to material leaks/spill into the environment). Spillage of fuel, oil, gas, chemicals and hazardous materials;
- Natural Risks that may affect the facilities and their resulting damage to property and the person (Earthquake, floods, Typhoon/Cyclone, Lightening, etc.)
- External Risks arising from delinquent actions, terrorism, or vandalism.

Emergency situations are possible even with proper planning, design and implementation of correct procedures and personnel training. Project contractors will develop a site-specific emergency response plan and submit it to MOL Pakistan's. The Emergency response plan is attached in **Annex-IV.**

8.11 Environmental Budget

Budget will be kept for the implementation of Environmental Management Plan. Estimated cost for the implementation of EMP is provided below.

Table 8.4: Environmental Budget

Sr. No	**Activities**	**Duration**	**Estimated Cost**
1.	Provision of PPE to workers	Annual	500,000
2.	HSE Trainings	Monthly	In house
3.	Waste Management	Monthly	500,000
4.	Testing of Environment Parameters (Air, water & Noise)	Annually	800,000
	Total		**1,800,000**

9. CONCLUSION

The project proposed by MOL Pakistan includes 2D & 3D seismic activities to explore the presence of new hydrocarbon reserves in Margalla Block (Punjab portion), District Attock and District Rawalpindi, Punjab.

Pakistan is striving through a severe energy crisis that has directly and indirectly affected all sectors of the economy over the past decade. Pakistan generates its power from an energy mix that includes oil, gas (natural gas and liquefied natural gas, LNG), coal, renewable sources (solar, wind and hydro energy), nuclear, and biomass. Pakistan's energy sector is heavily dependent on imported fuel (oil and LNG). Pakistan meets about 80% of its gas and 15% of its oil demand from local sources. In the 2022-23 fiscal year, oil production was 69,513 barrels per day, while gas production reached 3,259 million cubic feet per day. The remaining demand has been met through imports, which puts pressure on the balance of payments[23].

In order to assist the economic development and reduce the import bills, there is a dire need to explore and increase the production of oil and gas. The proposed exploration activities would help to achieve this goal besides having a positive impact on socioeconomic conditions as it would provide more job opportunities to the local people and generate opportunities for more business.

In order to assess the environmental and socioeconomic impacts of the proposed project activity the EIA study has been conducted to evaluate the impacts and propose mitigation measures. The findings from the study conducted have been categorically recorded and presented in this report.

A baseline survey of the project area conducted by the EIA study team provides the basis of establishing profiles of natural, socioeconomic and cultural environments which might be impacted by project activities. All the requirements have been addressed in this EIA, which has covered the following:

- The proposed project activities;
- Alternatives considered in finalizing the project description;
- Environmental conditions of the project area;
- Legislative requirements related to the project;
- Potential environmental impacts of the proposed project activities on the physical, natural and socio-economic receptors;
- Mitigation and monitoring measures that will help in avoiding or minimizing these impacts.

All activities associated with the proposed project have been reviewed and their possible impacts methodically analyzed. A comprehensive Environmental Management Plan has been put together and provided in the report for adherence which will ensure the evasion of environmental degradation or contamination.

Screening of potential impacts from the project activities finds that:

[23] https://ppisonline.com/wp-content/uploads/2023/09/Investment-Brochure-2023.pdf

- The project's impacts on the ambient environment will be short term and mostly localized.
- Since most of the activities will be carried out in the urbanized area, mobilization plan shall be developed in consultation with the local government (if required) to avoid inconvenience.
- Vegetation density near the urbanized area is low and mature trees are less common while the tree density are moderates nears recreational parks. MOL Pakistan will take appropriate measures to avoid tree cutting and vegetation damage.
- The predominant vegetation type of the area includes shrubs and grasses. Project activities will not significantly affect the vegetation density of the area.
- Impact from project related transportation activities can occur in areas falling close to communities. Adoption of safe driving practices and careful scheduling of activities will be required near these areas.
- The project is not water intensive, the impact on area's water availability is not expected from project's water consumption. However, water conservation measures will still be adopted to prevent any unanticipated impact.
- Protected areas are situated within project sites and MOL Pakistan will take appropriate measures to protect the wildlife and habitat.
- Socioeconomic impacts on micro-scale would be insignificant if any. Social issues like removal of existing business, property and resettlement are not anticipated from any project activity.

Based on the risk assessment carried out for the project, it is recommended that:

- The impact on animal life can be prevented by careful planning and adopting a "No Hunting, No trapping" Policy.
- Temporary inconveniences due to seismic operation are minimized through planning and coordination with local population and organizations in the neighborhood.
- Environmental Performance Monitoring is made an integral part of the Project to ensure environmental safeguards.
- Water conservation practices may be adopted at all stages of project.

A series of mitigation and monitoring measures have been included to address the concerns for these measures. Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental Management Plan, the adverse environmental and social impacts of the proposed Project activities are likely to be within the acceptable limits. The project is not expected to have long-term significant or irreversible negative environmental impacts at different phases of the project.

It is thus recommended that the EIA for the proposed project be approved with the condition that all corrective and mitigation measures proposed in this report will be implemented with diligence. The provided EMP in the report will provide guidelines and measures to ensure sustainable and eco-responsible execution of the project activities.

ANNEX-I: CONCESSION AGREEMENT

ANNEX-II: ENVIRONMENTAL MONITORING REPORTS

ANALYSIS REPORT

MOL PAKISTAN

➢ Ground Water Analysis

Report Reference No: AES-ENV-EM-01/2026

Dated: 13th January, 2026

Asian Environmental Services (Pvt.) Ltd.
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Document No. AES/LMS/FRM-115, Date of Issue 07 July 2022, Revision No. 00

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GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-ENV-EM-01/2026-GW-04	**Report Issue Date**	13-01-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-01-2026	**Sample Receiving Date**	02-01-2026
Analysis Completion Date	09-01-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			13 °C & 56 %
Sample ID	AES-ENV-GW-04/2026	**Sample Location**	Charpal Bazar
Customer Details	MOL Pakistan	**Monitoring Coordinates**	33°37'20" N 73°3'35" E

Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	284	± 1.40	Optimal
Total Dissolved Solids (TDS) **	SMWW 2540 C	< 1000 mg/L	380	± 2.77	Optimal
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.4	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500-Cl^- B	< 250 mg/L	83	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	BDL	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500-CN F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500-F^- C	≤ 1.5 mg/L	0.25	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3) **	SMWW 4500-NO_3^- D	≤ 50 mg/L	2.35	± 0.02	Optimal
Nitrite (NO_2) *	SMWW 4500-NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl^- B	0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L	0	N.A.	Optimal

13/01/2026

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GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-ENV-EM-01/2026-GW-04	**Report Issue Date**	13-01-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-01-2026	**Sample Receiving Date**	02-01-2026
Analysis Completion Date	09-01-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			13 °C & 56 %
Sample ID	AES-ENV-GW-04/2026	**Sample Location**	Charpai Bazar
Customer Details	MOL Pakistan	**Monitoring Coordinates**	33°37'20" N 73°3'35" E

Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	N.A.	Optimal
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.025	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

*Parameters are approved from Punjab Environmental Protection Agency (EPA).
**Parameters are accredited from Pakistan National Accreditation Council & approved from EPA.
The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

Abbreviations:

PEQS = Punjab Environmental Quality Standards
TCU = True Color Unit
NTU = Nephelometric Turbidity Unit
SMWW 24th Edition = Standard Methods for the examination of Water and Wastewater
N.A. = Not Available
MU = Measurement Uncertainty
CFU = Colony Forming Unit
NGVS = No Guideline Value Set

Remarks:
Optimal = Compliance with Permissible Range
Marginal = Close to Extreme Edge
High = Exceeds from Permissible Range
Low = Less Than Permissible Range

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Analyzed By

Reviewed By (TM) 13/01/26

Approved By (QM/Chief Chemist) 13/1/2026

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GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-ENV-EM-01/2026-GW-05	**Report Issue Date**	13-01-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-01-2026	**Sample Receiving Date**	02-01-2026
Analysis Completion Date	09-01-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the time of Sample collected			13 °C & 56 %
Sample ID	AES-ENV-GW-05/2026	**Sample Location**	Purana Chakra
Customer Details	MOL Pakistan	**Monitoring Coordinates**	33°35'19" N 72°58'36" E

Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	324	± 1.40	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	535	± 8.78	Optimal
pH**	SMWW 4500 H^+ B	6.5- 8.5	8.1	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl) **	SMWW 4500-Cl^- B	< 250 mg/L	132	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.164	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500-CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F)**	SMWW 4500-F^- C	≤ 1.5 mg/L	0.56	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3^-) **	SMWW 4500-NO_3^- D	≤ 50 mg/L	3.1	± 0.05	Optimal
Nitrite (NO_2^-) *	SMWW 4500-NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl^- B	0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L	0	N.A.	Optimal

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GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-ENV-EM-01/2026-GW-05	**Report Issue Date**	13-01-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/GSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-01-2026	**Sample Receiving Date**	02-01-2026
Analysis Completion Date	09-01-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			13 °C & 56 %
Sample ID	AES-ENV-GW-05/2026	**Sample Location**	Purana Chakra
Customer Details	MOL Pakistan	**Monitoring Coordinates**	33°35'19" N 72°58'36" E

Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	N.A.	Optimal
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.030	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

*Parameters are approved from Punjab Environmental Protection Agency (EPA).
**Parameters are accredited from Pakistan National Accreditation Council & approved from EPA.
The reported expanded uncertainty is based on combined standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

Abbreviations:

PEQS = Punjab Environmental Quality Standards
SMWW 24th Edition = Standard methods for the examination of Water and Wastewater
TCU = True Color Unit
N.A. = Not Available
CFU = Colony Forming Unit
NTU = Nephelometric Turbidity Unit
MU = Measurement Uncertainty
NGVS = No Guideline Value Set

Remarks:
Optimal = Compliance with Permissible Range
Marginal = Close to Extreme Edge
High = Exceeds from Permissible Range
Low = Less Than Permissible Range

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Analyzed By 13/01/26

Reviewed By (TM) 13/01/2026

Approved By (QM/Chief Chemist) 13/01/2026

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GROUND WATER ANALYSIS REPORT

Sample Details

Report Reference No.	AES-ENV-EM-01/2026-GW-06	**Report Issue Date**	13-01-2026
Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/QSP-014
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-01-2026	**Sample Receiving Date**	02-01-2026
Analysis Completion Date	09-01-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			13 °C & 56 %
Sample ID	AES-ENV-GW-06/2026	**Sample Location**	Kataria
Customer Details	MOL Pakistan	**Monitoring Coordinates**	33°31'46" N 72°52'7" E

Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Laboratory Analysis					
Color*	SMWW 2120 C	≤ 15 TCU	0	N.A.	Optimal
Taste*	SMWW 2160 C	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Odor*	SMWW 2150 B	Non-Objectionable	Non-Objectionable	N.A.	Optimal
Turbidity*	SMWW 2130 B	< 5 NTU	0	N.A.	Optimal
Total Hardness (as $CaCO_3$) **	SMWW 2340 C	< 500 mg/L	388	± 1.40	Optimal
Total Dissolved Solids (TDS)**	SMWW 2540 C	< 1000 mg/L	**1010**	± 8.78	High
pH**	SMWW 4500 H^+ B	6.5- 8.5	7.4	± 0.04	Optimal
Aluminum (Al)	SMWW 3111 B	≤ 0.2 mg/L	BDL	N.A.	Optimal
Antimony (Sb)	SMWW 3114 B	≤ 0.005 mg/L	BDL	N.A.	Optimal
Arsenic (As)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Barium (Ba)	SMWW 3113 B	0.7 mg/L	BDL	N.A.	Optimal
Boron (B)	SMWW 3113 B	0.3 mg/L	BDL	N.A.	Optimal
Cadmium (Cd)	SMWW 3113 B	0.01 mg/L	BDL	N.A.	Optimal
Chloride (Cl^-) **	SMWW 4500-Cl^- B	< 250 mg/L	150	± 1.59	Optimal
Chromium (Cr)	SMWW 3113 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Copper (Cu)	SMWW 3111 B	2.0 mg/L	0.165	N.A.	Optimal
Cyanide (CN^-)*	SMWW 4500-CN^- F	≤ 0.05 mg/L	0	N.A.	Optimal
Fluoride (F^-)**	SMWW 4500-F^- C	≤ 1.5 mg/L	0.95	± 0.06	Optimal
Lead (Pb)	SMWW 3114 B	≤ 0.05 mg/L	BDL	N.A.	Optimal
Manganese (Mn)	SMWW 3113 B	≤ 0.5 mg/L	BDL	N.A.	Optimal
Mercury (Hg)	SMWW 3114 B	≤ 0.001 mg/L	BDL	N.A.	Optimal
Nickel (Ni)	SMWW 3113 B	≤0.02 mg/L	BDL	N.A.	Optimal
Nitrate (NO_3^-) **	SMWW 4500-NO_3^- D	≤ 50 mg/L	4.0	± 0.05	Optimal
Nitrite (NO_2^-) *	SMWW 4500-NO_2^- B	≤ 3.0 mg/L	0	N.A.	Optimal
Selenium (Se)	SMWW 3114 B	0.01 mg/L	BDL	N.A.	Optimal
Residual Chlorine (Cl_2) *	SMWW 4500-Cl^- B	0.2 to 0.5 at Consumer & 0.5-1.5 at Source mg/L	0	N.A.	Optimal

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GROUND WATER ANALYSIS REPORT

Sample Details

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Nature of Sample	Ground Water	**Sample Collection Reference**	AES/LMS/QSP-01 4
Grab/Composite	Grab	**Sample Collected/Sent by**	AES
Sample Collection Date	02-01-2026	**Sample Receiving Date**	02-01-2026
Analysis Completion Date	09-01-2026	**Laboratory Temperature & Humidity**	(25 ± 5) °C & (55 ± 15) %
Ambient Temperature & Humidity at the Time of Sample collected			13 °C & 56 %
Sample ID	AES-ENV-GW-06/2026	**Sample Location**	Katarla
Customer Details	MOL Pakistan	**Monitoring Coordinates**	33°31'46" N 72°52'7" E

Ground Water Analysis Results

Parameter	Analysis Method	PEQS	Result	MU (CL95%)	Remarks
Phenolic Compounds (as Phenols) *	SMWW 5530 D	NGVS mg/L	0	N.A.	Optimal
Zinc (Zn)	SMWW 3113 B	5.0 mg/L	0.033	N.A.	Optimal
Microbiological Analysis					
Total Coliforms*	SMWW 9222 B	0 CFU / 100 mL	0	N.A.	Optimal
Fecal Coliforms *	SMWW 9222 D	0 CFU / 100 mL	0	N.A.	Optimal

*Parameters are approved from Punjab Environmental Protection Agency (EPA).
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Abbreviations:

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Analyzed By

Asian Environmental Services (Pvt) Ltd LAHORE

Reviewed By
(TM) 13/01/2026

Approved By
(QM/Chief Chemist) 13/01/2026

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Ensuring Quality and Sustainability

ANNEX-III: EMERGENCY RESPONSE PLAN

Emergency Response Plan

Contingency and Emergency Response Plans

- **PURPOSE AND SCOPE OF THE DOCUMENT:**

The objective of this Emergency Response Plan is to explain the line of action to be followed in case of an emergency on Seismic operations and to define the responsibilities of different persons. All the concerned CONTRACTOR employees will act as a team on both the ends i.e. Islamabad office and field location. Once issued, the plan will be used as a guideline to deal with all the medical emergencies and will be practiced through drills on reg ular basis.

Under no condition the plan should be changed without the infor mation of Management in Islamabad, and any change should be followed, in not more than 24 hrs, by the written report of the reason of the change from documented guidelines**.**

- **CONTRACTOR MEDICAL FACILITIES:**

To cover the medical problems on the field, CONTRACTOR will set a well-managed medical system, with contacts at reliable health facilities to take care of grave medical emergencies. The brief description is as follows:

- **CONTRACTOR FIELD DOCTOR:**

CONTRACTOR has employed the services of qualified medical doctor for its G&M and seismic operations in Project site. He is responsible for providing the medical coverage for minor health problems on the field. He is also responsible for providing first aid in case of a medical emergency and to giving suggestion to management r egarding evacuation of a diseased person in case of medical emergency.

- **HEALTH FACILITIES**
- ***CONTRACTOR FIELD CLINIC:***

CONTRACTOR will set a fairly well equipped clinic on the project for the medical coverage of its field employees. It will contain all the first aid material required to stabilize a casualty in case of serious medical emergency and Most of Life Saving Drugs.

MEDICAL EMERGENCY AT CONTRCTOR RILED LOCATION

There can be situations in which we can come across medical emergencies during our field operations. These emergencies can be:

- *Medical emergencies for example uncontrolled high-grade fever, severe dehydration, flaring up of gastric ulcer, burns etc .*

- All such emergencies will be referred to the nearest hospital m entioned in the list of hospitals.
- *Surgical emergencies for example acute abdomen, trauma, fractures etc.*
- All such emergencies will be referred to the nearest hospital mentioned in the list of hospitals.

Insect bites

- The field clinic has the capability to treat scorpion and snak ebite cases. However, all such cases will be referred to the Shifa, QA Hospital for treatment on the decision of the onsite doctor.
- All the daytime or night time s nakebite cases will be referred to nearest hospital. Field doctor will accompany the victim to the hospita l and will return after ensuring that the right person has started the pro per treatment. Company has a reasonable stock of anti-snake venom on the field . Under all conditions these sera will be carried along, due to possibility of non-availability in the hospital. If the snake has been killed, it will be carried along for identification.

Medical Emergencies related to Road Traffic Accidents

- All such cases will be referred initially to nearest facility. If after the initial evaluation, the person is found to have Multiple Severe Injuries or Head Injury, then he will be shifted to Shifa / QA hospitals, ISB/Rwp as soon as possible, after initial stabilization.
- Daytime / Night time Medical Emergency
- Emergencies related to heart problem will later be shifted to Shifa, QA hospital for specialized care.

CONTRACTOR FIELD DOCTOR:

CONTRACTOR will designate a qualified medical doctor on seismic operations. He will be responsible for the quick assess ment of the sick or injured person, as per his professional knowledge and the administration of first aid and stabilization of the person, who has been reported sick or injured.

a. IF FIRST AID IS ENOUGH:

- Inform the Field In-charge about the incident and the condition of the person.
- Record the incident as a First Aid Case in the record.

b. IF FIRST AID IS NOT ENOUGH:

- He will stabilize the victim in the field clinic, or at the site of the incidence (if required).
- Make Primary and Secondary assessment of the person and start the initial treatment. The assessment form is attached with the document as Annex-1 of this chapter. A copy of the form will accompany the patient in case of medical evacuation.

- Pass on the status of the patient to the Field Management. He will assess the need for the possible evacuation of the person and discuss it with the Base Camp field management.

The Field Doctor will remain in contact with the field manageme nt about the condition of the patient and the Field Management will further inform the Operation Manager and HSE Manager in Islamabad Office about the final plan. He will contact the hospital authorities, as per the advi ce of the Field Management, and will ensure that adequate arrangements have been made for safe evacuation.

c. IF DECIDED TO EVACUATE THE PATIENT:

- Field doctor will inform the Field Management about the status of the patient and will discuss the details about this Medevac, so that necessary arrangements for the safe and earliest possible evacuation of the patient can be made.
- Measures to be taken for the safe traveling of the patient be decided and documented.
- As soon as the patient is stabilized, evacuation will be done to the hospital, as decided earlier, u sing the best available transportation facility. The doctor himself or his nominated medic will travel with the patient, until he is handed over to medical personnel in the recommended health facility.

TRANSPORTATION OF THE PATIENT:

Well-equipped ambulances, one in each camp and two in the field with medics will be provided during seismic operations . Patient from seismic site w ill be evacuated and transported to medical facility in the nearest city. Hospital a ssurance survey will be conducted soon after mobilization of the crew to assess medical facilities in/around project area.

A doctor, medic and security escort will be ensured for night-time transportation of patient

Emergency Routes

Following routes will be followed in case of emergency.

Base Camp to nearest city

Will be updated prior to crew mobilization in the project area.

Primary Route

Will be updated prior to crew mobilization in the project area.

Total Distance = to be calculated

Total Time Taken=to be calculated

Alternative route from Base camp to Islamabad / Rwp

Will be updated prior to crew mobilization in the project area.

Total Distance = to be calculated

Total Time Taken=to be calculated

EMERGENCY TEAMS

1..1 Emergency Response Team (ERT)

This team shall be established on site and shall have personnel who are experts to deal with the emergenc ies like fire fighting, oil sp ill control, man lost etc.

This team shall include the trained personnel, radio operator, and camp boss.

1..2 Incident Management Team (IMT)

This shall be formed at the crew/field level normally headed by the party chief. In his absence Party Manager will fulfil his responsibilities. This team shall include Party Chief, Party Manager, HSE Advisor , Chief Geophysicist, Chief Surveyor, Cable Chief, Doctor, and Camp Administrator, security supervisor, vehicle supervisor and other responsible person on crew.

1..3 Emergency Management Team (EMT)

This team shall be based in the head-office Islamabad. This team shall be formed for managing the incidents/ accidents. Normally it shall be headed by the Deputy Country Manager.

The team shall include Deputy Country Manager as team leader, M anager HSE, Manager Operations, Manager HR, Manager Finance, Manager Security, Manager Admin & IT.

Additionally, EMT shall be announced on weekly basis to confirm the member's availability and circulated among the clients and field operations.

Any incident/ accident shall be r eported to EMT by the IMT. EMT shall decide the seriousness of the incident/ accident and informed the Country manager about the situation, who will decide if a crisis need to be dec lared.

Responsibilities

TEAM Leader

Team Leader holds the ultimate res ponsibility of safe and earliest evacuation in case of medical emergency. He will be heading the EMT and wi ll ensure that all the EMT members play their role satisfactorily and in time to proceed with this evacuation without any unnecessary delay.

OPERATION MANAGER

Operation Manager will ensure that all the necessary support and help is provided for the safe and quick medical evacuation and remain in touch with the field and the city arrangements in this regard.

PARTY CHIEF/PARTY MANAGER AND ADMINISTARTION

Party Chief/Party manager and Crew Administrator are responsibl e to ensure that overall field conditions are suitable for the free movement of vehicles and personnel during the evacuation and no security or logistics problem occur on the way. In coordination with EMT, he will provide all the support for the quick and safe evacuation of the casualty.

Crew HSE Advisor

Crew HSE Advisor is responsible to ensure that all hazards in field and camps are identified. He will also support and coordinate with crew management and administration incase of any emergency and will ensure the safe and quick evacuation of causality.

MANGER ADMINISTARTION ISLAMABAD OFFICE

In coordination with other members of EMT, Manager Administrati on will support all the facilities required for the evacuation activities towards Islamabad, or during overseas evacuation. His support may include coordinating the activities of other EMT members, arranging ambulance at Islamabad etc.

The contact detail of all the EMT members is mentioned in Annex-2.

MADICAL EMERGENCY TEAM BASE CAMP

Will be updated prior to crew mobilization in the project area.

FIRE CONTINGENCY PLAN

Fire is a major hazard in any situation where large numbers of people work and sleep in a relatively confined area. This Applies equally t o a seismic crew and to a town-based operation.

Four essential steps in the control of the fire hazards are:

1) Reduction of the Basic Risk by:

- Restricting cigarette smoking.
- Upgrading and maintenance of electrical fittings.
- Posting warning notices.
- Training - both in the use of fire-fighting equipment and in ge neral awareness of the hazards and what to do in the event of fire.

2) Early Detection by:

- Means of smoke alarms
- Personal vigilance

3) Prompt Reaction by:

- Shouting “Fire! Fire! Fire!”
- Sounding the fire alarm
- Evacuating the tents and containers
- Fighting the fire, if appropriate

4) Immediate Response by:

- Using the nearest suitable fire extinguishers
- Isolating the electrical supply, if appropriate
- Accounting for all personnel (Head count)
- Organizing available personnel to assist with fire-fighting, if appropriate

There shall be one Fire Chief/ Fire Fighting Team Leader. He will form a Fire Team from available personnel if th e fire team member not prese nt.

- When the Fire Alarm is sounded, the trailers or tents must be evacuated immediately, and the occupants must proceed directly to the Muster Point designated for their living area as due to pan demic COVID -19 all the workers are not allowed to gather at 1 muster point. Infact the camp is divided into different grids according to the field groups.
- A head count and search must be carried out soon by the Grid Incharge and report to Fire chief.

ON DISCOVERING A FIRE

Fire extinguishers, Dry Powder fire extinguishers are located n ear the door of every container, tent and on each vehicle. Foam fire extinguishers shall be located near fuel locations.

On discovering a fire, you should immediately attempt to fight it with the nearest extinguisher UNLESS :

- There is no extinguisher on hand OR
- The fire is near the exit to your room OR
- There is a noticeable quantity of smoke OR
- You are not confident of using the extinguisher OR
- The fire is visibly increasing in size. OR
- A fuel tank has caught fire (EVACUATE THE AREA)
- In which case, GET OUT AT ONCE AND SOUND THE ALARM .

- All personnel, upon hearing the alarm, proceed to the designated Grids Muster Point immediately.
- Any one near a radio upon hearing the alarm will make a general call announcing, “Fire in Camp - Fire in Camp”.

If a fire is extinguished, remember that it can re-ignite spont aneously. Do not leave the scene until it is assured that the fire is out and wi ll not re-ignite. Then immediately report the incident to the Party Chief, HSE Adviser or the most senior person in camp.

ON HEARING THE FIRE ALARM:

- Everyone is to proceed directly to the designated Grid Muster point. A head count will be conducted at the Grid Muster point. After headcount information will be shared with Fire chief that all persons have been evacuated from the grid.
- (FOLLOWING PROCEDURES ARE DESIGNED TO ENSURE THE SAFETY OF PERSONNEL .)
- All the fire wardens will check their Grid areas allotted to th em.
- The fire team will approach to the fire scene under the direction of the fire chief.
- The Fire Chief / Fire Team is to proceed directly to the fire and carry out the crew procedure for dealing with the situation.

Crew FIRE FIGHTING PROCEDURES

These are guidelines only to give a general outline towards getting a fire extinguished should the situation arise. Below assumes that we have a major fire in the camp area. Hopefully before it gets to this situati on somebody has been able to put the fire out while it is minor.

A fire fighting team will be set up from available personnel. T his team will be trained in correct fire fighting procedure. Other crew members will also be trained so they maybe co-opted onto the team as required. Eventually all crew members should be trained in the use of fire extinguishers and basic fire control.

THE PRIME CONCERN IN CASE OF FIRE IS THE PROTECTION OF PERSONNEL EQUIPMENT IS SECONDARY!!

- The person discovering the fires hould raise the alarm, immediately evacuate everyone from the area and notify the fire chief.
- The “ FIRE CHIEF” will be the most experienced in camp and will take complete charge of fire fighting and directing the “FIRE TEAM”.
- The senior member of the kitchen staff will account to the coordinator for their personnel, including the camp boss. The Cable Shop foreman will account for his men. The Camp boss will be responsible for accounting for foreigner camp staff and alerting the junior camp.
- The coordinator gets a head count at the designated muster points.

- At the same time the electrician will cut off the power to the fire location. Power should only be cut to the fire site as power is required for lighting if at night and also to run water pumps, if available.

THE LEAST PEOPLE INVOLVED THE BETTER. ALL OTHER PEOPLE ARE TO STAY AT THE DESIGNATED MUSTER POINT. SHOULD THEY BE REQUIRED THEY WILL BE DIRECTED WHERE TO GO AND WHAT TO DO.

REMEMBER THAT THIS IS ONLY A GUIDE. NOTHING EVER HAPPENS AS PLANNED.

MAN/VEHICLE LOST FLOW CHART

TO AVOID GETTING LOST:

- Plan your route in advance. Know the route. If in doubt, ask. I f marked tracks exist, use these rather than striking out across country .
- Inform someone of your destination and route. It is imperative that you inform the Base Camp Radio R oom, who runs Journey management of your destination, route etc and any other locations that you will be visiting.
- Cancel this information promptly on your return, or call from y our destination and have someone cancel it.
- Be sure your vehicle is equipped, no matter how short the journey.
- Check: Oil, Water, Tyre Pressure, Spare Wheel, Jack, Tools, Drinking Water, Tow Strap, Shovel, and Radio, before departure.
- If you are traveling on poorly defined tracks, be constantly aw are of where you are. The instant you do not know where you are, be fully aware for definite landmarks.
- If, after a few minutes (MAX. 5 MINS) you are still uncertain, STOP AT ONCE AND GO BACK ALONG YOUR TRACKS until you do know where you are and start again. This will only loose you a few minutes, and often only a few hundred meters.
- Failure to do this and continuing to drive on in the hope of finding a familiar track, is the most common cause of getting lost.
- Finally, take your Journey Management seriously. If you are lost or overdue, a search will be launched, and you will be found.

However, a Man Lost Emergency and Search causes a great deal of anxiety and effort by a large number of people. You will not be popular if you become the object of a full scale search because you neglected one of the simple points above!!

IF LOST OR BROKEN DOWN:

- DO NOT LEAVE YOUR VEHICLE - It's easier to locate a vehicle than a man.
- If possible, go back along your tracks to the last known point.
- If this is not possible - Go to the nearest high point.
- Protect yourself from the sun and conserve your energy. Tasks are better carried out in the cool of the morning or evening.

- Do not park under a tree or in the shadow of a large rock.
- STAY CALM - Anxiety and apprehension is common as the reality of being lost or immobile sets in.

Your absence has been noted from the Journey Management sheet and the Man Lost Procedure has started. You will be found.

- Use your radio every 30 minutes, on the hour and half hour. These are the times that people will be listening for you.
- Transmit your approximate location, route taken, any problems, and the amount of water you have on hand. Transmit "blind" even if you get no reply.
- If the engine will start, you should run it periodically to charge the battery.
- Signal every hour on the hour, using the most suitable means. Signal from the highest point in the area.

DAYTIME SIGNALS:

- The most effective non- radio signal is the heliograph - reflecting the sun's rays by means of a mirror.
- Use any of the vehicle mirrors and practice aiming the reflected image onto the ground in front of you, up to the horizon, and back again. Repeat this process through 360, covering the entire horizon.
- Smoke - the denser the better- is the second option. Use a spare tyre, but be sure to completely deflate it first, using a stick or pencil, to open the valve. Diesel will help the tyre burn, if any is available.

Add any kind of oily rags, green vegetation etc. that will ensure the maximum amount of smoke on the hour. This is the time when search vehicles will be stationary and actively looking for you.

NIGHT TIME SIGNALS:

- The only effective night signal is light, the brighter the bett er.
- Light a fire and have extra fuel ready to increase the size of the blaze on the hour.
- Use the vehicle headlights. If possible, remove one and use it as a spotlight. Sweep the horizon (as with the heliograph) on the hour.
- STOP at midnight, and sleep.

SEARCHING

PARTY CHIEF / PARTY MANAGER/HSEA IN CAMP TO CO ORDINATE ALL MAN LOST ACTIVITIES

- A Man Lost Situation occurs automatically when any person is no tified as being overdue by VJM, back in camp, or at his destination.

- Before commencing a search, it is imperative to check thoroughly the base camp to ensure that the missing party has not arrived. If possible, any likely alternative destinations should be checked out.
- CONTRACTOR Islamabad Office must be informed, day or night, if a Man Lost Situation exists.

DAYLIGHT SEARCH

- The destination and planned route are to be ascertained from the Journey Management Board. Planning should start at once to identify and search the most likely areas.
- Search vehicles are to be prepared.
- There must be two people in eac h vehicle and pre departure checks must ensure that:

  1. Fuel tanks are full

  2. Water tanks are full

  3. You have a good spare wheel and tools

  4. You have Maps and a GPS navigator

  5. You have a working radio

- A common radio frequency must be established and made known to all personnel involved in the search. Select the channel most likely to be used by the lost party.
- The controller must appoint one pe rson (maybe himself) to maintain a radio and telephone watch.
- A written Log of all activities, messages, decisions, and timings must be kept by the controller from the outset. A fifteen (15) minute call schedule must be maintained between search vehicles and the controller.
- An initial search should follow the lost person's route as noted on the Journey Management Register. If sufficient light remains, a search of all known roads and tracks in the area should be made.
- At dusk the vehicles will either return to camp or commence night search procedures, at the discretion of the P.C. or controller.

NIGHT SEARCH:

- A night search will be conducted at the sole discretion of the Party Chief.

DO NOT SEARCH IN DUNE AREAS IN THE DARK – IT IS HIGHLY DANGEROUS

- Factors affecting the decision on whether to conduct a night search include:

  6. The urgency of the search. Whether there is reason to believe that the lost party is injured.

7. The general type of terrain. Sand dunes or rough rocky areas in itially present unacceptable safety hazards at night.

- If a night search is to be launched, the vehicle preparations are the same as for a daylight search, but additionally:

8. Only the most experienced sta ff from survey department is to participate, and they should be familiar with the whole area to be searched.

9. Flashlights must be carried, and the vehicle should also carry a couple of blankets if there is the poss ibility or getting stuck.

- The controller should consider calling off the night search if the weather or terrain are causing problems for the search parties.
- Each vehicle must be stationary every hour on the hour in order to look for signals from the missing party.
- Close the highest piece of ground a few minutes before the hour. Stop and douse the lights in order to maximize night vision.
- A night search should not continue past 23.00 hours and the aim should be to have all search vehicles back in camp before midnight.

FIRST FULL DAY SEARCH

- The lost party may now be overdue by 18 hours. This is an extre mely serious emergency, and every available resource must be made available to locate the missing party.
- CONTRACTOR Islamabad Office must be kept informed of the search and any progress.
- All crew personnel must be involved in the search. Outside agencies must also be considered to help with the search.
- With the assistance of a surveyor, the controller must calculat e the theoretical range of the lost vehicle and use this distance as the radius of a circle centered on the point of origin of the lost party. The circle must be divided into sections and thoroughly searched.
- All tracks and water sources must be checked, and inquiries mad e of local inhabitants.
- If the lost party is not found, the search will continue until instructed to do otherwise by CONTRACTOR management.
- Refer to the emergency contacts for a listing of all relevant phone numbers and contacts.

WEATHER CONTINGENCY PLAN

In case of severe weather conditions the following precautions will be taken:

FOG

- No one shall leave the camp until the PC has assessed the situation and is satisfied that the visibility is such that driving will not be hazardous. All vehicles will travel with headlights on until the fog has completely cleared.

- Vehicles will travel in convoy if necessary.
- Should you be driving in the field when fog descends, you should stop and switch your headlights on. Remain stationary with your engine running. Do not attempt to drive to your destination especially in uneven terrain as disorientation is a possibility. Call base camp to inform them of your late arrival and present location

HEAVY RAIN

Driving in the rain calls for extra care and driving skills. The roads will be slippery, and acceleration and braking must be made gently. Reduce your speed and be aware of other road users. Should the rain be heavy enough to impair your vision, you should pull off the road in a safe location and wait for the weather to pass. Call base camp to inform them of your late arrival and present location.

WINDSTORM

Visibility will be seriously im paired, and disorientation is a possibility. Take care exiting the vehicle as the strong wind could blow the door out of your grasp. Call base camp to inform them of your late arrival and present location. If contact is not possible, the Man Lost situation may be started under the direction of the PC / APC

FIELD OPERATIONS

In all severe weather conditions the senior observer will decide upon the best course of action for the line crew and trouble shooters. Should the situation dictate, production will be stopped and personnel ordered to take shelter. Department heads will co-ordinate with their field units to decide upon the safest course of action.

All vehicles standing by on weather should call base camp and inform them of their status and position.

HEAVY RAIN & FLOODING

Excessive or “heavy” rainfall in an area over several days substantially increases the risk of loss or damage to both personnel and equipment. Heavy rainfall can result in flooding and mud slides.

Flash Floods

Flash flooding is the number one cause of deaths from naturally occurring phenomena - rain!

Personnel should ensure that they stay away from electrical installations during rains.

FLOODING PROCEDURE

In the event of flooding the following procedures shall be foll owed:

- If heavy rain is considered to be imminent, withdrawal to the camp location by all personnel shall be considered.
- Keep all vehicles fueled so that evacuation can be conducted without delay.
- If a flash flood warning is issued in your area immediately cease all operations and move to higher ground.
- If you come upon floodwater, STOP, TURN AROUND AND GO ANOTHER WAY. Never try to walk, swim or drive through swift water. Even six (6) inches of fast-moving floodwater can knock you off your feet and remember a depth of two (2) feet will float vehicles!
- If personnel become cut off from camp by flood waters, they shall move to high ground and notify camp via radio immediately. If safe to do so, shelter may be considered at a local CLIENT Facility.
- Should the lives of camp personnel become endangered due to serious camp flooding, the Party Chief shall instruct personnel to vacate to a designated area.
- The Party Chief shall keep CONTRACTOR Head Office and CLIENT informed of the situation and request assistance when required.

Flood Evacuation

PURPOSE*:*

- To evacuate to safety all personnel who would be at risk in th e work area in the event of flooding.

RESPONSIBILITY:

- Supervisors and Foremen working in the field are responsible for reporting deteriorating weather conditions. The Party Chief/PM is responsible for ensuring that all personnel at risk from flooding are evacuated safely.

SCOPE:

Flood Evacuation Procedure.

ORGANISATIONAL UNITS AFFECTED:

All units

Priority-I: Foremost goal must be to protect/save lives of the employees/human beings during flooding/excessive rains

Priority-II : The second priority after the lives must be assets/equipment's/vehicles of the organization

PROCEDURE:

- In the event of flooding the following procedures shall be followed:

- The Party Chief shall keep CONTRACTOR Base office and CLIENT informed of the situation and r equest assistance when required.

  a) At the first sign of inclement weather, supervisors and fore men shall inform their direct Supervisor , who in turn shall inform the Pa rty Chief.

  b) The Party Chief shall inform all departments and may request a further weather forecast from the local CLIENT facility or CONTRACTOR Operations Head Office.

  c) Designated area selected for the crew personnel where evacuees may be accommodated must be safe from floods and communicated to all the crew personnel in advance.

PRECAUTIONS

- Camp Administration should ensure that enough dry food supplies for at least seven days must be available at the crew food store.
- Weather forecast must be monitored through some reliable sites and communicated to all the Line Managers regularly.
- Crew Doctor to keep enough medicines for the purpose of skin allergies and snake bite must be available at the site to counter emergencies.
- The crew should keep sufficient funds available to pay-off the crew employees on time during the floods.
- Responsibilities of the Key Personnel before, during and after heavy rains/flood:
- Party Chief/PM: will be the overall in charge of the crisis management team and will be the authority to decide all the actions and communicate with the clients and head offices.
- Line Supervisors: will report directly to Party Chief and will get updates and guidance from time to time. All the line supervisors will be responsible for their subordinates.
- HSE Advisor: will communicate the evacuat ion plan to all the crew members and will give advice on safety issues and the risks related to rains/flooding to all the crew members especially drivers.
- Crew Administrator/Camp Boss: will ensure that the POB available must be provided with best possible welfare facilities
- Crew Doctor/Medics: will be in a state of emergency and highly alert along with enough medicine available for GIT, infectious & communicable diseases.
- Radio Room/Radio Operator: will communicate all the updates of rains/floods from the field and camp and report directly to Party Chief. He will be in continuous communication with the field crews.
- Electrician: will ensure that all the electric al equipment's are in working condition and shock free in waters and must be alert all the ti me.
- Vehicle Supervisor: will ensure that all the vehicles are evacuated to a safe place outside and parked on the right place along with right parking without halting roads for the local communities and loc al traffic.

- Mechanics: will ensure that all their emergency equipment/tools e.g. tow chains etc. are in place.
- Security Supervisor: will ensure that the security must keep eyes on the security situation and keep on the field camp and also on the place where the evacuees will be stayed. They will also ensure that all the crew employees and the assets/equipments are safe

FIELD OPERATIONS

In all severe weather conditions, the senior observer will decide upon the best course of action for the line crew and trouble shooters. Should the situation dictate, production will be stopped and personnel ordered to take shelter Department heads will co-ordinate with their field units to decide upon the safest course of action.

All vehicles standing by on weather should call base camp and inform them of their status and position.

EMERGENCY SPILL PROCEDURE

STOP THE FLOW AS SOON AS POSSIBLE

Use any safe, practical means at your disposal. Remember to lo cate and check the operation of all valves daily. Remember that every gallon you keep from leaking is one less to clean up later.

CONTAIN THE SPILL IN THE SMALLEST POSSIBLE AREA

Sound judgment is the key to good containment. Keep in mind th at other regulatory agencies have very definite ideas about what you can or cannot do with the natural resources around the fuel site If you use th e material around the spill to create a dike, be sure that it can be restored to its original condition after clean up is complete.

REPORT THE SPILL THROUGH THE PROPER CHANNELS AND INITIATE CLEAN-UP PROCEDURES

Prompt, accurate reporting is imperative and should be done as soon as possible after discovery of the spill. If the spill is minor a nd the clean up is obvious you should go ahead but if a major spill occurs you should stand by for detailed instructions. Remember that disposal of waste created by clean up has to be taken care of properly and not left to create anot her problem. In some cases, this may require evacuation of the waste to a suitable site designated by the authorities. In conclusion, you must do ever ything possible to prevent a spill but if one does happen you should STOP THE FLOW , CONTAIN THE MATERIAL and REPORT THE INCIDENT through proper channels, AND CLEAN IT UP .

Man overboard response plan

General

AS SOON AS PEOPLE ARE ON BOARD OF A BOAT - WHETHER THEY CAN SWIM OR NOT- THERE IS A RISK OF DROWNING.

At least one member of the boat crew must be capable of first aid and trained for overboard rescue and retrieval. *THE MOB AND DROWNING PREV ENTION BEGINS FROM A STRICT DISCIPLINE ON BOARD*.

Passengers must remain seated and never move from their assigne d position on board. Life jackets must be worn and a ttached before embarkation (pass engers and crew). All personnel boarding a boat must be given the necessary HSE a nd job related training thus being familiar with some *BASIC PRINCIPLES FOR SURVIVAL IN THE WATER:*

- Unless very close to the jetty or some safe place, any individ ual falls overboard / in the water must try to maintain his position.
- A MOB must never try to fight the current as this will tire the individual out and reduce the chances of survival. An experienced swimmer can scarcely swim at more than a knot and a one knot current is a weak one. SWIM ONLY IF VITAL.
- Any non-swimmer who falls in t the water must remember: The huma n body tends to float even in fresh water. So, if there are no floating objects nearby to hold onto, the individual must just float.
- A MOB must ATTRACT ATTENTION by shouting, blowing the whistle on the life jacket, keep an arm raised above his head if there are waves et c. DO NOT PANIC.
- A MOB must attempt to conserve BODY HEAT by going into the huddle position with knees drawn up, arms by the side and wrapped around the knees. If there is more than one person, up to ten people can link arms and adopt the huddle position.

Action to be taken by the boat

The first crew member sees a man falling overboard will be designated as the “spotter”. He will immediately shout “MAN O VER BOARD” to alert all personnel and throw the MOB ring to the person in the water. The Spotter must monitor the position of the man in the water at all times (keeps a finger pointed at the location of the victim).

CALL FOR ASSISTANCE (SUPPORT BOAT).

No other crew member will get into the water until help is avai lable from another boat and the rescue is coordinated. If retrieving the person by the crew other than the support boat, make the approach placing the individual with the bow pointing into current. Arriving next to the person in the water, the engines must be cut off until the person is retrieved. Any man falling overboard must be examined by medical personnel upon returning to base camp. MOB must not be left on his own until fully recovered. Resuscitation of a drowned person: Stretch the victim out on a fi rm flat surface, clear the respir atory air ways and apply artificial respiration.

The coxswain will advise all boat passengers and request assist ance from boat team members.

Note: It is necessary for the cable ch ief or drilling supervisor to s end a boat to travel to the location to assist, as it may be that the two remaining crewmembers have difficulty retrieving the casualty from the water.

This difficulty might be due to

- river and weather conditions
- the nature of the injuries
- the size and weight of the casualty
- the strength (or lack of) of the crewmembers
- one of the crew members may have received an injury in the inc ident
- one of the crew members may be upset and "panicky" and be able to provide only limited help

In the event there are two crew members in the water the problem of recovery by one person might prove to be impossible.

General duties

Coxswain

- Be responsible for the safe operation of the rescue boat
- Will keep on site supervisor advised
- Will assist with the recovery of the casualty from the water

Assistant of coxswain

- Initially acts as lookout
- Pinpoints casualty position in the water
- Establishes verbal contact with casualty (if conscious) and gathers information
- Ensures coxswain is kept advised
- Will take hold and secure the casualty
- Will assess the situation relating to condition of the casualty

Method of Recovery

The method of recovery in all i nstances will be dictated largel y by the circumstances encountered and equipment on hand. Determining factors such as weather and river state, the risk o f fire and the physical state of the casualty must be taken into account.

The degrees of urgency are also factors to consider.

Positioning the boat

- Avoid the situation where the boat may be blown down onto and over the casualty
- Approach the casualty from a position heading into the wind

- Start initial approach about 5-7 boat lengths distant
- Be at slowest steerage speed at a bout 2 boat lengths distant
- Alter course to approach alongside
- Stop alongside and secure the casualty

Recovery of Man Overboard

Three recognized methods of recovery are:

Vertical Recovery

Where a degree of urgency is required, or conditions do not allow for other means of recovery e.g. the casualty is face down in the water and you suspect breathing has stopped.

This method is best achieved by two persons.

Depending upon physical size of the casualty it may be difficult for the two crewmembers to lift him directly onto the sponson.

In this case it may be helpful by “bobbing” the MOB underwater momentarily in order that they gain some upward momentum prior to lifting.

- Position the casualty in such a way that his back is towards the sponson allowing his legs to rise to the surface
- Firmly hold both arms under the armpit and by the wrists; haul the casualty onto the sponson
- Move the casualty to a position along the inside of sponson, head aft, and hold secure
- If necessary First Aid can commence immediately e.g. check air way, start CPR
- Lower the casualty carefully to the deck to further investigate and treat injuries appropriately
- Notify the supervisor of the recovery

Horizontal Recovery with rope of life ring

Where injury is obviously not life threatening and weather conditions allow, a horizontal means of recovery is preferred.

Shout "man overboard" on the wind and designate a crew member to spot and point to the victim’s position in the water. The spotter should not take his eyes off the victim.

Provide immediate flotation. Throw buoyant object such as life rings and so on. This object may not only come to the aid of the victim but will "litter the water" where he went overboard and help your spotter to keep him in view. The rope can be used in either a rolling or straight lift action as appropriate to the degree of injury.

Assisted Lift

- To be used in cases where the rescue boat crew determines the survivor is fit and willing to board the rescue boat by himself
- To avoid chance of injury the cr ew will assist th e survivor as required

MOB back on Board

Once on board, First Aid treatment should be administered as far as possible and the condition of the casualty reported to base camp Doctor, so that preparations can be made. The casualty should be kept warm and monitored for signs of shock. More examinations and (if appropriate) MEDEVAC arrangements should be made on board ship

Be aware of "post rescue" collapse. This occurs when a casualty relaxes following rescue. Casualties can often suffer heart attacks immediately after being pulled out from the water.

First aid for drowning Rescue

ANNEX-IV: EXPLOSIVE STORAGE AND HANDLING PROCEDURE

Title: Magazine Entrance procedure

Application: Magazine Accountant & Loading Crew

Purpose

To ensure the safety of personnel that visits the Explosive sto rage area and the rules implementation for magazine area.

Scope

This document describes the curr ent policy and practice of BGP (Pakistan)

PPE & Other Requirements

Any person entering Magazine camp must have the following perso nal protection equipment:-

- Anti-static clothes
- Footwear with good soles
- Magazine Pass

Procedure for Visitors:

- Any visitor going to magazine ca mp will be given Magazine pass from HSE Office.
- On Arrival at Magazine camp Magaz ine pass is provided to securi ty staff for authorisation.
- Security staff will enter the na me in security record register.
- All metallic & prohibited items(Jewelery,Watch,Mobile,Belt and any other metallic or material having ignition potential) is kept at main security re ception.
- Security staff will scan the body by metallic scanner.
- Security staff will allow visito r under supervision of Magazine accountant.
- Gate will be locked after entrance by security.
- Visitors have to release static charge by touching anti static p ole and dip shoes in water pot for static charge removal befo re entering in storage area.
- Only Three persons at one time are allowed in storage area.
- While coming outside Security st aff will scan and check the vis itors properly.
- After visit security staff will lock the magazine entrance.
- Signature for the visit is kept by security staff and magazine pass is returned.

Procedure for Explosive Handlers:

- Authorized person list signed by party chief is provided to sec urity staff.
- Security staff checks persons according to the list.
- Only authorized persons are allowed under supervision of Magazi ne accountant.
- Workers have to release static c harge by touching anti static p ole and dip shoes in water pot for static charge removal befo re entering in storage area.

Title: Explosive Issuance & Return Procedure Section: Explosives

Application: Magazine Accountant & Loading Crew

PURPOSE:

To outline the basic requirements for the proper issuance and r eturning of Explosive and to keep the record properly.

SCOPE:

This document describes the current policy and practice of BGP, Pakistan.

ORGANIZATIONAL UNITS AFFECTED:

Magazine staff & Loading crew

PROCEDURE:

- Magazine Accountant will receive Explosive and Detonator stock form Biafo industries truck after counting & cross check with the letter provided.
- Chief geophysicist will cross check the letter and the amount o f explosive received.
- For Daily Usage Magazine accountant will issue explosive as per field requirement to Laoding Foreman.
- Each Loading Foreman has two Veh icls.One for Dynamite & other f or Detonator.
- Magazine accountant will note all details and quantity issued t o Laoding Foreman in his record register.
- Loading Foreman will issue to loading Foreman on Line and maint ain the record as per the format.
- After field work completion Laoding Foreman will return the rem aining to Magazine and Magazine accountant will update the returning record.
- Record will be maintained in Magazine accountant Register.
- Daily Usage Report of Explosive is submitted to Geo Office at e nd of Day Shift.
- Chief Geophysicist cross check the quantity and usage in Field area.
- Chief Geophysicist Cross check the record on random basis.

RECORD FOTMATS:

- Record is maintained on the below attached formats.

Title: Explosive Misfire Procedure

Section: Explosives ***Application: Shooters***

MISFIRE PROCEDURE

To ensure the safety of personnel in the event of a primed char ge failing to expl ode when fired.

GENERAL INFORMATION

Definition of a Misfire

A shot shall be deemed a misfire if it fails to explode when th e shot has been taken once while using the correct blaster unit and shooting procedure.

Misfire Prevention

Most misfires occur as a result of a faulty firing circuit. They can be avoided by following correct pre-loading and shooting procedures. It is better to prevent a misfire by following correct procedu res than to have to implement this misfire procedure.

Every effort must be made to avoid misfires by carefully follow ing the correct pre-loading Procedures. Charges must be completely screwed together with no gaps between charges, and caps completely seated within the detonator well.

Continuity testing must be carried out before the charges are connected to the Firing line.

Misfires occasionally result because of defective explosive cha rges but this is very rare.

If a shot fails to fire it must always be assumed that it is dangerous, and an uncontrolled detonation could occur at any time within 5 minutes of the shot being fired from the blaster unit.

In the event of a misfire the following procedure must be follo wed.

MISFIRE HANDLING

1. Disconnect the firing line from the blaster and short the wi res together.
2. Inform the observer.
3. Wait 5 minutes.
4. The circuit should then be tested, using a safety galvanomet er. It is most important that all testing is done from a safe place (preferably the firing point) and that all pe rsonnel are safe from any possible explosion which might occur during testing.
5. If a fault is discovered, one person may then approach the s hot point and check the connections between the firing line and the detonator leads, and remedy any defect found. The firing line must remain disconnected from the bla ster unit while p ersonnel are i n the shot point area. It must be shorted at all times.

6. Keep the shot point areas clear except for the person conduc ting the firing circuit test.
7. When the circuit has been tested and the shot point area is clear of all personnel, a further attempt to fire the shot can be made. Connect the firing line to the blast er unit and follow normal shooting procedures. No one is allowed to approach a misfired shot at this time.
8. If there is still a misfire, the shooter must inform the obs erver and again disconnect the firing line from the blaster unit and short the wires together.
9. The shooting crew must then wait for 30 minutes.
10. After 30 minutes have passed the shooter must ensure that the detonator wires are cut as deep down the hole as is possible and covered. The charge must be le ft to deteriorate naturally. No attempt must be made to recover the charge.
11. The observer must inform the party chief of the location of the misfire.
12. The party chief must ensure that the client and any local authorities are informed of the misfire. Any legal requirements of the country of operation must be observed to ensure the mis fire location is properly marked and fenced off. Any warning signs or barriers a s required by law must also be posted around the misfire location.

Observers must maintain a record of all misfires . Information r equired is as follows:

a. Location of the shot
b. Depth of charge
c. Type of explosive
d. Charge size
e. Date and time of misfire

All misfires must be treated with the greatest care, and only t rained, experienced, conscientious and careful personnel may deal with them. No one is allowed to approach a m isfired shot until a period of at least five minutes has elapsed in the case of electrical shot firing and n ot less than 30 minutes in the case of shots fired by safety fuse. Until such time as the misfire has been remedied, no drilling o r any other work may be carried out in the vicinity of the misfire.

PRINCIPAL CAUSES OF MISFIRES

The principal causes of misfires during electric shot firing ar e as follows:

1. Current Leakage - Although a blaster unit of sufficient capacity must always be u sed, damp or wet conditions may cause current leak age to earth or a short across connections. This may result in insufficient current passing through some of the detonators, th ereby giving rise to misfires. This fault can be eliminated by covering al l joints with jo int insulators, and by taking care to keep the joints dry and well away from strata or metallic objects. This applies especially to uphole harnesses .
2. The Firing Line - The firing line must always be checked before shooting commence s. It is sometimes possible for the firing line to get damaged if a shot blows out. If this occurs, a careful inspection must be made in order to rectify any bared or broken wires before it is used again. Check the firing line every morning and at any time there is a blow o ut.

The shooter must ensure that only two wires are present in the firing line. Excess wires must be cut off if geophone cable is used to make a firing line.

3. Incorrect Operation of the Blaster – Ensure the correct procedure (shooting procedure) for blaster operation is followed.
4. Incorrectly Connected Circuits - If care is not taken to keep connections separated, a detonator may be short circuited and will misfire. In addition, if the fi ring circuit is not tested, loose or dirty connections may introduce high resistance es that will pass undet ected and cause a misfire. In very large patterns, detonators may be mistakenly omitted from the c ircuit, and occasionally some detonators may be connected together in a closed circuit and no t included in the main circuit. *These errors can be avoided by careful and systematic checking of all connections.*

Title: Explosive Storage Procedure

Section: Explosives ***Application: Loaders & Shooters***

PURPOSE:

The purpose of this procedure is to provide guidance with the entire necessary requirement for constructing magazines, receiving and storing explosive materials.

ORGANIZATIONAL UNITS AFFECTED:

Crew management, geophysical department and explosives handlers .

POLICY:

Explosive Magazine Design and Construction.

- Approval from the relevant authority (License & local NOC) shal l be obtained prior to construction of the magazines.
- The location of the magazine shall be away from buildings or an y area to which the public has access. Full advantage should be taken of the natural features for protectio n in the event of an explosion, e.g. heavily wooded area, hills, banks, etc.
- The magazine complex shall be fenced off to prevent unauthorized entry.
- Explosives and detonators shall be stored in segregated locatio ns.
- The Magazines shall be free of natural hazards such as trees, o verhanging rocks, rain flooded rivers, rock sliding areas etc.
- Storage pits will be: -
    a. Buried in the ground.
    b. Constructed from solid material – cement block work. Or Containers with woodwork from inside.
    c. Built to large enough dimensions to ensure there is room for th e safe storage of the material.
    d. Freely ventilated to prevent degradation of explosives.
    e. Appropriately protected from the weather.
    f. So designed as to prevent anybod y from dropping anything into t he magazine.
    g. Lockable: -
    - Main gate in the outer perimeter fence.
    - Gate in the inner perimeter fence.
    - Doors into the magazines
- Signs warning not to use radios within the required distance of the store are to be posted.
- Adequately earthed lighting conductor shall be fitted.

Storage Procedures

- The magazines will not be filled with any explosive materials u ntil the license and local NOC has been obtained.
- Under no circumstances will the explosive stock exceed the lice nsed storage limits.
- Explosives shall be stored off the ground on sound pallets.
- Explosives shall be put in shelves or stacked in piles (interla ced in a brickwork manner) to a height of not more than 2 meters and well clear (5 inches minimum) from the walls.
- There shall not be material othe r than explosives stored in or around the magazine.
- No energy sources such as matche s, cigarettes, naked fire, batt eries, radios, cameras, video recorder, fuel, etc. in the immediate vicinity of the explosive's magazine.
- There shall be fire extinguishers available in the store, to fi ght an external fire.
- Waste paper, empty explosives boxes and similar material shall not be allowed in the store area. Repackaging of explosives shall be done outside the magazine.
- The storage rules and procedures should be posted in the store.
- Appropriately trained magazine accountant shall be placed twenty- four hour a day.
- A proper number of armed securit y people shall be deployed at t he magazine area at all times. These people shall also be trained on the storage rules and procedures.
- Personnel entering the storage area shall wear "Explosive Magaz ine Pass" at all times. Personnel without this Pass on will not be allowed to enter.
- Proper reliable communication to the crew's office to raise the alarm in case of emergency shall be made available to the magazine accountant or security personnel.
- Proper lighting shall be provided in the magazine area for the security people to detect any trespassers trying to sneak in the storage area at night.

Record Keeping, Distribution and Handling:

- Explosives shall be used in the order in which they are deliver ed so that old dated stocks are not allowed to accumulate.
- If any explosives have been present in a magazine for more than three months, a weekly inspection for deterioration of the explosives shall be done by the accountant and the geophysicist in charge of the magazine.
- A written record of all explosiv es received, issued and returne d to the magazines shall be maintained properly and to be inspected by the geophysicist in charge on a weekly basis .
- Contaminated or damaged explosives shall be disposed of under t he strict supervision of the geophysicist & HSE Staff.

Title: Explosive Transportation Procedure

Section: Explosives ***Application: Loaders & Shooters***

PURPOSE:

To outline the basic requirements for transporting explosive ma terials during the course of operation.

ORGANIZATIONAL UNITS AFFECTED:

Crew management and explosives vehicle drivers.

POLICY:

- Transport of explosives shall comply with local / government re gulations governing the movement of explosives at all times and they will obtain a valid license for transportation of expl osives along with “E Form” and a route map of the area.
- Are vehicles used in the transport of the explosives shall be m echanically well maintained.
- All vehicles used for explosives transport shall be diesel powe red (not petrol) and dedicated to this purpose.
- The driver of the explosives vehicle shall be trained in explos ives handling.
- Are all parts of the vehicle in contact with the explosive load constructed or covered with a non-sparking material.
- When an open body vehicle is used for road transport of the exp losives, the explosives are to be covered with a water resistant tarpaulin, or put in well designed and made woo den boxes with padlocks. The wooden container shall have a security fitted lid and securely fastened to the b ed of the vehicle.
- Each vehicle shall have a “Danger- Explosives” sign or suitable indication of a dangerous load.
- A proper static chain shall be installed. It should be attached to the metallic part on the chassis of the vehicle.
- A Red Flag will also be fitted at the top of the vehicle body f or easy identification of the explosive vehicle.
- Each vehicle shall be properly equipped with at least one fire- fighting extinguisher in a proper easily accessible location, a shovel and a First Aid Box.
- Radio / Transmitters are not allowed to be fixed inside the Exp losive Vehicles.
- The driver of explosives vehicle shall know the purpose of the fire extinguisher on his vehicle (to fight fire outside, NOT to fight an explosives fire).
- Explosives and detonators are to be transported in separate veh icles. Small quantities of explosives and detonators for LVL operation can be carried in one vehicle but they shall be contained in separate lockable wooden boxes and segregated properly.

- Each vehicle shall carry a security guard to ensure that the ve hicle is protected and will never be left unattended.
- Other vehicles standards will also be implemented on explosive vehicles.
- Explosives vehicles must not refuel or enter a workshop for ser vice when they have explosives carried on.

In- Field Transportation and Distribution

- Site carriage containers shall be appropriately constructed and used:
    a. They shall be constructed of non-ferrous material such as leather, moulded rubber, wood or reinforced canvas.
    b. They shall be sealed and lined to prevent entry of water and dust.
    c. Locks, rivets, etc. shall be made of brass and suitably protect ed from direct contact with explosives.
    d. Plastic containers of any descri ption shall be strictly prohibi ted for the transportation or carriage of detonators.
- Explosives fitted with detonators shall never be carried or tra nsported.
- Explosives and detonators shall always be carried in separate c ontainers.
- Explosives handlers shall carry a book to record the quantities of explosives stored and distributed.

Title: Explosive Shooting Procedure

Section: Explosives ***Application: Loaders & Shooters***

Purpose

To ensure the safety of personnel at the shot points and elimin ate misfires caused by incorrect connection of detonators/ firing lines and blasters.

ORGANISATIONAL UNITS AFFECTED

Observers and shooting personnel.

PPE Requirements

All shooters and helpers must have the following personal prote ction equipment :-

- Hard hat
- Eye Protection
- Hearing Protection
- Reflective vest
- Gloves
- Footwear with good soles
- Loose fitting clothing

Additional Equipment: Whistles and Flags

The shooter and observer must have a copy of the hole depths and charge sizes, and a table of safe firing distances.

At the start of each day the blaster unit must be tested as follows:-

Communications check with observer

1. Ensure the radio is properly connected
2. Turn the radio on and check operating channel
3. Call the observer and say the following :- “Blaster No # Ready”
4. Turn the switch to the test position as shown and hold it in th at position while the observer sends a tone. Do not release the switch unt il the tone has finished.
5. The observer will inform the shooter if the test is good.
6. When the test is complete shooting can begin

Before Shooting

1. The firing line must not be connected to the blaster until the area is clear and the pattern is ready for shooting. The firing line must be shorted as shown.
2. BEFORE CONNECTING CHARGES, THE SHOOTER AND ALL PERSONNEL MUST ENSURE THEY ARE UPHILL FROM THE SHOT TO BE FIRED. NO PERSONNEL PERSONNEL MUST REMAIN UPHILL FROM THE SHOT POINT WHILE THE SHOT IS FIRED

Connecting charges

A flag must be placed to indicate the shot point or pattern whi ch is going to be fired

On deep hole shots, the detonator wires must be separated and c onnected in series to the firing line as shown by the arrows. When the wires are connected, they should be buried.

Pop Shots

All pop shot charges must be connected in series as illustrated below before the firing line is

connected :-

- bury each connection with

FIRING LINE

The firing line must be shorted at all times until the detonators are ready to be connected.

When the charges are connected, all personnel must get clear of the shot point and make sure that nobody goes near it.

They must stay at least 50 metres from the shot point

When all personnel are clear they will give one loud whistle blast which will tell the shooter that the charge is connected, and the area is clear. All personnel must use hearing and eye protection as well as other PPE items at this time.

Explosives

The shooter will respond with 3 whistle blasts to indicate that he is going to connect the firing line to the blaster.

WHEN THE SHOOTER HAS BLOWN THE WHISTLE 3 TIMES NOBODY MAY GO NE AR THE SHOT POINT UNTIL THE SHOT HAS BEEN FIRED

The person operating the shooting box (“shooter”) is personally responsible for clearing the shooting pattern before connecting the firing line and arming the blaster. He is responsible for keeping it clear until after the shot is fired.

THE SHOOTER MUST BLOW THE WHISTLE 3 TIMES

THE SHOOTER WILL CONNECT THE FIRING LINE TO THE BLASTER WHEN HE IS CERTAIN THAT ALL PERSONNEL ARE AT A SAFE DISTANCE FROM THE SHOT

THE SHOOTER WILL THEN PERFORM A CAP TEST . HE WILL TURN THE SELECTOR TO THE "CAP TEST" POSITION AND CHECK THE READING ON THE OHMMETER TO MAKE SURE THE FIRING CIRCU IT IS GOOD .

THE SHOOTER WILL SWITCH THE BLASTER UNIT TO THE "ARM" POSITION AND HOLD IT THERE WHILE THE OBSERVER SENDS THE TONE TO FIRE THE SHOT . HE MUST NOT RELEASE THE SWITCH UNTIL THE TONE HAS FINISHED AND THE SHOT HAS FIRED .

The shooter will then call the observer and say the following:-

The observer will tell him to "ARM" the blaster unit.

THE SHOOTER WILL REPORT WHEN THE SHOT HAS FIRED.

IF THERE IS THUNDER OR LIGHTNING …….

WHEN THE SHOT HAS FIRED THE SHOOTER WILL SOUND ONE LONG BLAST ON THE WHISTLE TO INDICATE THAT THE SHOT HAS FIRED AND IT IS SAFE TO APPROACH THE SHOT POINT.

HELPERS WILL THEN PULL UP THE CAP

- IF THERE IS A THUNDERSTORM WITHIN 5 KILOMETRES OF THE SHOOTING OPERATION , WORK MUST BE SUSPENDED.
- ALL EXPLOSIVE CONTAINERS MUST BE CLOSED AND PERSONNEL MUST REMAI N AT A SAFE DISTANCE FROM THEM .
- (INCLUDING EXPLOSIVE VEHICLES DRIVERS , IF THERE IS EXPLOSIVE INSIDE THE VEHICLES)
- THE SHOOTERS MUST WAIT FOR AT LEAST 30 MINUTES AFTER THE STORM HAS PASSED BEFORE THE WORK MAY RESUME.