



# ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

## SEISMIC SURVEY IN SHAKARPARIAN AREA, MARGALLA BLOCK



EMC Pakistan Private Limited

MOL PAKISTAN OIL & GAS CO. B.V.



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## ABBREVIATIONS

Acronym	Title
API	American Petroleum Institute
CBD	Convention on Biological Diversity
CCA	Climate Change Act
CO	Carbon Monoxide
dB(A)	Decibels on the A-weighted scale
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMC	EMC Pakistan Pvt. Ltd.
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
EIA	Environmental Impact assessment
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
MPL	Maximum Permissible Levels
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NEQS	National Environmental Quality Standards
NGO	Non-governmental Organization
NO <sub>2</sub>	Nitrogen Dioxide
NOC	No Objection Certificate
NO <sub>X</sub>	Nitrogen Oxides
OGRA	Oil and Gas Regulatory Authority
PEPA	Pakistan Environmental Protection Agency
PM <sub>2.5</sub>	Particulate Matter ≤ 2.5 microns
PM <sub>10</sub>	Particulate Matter ≤ 10 microns
PPE	Personal Protective Equipment
PPEPCA	Pakistan Petroleum Exploration and Production Companies Association
PVC	Polyvinyl Chloride
TDS	Total Dissolved Solids
UNDP	United Nations Development Program
VOC	Volatile Organic Compounds
WHO	World Health Organization

## Executive Summary

This EIA report presents the assessment of the potential environmental impacts of the proposed two-dimensional (2D) and three dimensional (3D) seismic survey in the Shakarparian located in the Margalla Block (the 'Project'). The proposed project comprises acquisition of 3D seismic data in Shakarparian area constituting about 11.4 km<sup>2</sup>.

Seismic surveys are the primary tool utilized during the exploration of hydrocarbons in an area. A seismic survey is conducted by creating an energy wave commonly referred to as a 'seismic wave' on the surface of the ground along a predetermined line, using an energy source i.e., Dynamite or Vibroseis. This wave travels into and through the earth strata, where it is reflected and refracted by various subsurface formations, and returns to the surface where receivers called geophones are used to detect the waves and recorded for analysis. By analyzing the time, it takes for the seismic waves to reflect off subsurface formations and return to the surface, formations can be mapped and potential oil or gas deposits identified. Both dynamite and Vibroseis will be utilized depending upon the topography of the project site for the data acquisition.

The project area falls in Zone III, designated as a protected area, heavily overlapping with the Margalla Hills National Park. Land uses in the area includes recreational, civil infrastructure. The common land uses in the project area include comprises forest and open spaces for recreational uses.

The flora of the project area is mix of scrub vegetation, shrubs, and trees. The project area has a semi-arid to sub-humid continental climate characterized by extreme temperatures, with hot summers (up to 40°C) and cold, mild winters (dropping to 5°C). The area receives significant monsoon rainfall from July to September and light winter rain from western disturbances. Generally, there are two significant yet variable rainfall periods, the summer monsoon, and winter precipitation from December to March, which is crucial for the agricultural season.

Environmental Impact Assessment study has been conducted by EMC Pakistan Pvt. Ltd. in fulfillment of the requirements laid down in Pakistan Environmental Protection Act, 1997. The Pak EPA (Review of IEE and EIA) Regulations, 2000, categorize oil and gas exploration projects in Schedule I (Oil and gas extraction projects including exploration, production, gathering systems, separation and storage) thus requiring an IEE. However, EIA study has been conducted upon the directions of Pak EPA communicated vide EPA letter bearing reference number F. No. 2(1)/2025-EIA-MOLG-Dir (EIA/Mont)/01 dated December 8th, 2025. The proposed project activities will commence after obtaining approval from EPA.

The main objective of EIA study is to assess the potential environmental impacts of the proposed activity and devise suitable mitigation measures to limit the potential negative environmental impacts (if any).

A detailed assessment of project activities was carried out in the EIA study which involved identification of all major and minor impacts from the proposed exploration activities. Mitigation measures have been suggested side by side to manage the impacts that arise. The efficacy of mitigation measures is further enhanced by provision of EMP which provides a comprehensive action plan for implementation of the mitigation measures and monitoring plan.

Scale of impact of exploration activities is mostly small which can be further controlled by implementing the mitigation measures as suggested in the EMP.

Overall assessment of the environmental impacts of the project activities finds that:

- Shakarparian is a sensitive ecosystem and requires careful planning and execution of project activities to protect the wildlife from the proposed activities. Particular emphasize may be made on waste management, and noise management avoiding damages to natural habitat.



- Protection of green cover and vegetation in the area is important and project planning must address this in its layout and designs. 2D and 3D seismic survey designs offer significant flexibility in layout, which enables the execution of exploration activities while protecting green cover and sensitive environments. Modern survey techniques, including "green seismic" technology, are specifically designed to minimize surface impact in forested or environmentally sensitive areas.
- Noise and vibration associated with data acquisition can impact local wildlife, hence planning and project timing is important. The survey schedules need to factor in the breeding, and nesting windows of the local wildlife.
- Land and water contamination from project activities is possible during fuel and chemical handling activities including storage. This is avoidable through careful implementation and monitoring.
- The impact on project area communities is possible during movement and transportation activities. Planning and scheduling of these activities in a sensitive manner can address this issue and prevent undesirable impacts.

The project planning and design needs to ensure that the following environmental and social considerations are taken care of during project execution:

1. Local water sources
2. Local wildlife and biodiversity
3. Vegetation and green cover
4. Drainage pattern
5. Communities and local infrastructure

For effective management of environmental issues, an Environmental Management Plan has been developed for the project. The EMP identifies the specific measures that will be adopted to ensure that the environmental mitigation plans are implemented and also continued compliance with the regulatory requirements and the EIA are achieved. The project would utilize Green Seismic Technology, which is an eco-friendly approach to oil and gas exploration that uses wireless equipment to reduce environmental impact in sensitive, forested, or hard-to-reach areas. It reduces the need for heavy vehicles and clearing access lanes, significantly reducing deforestation. To prevent tree cutting, use of curvilinear, flexible profiles to bypass trees may be considered.

Based on the findings of the environmental assessment, it is reasonable to suggest that the environmental impacts from the proposed seismic survey activities can be managed through EMP and good industry practices such that the impacts would remain within acceptable limits. The Study therefore recommends that the EIA Report may be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management Plan will be followed in letter and spirit.

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**ANNEXURES:**

- Annex-I: Explosive Shooting Procedure
- Annex-II: Emergency Response Plan
- Annex-III: Waste Management Plan



# 1. INTRODUCTION

This Environmental Impact Assessment (EIA) was carried out for the 3D Seismic survey activities in the Shakarparian area of Margalla Block, located in Islamabad. MOL Pakistan Oil & Gas Company B.V. (herein after referred as MOL Pakistan), plans to conduct 2D/3D seismic survey in the Margalla Block, falling within geographical jurisdiction Islamabad Capital Territory.

The environmental assessment was conducted in accordance with the Pakistan Environmental Protection Act, 1997 (PEPA 1997), and specifically the Pakistan Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2000 (S.R.O. 339(1)/2001) issued under Section 33 thereof. This EIA has been conducted to fulfill the statutory obligation for obtaining prior environmental approval from the Pakistan Environmental Protection Agency (Pak-EPA).

This EIA aims to provide assessment of the proposed seismic survey activities in the Margalla Block, to assess the impacts of exploration activities on existing physical, ecological and socioeconomic environment of project area. The main rationale of EIA study is to make sure that:

- Any major undesirable impacts on environment (physical, ecological and socioeconomic) during Exploration Surveying are identified;
- Negative impacts (if any) are correctly addressed and satisfactory mitigation measures are suggested for inclusion in the proposed activities of the project;
- Environmental Management Plan (EMP) is provided for sustainable development and operation of the project;
- Report is submitted to Federal Environmental Protection Agency (Pak EPA) and Environmental Approval is obtained under section 12 of the Pakistan Environmental Protection Act, 1997.

## 1.1. Project Overview

The project comprises 3D Seismic Survey for oil and gas exploration in Shakarparian area of Margalla Block. The 3D seismic survey is a specialized techniques which support in mapping of major structural features (faults, folds), and providing foundational geological insights leading to reservoir characterization, optimizing well placement, identifying subtle features, and increasing drilling success.

The project will build upon the knowledge base of previous seismic survey activities carried out in the past which multiple 2D surveys were carried out in different campaigns since 2008, the most recent one was carried out in 2019. The findings of these surveys will be dovetailed with new seismic survey plans for a more rigorous survey to gather subsurface geological and formations data. The plan is to collect 3D seismic data over 11.4 square kilometers area of Shakarparian.

## 1.2. Project Rationale

Pakistan faces a persistent gap between domestic energy supply and demand, relying heavily on imported oil and liquefied natural gas (LNG) to meet the demand of its power, industrial, transport and household sectors. This dependence exposes the country to volatile international fuel prices and foreign-exchange pressures, contributing to energy shortages, circular debt and constraints on economic growth. Enhancing indigenous exploration and production of hydrocarbons is therefore a strategic national priority, aimed at improving energy security, reducing the import bill and supporting stable, affordable energy for long-term socio-economic development.

Within this context, the proposed seismic survey forms part of the upstream exploration efforts to identify new domestic oil and gas resources. High-quality subsurface seismic data are essential to outline the potential hydrocarbon-bearing formations, understand the structural and stratigraphic framework, and reduce geological uncertainty before committing to costly exploratory drilling. By enabling MOL Pakistan to target the most promising prospects and avoid unnecessary or speculative wells, the survey will improve the efficiency of exploration, lower the environmental footprint per unit of discovered resource, and support evidence-based decisions on whether subsequent drilling and development in the block are justified in technical, economic and environmental terms.

### 1.3. Proponent Brief Profile

MOL Pakistan, an oil and gas company owned by the MOL Group that is known worldwide for mega business ventures in different investment fields, launched its operations in Pakistan in 1999 in the exploration and production sector and has, ever since, made a number of oil and gas discoveries.

MOL Pakistan has working interests in two operated Tal & Margalla and one partner operated Karak Block which is operated by MPCL. MOL has made eleven discoveries in operated and four discoveries in partners operated blocks.

MOL Pakistan is always on the look for opportunities in Exploration and Production (E & P) sector in Pakistan through involvement in Exploration Blocks and acquisition of state owned upstream/downstream opportunities available for privatization. MOL Pakistan sincerely believes that its E & P skill inventory gathered over the period of time can positively contribute towards the self-sustainability of Pakistan's energy needs.

### 1.4. Scope of EIA

The present Environmental Impact Assessment (EIA) shall cover the project activities planned in the Shakarparian area and a portion of the Margalla Hills National Park (MHNP) falling in the planned 3D area of the Margalla Block. Based upon the acquisition and interpretation of seismic data obtained through the project, MOL Pakistan will subsequently plan exploratory and/or development wells at technically and economically viable prospects.

MOL Pakistan is always on the look for further investment opportunities in Exploration and Production (E & P) sector of Pakistan through involvement in further Exploration Blocks and acquisition of state owned upstream/downstream opportunities available for privatization. MOL Pakistan sincerely believes that its E & P skill inventory gathered over the period of time can positively contribute towards the self-sustainability of Pakistan's energy needs. MOL Group is a leading integrated Central Eastern European oil and gas corporation headquartered in Budapest, Hungary. It has operations in over 30 countries and employs 25,000 people worldwide. MOL's exploration and production activities are supported by 80 years' experience in the hydrocarbon field.

Any additional project phases or associated activities such as exploratory or development drilling, laying of pipelines, or establishment of production and processing facilities will be subject to separate environmental assessment (IEE or EIA) as required under the applicable environmental regulations. In the current report, the study evaluates the potential environmental and social impacts arising from the proposed 3D seismic survey activities planned by MOL Pakistan. Detailed description of project and associated activities is provided in Section 2.

## 1.5. Project Categorization

The Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 provide categorization of projects for EIA and IEE based on the expected nature and severity of environmental impacts. Projects with potentially significant and adverse impacts have been listed in Schedule II and the projects with small scale; less adverse impacts have been listed in Schedule I. Projects falling in environmentally sensitive areas are listed in Schedule II as well. For projects not listed in the schedules, EPA can issue directives for EIA or IEE based on the review of nature and potential environmental impacts of the projects.

According to the categorization given in Schedules I and II of the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000, the proposed project falls in Schedule II **Category I: All projects in Environmentally Sensitive Areas.**

Accordingly, this EIA study was carried out in light of the advice of Pak EPA received vide EPA letter number F. No. 2(1)/2025-EIA-MOLG-Dir (EIA/Mont)/01 dated December 8<sup>th</sup>, 2025.

## 1.6. EIA Methodology

The EIA study has adopted the following methodology for conducting risk assessment of the project activities.

### 1.6.1. Understanding the Proposed Project

This step involved collecting information from MOL Pakistan on the proposed project activities and understanding the activities to identify potential impacts from them.

### 1.6.2. Scoping

A scoping exercise was undertaken to identify the potential issues that are to be considered in the environmental impact assessment. The scoping focused on the following key considerations:

- Identification of sensitive receptors in the area
- Potential environmental and social issues associated with the project
- Concerns of the residents regarding the project
- Community expectations regarding the project

### 1.6.3. Review of Legislation and Guidelines

National legislations, international agreements, environmental guidelines, and best industry practices were reviewed to set environmental standards that the proponent will be required to follow during different stages of the project. Environmental Protection Agency Review of Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) Regulations, 2000 used during the study. Review of legislations included but not limited to the following:

- Policies and core environmental legislation directly relevant to the project, such as the Pakistan Environmental Protection Act, 1997 and associated national environmental quality standards (NEQS) for air, water, noise and municipal/industrial effluents, as well as provincial rules where applicable.
- Complementary sectoral legislation governing sustainable management of land, surface and groundwater resources, water quality, atmospheric emissions, biodiversity and protected areas, with particular emphasis on requirements for projects located in or near ecologically sensitive areas.
- Guidelines and standards for environmental assessment in ecologically sensitive areas, including Pakistan EPA's sectoral and general EIA guidelines, multilateral development bank

(e.g. ADB, World Bank) safeguard policies, and relevant international conventions to which Pakistan is a party (e.g. CBD, Ramsar, UNFCCC), where these provide more stringent or more detailed guidance.

- Institutional and administrative arrangements, including identification of all concerned authorities (Federal/Provincial EPAs, Wildlife/Forest Departments, local administration and other line agencies), clarification of their respective roles and responsibilities, and mapping of the IEE/EIA approval process, indicative documentation requirements, and typical processing timelines based on review of official procedures and consultations with the relevant organizations.

#### 1.6.4. Secondary Data Collection

All available published and unpublished information pertaining to the background environment was obtained and reviewed. It included previous environmental studies and environmental baselines conducted for exploration activities in project area. All data sources were reviewed to collect information relevant to physical, biological and socio-economic environment within project area.

#### 1.6.5. Field Data Collection

The environmental profile of the project area was established through secondary data as well as primary data (field surveys). Schedule of field activities is given below:

- Physical Environment Survey: 8<sup>th</sup> Dec, 2025
- Ecological survey: 13<sup>th</sup> till 23<sup>rd</sup> Jan, 2026 (in phases)
- Social survey: 9<sup>th</sup> Jan, 2026

Site visits were conducted periodically during the EIA study. During the site visit, primary information on the physical, biological and socio-economic background conditions of the project area were collected. Environmental conditions of project area were monitored through environmental monitoring of ambient air and water samples were collected to assess water quality of the project area.

Discussions were held with the members of the community resident in the area to collect area-specific primary information along with their views and concerns regarding the project and its activities. The primary data were examined and compared with secondary data available from earlier environmental studies in the region. The scope of survey included collection of information on following key aspects:

1. Baseline data for physical and ecological environment of the Project Area including the following items:
  - Climate
  - Land use
  - Air Quality
  - Noise Quality
  - Topography
  - Soil
  - Seismicity
  - Geomorphology/Geology
  - Hydrology
  - Vegetation
  - Flora and Fauna and habitats
  - Protected areas

2. Baseline data for social environment of the Project Area including the following items:

- Administrative Division
- Demography and Settlement
- Socio-Economic Activities
- Agriculture
- Existing Infrastructure and Social Services
- Social Issues

#### **1.6.6. Screening of Project Alternatives**

Available project options were evaluated to assess their technical feasibility, environmental and social implications, and overall economic viability. This exercise ensures that the proposed option is not selected by default, but is demonstrably preferable to other reasonable ways of achieving the same exploration objectives.

#### **1.6.7. Identification of Aspects**

Identification of environmental aspects and their significance is fundamentally important for determination of severity of incidence of impacts at different stages of the project. This step is aimed at obtaining an inventory of the aspects. The aspects identified during this step cover all activities in order to determine those which have or can have significant impact on the environment.

#### **1.6.8. Impact Identification and Assessment**

Potential impacts which may arise from proposed activities were identified. These include effects on physical, biological, socio-economic, archaeological and cultural environment. Impacts were identified in particular on the wildlife reserve and assessed on the basis of field data collected from project area, secondary data, expert's opinion, and monitoring results of previous oil and gas exploration projects in Pakistan.

#### **1.6.9. 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 project zone of influence. Mitigation measures recommended here are based on past experience, best industrial practices, legislative requirements and professional judgment.

#### **1.6.10. Environmental Management Plan (EMP)**

An environmental management & monitoring plan (EMMP) was developed to oversee the environmental performance of the project and adoption of proposed mitigation measures. A monitoring plan has also been incorporated in the EMMP to monitor impact of all activities and performance of mitigation measures and to identify the residual impact if any, and also the positive/negative changes in the physical, and social environment.

#### **1.6.11. Documentation, Review and Conclusion**

Findings of the EIA study were compiled in the form of this EIA report. The data collected during the study was compiled into sections. Supporting information has been provided as annexures.

## 2. PROJECT DESCRIPTION

### 2.1. Introduction

A detailed description of the project activities is presented in this section including primary and associated activities and related relevant information.

### 2.2. Margalla Block

The Margalla Block (No.3272-20) spans across the Islamabad Capital Territory and extends into the provinces of Punjab and Khyber Pakhtunkhwa, Pakistan. The total area of the Block is 1,847.18 square kilometers. MOL Pakistan is the operator with other JV partners including Pakistan Oilfields Limited (POL) and Mari Petroleum Company Limited (MPCL). The block was granted to MOL Pakistan on November 08, 2006. So far two wells have been drilled in the block, Margalla-1 in 2010 and Tarnol-1 in 2022.

### 2.3. Project Rationale & Objectives

MOL Pakistan has been collecting 2D seismic data since 2008 until 2019 in different areas of Margalla Block. In the current project, MOL Pakistan will be collecting 3D seismic data from the Shakarparian area and a section of the Margalla Hills National Park (MNHP), as shown in Figure 2.1. The project will also re-validate the previous the data collected using 2D technique. The data will be used to formulate future drilling plans to determine the presence of recoverable hydrocarbons.

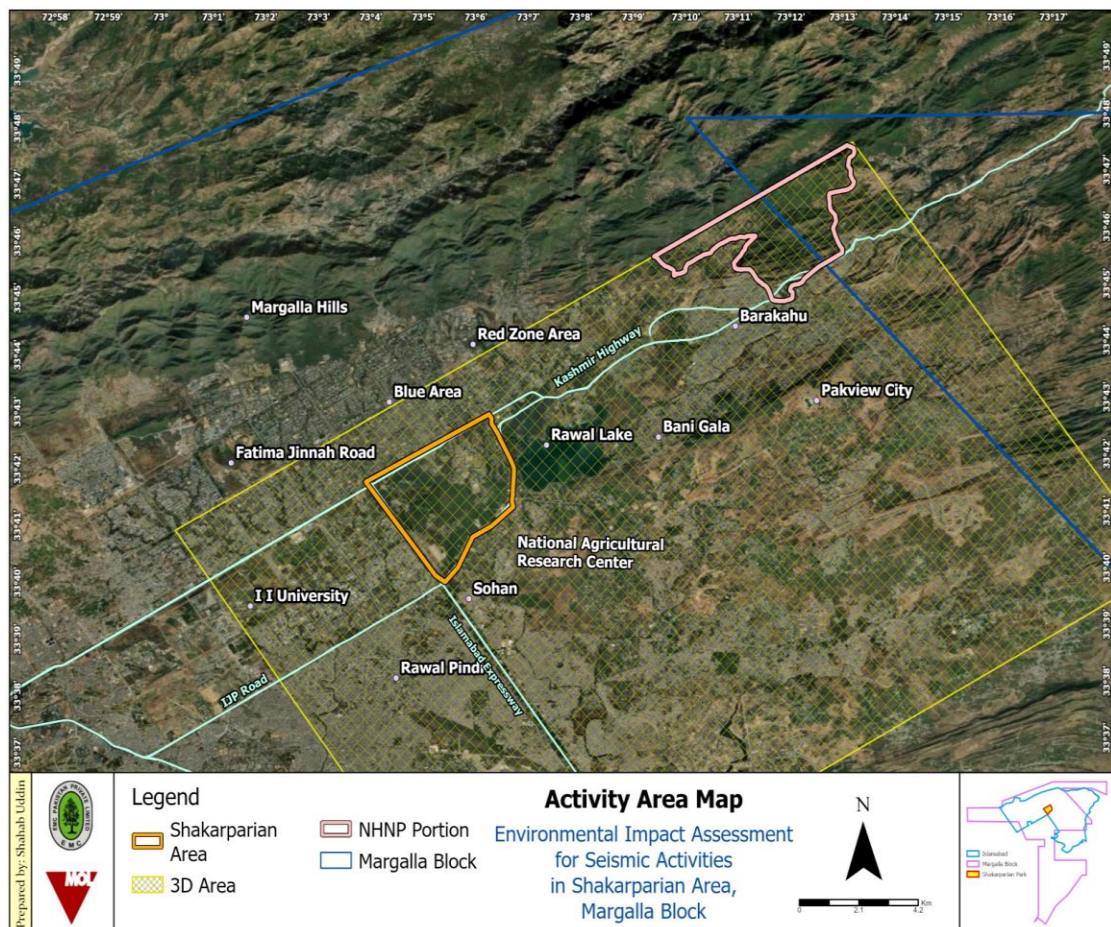


Figure 2.1: 3D Activity Area Map

## 2.4. Project Location

The seismic survey activities will be carried out in the Shakarparian area which is an extension of Margalla Hills National Park (MHNP) along with a portion including a portion of the MHNP falling inside the planned 3D area (11.4km<sup>2</sup>). The Shakarparian was notified as a protected forest in 1980, with estimates indicating a forested area on the 1,376 hectares (≈13.76 km).<sup>1</sup> The area includes Shakarparian Hills, Pakistan Monument and associated parklands and viewpoints, and functions as an important habitat patch and ecological corridor linking the urban core with the broader Margalla Hills ecosystem. Though smaller in size compared to other national parks, its location, accessibility, and cultural significance make it one of the most frequented and cherished urban parks in the country.

## 2.5. Seismic Survey Program

The project plan is to collect 3D seismic data over 11.4km<sup>2</sup> of the Shakarparian area and about 11.7km<sup>2</sup> of the MHNP in the North. Seismic survey is the pursuit for commercially economic subsurface deposits of crude oil, natural gas and minerals by the recording, processing, and interpretation of artificially induced shock waves in the earth. Artificial seismic energy is generated on land by vibratory mechanisms mounted on specialized trucks. Seismic waves reflect and refract off subsurface rock formations and travel back to acoustic receivers called geophones. The travel times (measured in milliseconds) of the returned seismic energy, integrated with existing borehole well information, aid geoscientists in estimating the structure (folding and faulting) and stratigraphy (rock type, depositional environment, and fluid content) of subsurface formations, and determine the location of prospective drilling targets.

Information about subsurface geology is gathered by directing shock waves into the ground and recording the time taken for them to reflect off subsurface rock layers. The shock waves are generated either by detonating dynamite in holes drilled in the ground by surface vibration or by using vibrators which are large movable trucks with a built-in base plate which is lowered to make contact with the ground surface when operational for sending shock wave at controlled frequency. The reflected shock waves are recorded using geophones (sensitive microphones), which are laid out along the area where the vibration takes place. Seismic surveys can be conducted using a number of methods, including deep holes, shallow holes (also referred to as the pop-shot method), surface shots, and truck-mounted vibrators.

In three-dimensional (3D) reflection seismic surveying the sound detectors (numbering up to a thousand or more) are spread out over an area and the sound source is moved from location to location through the area. 3D exploration programs are generally a uniform and evenly spaced grid of lines. Receiver lines containing the recording devices (geophones) usually, but not always, run in a direction perpendicular or diagonal to the source lines. The resultant product can be thought of as a cube of common depth point stacked reflections.

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 (for wired Geophones). A cable is laid to join all geophones (buried just

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<sup>1</sup> <https://crss.pk/shakarparian-forest-the-vital-organ-of-islamabads-ecosystem/>

below the ground) and connect with the recording truck that has the main electronic hardware used to record the data coming from sub-surface. When using wireless geophones, the data is stored within the device and then retrieved on the processing facility on camp after acquiring all data on the field. Approximately 70-80 laborers will be employed for laying and retrieving of cables while 10-15 laborers are required in later case. The primary source of recording instrument will be wireless geophones (nodes) for seismic survey.

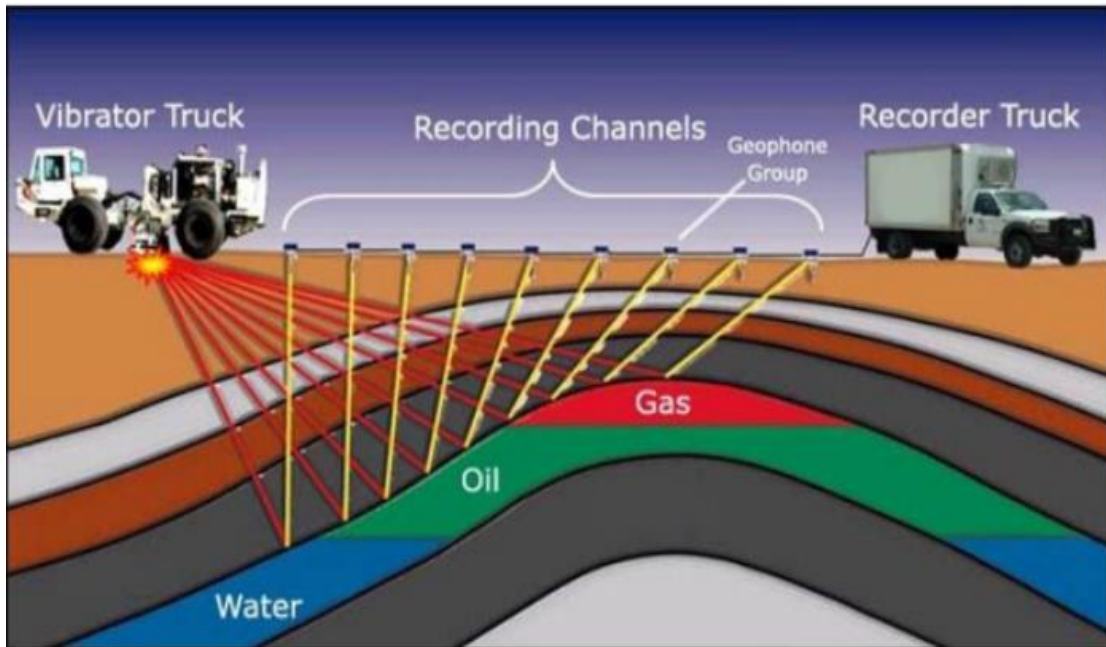


Figure 2.2: Onshore Seismology Using a Vibrator Truck as a Seismic Energy Source<sup>2</sup>

## 2.6. Project Schedule

The field mobilization for the project is expected to take off from second quarter of 2026. The entire operations will take about 10-12 months. The tentative schedule of activities is given below:

S #	Activity	Duration
1	Mobilization	4 weeks
2	Land permitting	2-3 months
3	Site preparation	4-5 weeks
4	Seismic Survey	10-12 months
5	Site restoration	3 weeks
6	Demobilization	3 weeks

## 2.7. Project Activities

The project involves following major and associated activities:

- 3D Seismic Survey Program
- Grid design/layout
- Permitting
- Site preparation and equipment layout
- Data acquisition
- Utilities, supplies and logistics

<sup>2</sup> Source: Adapted from <http://www.cougarlandservices.net/landowner>

- Data processing and interpretation
- Line restoration

These activities are described in more detail in the following sections.

### **2.7.1. Permitting**

Before commencement of work, a permitting team headed by a chief permit man will arrive in the area. The aim is to approach the communities and landowners for temporary land acquisition (permitting) for project works. The team will facilitate the activities such as liaising with local landowners and authorities to inform them of the operation and make necessary arrangements. The permitting team will identify the ownership of the land areas over which the seismic operation will be undertaken. In consultation with the district administration and following agreed rates, compensation will be given to the landowners. During the seismic survey the chief permit man will be the focal point for communication between local inhabitants and seismic survey personnel.

### **2.7.2. Survey and Preparation for 3D area**

For 3D, process begins by defining the survey area, designing the grid (often 25 x 25 m or 12.5 x 25 m cells), and determining the layout of receiver lines and source lines to ensure proper coverage of the target formation. On the selected land, number of geophones are placed, along with seismic sources, with receiver lines often perpendicular or diagonal to source lines. The terrain of Shakarparian National Park consists of low rolling hills, manicured gardens, and patches of native woodland.

### **2.7.3. Data Acquisition**

The seismic survey will be conducted using standard onshore seismic survey operations and procedures. The survey will consist of an array of seismic lines arranged in a grid with lines usually spaced 100-400 m apart.

Two types of techniques, Vibroseis and shothole/pop shots will be utilized for data acquisition depending on the landform, site accessibility, land use, and topography. Vibroseis is often preferred, most common, and dominant method for land seismic data acquisition, particularly for 3D surveys, due to its efficiency, low environmental impact, safety, and operational flexibility. While shot holes (dynamite) are alternate options for areas where heavy Vibroseis trucks cannot operate due to accessibility, topography or geological concerns.

### **2.7.4. Recording**

Sensors record the data, creating a large, 3D volume of raw data. The data is sorted into "common-cell" gathers (bins), where each trace is positioned to pass vertically through the center of a grid cell.

The primary source of recording instrument will be wireless geophones (nodes) for seismic survey. Wireless geophones are remotely connected with the recording truck without any cables with a minimum human footprint. With wireless geophones, the data is stored within the device and then retrieved on the processing facility on camp after acquiring all data on the field. Approximately 10-15 laborers are required when recording through wireless geophones.

### **2.7.5. Demobilization and Site Restoration**

Restoration is done through green teams and later inspected by contractor HSE team and finally by client HSE team. Restoration will include removal of all cables, geophones, station units, flags,

stakes and wastes from the lines. For reference purposes a photographic record of the sites prior to set-up will be taken. The following activities will be carried out for site restoration:

- Demobilization of all equipment and machinery;
- Disposal of any waste material remaining at the time of completion of the operation;
- Dismantling and removal of fence or barriers surrounding the camp area; and
- General restoration of the site area including landscaping and restoration of drainage where required.

### 2.7.6. Data Analysis

After completion of field activities, the collected data is analyzed by a team of experts. The process includes various activities e.g. converting raw field data into desired data format, removing noise (e.g., machinery, wind) and applying filters, and other activities like stacking and migration.

## 2.8. Data Acquisition Techniques

### 2.8.1. Up-holes

Up-holes have different categories, pop shots (shallow drill holes) and deep holes (1.5m to 100m at max). Pop-shots are shallow, low-energy explosions, often conducted near-surface which allow estimation of the thickness and seismic velocity of the weathered zone as well as the sub-weathering velocity.

After completion of drilling, each shot hole will be loaded with approximately 2-6 kg per hole. Expected total number of pop shot holes and the total charge size is subject to seismic designing which is under progress. Explosives will be handled by a loading crew who will be specially trained in the handling, storage, transportation, charging, firing and safety of dynamite. The charges will be carefully inserted into each hole before the cylindrical PVC casing is removed. Each hole will then be backfilled with sand/mud.

For detonation, TOVEX Gel based manufactured by Biafo shall be deployed, which is widely used in surface and underground mining, quarrying, and construction for rock breaking. Tovex is a water-gel, mining-grade explosive designed as a safer, more stable alternative to nitroglycerin-based dynamites. Composed mainly of ammonium nitrate and methylammonium nitrate, it is used extensively in mining for its high-performance shattering and heaving capabilities. Unlike dynamite, Tovex is generally more resistant to shock, friction, and fire, making it safer to transport and handle. Tovex has largely displaced traditional dynamite due to its high detonation velocity. Its jelly-like consistency provides excellent water resistance, thus making it suitable for wet conditions.

Drilling will be done with the help of truck mounted drilling rigs. To ensure stability of the borehole, a water-based bentonite mud will be circulated through the hole. It is estimated that for each hole approximately 4,000 to 8,000 litres of water will be required for the preparation of the bentonite mud. The mud will be prepared in an earthen pit near the hole. A similar pit will be used to store the used mud. After drying the pits along with their contents (bentonite mud and cuttings) will be backfilled.

Once recordings have been made, the majority of the cuttings will be returned to the hole. The cuttings present no risk to the environment in toxicity terms. Excess cuttings at each up-hole, if any, are placed on top of the up-hole and will integrate into the soil over time.

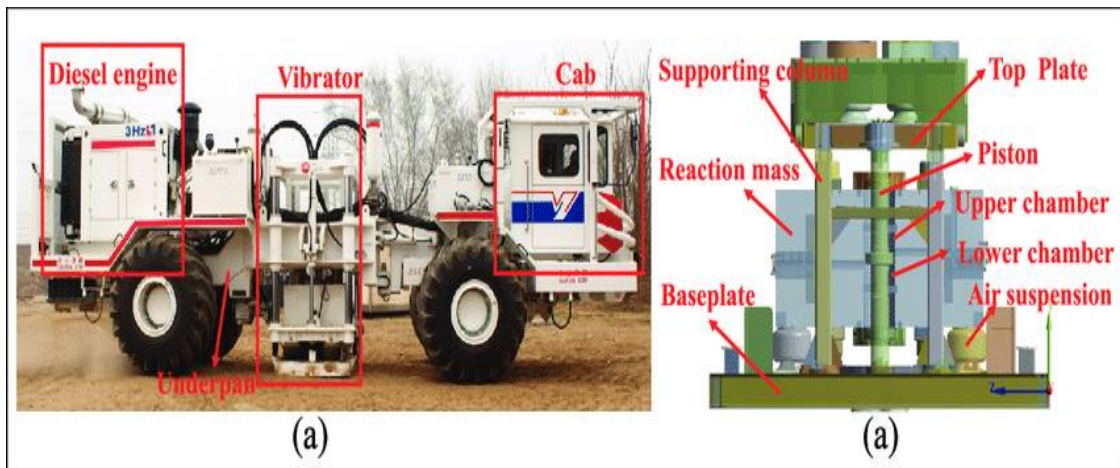


Figure 2.3: Data Acquisition Equipment/Recorder

### 2.8.2. Vibroseis

This technique will make use of vibrators as an energy source. Vibrator consists of a heavy mass attached to a steel plate mounted on a truck. Truck will lower the steel plate to rest on the ground by means of hydraulic jacks. Steel plate will be made to vibrate, creating energy waves that will travel downwards into the earth's surface. Reflected waves will be received on the ground.

Arrangement of cables, geophones and station units will be similar to the arrangement adopted for dynamite. A series of 4 vibrators will follow each other along the line. All 4 vibrators will stop at a point called Vibroseis point, and produce energy waves in the manner described above. With this technique approximately 5-8 km of line can be recorded each day.

### 2.8.3. Equipment

The equipment to be used during a typical seismic survey program and quantity has been mentioned below:

- GPS receivers
- Survey data processing system
- Differential GPS
- Data loggers
- Energy Source
- Dozers (for line clearing)
- Vibrator trucks (energy source)
- Hand-held pneumatic drills with compressors
- Telemetry recording system
- Recording truck
- Cable station units
- Telemetry cables
- Geophone strings and nodes
- Wireless geophones
- Digital grade geophones
- Portable recording system
- Manual energy source
- Down-hole detectors

## 2.8.4. Access and mobility

Shakarparian area has varied and rugged terrain comprising mostly hilly areas and undulating land surfaces. There will be accessibility issues during data acquisition process. In order to avoid tree cutting and site preparation works, pop shots method for data acquisition will be adopted in the area with these constraints. Access to seismic lines will mostly be through existing available tracks. As 4WD vehicles will be used by the project, these tracks can be used without any improvement. Short reaches of new tracks may have to be prepared in rural areas where there is no existing access, however, the preparation of new tracks will be minimized. For seismic surveys, the logistics support generally consists of fuel storage tanker, which generally holds around 8,000 liters of diesel, a water truck and a few light vehicles for food supply.



Wireless Geophones



Geophone with cable



Hydrophone



Vibrator truck

Figure 2.4: Seismic survey equipment

## 2.9. Staffing and Supplies

### 2.9.1. Camps, Staffing and Supplies

Base camp and fly camp will be prepared to house the workforce. The location for seismic base camp is under consideration. It will be positioned strategically in a land having minimum security issues. Considering the sensitive and protected nature of the area area, campsites will not be established in the project area.

For explosives storage, a bulk stock of dynamite will be transported to the project area. This will be stored in a purpose-built explosive storage area called Magazine camp which is setup as per international safety standards, located at a safe distance from communities.

## 2.9.2. Utilities

Water requirement will be for domestic purpose and for pop shot drilling whereas, use of jack robs drilling and Vibroseis operation will not require water.

- Domestic water: Approximately 140,000 liters/day (at the rate of 200 liters per capita per day)
- Mud preparation: 4,000-8,000 liters/up hole

Water will be sourced from existing commercial hydrants at market rates. Water consumption and conservation as per EMP will be managed.

Electricity requirement will be met through self-generation using diesel generators. Two generators of 450kVA power will be utilized for this purpose. Multiple gensets of different capacities will be used as per requirements.

## 2.10. Project Alternatives

### 2.10.1. Business as Usual/No Project Alternative

Seismic surveys for geophysical investigation are necessary to determine the presence of an oil or gas reservoir in the area. Given the benefits to the economy of Pakistan in case of a significant gas discovery, the no project option is not considered a desirable option. The 'No-Project' option, if taken, will prevent from exploring the subsurface for hydrocarbon reserves. The proposed exploration activities offer a chance to move Pakistan's energy balance towards the positive side and decrease the demand and supply gap in the country.

### 2.10.2. Alternative Project Location and Alignment of Survey Lines

Many national and multinational companies, in addition to public sector organizations, are actively engaged in oil and gas exploration activities in different concession areas and exploration sites in Pakistan. The site for oil and gas exploration is chosen after extensive geological and land surveying. The location of seismic lines can be slightly adjusted to protect any sensitive aspect i.e. tree, road, water body etc.

### 2.10.3. Technology Options for Data Acquisition

There are two techniques conventionally available for collection of seismic data, Vibroseis and up-holes/shotholes. Selection of the technique depends on many factors including local terrain, land use type, accessibility etc. Vibroseis is generally suitable for terrain with gentle slopes, salt plains and flat sandy areas while shotholes/up-holes is suitable in areas where there is accessibility issues, rough terrain and land use constraints e.g. cultivated land, built-up area, dense vegetation required for land clearing to support truck movement. Up-holes may also be drilled at selected locations within the area of the seismic exploration. Each seismic exploration will involve housing number of people in a camp site and the use of water for domestic and operational purposes. Local labor will also be employed during the operation.

Up-hole/shothole (also known as dynamite method) was extensively used for seismic data collection before the introduction of Vibroseis in the industry. Multiple features of dynamite technique make it a preferred choice for collection of seismic data including low cost and high reliability of the data collected. The only cost involved is the cost associated with the labor required for excavation of up-holes/shot holes for placing the dynamite. The only significant drawback with dynamite is that it cannot be used in populated areas.

Vibroseis technique was introduced in 1961 after which the use of a vibrator as a seismic source has become widespread. The vibrator is a surface source, and emits seismic waves by forcing vibrations of the vibrator baseplate which is kept in tight contact with the earth through a pull-down weight.

#### **2.10.4. Options for Project Schedule**

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

## 3. LEGISLATIVE & ADMINISTRATIVE FRAMEWORK

### 3.1. Introduction

This Section provides synopsis of policies, legislation, and guidelines that may have relevance to the project. The proponent of this project will comprehensively follow the relevant and applicable regulatory requirements as described in the national and international guidelines. Relevant guidelines have been incorporated in the mitigation measures and the Environmental Management Plan (EMP) which has been formulated for better environmental management during project implementation.

Being the frontline O&G Company with operations in over 30 countries, MOL Group implements its operations strictly in line with its Health Safety and Environmental Policy. Areas including environmental protection and conservation, process and community safety lie at the core of this policy. 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. MOL Group, in order to implement its HSE policy, continuously updates its quality-based HSE management system.

#### 3.1.1. Administrative and Institutional Setup for Environmental Management

Environmental issues are governed by three levels of the government viz. Federal, Provincial and Local Government. After the 18th amendment, the subject of environment is now under the exclusive domain of the provincial government. The main consequences of this change are as follows:

1. The Ministry of Environment at the federal level have been abolished. Its functions related to the national environmental management have been transferred to the provinces. The international obligations in the context of environment will be managed by various ministries and departments of the federal government,
2. The Pakistan Environmental Protection Act 1997 (PEPA 1997) is technically no longer applicable to the provinces and is applicable only in the Islamabad Capital Territory. The provinces have enacted their own Environmental Protection Act for enforcement within province.

The Pakistan environmental protection council is the top body formed under the Pakistan Environmental Protection Act, 1997. The council's mandate includes the implementation of the Pakistan Environmental Protection Act, 1997 as well as establishing national policies related to environment and ensuring they've been implemented, approving National Environmental Quality Standards while offering direction on renewable, biodiversity and non-renewable conservation, considering the yearly report on the national environment on top of stopping individuals from contravening the 1997 Pakistan Environmental Protection Act.

The Pakistan Environmental Protection Agency existence is founded within the Pakistan Environmental Protection Council and has a Director General heading it. The Director General is given the authority to establish the advisory committees as required to help him carry out his duties. Section six of the Act, 1997 details the function while the power is clearly put in Section Seven.

The proposed project lies in within the ICT and hence the laws and policies applicable within ICT shall apply to the project.

### **Role of CDA, MCI, and IWMB**

The Capital Development Authority (CDA) oversees the overall management, maintenance, and environmental protection of MHNP including Shakarparian as a key public recreational green space within the Islamabad Capital Territory (ICT). CDA ensures sanitation and waste management, including collection, transportation, and safe disposal of solid and liquid waste from park open spaces, pathways, and visitor areas, in coordination with relevant agencies.

CDA's Environment Protection functions directly govern Shakarparian through forest conservation, afforestation of barren slopes, erosion control on Regosols, maintenance of viewpoints, and protection of green assets essential to the park's ecological and recreational value. The CDA Forests Division and Soil Conservation Division implement soil stabilization and vegetation management programs tailored to Shakarparian's undulating Potwar Plateau terrain, critical for seismic survey compliance.

The Metropolitan Corporation Islamabad (MCI), in coordination with CDA, supports Shakarparian operations by maintaining cleanliness, pathways, and public facilities. These activities are governed by the Islamabad Capital Territory Municipal Bye Laws, 1968 (as amended) and Islamabad Regulations 1979 (Upkeep of Cleanliness) (as amended).

The Islamabad Wildlife Management Board (IWMB), functioning under CDA oversight as legal custodian of the adjacent Margalla Hills National Park (which includes Shakarparian), manages wildlife habitats in the park area, protecting species such as pheasants, small mammals, and migratory birds. IWMB addresses threats including vegetation disturbance, pollution, and encroachment, requiring prior clearance for seismic survey activities to safeguard protected species and breeding areas during operations.

### **3.1.2. MOL Pakistan HSE Policy**

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## **3.2. National Policies and Plans**

### **3.2.1. National Environmental Policy, 2005**

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10th meeting on 27th December, 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29th June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country. The broad goal of NEP is, "To protect, conserve and restore Pakistan's environment in order to improve the life quality of the citizens through sustainable development". The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development.

### 3.2.2. National Conservation Strategy (NCS)

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

A mid-term review of the NCS in 2000 concluded that achievements under the NCS were primarily awareness raising and institutional building rather than meaningful improvement of the environment and natural resources and that the NCS was neither designed nor adequately focused as a national sustainable development strategy (GoP), November 2002. Thus, the need for a more focused National Environmental Action Plan (NEAP) was formulated and approved by the Pakistan Environmental Protection Council in 2001 to practically improve the national environment with emphasis on poverty reduction, and economic as well as sustainable development.

NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that would safeguard public health, promote sustainable livelihoods and enhance the quality of life for the people of Pakistan.

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

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

### 3.2.3. The Biodiversity Action Plan, 2000

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

The Pakistan Environmental Protection Council (PEPC) has approved the action plan and steering committees at federal and provincial levels have been formed to implement it. Developing the

Biodiversity Action Plan for Pakistan, 2000 has been the most significant direct steps towards addressing the biodiversity loss.

### **3.2.4. National Climate Change Policy, (Updated 2021)**

The National Climate Change Policy (NCCP) of Pakistan, first approved in 2012 and updated in 2021, serves as a comprehensive framework to address the challenges posed by climate change in the country. Recognizing Pakistan's high vulnerability to climate change impacts, the policy primarily focuses on climate-resilient development and adaptation, while also addressing mitigation efforts to the extent possible. The policy goal is to mainstream climate change considerations into the economically and socially vulnerable sectors and steer Pakistan towards climate-resilient development. The updated policy (2021) also emphasizes a transition towards climate-compatible development. The Policy also indicates that the government aims to decarbonize the economy, aiming for 60% clean energy by 2030, which affects the expansion and operational approvals for fossil fuel projects.

Acknowledging the climate change vulnerabilities and its responsibilities as a prominent O&G operator, MOL implements its HSE policy which focuses on environmental conservation and activities that contribute to climate change adaptation and resilience e.g. afforestation/reforestation, flaring reduction, and methane leak detection etc. The prime objective is to integrate sustainability into its core operations and strengthen climate resilience in Pakistan.

## **3.3. National Environmental Legislations**

### **3.3.1. Pakistan Environmental Protection Act, 1997**

The Pakistan Environmental Protection Act, 1997 (PEPA) is the fundamental legislation pertaining to environmental management in Pakistan. It is broadly applicable to air, water, soil, marine and noise pollution, as well as to the handling of hazardous waste. It empowers the government to formulate regulations for protecting the environment. Penalties have been prescribed for those contravening the provisions of the Act. In addition, the EPAs have been empowered to conduct inquiries into possible breaches of environmental law either upon the registration of a complaint or on their own accord. Some key provisions of the Act include:

- Prohibition of emission or discharge of noise, waste, air, or effluent that flout the NEQS.
- Filing with EPA, a report on environmental assessment as per the area's sensitivity or indicating where the projects impact would be on the environment.
- Prohibition of waste disposal in on highways, public land or local council administered or owned land, unless it is according to the Act, 1997.
- Prohibition on import of lethal waste as described in the Act, 1997.

After the 18<sup>th</sup> Amendment, the PEPA, 1997 has limited application to projects falling in the ICT jurisdiction and those located offshore beyond the provincial maritime jurisdiction.

### **3.3.2. National Environmental Policy, 2005**

The National Environmental Policy (NEP) was approved by the Pakistan Environmental Protection Council (PEPC) in its 10<sup>th</sup> meeting on 27<sup>th</sup> December, 2004 under the chairmanship of the Prime Minister of Pakistan and thereafter approved by the Cabinet on 29<sup>th</sup> June 2005. NEP is the primary policy of Government of Pakistan that addresses the environmental issues of the country. The broad goal of NEP is, "To protect, conserve and restore Pakistan's environment in order to improve the

life quality of the citizens through sustainable development”. The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development.

### **3.3.3. Pakistan Climate Change Act, 2017**

Federal Cabinet of Government of Pakistan approved the Pakistan Climate Change Act 2016 in November. It was enacted in 2017 after it was passed by the National Assembly. Consequent to the Act, three relevant institutions have been setup namely Pakistan Climate Change Council, Pakistan Climate Change Authority, and Pakistan Climate Change Fund.

The Act is the primary federal legislation designed to address environmental threats through adaptation and mitigation strategies, extending across the country. The Act calls to integrate the necessary climate change considerations into long-term planning, specifically in sectors like water, agriculture, and forestry. The Act also calls for reducing current and future emissions and enhancing potential sinks for greenhouse gases via the climate change authority whose function will be to work in collaboration with relevant Government Agencies and nongovernmental organizations and (after the conduct of relevant research and studies), set targets and coordinate actions for the reduction of greenhouse gas emissions and development of carbon markets.

The Act requires that project activities are planned and executed in a manner that contribute to reduction and mitigation of GHG emissions by adopting latest technologies.

### **3.3.4. 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 environmental Protection Act, 1997. However, pollution offences can still be tried under the Pakistan Penal Code, 1860.

### **3.3.5. Hazardous Substances Rules, 2003**

The Hazardous Substances Rules, 2003 call for the safe handling, storage, transportation, use, and disposal of hazardous substances to prevent adverse impacts on human health and the environment. Explosives used during the project, including dynamite and detonators for seismic activities, fall within the definition of hazardous substances due to their reactive, flammable, and potentially toxic nature. Under these Rules, the project proponent is required to ensure that explosive materials are stored in approved, clearly marked, and secure magazines located away from public access, water bodies, and environmentally sensitive areas. The Rules also require the preparation and implementation of safety procedures, emergency response plans, and training of personnel involved in handling explosives. During usage, explosives must be handled by trained and authorized staff, with measures in place to prevent accidental detonation, spillage, or environmental contamination. Compliance with the Hazardous Substances Rules, 2003 is therefore essential to minimize risks to workers, the public, and the surrounding environment during seismic activities involving explosive materials.

### **3.3.6. The Explosives Substances Act, 1908**

This Act prevents the unlawful manufacture, possession, use, sale, transport, and import of explosive substances. The Act defines explosive substances broadly and prescribes strict penalties, including imprisonment and fines, for acts intended to endanger life, cause serious damage to

property, or disrupt public safety. It empowers law-enforcement agencies to investigate, search, and prosecute offences related to explosives and places the burden of proof on the accused in certain cases. The Act is primarily aimed at safeguarding public security and maintaining law and order by regulating and controlling activities involving explosive materials.

Use of dynamite during the seismic activities requires its careful possession, transport, storage, and detonation as per the law. The law also requires to obtain authorization from the competent authorities, to ensure that explosives are handled only by licensed personnel, and used strictly for approved purposes.

### **3.3.7. The Explosives Rule, 2010**

The Explosives Rules, 2010, issued under the Explosives Act, 1884 by the Department of Explosives (DoE), Ministry of Industries and Production, govern the licensing, storage, transportation, handling, and use of explosives such as dynamite and detonators employed in seismic shothole surveys. Explosives qualify as Class 1 hazardous materials (e.g., 1.1D detonators, 1.4 dynamite), necessitating Form EL-03 site/magazine licenses with Rs. 500,000 security deposits, blast-resistant construction (Specification No. 2 bunkers), minimum separation distances of 500m from roads/forests. The Rules mandate pre-use inspections, vehicle permits for transport (max 50kg/load), trained blasters (license via Rule 106), and emergency protocols including fire suppression and spillage containment to avert risks to human health, wildlife, and Shakarparian's protected ecosystem.

The proponent must secure DoE approvals prior to magazine camp establishment (e.g., 10x5m secure enclosures away from watercourses), implement handling SOPs (no storage >30 days, daily inventories), conduct mock drills, and ensure licensed disposal prioritizing non-explosive Vibroseis/up-hole alternatives to bypass requirements entirely. Compliance safeguards against detonation hazards, groundwater contamination, and regulatory violations under PEPA 1997.

### **3.3.8. Antiquities Act, 1975**

The Antiquities Act of 1976 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, military or scientific interest, and empowers the Government of Pakistan to prohibit excavation in any area that may contain such articles of archaeological significance.

This act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance. Under this act, the project proponent is obligated to:

- Ensure that no activity is undertaken in the proximity (i.e. on, or within a distance of two hundred feet of a protected immovable antiquity, or with an approval from the concerned department
- Report to the Department of Archaeology, Government of Pakistan, any archaeological discovery made during the course of the project.

### **3.3.9. The Forest Act 1927**

The Forest Act, 1927 empowers the Government to declare any forest area reserved or protected. The act also empowers the government to prohibit the clearing of forests for cultivation, grazing,



hunting, removing forest produce, quarrying, felling, and lopping. Other offences punishable under the Act include land clearing, kindling, keeping or carrying fire, tree cutting, damage to plantation, quarries, construction of building or other structure, removal of soil or damage to the soil, water, natural vegetation (shrubs, herbs and plants), fish, wild animals and wild birds etc. in a forest.

The Shakarparian being part of the MHNP requires careful execution of project as per the provisions of the forest act including any ground works and data collection activities that can affect soil and subsoil, flora, fauna and local ecosystems.

### **3.3.10. Islamabad Nature Conservation and Wildlife Management Act, 2024**

The Islamabad Nature Conservation and Wildlife Management Act, 2024, enacted on August 27, 2024, provides a comprehensive legal framework for the protection, preservation, conservation, and sustainable management of biodiversity, wildlife, and ecological systems within the Islamabad Capital Territory (ICT), including Margalla Hills National Park and other protected areas. The Act replaces the earlier 1979 Ordinance and restructures the Islamabad Wildlife Management Board (IWMB) into a fully empowered regulatory authority with enhanced enforcement powers, revenue-generation mechanisms, and authority to oversee conservation measures across ICT.

The legislation introduces strict provisions to safeguard ecological integrity by prohibiting activities that may harm wildlife or their habitats, including illegal hunting, habitat destruction, vegetation removal, unauthorized land clearing or excavation, illegal wildlife trade, and keeping wild or exotic animals as pets. It also establishes mechanisms for declaring and managing protected areas, defining protected natural resources, and imposing penalties for environmental violations.

Since the project area falls within protected zones recognized under the Act, all project activities must strictly comply with its requirements. Seismic survey operations particularly those involving ground disturbance, vehicular movement, drilling, vegetation clearance, or use of explosives—may potentially conflict with the Act if they result in habitat alteration or wildlife disturbance without prior authorization from the Board. Therefore, the EIA must clearly demonstrate compliance with the Act by incorporating appropriate mitigation measures, restoration planning, waste management protocols, and necessary approvals to ensure that project implementation does not compromise conservation objectives or violate prohibited activity clauses.

## **3.4. ICT / Local Laws and Regulations**

### **3.4.1. Islamabad Capital Territory Local Government Act, 2015**

This Act is expedient to establish an elected local government system to devolve political, administrative and financial responsibility and authority to the elected representatives of the local governments; to promote good governance, effective delivery of services and transparent decision making through institutionalized participation of the people at local level; and, to deal with ancillary matters.

### **3.4.2. Islamabad Capital Territory (Zoning) Regulation, 2005**

For administration and land use characterization, through this regulation, the Islamabad Capital territory has been divided into following five zones:

**Zone-1:** This zone constitutes sectors up to the existing alignment of the G.T. road from the point of intersection of G.T. road with Shah rah-e-Kashmir to the point of the Nicolson Monument inclusive of sector H-14, H-15, H-16, H-17, I-14, I-15, I-16, I- 17.

**Zone -2:** The zone consists of an area bounded by G.T. road in the north & north east, north of Shah rah-e-Kashmir and Capital limits in the west, comprising residential sectors G-15 (part), G-16, G-17, F-15 (part), F-16, F-17, E-15 (part), E-16, E-17, D-16, D-17, C-17, AND B-17.

**Zone -3:** Margalla Hills National Park as notified under section 21 of the Islamabad Wildlife (Protection, Preservation, and Conservation & Management) Ordinance 1979, other protected ranges, forest areas and un-acquired land falling between the Margalla Hills & north of Murree Road shall constitute this zone.

**Zone-4:** This zone comprises Islamabad Park and rural periphery wedged between Murree Road towards north and Lehtrar road towards south and extending beyond Simly road up to the ICT limits in the north east. This zone excludes the part of Margalla Hills National Park and Rawal Lake.

**Zone-5:** This zone comprises areas falling south of Islamabad Park and extending up to outer limits of ICT towards south, south west and south east.

The Margalla Block spans a large part of ICT comprising most or all portion of the five zones except zone 5, of which a relatively small portion falls in Margalla Block. Debate persists regarding adherence to environmental regulation and zoning law, especially in areas zoned as protected forests. Judicial interventions have previously underscored the need to prevent illegal land use change within Shakarparian's limits.

## 3.5. Oil & Gas Sector Laws and Regulatory Framework

### 3.5.1. Petroleum Exploration and Production Policy, 2012

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

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

### **3.5.2. 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 principal 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.

### **3.5.3. Pakistan Petroleum Exploration and Production Companies Association (PPEPCA)**

PPEPCA is an association of private sector companies and semi-autonomous departments concerned with exploration and production of Oil & Gas. It provides a forum for such companies to discuss issues, formulate common strategies and convey concerns and demands to the government and other stakeholders in the Oil & Gas business.

PPEPCA has also been particularly effective in collecting and disseminating information in current trends in exploration and production to its members, and has been instrumental in informing members of changes in government policy and in formulating a response to such policy changes.

## **3.6. National Environmental Assessment Guidelines**

### **3.6.1. Pakistan Environmental Assessment Procedures**

EPA has prepared a set of guidelines for conducting environmental and social assessments. The guidelines derive from much of the existing work done by international donor agencies and NGOs. The package of regulations, of which the environmental and social guidelines form a part, includes the PEPA 1997 and the NEQS. The package of regulations prepared by PEPA with relevance to this EIA includes:

- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
- Guidelines for the Preparation and Review of Environmental Reports;
- Sectoral Guidelines for Environmental Reports-Oil and Gas Exploration and Production
- Guidelines for Public Consultation

### **3.6.2. Policy and procedures for filing, review and approval of environmental assessments**

These guidelines define the policy context and the administrative procedures that will govern the environmental assessment process, from the project pre-feasibility stage, to the approval of the environmental report. According to the procedures laid out in the policy guidelines, IEE's or EIA's are to be filed with the EPA of the province where the project is to 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. Projects have been classified in the policy guidelines by expected degree of adverse environmental impacts.

### **3.6.3. Guidelines for the preparation and review of environmental reports**

It requires 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.

### **3.6.4. Guidelines for public consultation**

These guidelines are intended to provide assistance throughout the environmental assessment of project by involving the public which can lead to better and more acceptable decision-making. Public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the proposal, will lead to better outcomes, and lay the basis for ongoing positive relationships between the participants.

### **3.6.5. Pakistan EPA (Review of IEE/EIA) Regulations 2000**

The IEE/EIA Regulations 2000 provide the necessary details on the preparation, submission, and review of the IEE and the EIA. Categorization of projects for IEE and EIA is one of the main components of the IEE/ EIA Regulations 2000. Projects have been classified on the basis of expected degree of adverse environmental impact. Project types listed in Schedule II of the regulations are designated as potentially seriously damaging to the environment and require an EIA, whereas those listed in Schedule I as having potentially less adverse effects and require an IEE. But all projects located in environmentally sensitive areas would require an EIA (section 22). In accordance of the IEE-EIA Regulations 2000 the proposed project falls in Schedule I requiring an IEE as the project is categorized as Schedule I: Category B subcategory 5. Energy: Oil & gas extraction projects including exploration, production, gathering systems, separation and storage.

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#### **3.7.4. National Environmental Quality Standards (NEQS)**

The NEQS are uniform standards applicable to all kind of industrial and municipal effluents. Different Parameters are set showing permissible levels of pollutants in liquid effluents and gaseous emissions. These were first promulgated in 1993 and were last revised in 2000. To enforce NEQS, Government has been empowered to levy a pollution charge.

For liquid effluents, there are 32 parameters showing permissible level of pollutants before its discharge into sea, inland water & sewage. And, for gaseous emissions, there are 16 parameters. The National Environmental Quality Standards for municipal and industrial liquid effluents, gaseous emissions, motor vehicle exhausts and noise have been annexed in this report.

#### **3.7.5. Sectoral Guidelines for 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.

### **3.7.6. Guidelines for Operational Health, Safety and Environmental Management, 1996**

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.

### **3.7.7. PPEPCA guidelines for Upstream Oil and Gas Exploration**

These guidelines have been prepared to assist the industry and the practitioners in meeting these challenges. The need for the development of these guidelines was felt by the industry few years back when the industry sectorial guidelines prepared by the Federal EPA were found to be insufficient. The present new guidelines are based on previous work by international industry associations, donor agencies, non-government organizations, and statutory bodies and national experiences. The guidelines have been divided into 4 parts for clarity and ease of use.

## **3.8. International Treaties and Guidelines**

### **3.8.1. 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 their sustainable use.

### **3.8.2. IUCN Red List**

The red list is published by IUCN and includes those species that are under potential threat of extinction. These species have been categorized as:

- **Endangered:** species that are found to be facing a very high risk of extinction in the wild in the near future, reduction of 50% or more either in the last 10 years or over the last three generations, survive only in small numbers, or have very small populations.
- **Vulnerable in Decline:** species that are seen to be facing a risk of extinction in the wild, having apparent reductions of 20% or more in the last 10 years or three generations.
- **Vulnerable:** species that are seen to be facing a high risk of extinction in the wild, but not necessarily experiencing recent reductions in population size.
- **Lower Risk:** species that are seen to be facing a risk of extinction that is lesser in extent than for any of the above categories.
- **Data Deficient:** species that may be at risk of extinction in the wild but at the present time there is insufficient information available to make a firm decision about its status.

### **3.8.3. World Bank Guidelines on Environment**

The Environmental Assessment-Operational Policy 4.01. Washington, DC, USA. World Bank 1999 and Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991 provide general guidelines for the conduct of an IEE/EIA, and address the IEE/EIA practitioners themselves as well as project designers. The Environmental Assessment Sourcebook, Volume III in particular has been designed for the Bank projects, and is especially relevant for the impact assessment of large-scale infrastructure projects. It contains enormous information which is useful to environmentalists and project proponents. The Sourcebook dealing with the assessment of industry and energy projects is more specific. The Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998 provides general waste management policies with specific techniques for the prevention of air and water pollution. Project guidelines are presented for major pollutants as well as typical emissions from various industrial sectors.

### **3.8.4. IFC EHS guidelines for Onshore Oil and Gas Development**

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines for Onshore Oil and Gas Development include information relevant to seismic surveys, exploration and production drilling, development and production activities, transport activities including flow lines and pipelines, other facilities including pump stations, metering stations, pigging stations, compressor stations and storage facilities, ancillary and support operations, and decommissioning. For onshore oil and gas facilities located near the coast (e.g., coastal terminals marine supply bases, loading/offloading terminals).

### **3.8.5. IAGC Environmental Manual for Geophysical Operations**

This environmental manual has been produced for seismic surveys. These include the sections on access roads, base camps, hazardous materials, and operations in desert and semi-arid climatic conditions.

The manual provides comprehensive, industry-standard guidelines for conducting land and marine seismic surveys in an environmentally responsible manner. It focuses on minimizing impacts through proactive planning, site-specific mitigation strategies for sensitive habitats (arctic, rainforests, wetlands), and regulatory compliance. It also provides specific, actionable techniques to minimize impact, including proper handling of waste, minimizing vegetation clearing on land, and reducing sound impacts on marine life.

Reference has been made to the guidelines provided in the manual as well as other relevant guidelines while devising mitigation strategies for the potential impacts from the seismic survey activities.

## 4. ENVIRONMENTAL & SOCIAL BASELINE

### 4.1. General

This section provides a detailed environmental and social baseline profile of the project area where the proposed project will be undertaken. The information presented in this section covers:

- Physical Environment
- Ecological Environment
- Socioeconomic Environment

Information for the above areas has been collected from both primary and secondary sources. Secondary data includes maps prepared by the Geological survey of Pakistan, Soil survey of Pakistan, published literature; Census Reports etc. Primary data was collected through field surveys, onsite environmental monitoring and discussions with the MOL team regarding site activities.

### 4.2. Methodology for baseline data collection

Data used to compile this section was obtained from previous environmental reports<sup>3</sup>, published literature and field survey. Published literature was used in describing all aspects of the environment, more extensively for some aspects than for others. It was used extensively for the sections on soil, climate, water resources, wildlife, vegetation and air quality. A list of references appears at the end of this report.

Information on geomorphology, drainage, water resources, settlement locations, agricultural land and access roads was also obtained from the online mapping services, Atlas of Pakistan and Geological Survey of Pakistan 1:200,000 geological maps of the area.

Field surveys were conducted to collect primary data for this study. A team consisting of environmentalists, and biologists, visited the project area to collect the data. Surveys were held as per following schedule:

- Physical Environment Survey: 8<sup>th</sup> Dec, 2025.
- Ecological survey: 13<sup>th</sup> till 23<sup>rd</sup> Jan, 2026 (in two phases)
- Social survey: 9<sup>th</sup> Jan, 2026

### 4.3. Project Area

The area where the project components will be located, where the project activities are expected to take place and where the proposed activities' environmental impact is expected to occur, has been referred to as the 'project area'. The Shakarparian area extending over 11.4 km<sup>2</sup> and the portion of MHNP falling inside the 3D area which is about 11.7km<sup>2</sup> has been referred as the Project area for the baseline. For features like geology, and seismicity, the entire area of Federal capital has been taken as reference area. A map showing the environmental features of the project area is given in Figure 4.1. The features are described in detail in the following sections.

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<sup>3</sup> IEE for Drilling of Tamol-1 exploratory well in Margalla Block, 2021, IEE for 2D Seismic Survey in Margalla Block, 2016, EIA of 2D Seismic Survey in Sensitive Areas of Margalla and Margalla North Blocks, 2008, 2D Seismic Survey in Non-Sensitive Areas of Margalla and Margalla North Blocks, 2008

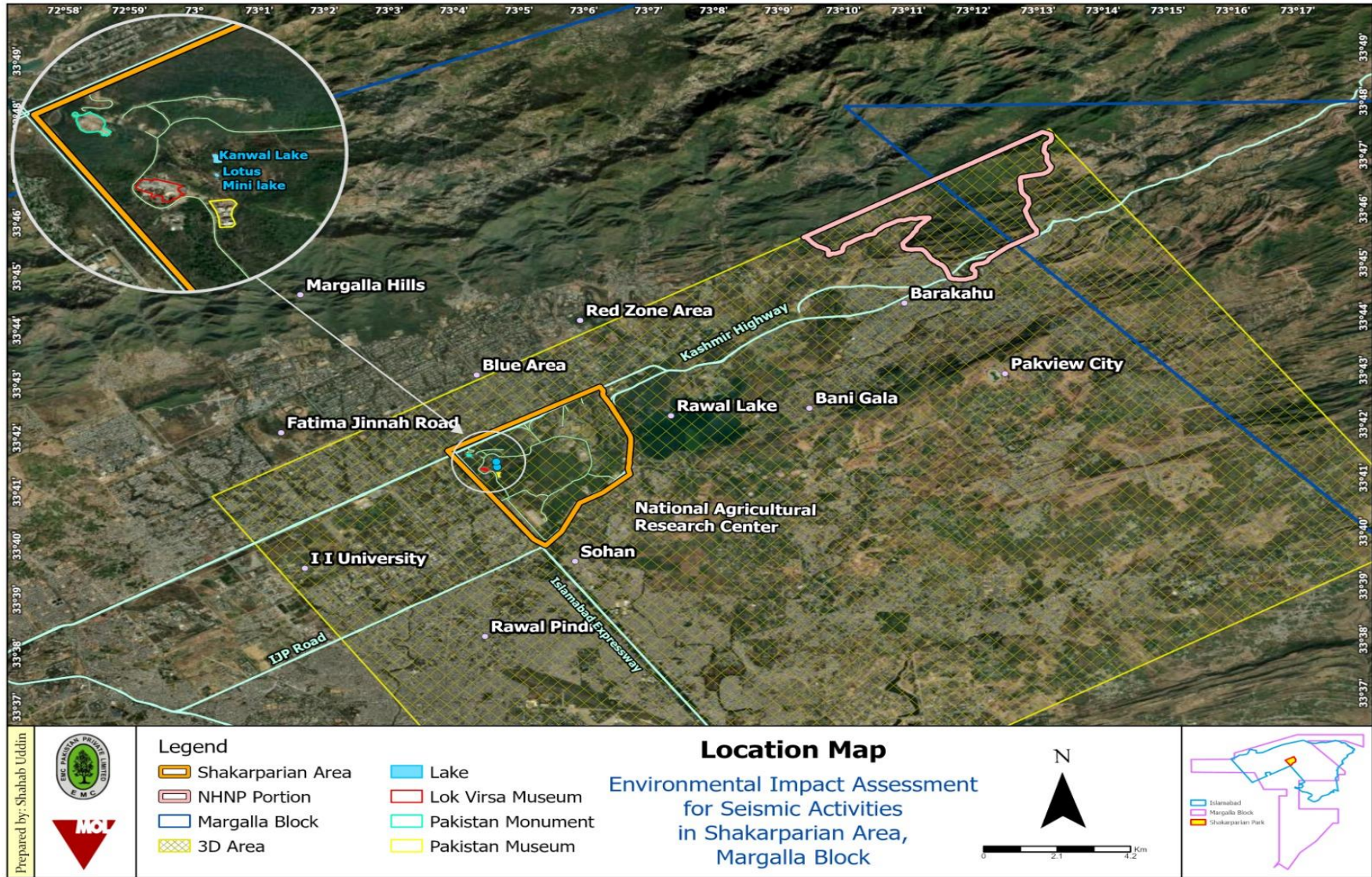


Figure: 4.1: Project Area Location Map

## 4.4. Physical Environment

### 4.4.1. Geology

The project area features a prominent sequence of Eocene limestone strata comprising the Margalla Hill Limestone and underlying Lockhart Limestone formations, which form the resistant cap rock of Shakarparian's hills and ridges. These are overlain by Quaternary colluvial and talus deposits on steeper slopes. On the northern side of the survey footprint, low hills composed primarily of tightly folded Eocene limestones and shales are exposed, while the southern boundary interfaces with Pleistocene alluvial fans and urban fill deposits along the Islamabad plain. The structural grain trends north-south with east-verging folds and thrust faults typical of the Potwar Syntaxis transition zone. Geological formations found in the project area are described below:

- **Margalla Hill Limestone Formation (Eocene):** thick-bedded to massive, white to yellowish limestone, pebbly and rich in fossils; forms prominent hill caps and ridges of Shakarparian; resistant to weathering.
- **Lockhart Limestone Formation (Eocene):** underlying the Margalla Hill Limestone, pale yellowish limestone with fossiliferous beds; calcareous, fine-grained; conformable contact with overlying formations.
- **Patala Formation (Paleocene):** shale dominant in lower part with thin limestone beds; overlain unconformably by Eocene limestones.
- **Rawalpindi Group (Kamlial and Chinji Formations):**
  - Kamlial Formation: greenish-gray, thick-bedded sandstone with subordinate clay and siltstone; medium- to coarse-grained, cross-bedded; contains conglomerate lenses.
  - Chinji Formation: interbedded sandstone, silty clay and siltstone; sandstone brownish-gray, weathering to spheroidal pieces.
- **Murree Formation (Miocene):** dark red to purple sandstones with subordinate purple shale and conglomerate; exposed in lower slopes and valley fills.
- **Siwalik Group (Nagri and Dhok Pathan Formations):**
  - Nagri Formation: grayish-green, fine- to medium-grained sandstone interbedded with red silt and clay.
  - Dhok Pathan Formation: sandstone interbedded with clay; forms lower foothills.
- **Recent Alluvium and Colluvium:** found along seasonal drainages and valley bottoms; unconsolidated gravel, sand and clay derived from erosion of surrounding hills; forms fertile patches supporting vegetation.

### 4.4.2. Topography

The project area's terrain comprises of rolling hills and moderate slopes characteristic of the outer Margalla foothills, with steeper gradients toward the north transitioning to gentler undulations near urban interfaces. It features undulating terrain representing the southernmost Himalayan fold belt extension, primarily composed of Eocene-age sedimentary limestone overlain by Quaternary colluvial and alluvial deposits. Its landscape features low to moderate hills rather than high peaks, with elevations typically ranging from 500–800 meters above sea level, forming a natural escarpment between the Potohar Plateau and the Islamabad plain.

The principal ranges within the broader Margalla Hills National Park system, including Shakarparian, maintain a north south orientation aligned with regional thrust faulting. Individual hill features seldom exceed 900–1,000 meters, with Shakarparian's highest points reaching approximately 750–800 meters. These form a series of broken ridges and spurs separated by

seasonal valleys and gullies that channel monsoon runoff toward the urban basin. As the area is elevated above the surrounding urban plain by 200–300 meters. The general topographic slope is south eastward toward the Rawal Lake catchment and Soan River system, though local drainage follows structural lineaments toward topographic lows.

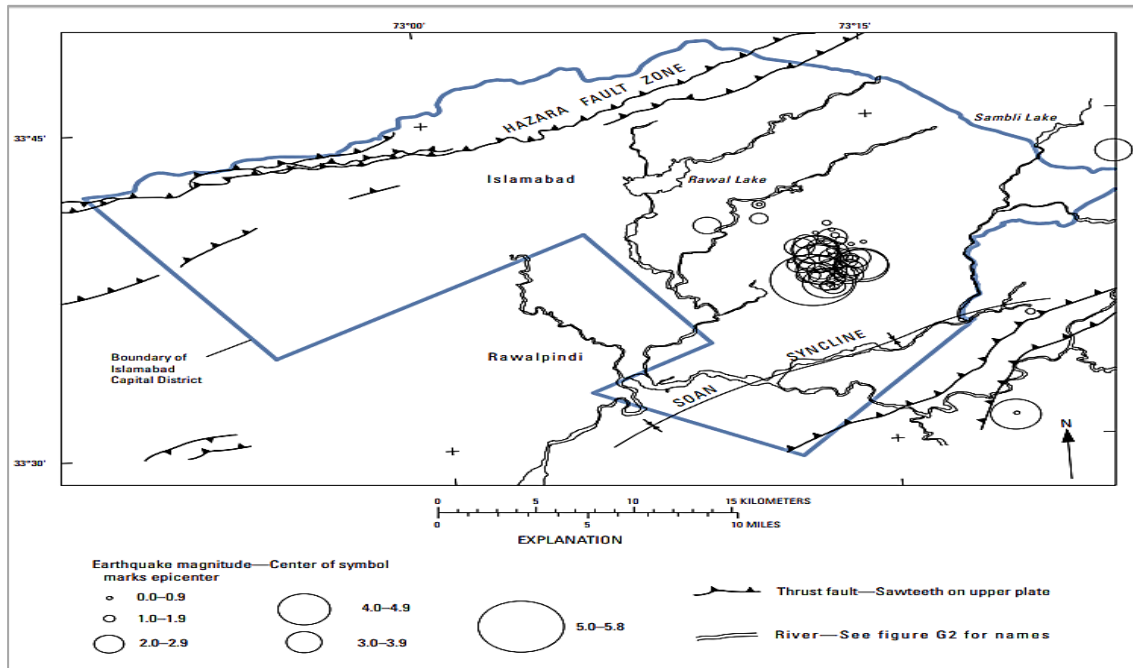
#### 4.4.3. Soil

Soil texture in the project area ranges from calcareous silty loam to clay loam. Soils are derived primarily from weathered limestone parent material and vary from silty loam on slopes to clay loam in valley bottoms. These soils support subtropical dry semi-evergreen forest vegetation and are moderately fertile, though nutrient-poor due to limited organic matter accumulation. Soil drainage is generally good except in topographic depressions where seasonal waterlogging occurs during monsoon periods. The soils serve ecological functions rather than intensive agriculture within the protected area boundary. Soil of the project area appeared to be the combination of sand, silt loam, alluvium and saturated. The soils are generally well-drained but are prone to erosion, especially on exposed slopes with sparse vegetation cover. This erosive nature contributes to sediment inflow during monsoon rainfall. The soils are closely linked to the underlying sandstone and shale formations of the Potwar Plateau. The dominant soil types are shallow, stony, and calcareous in nature, developed mainly from weathered sandstone and loess. These soils are generally classified as Regosols, particularly on the hill slopes surrounding the area, where soil depth is limited due to steep gradients and active erosion.

In relatively flat and sheltered areas, such as valley floors and gentle slopes, deeper loamy and silty soils are present. These soils have developed from weathered shale and alluvial deposits and are moderately fertile, supporting limited agriculture and vegetation. Along stream courses and near drainage margins, recent alluvial soils consisting of sand, silt, and clay are found.

#### 4.4.4. Seismic Vulnerability

The project area lies at the southern margin of the Potwar Syntaxis, a complex zone of the Himalayan Foreland Fold-Thrust Belt where the Main Boundary Thrust transitions laterally into the Jhelum Fault and Balakot-Bagh Fault systems. The area is bounded to the north by the Margalla Thrust and Main Boundary Thrust system, and to the south by the Islamabad Fault and associated thrust ramps. This zone consists of an arc of thrust and folded rocks about 25 km wide and 150 km long that is convex to the south and extends west-southwestward away from the Himalayan syntaxis. More than 20 individual thrust sheets have been identified across the 25-km-wide zone north of Islamabad, but only 5 major thrusts lie within the area. In the Islamabad area, some of the thrust faults are slightly oblique to the front of the Margalla Hills; hence, they project west-southwestward beneath the cover of the piedmont fold belt. The extensions of these faults are prominent north of Fateh Jang, 25 km west of Rawalpindi, where they form the south margin of the Kala Chitta Range, which is an echelon extension of the structural pattern of the Margalla Hills. Based on the seismic zoning, the project area falls in Zone 2B corresponding to peak horizontal ground acceleration between 0.16 to 0.24g.



**Figure: 4.2: Potentially active faults in the Islamabad-Rawalpindi study area. Centers of circles are epicenters, and radii of circles are proportional to magnitude, (Source: Geological survey of Pakistan)**

The thrust and fold structure of the Margalla Hills immediately north of Islamabad is complex. The Margalla Hills consist of at least five principal thrust sheets that repeat the pre-Miocene marine section. The structurally lowest sheet dips generally northward at about 30°, and the higher thrust sheets dip progressively more steeply, so that the northernmost and structurally highest are overturned and dip southward at about 85°. The thrusts have most commonly broken through the beds within or just beneath the Samana Suk Formation, although almost all pre-Miocene units are cut at some place in the study area. Higher in the section, thrusts are common at the base of the Margalla Hill Limestone (probably within the shale of the Patala Formation) and within the overlying Chorgali Formation.

#### 4.4.4.1. Piedmont Fold Belt

The faults and folds in the piedmont fold belt south of the mountain front probably have high potential activity, although definitive exposures are sparse and discontinuous. The Pleistocene Lei Conglomerate, overlying the sandstone of the Murree Formation (lower Miocene), is folded in the broad anticline at Shakar Parian Park in Islamabad. The Lei Conglomerate also is tilted 80° southward along a thrust fault in the Kuldana Formation (lower Eocene) north of Golra, about 17 km northwest of Rawalpindi. The fault at Golra may be an eastward projection of the southward overthrusting of the mountain front along the south face of the Kala Chitta Range, a major range that begins about 25 km west of Rawalpindi and extends westward south of the Margalla Hills. Major faults bounding the Khalri Murat Range, about 15 km south of the Kala Chitta Range, may also extend northeastward toward Rawalpindi, concealed beneath Quaternary eolian and alluvial deposits.

#### 4.4.4.2. Seismic Hazard

The Islamabad-Rawalpindi area lies in a tectonically active zone, where faulting, folding, and earthquakes have been frequent in the recent geologic past. Quaternary deposits are tectonically

deformed throughout the map area. In A.D. 25, the Buddhist monasteries at Taxila, 25 km west-northwest of Islamabad, were destroyed by an earthquake estimated at Modified Mercalli intensity IX (Adhami and others, 1980). More recently, a Richter magnitude 7.6 earthquake on 8th October, 2008, 65 miles north-northeast of Islamabad caused severe damage including collapse of Margalla Toer. Subsequently, the re-zoning of seismically active areas was carried out.

According to Building Codes for Pakistan, the project area falls in Zone 2B which corresponds to peak ground acceleration of 0.16 to 0.24g. Studies by National Engineering Services of Pakistan (NESPAK) indicated that a realistic seismic factor for building design should probably be higher than that indicated on the seismic zoning map of Pakistan (Adhami and others, 1980, p. 133). According to NESPAK, recommended design for 0.125-g (gravitational acceleration) horizontal acceleration for ordinary structures, and for 0.2 g without collapse for important structures (Adhami and others, 1980, p. 137). NESPAK (Adhami and others, 1980, p. 131) estimated that each year there is a 50 percent chance of a Richter magnitude 4 earthquake, an 8.33 percent chance of magnitude 5, a 1.67 percent chance of magnitude 6, a 0.26 percent chance of magnitude 7, and a 0.11 percent chance of magnitude 7.5 (recurrence intervals of 2, 12, 66, 380, and 912 years, respectively).

#### 4.4.5. Hydrology

##### 4.4.5.1. Surface water

The project area has surface water in the form of lakes and stormwater channels. In the MHNP portion falling in the 3D area, one major stream named Shahdra Steam flows from North to south which later connects with Korang River, and contributes to the recharge of the Rawal Lake. In Shakarparian, two lakes, locally known as Lotus Lake and Kanwal Lake are found, with Lotus Lake being the larger of the two. During the site visit, it was observed that the Kanwal Lake had dried up completely, whereas the Lotus Lake still contained some water. These water bodies provide important microhabitats for aquatic and semi-aquatic species, including birds, amphibians, and insects, and contribute to the ecological diversity of the area. The temporary drying of the smaller lake highlights seasonal variability and the potential vulnerability of these habitats to climatic fluctuations and water resource pressures. In addition, minor natural drainage channels and small nullahs originating from the Shakarparian hills convey surface runoff during the monsoon season and remain mostly dry during other periods. Overall, surface water in the Shakarparian area plays a limited but important role in enhancing the local environment and managing rainwater within the hilly terrain. The Lakes have been landscaped for recreational and aesthetic purposes.

Seasonal streams and gullies within Shakarparian convey monsoon flows, with principal drainages including those flowing toward Pakistan Monument and the Islamabad Expressway corridor. These watercourses remain dry outside monsoon periods but support riparian vegetation and serve as wildlife movement corridors during wet seasons.

##### 4.4.5.2. Ground Water

Groundwater in the project area and its surroundings occurs at variable depths influenced by hilly terrain, geology, and land use. In the Shakarparian hills and adjoining elevated areas, groundwater is generally encountered at greater depths, typically ranging from 250 to 400 feet, whereas in the surrounding areas, groundwater depths range from approximately 100 to 300 feet. Overall, the groundwater quality in the area is generally fresh and suitable for domestic use, particularly in less disturbed zones. However, in settlements with higher population density, localized deterioration in quality may occur due to seepage from septic tanks and surface runoff, making basic treatment or

filtration advisable before drinking. The water table depth of the surveyed areas as reported by locals is given below:

- G-6, Islamabad 80-120 ft
- G-7, Islamabad 100-150 ft
- I-8, Islamabad 200-250 ft
- Bara Kahu 130-190 ft

#### **4.4.6. Land Use and Land Cover**

The project area falls in Zone III, designated for protected areas like MHNP. Land use in the area predominantly comprises forest and open spaces for recreational uses. Shakarparian constitutes Islamabad's 25-30% forest cover alongside Margalla Hills National Park, maintaining 18% recreational open space including Pakistan Monument and event grounds, 4% water bodies comprising Lotus Mini Lake and Kanwal Lake and 5% built infrastructure with restaurants and pathways. The nearest residential sectors G-6, G-7 and I-8 are approximately within 500m vicinity of Shakarparian, separated by major road corridors. It includes various recreational landmark including monuments and museums, Lakes etc. In the MHNP portion falling in the 3D area.

Shakarparian represents subtropical dry semi-evergreen forest transitioning to urban green buffer zones. Due to protected status most of the area supports natural vegetation. Designated as protected forest since the 1960 Islamabad Master Plan and integrated into Margalla Hills National Park buffer in 1980, Shakarparian permits regulated recreational use under CDA Environment Wing oversight while prohibiting commercial exploitation.

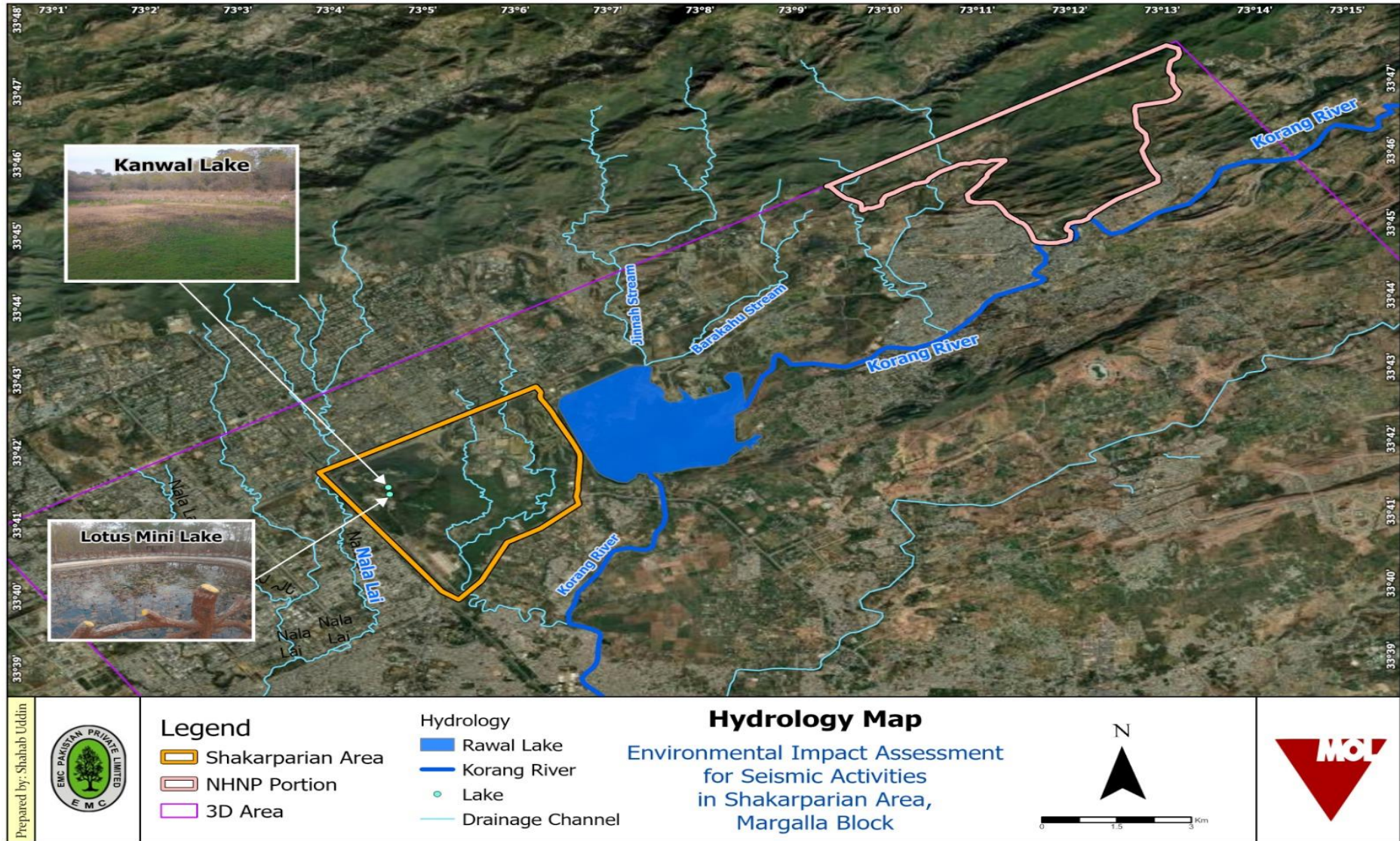


Figure: 4.3: Project area Hydrology Map

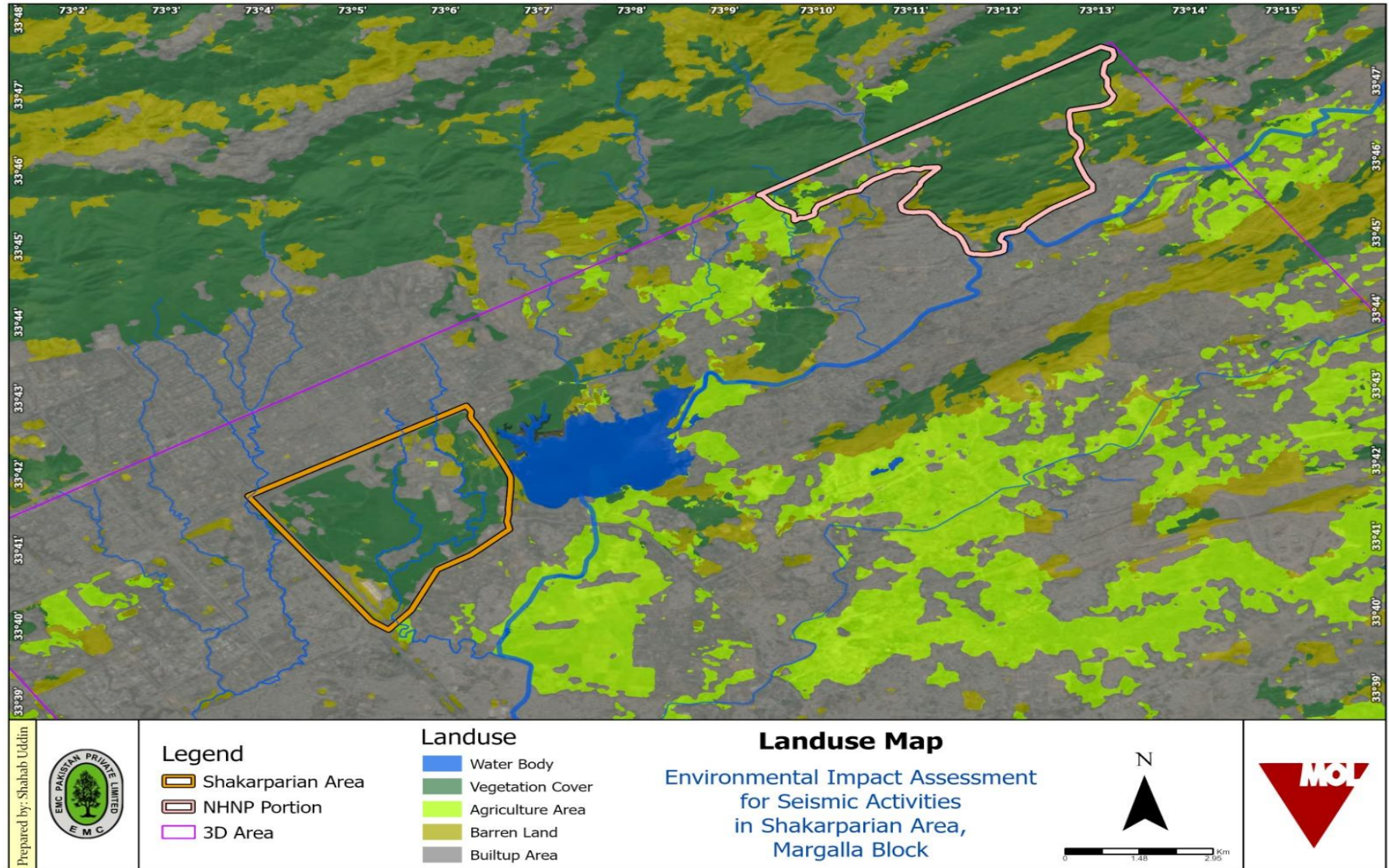


Figure: 4.4: Project area Hydrology Map

#### 4.4.7. Noise

The project area is a calm serene air shed with noise sources limited to generators used by some restaurants for power supply, and traffic from visitors plying to area for recreational and tourism purposes. Noise monitoring conducted in the project area show prevailing of 50dBA to 55dBA on average. Noise monitoring results are presented below and Laboratory report is annexed.

To determine the baseline noise levels of the project area, noise monitoring was conducted at selected locations within project area including sectors G-6, G-7, and I-8. Project area being a protected zone, exhibits low ambient noise levels, due to limited vehicular movement, visitor activity, and absence of major noise sources. The surrounding sectors G-6, G-7, and I-8, which comprise residential and commercial areas, recorded comparatively higher noise levels. These elevated levels are mainly attributed to traffic flow, commercial activities, human movement, and routine urban operations. Overall, the noise profile shows a clear gradient, with lower noise levels within Shakarparian and higher levels in the adjoining urban sectors, reflecting differences in land use, traffic intensity, and human activity patterns.

**Table 4.1: Noise levels of adjacent areas of Shakarparian**

No.	Area	Location	Recorded Values	Type
1	Shakarparian	33°41'28.62"N, 73° 5'41.81"E	42.4db	-
2		33°41'36.79"N, 73° 5'37.89"E	48.7db	-
3	G-6	33°42'29.94"N, 73° 5'11.92"E	57.3db	Residential
4		33°42'26.35"N, 73° 5'18.75"E	66.8db	Commercial
5		33°42'28.67"N, 73° 5'5.99"E	59.1db	Residential
6	G-7	33°41'55.70"N, 73° 4'10.39"E	58.2db	Residential
7		33°42'11.64"N, 73° 4'30.30"E	63.7db	Commercial
8	I-8	33°40'35.43"N, 73° 4'34.07"E	61.5db	Residential
9		33°40'25.16"N, 73° 4'44.84"E	58.9db	Residential
10		33°40'4.32"N, 73° 4'31.44"E	63.4db	Commercial
11		33°40'17.76"N, 73° 4'32.50"E	64.8db	Commercial
12		33°40'14.69"N, 73° 4'27.41"E	62.3db	residential

**Table 4.2: Noise limits for different area classifications**

Category of Area	Day time	Night time
Residential area	55	45
Commercial area	65	55
Industrial area	75	65
Silence Zone	50	45

<https://environment.gov.pk/SiteImage/Misc/files/Rules/SRO2010NEQSAirWaterNoise.pdf>





Figure 4.5: Noise Monitoring

#### 4.4.8. Climate

Project area lies in the humid–sub-humid part of the Potohar Plateau and has a monsoonal climate, with hot, wet summers and cool to cold, mostly dry winters. The summer season generally extends from about May to September, with June the hottest month; daytime maximum temperatures in peak summer often reach 38–40°C in the urban area, and on very hot days can approach or slightly exceed 42°C, especially before the onset of the monsoon. Winter extends from roughly December to February, with January the coldest month; night-time minimum temperatures in this period commonly fall to 2–4°C and can occasionally drop to around 0°C or slightly below during cold waves.

Most of the annual rainfall occurs during the summer monsoon, with frequent convective storms from late June through September, while spring and winter bring lighter rain associated with western disturbances, this pattern produces a pronounced wet season and a comparatively dry late autumn and early spring. In day-to-day terms, summers are typically hot to very hot and often humid, with many clear or partly cloudy days interrupted by intense monsoon showers and thunderstorms, whereas winters are generally cool to cold but mostly clear, with occasional fog and light rain and a few particularly cold nights when frost can form in exposed locations.<sup>4</sup>

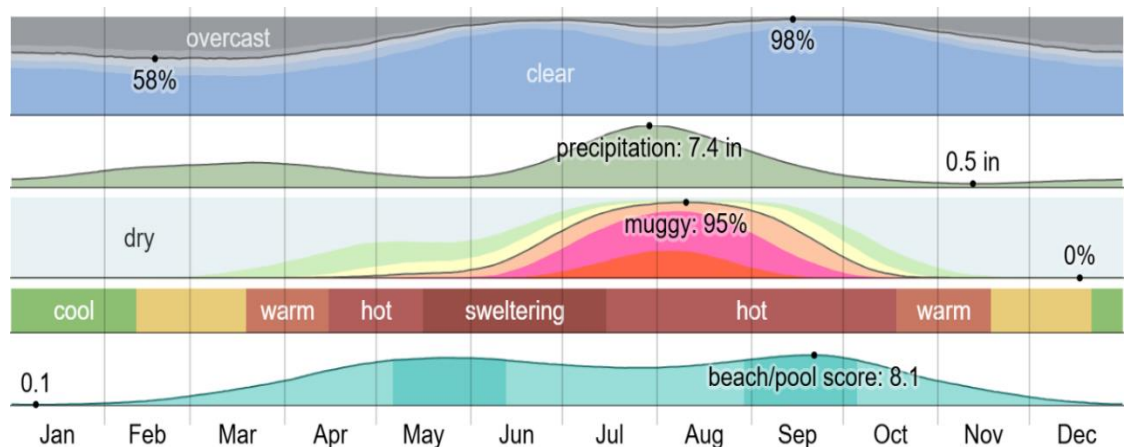


Figure 4.6: Climate Summary of Islamabad Capital Territory (ICT)

<sup>4</sup> [https://weatherspark.com/y/107761/Average-Weather-in-Islamabad-Pakistan-Year-Round#google\\_vignette](https://weatherspark.com/y/107761/Average-Weather-in-Islamabad-Pakistan-Year-Round#google_vignette)

#### 4.4.8.1. Temperature

Seasonal temperature variation is high with hot summers and chilling winters. Summer season lasts about 3 months from May to July, with an average daily high temperature above 35°C (95°F); June is the hottest month, with an average high of about 38.7°C (102°F) and an average low of 23.7°C (75°F). The cool season lasts for about 3 months from December to February, with an average daily high below about 21°C (70°F); January is the coldest month, with an average low of about 2.6°C (37°F) and an average high of 17.1°C (63°F).

#### 4.4.8.2. Rainfall

The wet season in Islamabad generally extends from late June to late September, when monsoon currents dominate and the likelihood of a given day being rainy increases sharply compared to the rest of the year. Within this period, July is typically the month with the greatest number of wet days, with long-term station statistics indicating on the order of 13–15 days in July that receive at least 1.0 mm of rainfall.<sup>5</sup> The dry season lasts from October to June, when the chance of a wet day is much lower and most months experience only a few days with measurable precipitation. November is among the driest months, usually recording only about 1–3 wet days with at least 1.0 mm of rain, so conditions remain predominantly dry for most of this period. At the elevation of Islamabad, wet days almost always involve rain only; snowfall or mixed rain-and-snow events are rare and largely confined to higher ground in the surrounding hills, so the relevant form of precipitation for the project area is rain rather than snow.<sup>6</sup>

### 4.5. Biological Environment

The biological environment of the project area is shaped by its undulating topography, moderate elevation, and subtropical climatic conditions. The area receives seasonal monsoon rainfall, which, combined with local soil characteristics, supports a mix of planted and natural vegetation dominated by scrub forest species, ornamental trees, shrubs, and grasses. Shakarparian and its surrounding green spaces provide habitat for common urban and semi-urban wildlife, including birds, small mammals, reptiles, and insects, while nearby ponds and landscaped areas support limited aquatic and semi-aquatic species. Overall, Shakarparian functions as an important green zone within Islamabad, contributing to urban biodiversity, ecological balance, and recreational value.

#### 4.5.1. Legal and Conservation Status

The project area falls under the jurisdiction of Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance 1979, which intends to safeguard natural scenery, flora and fauna in their natural state. Shakarparian is recognized as part of the broader Margalla Hills National Park, notified formally in 1980, conferring statutory protection to the area's ecological features and biodiversity.

Ecologically, the Area represents a subtropical semi-evergreen woodland and scrub ecosystem, characteristic of the Potohar Plateau and lower Himalayan foothills. The area comprises a mosaic of natural scrub forest, mixed deciduous woodland, grasslands, and managed urban green spaces, reflecting both native ecological conditions and long-term anthropogenic modification. This heterogeneous ecosystem supports a range of flora and fauna adapted to dry sub-humid climatic

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<sup>5</sup> [https://weatherspark.com/y/107761/Average-Weather-in-Islamabad-Pakistan-Year-Round#google\\_vignette](https://weatherspark.com/y/107761/Average-Weather-in-Islamabad-Pakistan-Year-Round#google_vignette)

<sup>6</sup> Hussain, S. S., & Lee, J. Y. (2014). Rainfall Trends in Different Climate Zones of Pakistan. *Pakistan Journal of Meteorology*, 10(19), 37–47.

conditions, shallow soils, and undulating terrain, while also functioning as an important urban–natural interface ecosystem within Islamabad.

#### 4.5.2. Ecological Functions and Ecosystem Services

Shakarparian contributes to the urban ecosystem in multiple ways:

- **Climate regulation:** Its vegetative cover moderate's urban temperatures and reduces heat island effects through transpiration and shading.
- **Air quality:** Trees and shrubs sequester carbon dioxide and filter particulate matter from city air.
- **Hydrological benefits:** Vegetation aids in soil stabilization, infiltration and groundwater recharge, reducing flood risk.
- **Habitat provision:** Even as an urban park, it sustains ecological niches for various fauna, maintaining ecological connectivity with the larger Margalla Hills system.
- **Cultural services:** offer opportunities for recreation, traditional use, aesthetic enjoyment, and community identity.

#### 4.5.3. Ecological Baseline Study

A detailed ecological study was carried out for the Shakarparian area to collect data on ecological status of the project area. The surveys were conducted from 13th till 26th Jan, 2026 by team of ecologists, GIS expert and junior environmentalist. Findings of the survey formed basis for development of the ecological baseline of project area.

#### 4.5.4. Methodology for Flora survey

##### 4.5.4.1. Study Area Delineation

- The Shakarparian Protected Area and adjacent green spaces were divided into representative vegetation zones, including mixed woodland, scrub vegetation, landscaped gardens, planted forest patches, and urban-edge green belts.
- Sampling locations were selected along accessible trails, plantation blocks, open scrub areas, and natural vegetation patches to capture variation in species composition and disturbance levels.
- GPS coordinates were recorded for vegetation observation points and transects to maintain spatial consistency and support future monitoring surveys.

##### 4.5.4.2. Survey Timing and Frequency

- Floral surveys were conducted during daylight hours, primarily between 08:00 and 13:00 hrs, when plant identification and vegetation assessment could be carried out effectively.
- Multiple walkthrough surveys were undertaken across different habitat zones to ensure representative coverage of dominant and understory vegetation.

##### 4.5.4.3. Data Collection Techniques

###### a) Trees and Shrubs

- Line transects and visual reconnaissance surveys were used to document dominant tree and shrub species across woodland and plantation areas.
- Species were identified based on morphological characteristics such as leaf structure, bark texture, flowers, and growth form, supported by regional floristic guides.
- Data recorded included species name, approximate abundance, canopy condition, regeneration signs, and associated habitat type.

**b) Herbaceous Flora and Ground Vegetation**

- Opportunistic sampling and quadrat-style visual assessments were used to document grasses, herbs, and understory plants within scrub and open areas.
- Observations focused on dominant ground cover species, invasive plants, and seasonal vegetation patterns.

**c) Planted and Ornamental Vegetation**

- Landscaped zones and managed plantations were surveyed to record introduced and ornamental species contributing to the urban green character of Shakarparian.
- Particular attention was given to plantation structure, canopy continuity, and areas affected by vegetation removal or management activities.

*4.5.4.4. Threats and Disturbance Recording*

- Signs of vegetation disturbance such as tree cutting, removal of invasive species, soil exposure, trampling, and habitat modification were documented during field surveys.
- Habitat condition assessments included canopy density, presence of invasive species, regeneration status, and impacts from recreational use and urban activities.

*4.5.4.5. Data Recording and Analysis*

- Floral data were compiled into structured field records including species lists, habitat association, and GPS-tagged observation points.
- Relative abundance and vegetation composition were evaluated to understand ecological patterns across woodland, scrub, and landscaped zones.
- Observed disturbances were integrated with vegetation distribution to identify sensitive or degraded habitat patches.

*4.5.4.6. Limitations of the Floral Survey*

The floral assessment at Shakarparian was subject to several methodological constraints:

- **Seasonal Limitations:** The survey represents a snapshot in time and may not capture seasonal flowering species or annual herb diversity.
- **Accessibility Constraints:** Dense vegetation and restricted areas limited detailed assessment of some microhabitats.
- **Management Influence:** Ongoing plantation management and removal of certain species may affect current vegetation structure compared to historical conditions.

**4.5.5. Findings of Flora Survey**

*4.5.5.1. Floral Diversity*

Ground cover in Shakarparian mainly consists of natural grasses and low shrubs, including species such as Sariaia (*Heteropogon contortus*) and Khawi (*Cymbopogon jwarancusa*), particularly on open slopes and less-managed areas. In disturbed patches and along drainage lines, common grasses and hardy shrubs are present, playing an important role in soil binding and erosion control.

The herbaceous and medicinal flora is represented by widely occurring species such as Bugle Weed (*Ajuga bracteosa*), Cholai (*Amaranthus viridis*), Yellow Sorrel (*Oxalis corniculata*), White Top Weed (*Parthenium hysterophorus*), Common Fumitory (*Fumaria indica*), and Wandering Jew (*Commelina benghalensis*), which grow naturally along pathways, shaded areas, and moist spots. Overall, the flora of Shakarparian is typical of an urban recreational park, consisting of common, non-threatened species that contribute to ecological balance, landscape beauty, and environmental stability.

#### 4.5.5.2. Dominant Flora

The protected area hosts diverse plant communities, including both native and planted vegetation. Large stands of indigenous trees such as sheesham (*Dalbergia sissoo*), kikar (*Acacia nilotica*) and amaltas (*Cassia fistula*) intermingle with ornamental plantations and urban gardens. Scientific surveys have identified over 661 plant species across more than two dozen families in the greater Shakarparian landscape. Six dominant vegetation associations — including *Cynodon dactylon*, *Carissa opaca*, *Lantana camara* and others — reflect both natural and disturbed vegetative assemblages.

Scientific Name	Common Name	Growth Form	IUCN Status
<i>Acacia modesta</i>	Phulai	Tree	Least Concern (LC)
<i>Olea ferruginea</i>	Wild Olive (Kahu)	Tree	Least Concern (LC)
<i>Dalbergia sissoo</i>	Sheesham	Tree	Vulnerable (VU)
<i>Ziziphus mauritiana</i>	Ber	Tree	Least Concern (LC)
<i>Bauhinia variegata</i>	Kachnar	Tree	Least Concern (LC)
<i>Carissa opaca</i>	Garanda	Shrub	Least Concern (LC)
<i>Dodonaea viscosa</i>	Sanatha	Shrub	Least Concern (LC)
<i>Justicia adhatoda</i>	Vasaka	Shrub	Least Concern (LC)
<i>Calotropis procera</i>	Aak	Shrub	Least Concern (LC)
<i>Cynodon dactylon</i>	Bermuda Grass	Grass	Least Concern (LC)
<i>Saccharum spontaneum</i>	Kans Grass	Grass	Least Concern (LC)

Scientific Name	Common Name	Native Status	IUCN Status
<i>Pinus roxburghii</i>	Chir Pine	Planted (non-native locally)	Least Concern (LC)
<i>Pinus wallichiana</i>	Blue Pine	Planted (ornamental)	Least Concern (LC)
<i>Azadirachta indica</i>	Neem	Planted	Least Concern (LC)
<i>Eucalyptus camaldulensis</i>	Eucalyptus	Introduced	Least Concern (LC)
<i>Bombax ceiba</i>	Semal	Planted / native regionally	Least Concern (LC)
<i>Ficus benghalensis</i>	Banyan	Planted	Least Concern (LC)
<i>Ficus religiosa</i>	Peepal	Planted	Least Concern (LC)
<i>Cassia fistula</i>	Amaltas	Planted	Least Concern (LC)

Scientific Name	Common Name	Status	IUCN Status
<i>Broussonetia papyrifera</i>	Paper Mulberry	Invasive	Least Concern (LC)
<i>Lantana camara</i>	Lantana	Invasive	Least Concern (LC)
<i>Prosopis juliflora</i>	Mesquite	Invasive	Least Concern (LC)

#### 4.5.5.3. Anthropogenic Influence on Vegetation

Recent events have triggered significant concern regarding vegetation loss. Large-scale tree-cutting operations have opened previously contiguous woodland, leading to barren patches near areas such as the Lok Virsa section of Shakarparian. Authorities have stated that several trees predominantly paper mulberry (*Broussonetia papyrifera*), considered an allergenic non-native species were removed for public health reasons. This has been met with widespread debate among environmental groups, who argue that the scale of removal extends beyond a management of allergenic species and constitutes broader ecological degradation.



Figure 4.7: Flora of the project area

#### 4.5.6. Methodology for Faunal Survey-Birds

The survey was conducted to document faunal species diversity, abundance, habitat association, and behavioral observations within selected locations of Margalla Hills National Park and Shakarparian. The information supports baseline ecological assessment and biodiversity documentation.

A field-based observational survey was undertaken using a combination of line transect walks and point count methods, which are standard techniques for terrestrial bird assessments in forest and shrub habitats. Surveys were carried out along accessible trails and habitat patches representing deciduous shrub forest, mixed vegetation, and adjacent urban edge habitats.

##### 4.5.6.1. Survey Timing and Duration

Field surveys were conducted during early morning hours (approximately 08:00–12:00 hrs) when bird activity is highest, ensuring better detectability. Observations were recorded continuously while walking slowly along transects and during short stationary observation periods.

##### 4.5.6.2. Sampling Method

Two complementary methods were employed:

###### a) Line Transect Method

Observers walked along predetermined paths at a slow pace, recording all birds seen or heard within detectable range. Species identity, number of individuals, behaviour, and habitat type were noted.

###### b) Point Count Observations

At suitable locations, observers stopped for short durations to record birds present in the surrounding area. This method improved detection of calling and canopy-dwelling species.

##### 4.5.6.3. Bird Survey

Bird species were recorded using visual and auditory detection methods, including:

###### c) Visual Observations

Observers conducted slow walks along transects and point stops, recording birds seen using binoculars. Species, numbers, behaviour, and habitat associations were documented.

###### d) Call Identification Method

Many bird species were identified based on distinct vocal calls, especially species hidden within dense vegetation. Observers paused periodically to listen for calls and recorded species detected through sound cues.

###### e) Behavioural Observations

Behaviour such as feeding, calling, nesting, perching, or flocking was recorded to understand habitat use and activity patterns.

###### f) Habitat Recording

Habitat type and location coordinates were recorded for each observation to determine habitat preference.

#### 4.5.7. Methodology for Mammal Survey

Since mammals are often elusive or nocturnal, surveys relied largely on indirect evidence in addition to occasional sightings.

#### *4.5.7.1. Direct Sightings*

Mammals encountered during transect walks were recorded with details on species, number, behaviour, and habitat.

#### *4.5.7.2. Indirect Evidence Collection*

Presence of mammals was determined through observation of:

- Footprints and tracks
- Droppings (scat)
- Burrows and dens
- Feeding remains (food leftovers, chewed vegetation, prey remains)
- Scratch marks on trees
- Trails and movement paths
- Sounds or calls
- Odour marks
- Resting or bedding sites

#### *4.5.7.3. Den and Burrow Surveys*

Potential denning or burrow sites were inspected to identify species use based on size, structure, and associated signs.

#### *4.5.7.4. Community Information*

Local information from park staff and visitors was used to confirm presence of certain species.

#### *4.5.7.5. Data Collection Parameters*

For each observation, the following information was recorded:

- Time of observation
- Species common name
- Number of individuals observed
- Sex (where identifiable)
- Age class
- Behaviour (feeding, calling, perched, etc.)
- Habitat type
- GPS coordinates (latitude & longitude)
- Elevation/altitude

Bird identification was performed visually and through vocal calls using field experience and standard regional bird identification guides.

#### *4.5.7.6. Habitat Coverage*

The survey covered representative habitats including:

- Deciduous shrub and mixed forest vegetation
- Scrub and open woodland areas
- Urban edge and settlement interfaces

#### *4.5.7.7. Data Handling and Analysis*

All field observations were compiled into a structured database and later analyzed to determine:

- Species occurrence

- Relative abundance
- Habitat preference
- Behavioural patterns

#### 4.5.7.8. Limitations

The current survey constitutes a short-term ecological assessment, intended to provide an indicative overview of the avifaunal assemblage within the study area. Due to the limited temporal scope and sampling duration, the data may not fully represent the complete species diversity. In particular, migratory, nocturnal, cryptic, and breeding bird species could be under-detected. To ensure robust baseline information and enhance the reliability of future impact evaluations, it is recommended that extended, multi-seasonal, and methodologically diverse surveys be conducted across different habitat types and seasons.

#### 4.5.7.9. Equipment Used

Survey activities employed:

- Binoculars for visual identification
- GPS device/mobile GPS for location recording
- Field notebooks or digital data sheets
- Camera for photographic documentation where possible

### 4.5.8. Findings of Fauna Survey

Baseline biodiversity surveys indicate a total of approximately 29 birds and 5 mammal's species were recorded animal species. The maps have been developed to show the area of recording of these species. During the survey in the area, the following mammals were encountered and recorded.

#### 4.5.8.1. Birds

Avifauna is relatively rich, with over 100 bird species recorded. Resident and migratory species such as bulbuls, parakeets, mynas and hoopoes use the area for foraging, nesting and seasonal stop-overs. These birds contribute to pollination, seed dispersal, and the overall ecological balance of the urban green space.

Scientific Name	Common Name	IUCN Status
<i>Leiothrix lutea</i>	Red billed leiothrix	Least concern
<i>Pycnonotus leucogenys</i>	Himalyan bulbul	Least concern
<i>Pycnonotus cafer</i>	Red vented bulbul	Least concern
<i>Hypsipetes leucocephalus</i>	Black jungle bulbul	Least concern
<i>Megalaima asiatica</i>	Blue throated barbet	Least concern
<i>Megalaima haemacephala</i>	Coppersmith barbet	Least concern
<i>Megalaima virens</i>	Great barbet	Least concern
<i>Aegithalos leucogenys</i>	White cheeked tit	Least concern
<i>Parus cinereus</i>	Cinerous tit	Least concern
<i>Lophura leucomelanos</i>	Kalij pheasant	Least concern
<i>Francolinus pondicerianus</i>	Grey francolin	Least concern
Picidae	Eurasian wryneck	Least concern
<i>Ficedula</i>	Red breasted flycatcher	Least concern
<i>Gallinula chloropus</i>	Common moorhen	Least concern
Rallidae	Eurasian coot	Least concern

Alcedo atthis	Common Kingfisher	Least concern
Halcyon smyrnensis	White throated kingfisher	Least concern
Acridotheres tristis	Common myna	Least concern
Acridotheres fuscus	Jungle myna	Least concern
Acridotheres ginginianus	Bank myna	Least concern
Dendrocopos canicapillus	Grey capped pygmy woodpecker	Least concern
Dinopium benghalense	Flameback woodpecker	Least concern
Streptopelia decaocto	Eurasian collard dove	Least concern
Picumnus innominatus	Speckled piculet	Least concern
Sturnia malabarica	Chestnut starling	Least concern
Sturnia pagodarum	Brahminy starling	Least concern
Sturnus vulgaris	Eurasian starling	Least concern
Prinia inornata	Plain prinia	Least concern
Microcarbo niger	Little cormorant	Least concern

The avifaunal survey conducted across selected locations of Margalla Hills National Park and Shakarparian recorded a diverse assemblage of bird species primarily associated with deciduous shrub and mixed vegetation habitats, with occasional observations in urban-edge areas. Observations made between 08:00 and 12:00 hours indicate active feeding, calling, and perching behavior among commonly encountered species such as Himalayan Bulbul, Red-vented Bulbul, Indian White-eye, and Black Jungle Bulbul, reflecting healthy shrub and forest-edge bird communities. Ground-dwelling species including Kalij Pheasant and Grey Francolin were also recorded, indicating suitable undergrowth and feeding habitats, while woodland specialists such as barbets, woodpeckers, tits, and flycatchers confirm the presence of structurally diverse vegetation. Most individuals recorded were adults, with flocking behavior observed in several passerine species, suggesting stable local populations. The survey results demonstrate that deciduous shrub habitats within the park provide important feeding and shelter resources, supporting both resident and seasonal bird species across varying elevations and landscape conditions.

#### 4.5.8.2. Mammals and Small Vertebrates

Smaller mammals including squirrels, mongoose, hedgehogs and porcupines are present in woodland and edge habitats, while foxes and occasionally wild boar are observed in the denser vegetated zones. The mammals found in the area are listed below.

Group	Common Name	Scientific Name	IUCN Status
Pholidote	Pangolin	Manis carssicaudata	Endangered
Cervidae	Barking deer	Muntiacus muntjac	Least concern
Pteropus	Flying fox	Pteropus	Least concern
Canidae	Jackal	Canus aureus	Least concern
Suidae	Wild boar	Sus scrofa	Least concern

#### 4.5.8.3. Legal and Conservation Status

Shakarparian falls under the jurisdiction of the Islamabad Wildlife (Protection, Preservation, Conservation and Management) Ordinance, 1979, which aims to safeguard natural landscapes, flora, and fauna in their natural state. The area is recognized as part of the broader Margalla Hills National Park, formally notified in 1980, thereby conferring statutory protection to its ecological integrity and biodiversity values.

Ecologically, the Shakarparian Protected Area represents a subtropical semi-evergreen woodland and scrub ecosystem characteristic of the Potohar Plateau and the lower Himalayan foothills. The landscape comprises a mosaic of natural scrub forest, mixed deciduous woodland, grasslands, and managed urban green spaces, reflecting both native ecological conditions and long-term anthropogenic influences. This heterogeneous habitat supports a diverse assemblage of flora and fauna adapted to dry sub-humid climatic conditions, shallow soils, and undulating terrain, while also functioning as a critical urban–natural interface within Islamabad.



Jackal



Wild Boar



Burrow of Pangolin

**Figure 4.8: Fauna spotted during the survey**

#### **4.5.9. Current Challenges**

##### *4.5.9.1. Deforestation and Land-use Change*

Reports indicate extensive tree felling activities in late 2025 and early 2026 that have opened gaps in previously dense tree cover. Critics contend that actual vegetation loss, linked to infrastructure development and urban projects, exceeds just the targeted removal of allergenic trees. Such removals have generated public dissatisfaction and raised alarms over diminished ecological functionality.

##### *4.5.9.2. Urban Pressures*

Ongoing urban expansion, land leasing for commercial purposes, and proposed developments (such as sports complexes, hospitality structures and roads) pose risks of habitat fragmentation and biodiversity decline unless strictly regulated. Historical environmental impact assessments have noted that large-scale construction within or adjacent to Shakarparian could degrade tree cover, soil stability and local wildlife populations.

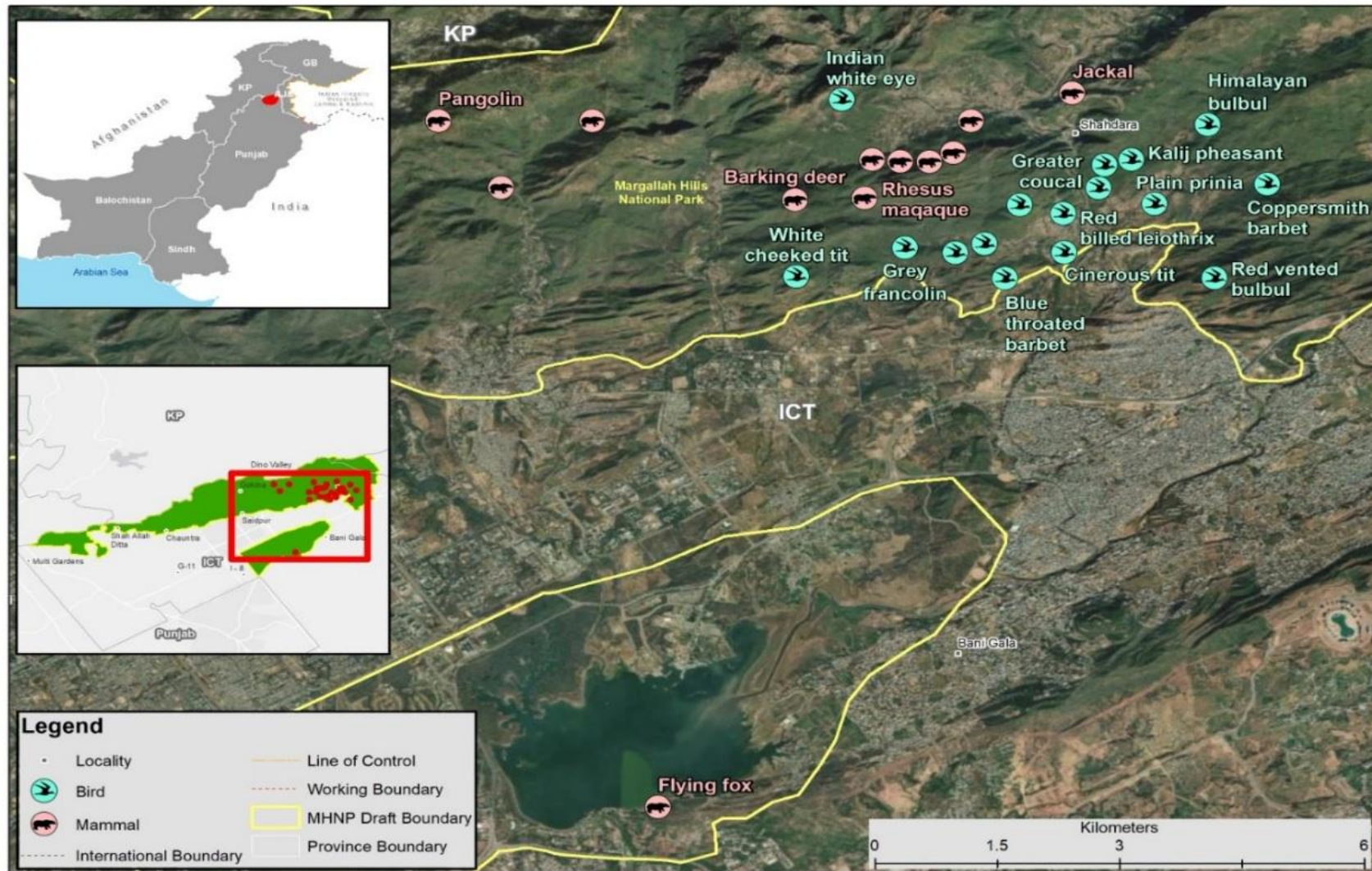


Figure 4.9: Map showing Spatial distribution birds and mammals' species in the selected part of MHNP



Figure 4.10: Map showing Spatial distribution birds and mammals' species in Shakarparian

## 4.6. Social Baseline

Information on the social aspects of project area is presented below. The data was collected through social surveys of project area. The social aspects covered in the section include the general administration, land use, civil infrastructure network, common social issues and social constraints of the area.

### 4.5.1 District Administration

Islamabad Capital Territory is administered as a federal capital territory directly under the federal government, managed by the Capital Development Authority (CDA) which divides the city into 5 administrative zones. Shakarparian falls under Zone III jurisdiction, with the CDA Environment Wing responsible for protected area management and green space oversight.

### 4.5.2 Land use features

Land use within the Shakarparian area comprises a mix of protected forest, landscaped recreational spaces, cultural landmarks, and major sports and community infrastructure. While the area forms part of the extended landscape of Margalla Hills National Park, it also accommodates significant built structures. The Pakistan Monument and the adjoining Pakistan Monument Museum function as key tourism and heritage zones. Additionally, the National Institute of Folk and Traditional Heritage (Lok Virsa) and the Pak-China Friendship Center contribute cultural and event-based land use within the vicinity.

The broader Shakarparian zone also includes prominent sports and recreational facilities such as the Pakistan Sports Complex (including Jinnah Sports Stadium), Islamabad Club, Pakistan Football Club, and the Pakistan Boy Scouts Association facilities. These institutions, along with internal roads, parking areas, pedestrian pathways, and landscaped gardens, establish the area as a multifunctional urban–ecological interface. Although no permanent residential settlements exist within the protected boundary, surrounding urban sectors and major road corridors contribute to sustained visitor pressure, defining Shakarparian as both a conservation landscape and an intensively utilized recreational and institutional zone.

In addition, the Islamabad Parade Ground located within the Shakarparian vicinity serves as a designated ceremonial and public gathering space, hosting national events and large-scale assemblies. Besides Shakarparian parade ground, there is a high-security zone in the Shakarparian area which comprises multiple military units and installations. The area is a restricted zone under the management of Pak Army.

### 4.5.3 Demography

According to the 2023 Population and Housing Census of Pakistan, the total population of Islamabad Capital Territory (ICT) is 2,363,863. Of this population, about 1,108,872 people live in urban areas, while around 1,254,991 reside in rural areas. The gender distribution includes approximately 1,247,693 males and 1,115,900 females, along with a small number of transgender persons, showing a slightly higher male population. Overall, the population of ICT is spread between planned urban sectors and rural settlements, which affects the planning and provision of infrastructure, services, and development activities.<sup>7</sup>

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<sup>7</sup> [https://www.citypopulation.de/en/pakistan/admin/islamabad/501\\_islamabad/](https://www.citypopulation.de/en/pakistan/admin/islamabad/501_islamabad/)

#### 4.5.4 Movement and accessibility

Shakarparian is situated within the urban fabric of Islamabad and is directly linked to central city corridors through an established network of primary roads and internal park routes, providing access to recreational zones and tourism-related locations such as the Pakistan Monument precinct. Connectivity to the area is facilitated through major city arteries surrounding the Shakarparian Hills, enabling movement between the protected landscape, nearby commercial centres, and residential sectors of Islamabad. Transportation within the project vicinity is predominantly road-based, with visitors and park users accessing the area through paved routes and designated entry points that connect urban areas with the Margalla Hills National Park extension. The surrounding road infrastructure supports regular recreational visitation while maintaining the role of Shakarparian as a transitional ecological corridor between the city centre and the Margalla foothills.

#### 4.5.5 Common Social Issues

The Shakarparian Protected Area primarily functions as a recreational park and urban ecological buffer; therefore, social concerns within the project vicinity are mainly linked to land management, visitor pressure, and ongoing urban expansion rather than residential service provision. Within the park, issues such as overspending vehicles on access roads, occasional littering, and the presence of stray dogs pose minor safety and environmental management challenges, particularly during periods of high visitor activity. Increasing recreational use places additional pressure on park maintenance and highlights the need for continuous monitoring to preserve the ecological and aesthetic value of the landscape.

In the surrounding areas, environmental and governance-related concerns have also been observed. Reports of tree-cutting and vegetation removal have generated public debate and concern regarding the potential loss of green cover and ecological degradation. Rapid urban development and proposed infrastructure or commercial activities near the protected landscape may contribute to habitat fragmentation and changes in land use. In addition, challenges related to regulatory enforcement and compliance with environmental zoning and protected-forest regulations remain significant issues. These factors indicate the need for improved management planning, stricter enforcement of conservation policies, and balanced regulation of recreational activities to maintain ecological integrity within the Shakarparian Protected Area and its surrounding environment.

#### 4.5.6 Commercial Activities

Commercial activities within Shakarparian are limited in scale and are primarily associated with recreational tourism and public visitation. Small food kiosks, refreshment stalls, souvenir vendors, and seasonal mobile vendors operate in designated areas to serve visitors, particularly near viewpoints, parking zones, and major pedestrian routes. Informal photography services, guided tour activities, and occasional event-based setups also contribute to minor economic activity within the park. These commercial uses remain largely service-oriented rather than permanent retail development, reflecting the protected and recreational status of the area. Overall, commercial activity supports local livelihoods and enhances visitor experience; however, it requires regulation to manage waste generation, traffic flow, and potential disturbance to the natural landscape and park aesthetics.

#### 4.5.7 Archeological and Cultural Sites

Shakarparian, located within the Islamabad Capital Territory (ICT), contains several important monuments, ceremonial grounds, and cultural institutions that enhance its heritage and symbolic significance. Although the area primarily functions as a recreational and administrative zone, it also serves as a prominent cultural and national ceremonial landscape within Islamabad.

Key heritage and cultural landmarks within and adjacent to Shakarparian include:

- **Pakistan Monument and Museum:** A national monument symbolizing the unity and cultural diversity of Pakistan. It is a major tourist attraction and venue for national commemorations and state events.
- **National Institute of Folk and Traditional Heritage (Lok Virsa):** A major cultural institution dedicated to the preservation and promotion of Pakistan's folk traditions, crafts, music, and ethnographic heritage. The Lok Virsa Heritage Museum within the complex displays regional cultural artifacts and hosts national cultural festivals and exhibitions.
- **Islamabad Parade Ground:** A large ceremonial ground used for national day celebrations, public gatherings, defense exhibitions, and official state functions, contributing significant symbolic and institutional value to the area.
- **Museum of Natural History:** It is located at Garden Avenue Shakarparian, short of Lok Virsa on the left side. It has four divisions namely Botanical Sciences, Earth Sciences, Zoological Sciences and Public Services.

While Shakarparian does not contain formally designated archaeological sites within its footprint, the broader Islamabad region has historical associations with ancient civilizations due to its location near the Potohar Plateau. The concentration of nationally significant monuments, museums, and ceremonial grounds underscores the cultural sensitivity of the area and highlights the importance of careful planning and management of any proposed development activities to avoid adverse impacts on heritage structures, ceremonial functions, and the visual landscape.



**Pakistan Monument**



**Pakistan Museum of Natural History**

**Figure 4.11: Major land marks in project area**

## 5. STAKEHOLDER CONSULTATION

### 5.1. Introduction

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.

### 5.2. Consultation Objectives

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.

### 5.3. Consultation Methodology

EMC team carried out consultations with the local residents in the vicinity (primary stakeholders) of the project and with the relevant departments (secondary stakeholders). The consultation approach included:

- Communication of project scope and objectives to the stakeholders
- Identification of values held by the residents/departments and their concerns regarding the development activities in the project area.
- Obtaining their feedback and suggestions on the proposed project activity.

Identification of stakeholders is one of the major steps for designing an effective consultation process. For this purpose, a site visit was carried out by EMC social team to identify the communities and the relevant stakeholders for consultation. Consultation meetings were conducted with the identified stakeholders residing or working in the nearby areas of project and with relevant departments by EIA team. Queries regarding the project were responded by EIA team during the session. Concerns and suggestions of the respondents were noted down by the team and pictures of the session were taken with the consent of the stakeholders.

### 5.4. Identification of 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 5.1(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 project and propose mitigation measures that minimize the negative project impacts and enhance the positive ones.

S. No.	Stakeholder Groups	Stakeholders
1	Proponent	<i>MOL Pakistan HSE Team, Exploration Dept.</i>
2	Settlements near the project area	Residential areas of Sector G-6, G-7 and I-8
3	Commercial entities	Grocery Shop, Tea Stall, Transport Agent, Local restaurant, Auto workshop,

S. No.	Stakeholder Groups	Department	Name and Designation
1	Government Departments	Environmental Protection Agency, Islamabad	Mr. Khalid Mehmood, Director EIA
		Capital Development Authority (CDA), Islamabad	Mr. Akhtar Rasool (Director Environment) Mr. Idress (Deputy Director, Parks)
		Islamabad Wildlife Management Board (IWMB)	Dr. M. Saeed, AD R&D, IWMB
2	Environment practitioners and experts	NUST Islamabad	Dr. Zeshan, Professor, SEE (IESE), NUST, Islamabad Dr. Erum Aamir, Assistant Professor, SEE (IESE), NUST, Islamabad

## 5.5 Outcome of Consultation

### 5.5.1 Consultation with Government Departments and Institutions

A meeting was held with the government stakeholder department and were briefed about the project purpose and project location. The department consulted at Islamabad Capital Territory (ICT) for the feedback on the proposed activities are as under.

S#	Departments	Date:	Feedback
1.	EPA Islamabad		<ul style="list-style-type: none"> <li>The project area has conservation importance and the local ecological is sensitive. Careful management during project is critical.</li> <li>Prudent monitoring plan should be implemented during the project.</li> </ul>
2.	CDA, Islamabad	26 <sup>th</sup> Jan, 2026	<ul style="list-style-type: none"> <li>After completion of project activities, plantation and landscaping shall be carried out to restore the area to conditions similar to the baseline.</li> <li>Tree cutting is strictly prohibited after a suo moto notice by the Court.</li> <li>Tree transplantation may be considered only if the tree trunk width is less than 12 inches and height is under 8–10 feet, subject to species-specific conditions and prior approval.</li> </ul>

			<ul style="list-style-type: none"> <li>Waste management shall be the responsibility of the project proponent, and all waste must be managed at the proponent's own cost.</li> <li>Any damage caused during project activities shall be fully restored to the original condition.</li> <li>Prior approval from CDA) is mandatory for carrying out activities in protected or sensitive areas.</li> </ul>
3.	Islamabad Wildlife Management Board (IWMB)	1 <sup>st</sup> Dec, 2025	<ul style="list-style-type: none"> <li>is the custodian of protected areas in Margalla Block, with support from CDA.</li> <li>Common fauna in surrounding areas (e.g., Shakarparian) include foxes, jackals, porcupines, wild boar, waterfowl, turtles, and other species.</li> <li>The area supports diverse wildlife, including around 30 mammal species; Pangolin is an endangered species.</li> <li>Prior approval from IWMB is mandatory for carrying out any activities in protected areas.</li> <li>Breeding seasons vary from species to species, and project activities should consider wildlife sensitivity periods.</li> <li>A buffer zone of 100 meters is defined for protected areas as per the relevant Act.</li> <li>Project activities should be avoided within National Park areas.</li> <li>If activities are unavoidable, international environmental and wildlife protection protocols must be strictly followed.</li> </ul>



Figure 5.1a: Consultation with Field office env directorate CDA



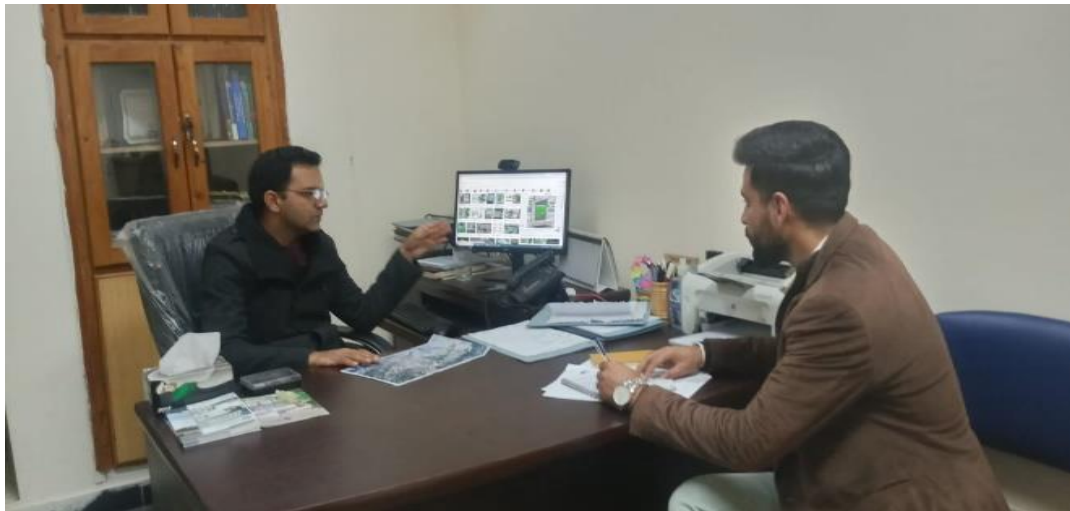
Figure 5.1b: Consultation with IWMB

### 5.5.2 Consultation with Environment Practitioners and Experts

Consultation was conducted with academic expert to gather feedback on the proposed project. A meeting was held with Prof. Dr. Zeshan and Dr. Erum Aamir, their feedbacks are presented in the below.

Name	Designation	Feedback
Dr. Zeshan	Professor, SCEE (IESE), NUST, Islamabad	<ul style="list-style-type: none"> <li>• Avoid tree cutting during all project activities.</li> <li>• Prevent adverse impacts on biodiversity and wildlife habitats.</li> <li>• Islamabad already faces water scarcity; project activities should not stress community water resources.</li> <li>• Ensure proper storage and treatment of wastewater using separate systems for municipal and hazardous wastewater.</li> <li>• For municipal wastewater, use anaerobic wastewater treatment technologies.</li> <li>• Apply on-site treatment options such as soak pits, septic tanks, and portable septic tanks where appropriate.</li> <li>• Implement sludge processing and safe disposal for hazardous wastewater.</li> <li>• Minimize CO<sub>2</sub> and other greenhouse gas (GHG) emissions during project execution.</li> <li>• Promote innovative solutions such as Liquid Trees for CO<sub>2</sub> absorption and air quality improvement.</li> </ul>
Dr. Erum Aamir	Assistant Professor, SCEE (IESE), NUST, Islamabad	<ul style="list-style-type: none"> <li>• Ensure strong understanding of climate change concepts and actively avoid and minimize emissions during project activities.</li> <li>• Implement proper solid waste management, including collection, segregation, recycling, and safe dumping.</li> <li>• Prevent soil and dust pollution, particularly PM<sub>2.5</sub> and PM<sub>10</sub> emissions.</li> <li>• Use biochar as a sustainable measure to reduce pollution and improve soil quality where applicable.</li> <li>• Install activated carbon filters for purification of smoke and exhaust emissions from all types of equipment and vehicles.</li> <li>• Ensure no tree cutting during any phase of the project.</li> <li>• Promote rainwater harvesting to address Islamabad's water scarcity.</li> </ul>

		<ul style="list-style-type: none"><li>• Harvest rainwater using efficient and effective systems to reduce reliance on community water resources.</li></ul>
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**Figure 5.2a: Consultation with Professor Dr. Zeshan, SCEE (IESE), NUST, Islamabad**



**Figure 5.2b: Consultation with Dr. Erum Aamir, Assistant Professor, SCEE (IESE), NUST, Islamabad**

### **5.5.3 Consultation with Communities**

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:

- The area surrounding Shakarparian is generally peaceful, project activities should be managed in a manner that does not increase noise levels or traffic congestion.
- Shakarparian functions as an important recreational and family oriented public space; all project related works should be carried out carefully to prevent damage to trees, lawns, and natural greenery.
- Water supply in the area is generally available; however, occasional shortages occur during the summer season.
- Provision of employment opportunities by the project would contribute positively to the local economy.

- Healthcare facilities are located nearby; however, the availability of rapid emergency response services is essential in case of accidents or health related incidents during project execution.
- Cleanliness of the park and surrounding areas is a key concern, particularly during holidays; effective waste management and litter control measures should be strictly implemented.
- Traffic volumes are high during weekends and peak visiting hours; scheduling of project activities during off-peak hours is recommended to avoid congestion and parking issues.
- Provision of employment opportunities for local residents, particularly youth, would be beneficial and is strongly encouraged.
- Clear communication regarding project timelines, working hours, and activity schedules is necessary to minimize inconvenience to visitors and nearby communities.
- Preservation of the natural landscape, scenic views, and environmental quality of Shakarparian is considered essential; any disturbance to the environment should be avoided.
- Development initiatives aimed at improving park facilities are acceptable, provided that no harm occurs to greenery and public access remains uninterrupted.
- A comprehensive waste disposal, site safety, and environmental management plan should be implemented prior to the commencement of project activities.
- Proper signage, safety barriers, and access control measures should be installed at work sites to ensure visitor safety.
- Strict measures should be enforced to prevent littering and damage to lawns, trees, and landscaped areas.
- Enhancement of public amenities, including benches, shaded sitting areas, and clean toilet facilities, would be positively received by park users.





Figure 5.3: Consultation with local residents in project area vicinity (G6, G7, I-8)

## 6. ENVIRONMENTAL & SOCIAL RISK ASSESSMENT

### 6.1. Introduction

This section presents the outcome of screening process and risk assessment conducted to identify potential environmental and social impacts of project's activities followed by assessment to determine the scale and magnitude of identified impacts.

The screening process, besides identifying potential environmental impacts and the possibility of residual impacts, also outlines mitigation measures that may be adopted in order to prevent, reduce or minimize the impact. The screening process has also identified possible risks pertaining to natural environment including physical environment, fauna and flora and nearby communities apart from health safety risks.

The potential impacts related to the proposed project have been identified through professional judgment, experience, process understanding, and field observations. Impact significance has been assessed using a Risk Assessment Approach based on the severity and likelihood of the potential impact.

### 6.2. Methodology adopted for Risk Assessment

Oil and gas sector has its own distinctive impacts associated with the exploration activities. The sectoral guidelines on oil and gas exploration provide guidance on significant environmental impacts from exploration activities. The environmental aspects of the project were identified in relation to the present land use, effect on vegetation, physical environment and other during the project.

The methodology adopted for impact assessment comprised following steps:

1. Identification of impacts through review of guidelines, previous similar studies and field data from surveys
2. Assessment of magnitude and scale of impacts using applicable guidelines, site data (surveys) and project activities
3. Mitigation Measures through review of national and international guidelines, and best industry practices
4. Identification of residual impacts after mitigation measures and determining monitoring requirements

The major element involved in the process of environmental impact assessment is identification as it leads to other elements such as quantification and evaluation of impacts. Although, in general number of impacts can be identified while describing the project, all the impacts may not be considered significant. Hence it is necessary to identify the critical impacts that are likely to cause significant impact on various components of environment due to the project.

While identifying the impact for exploration activities in the study area, all significant project activities have been accounted for. The availability of energy resource (oil/gas) the end product has been considered for the purpose of economic benefits.

National Environmental Quality Standards (NEQS) were reviewed for determining the permissible levels of environmental parameters during project operation and classification of the site with respect to its pollution status.

### 6.3. Screening of potential impacts

The seismic survey activities in the project area would require following environmental constraints to be addressed:

1. Impacts on Physical Environment (Air, Noise, Water, and land/Soil resources)
2. Impacts on Ecology (Flora, Fauna, habitats)
3. Impact on social environment (land use change, infrastructure, community health hazards, accessibility)
4. Project Benefits (Positive impacts)
5. Community Health and Safety

### 6.4. Impacts on Physical Environment

#### 6.4.1. Changes in Landscape and Soil Erosion

Site preparation for lines, preparation for access tracks, up-holes/shot holes, movement on dirt tracks will create ground disturbances leading to soil erosion. The probability and scale of impact is expected to remain small as most of the project area has well bound soils with green cover in the form of grasses, shrubs or other form of vegetation. In some areas, the effect can be more pronounced where there has been no previous activity of soil erosion. The activities can also affect slope stability thus increasing erosion. The overall impact will be localized and can be controlled effectively by adopting mitigation measures.

#### Mitigation Measures

- Seismic survey in the undulating areas will follow natural contours wherever possible. However, in areas where seismic line cutting is a requirement, the activity will be carried out in a way that would minimize disturbance to natural topography and soils.
- The width of lines cleared for seismic survey will be limited to 4m to minimize clearing of vegetation and disturbance to soil from a large area.
- Cut and fill works will be avoided to at least kept to minimum.
- Clearing of vegetation will be kept to a minimum, to the extent possible.
- Existing access roads shall be used as much as possible and new roads will be planned carefully.
- Total land uptake for the project will be kept to the minimum required.
- Vehicle speeds will be regulated and monitored to avoid excessive dust emissions.
- Trainings will be conducted for the drivers on use of roads, access roads and dirt tracks.
- Activities will be confined within work corridors.
- Photographs will be taken at regular intervals throughout the project activities to monitor any changes on soil and its conditions.
- Regular monitoring of project activities will be done to identify any soil erosion occurring from the project activities, especially areas close to any slopes.

#### 6.4.2. Dust and Gaseous Emissions

The dust and gaseous emissions from the equipment and vehicles can alter the local air quality of project area. The effect will be localized and site specific and scale of impact can vary depending on the nature and intensity of activities.

Dust emissions cause the amount of particulate matter in the air to increase, and thus become a health concern. Dust clouds also reduce road visibility, creating a traffic hazard. Dust emissions due to road travel can create dust clouds and increase local PM concentration.

Two generators of 450HP will be used during the project. Emissions sources would include generators and vehicles used during seismic surveys. NEQS for diesel generators are not available and World Bank or US EPA standards are generally adopted. World Bank environmental guidelines have set a much higher limit for NO<sub>x</sub> emissions produced by engine driven power plants. The guidelines (World Bank, 1998) suggest NO<sub>x</sub> emission limits of 2,000 mg/Nm<sup>3</sup> at 15% oxygen.

Emissions from vehicles and equipment are generally similar to those produced by diesel generators in terms of the pollutants discharged viz. SO<sub>2</sub>, NO<sub>x</sub>, PM, etc., except that the extent will be considerably lower. Monitoring of air emissions from generators during previous exploration activities shows that the emissions remain within the National Environmental Quality Standards (NEQS). The emissions will also disperse quickly with the prevalent wind currents.

##### **Mitigation Measures**

- Dust emissions due to road travel will be minimized by regulating vehicle speeds and watering of the access track.
- The exhaust emissions produced by these generators will be monitored and only if they are found to meet the NEQS will these generators be used.
- Generators and other equipment and vehicles used will be maintained in a good condition to ensure that emissions are kept to a minimum level.

#### 6.4.3. Noise and Vibrations

The use of Vibroseis acoustic energy sources, dynamite charging, and power augers for shallow drilling are potential sources of noise and vibration during the project. The key receptors include the survey crew, communities located close enough and wildlife. The base camp site can also be a source of noise pollution from use of generators if not adequately enclosed for noise protection.

The continuous low-frequency rumble from generators and the impulsive sound from Vibroseis sweeps may cause annoyance, disturbance, and stress for wildlife and affect their communication and nesting behavior. Increased noise levels during transportation activities can be a source of nuisance for locals and a source of disturbance to the native wildlife.

Vibrations generated by Vibroseis trucks and heavy vehicles may disturb wildlife, particularly ground-nesting birds and burrowing animals, and may cause soil compaction along vehicle tracks. Vibrations produced from Vibroseis operations and shooting may also propagate to sensitive environmental receptors such as water bodies, steep slopes, and heritage structures, potentially affecting their physical integrity or ecological function.

##### **Mitigation Measures**

- All seismic operations will be carried out only during daylight hours.
- Ensure that Vibroseis and other vehicles have working silencers to muffle noise.

- Workers will be sensitized on hazards likely to be encountered in such a work environment, and trained accordingly.
- Use of personal protective equipment such as ear muffs will be enforced, and setting up of buffer zones in areas of active seismic survey to keep away unauthorized personnel.
- Blasting will be avoided as much as possible during proposed project activities to provide relief to the sensitive environmental receptors of the area.
- Regular monitoring of noise near communities will be carried out.

#### 6.4.4. Soil and water Contamination

Following activities can cause contamination of soil and water sources of project area.

1. Solid and Liquid Waste
2. Oil and chemical during handling and storage and spills

##### 6.4.4.1. Leaks and spills

Leaks from vehicles, equipment, or storage containers at work sites and handling and transfer operations can cause contamination of soil and water. Depending on the nature and scale of spill or leaks, the impact can be medium to significant and localized. Soil contamination can occur from chemical or oil spills during chemical or fuel handling (loading and storage activities). Runoff from fuel storage area can also carry fuel content and cause soil contamination.

#### 6.4.5. Wastes

Solid and liquid wastes can also pose a hazard for local wildlife if disposed of improperly. It also degrades the aesthetic value of the area if not handled well. Plastic waste is of particular concern due to environmental pollution and risk to animal life. Waste oils and petroleum used in vehicles and exploration machinery may spill or leak on/into the ground, hence polluting the soil or water bodies in the project area.

##### Mitigation Measures

- Waste Management Plan will be implemented.
- At the time of restoration all pin flags, signs, and refuse from seismic lines will be removed.
- Monitoring of all waste handling, transportation and storage activities will be done on regular basis and any non-compliances will be immediately addressed.
- Table given below elaborates the summary of wastes generation due to proposed Seismic activity and their proposed disposal methodologies.

#### 6.4.6. Water Resource

Water will be required for mud preparation and camp activities. Estimated requirement is approximately 40,000 litres/day which will be obtained from commercial sources. The overall impact from the project on local water availability is expected to remain small due to nature of project activities which are not water intensive. If there are water availability issues, MOL will consider to dig a dedicated water well for the camp activities.

##### Mitigation Measures

- The principal criteria for water source selection will be to make sure that the local community needs are not affected from project's water sourcing.

- For commercial or private water sources, an assessment of the total capacity and yield of the water source will be made prior to selection of the water source.
- Any new well if planned, will be safely located away from any existing wells.

#### 6.4.7. Impact on drainage

Construction of access tracks can affect the local drainage network. The streams and natural depressions will require protection to prevent the impact on local drainage. Improper disposal of waste into land can also lead to choking of channels.

##### **Mitigation Measures**

- Safety distances will be maintained from the water channels and water bodies.
- Cut and fill works will be carefully planned and excavated soil disposed of properly to avoid choking of channels.

#### 6.4.8. Impact on Local Ecology

The project area being a Protected territory, and situated within an urbanized matrix, remains ecologically valuable yet vulnerable to cumulative anthropogenic impacts. Its vegetative cover and faunal diversity contribute critically to urban climate regulation, carbon sequestration, and aesthetic ecosystem services, underscoring the need for enhanced ecological resilience and management. The seismic-induced disturbances may disrupt key wildlife habitats and ecological linkages, especially for species sensitive to vibration or changes in microhabitat structure. The park harbors the Indian Pangolin (*Manis crassicaudata*), an IUCN Red List classified Endangered species, which is particularly vulnerable to habitat disturbance and soil instability due to its burrowing behavior and specialized habitat requirements. Any seismic or anthropogenic disturbance may further threaten its local population and critical foraging and breeding grounds.

Seismic activities within the protected areas of Islamabad, particularly Margalla Hills National Park and Shakarparian Protected Area, present notable though localized risks to both the biophysical and socio-economic components of these ecosystems. The potential impacts include habitat disturbance, noise and vibration effects, soil destabilization, and fragmentation of ecological corridors, all of which can alter species behavior, breeding success, and habitat connectivity. While such effects are likely to be temporary and spatially confined, they may compound existing environmental stresses, particularly those arising from urban expansion, vegetation degradation, and recreational pressures.

##### **Temporal Nature of Impacts**

Most impacts from seismic activities are likely short-term and localized if operations are carefully planned. Temporary disturbances may subside once activities cease, and fauna often return to previously used habitats if disturbance is not persistent.

Long-term impacts may occur if habitat loss or fragmentation is significant or if repeated disturbances occur during critical breeding or migratory periods.

##### **Mitigation Measures**

- Conduct site-specific seismic vulnerability assessments focusing on biodiversity hotspots, slope stability, and sensitive habitats, particularly in pangolin habitat zones.
- Implement continuous ecological monitoring before and after seismic events to detect changes in habitat integrity, species behavior, and regeneration capacity.

- Strengthen vegetation cover through native reforestation and soil stabilization to minimize erosion and maintain ecological connectivity.
- Restrict human disturbance in high-risk and sensitive ecological zones within both Margalla Hills and Shakarparian Protected Areas.
- Develop integrated management and restoration plans incorporating disaster risk reduction, wildlife conservation (with a focus on the Indian Pangolin), and urban planning coordination.
- Conduct seismic activities outside peak migration and breeding seasons; maintain buffer zones around roosting and feeding areas; minimize noise and human presence
- Restrict vehicle movement to designated paths; avoid sensitive habitat zones; implement wildlife monitoring during operations
- Limit heavy machinery near shallow and sensitive areas and avoid sediment runoff
- Confine operations to defined tracks; restrict equipment movement; restore any damaged vegetation post-survey
- Schedule activities to avoid critical periods; enforce strict no-disturbance zones; implement post-activity ecological monitoring
- Implementation of “No Hunting and No Trapping” policy by MOL.
- Burrows or dens will be assumed as active and will be first evacuated by using soft start approach and then cleared in a careful manner.
- Speed limits to be observed to ensure animals do not get hit by vehicles.
- Effective measures shall be taken to protect the environment and control pollution so that restoration of regional ecology is ensured at the time of demobilization.
- General awareness of onsite crew will be increased regarding the biological resources.

## 6.5. Socio-economic issues

All development initiatives give rise to social impacts in the project area. Socio-economic impacts vary from project to project and are not easily quantifiable. These are consequences of project activities on the human population that alter the ways in which people live, work, interact, relate to one another, organize to meet their needs and generally exist as members of society.

### 6.5.1. Land Acquisition

Land acquisition will not be needed for the surveys and land permitting will be sufficient. The overall scale of impact is expected to remain negligible with adequate and transparent community outreach process. Land uptake by the project will not be significant and will not have any measurable significant effect.

#### Mitigation Measures

- A transparent and fair land permitting process will be followed.
- A grievance redressal mechanism will be implemented to address any grievances that may arise.
- The process will be recorded, registered and monitored.

### 6.5.2. Community Disturbance

The aspects leading to community disturbance are discussed below.

#### 6.5.2.1. *Mobility and transportation*

The project activities may affect mobility of local residents including women. Careful planning and scheduling of activities is important to avoid the impact.

##### **Mitigation Measures**

- Project vehicles and equipment will not be located randomly in the project area; the drivers will be instructed to consider the possible hindrance from parking the vehicles in such area which could create disturbance to the locals.
- Gender issues will be communicated to the project personnel before start of work

#### 6.5.2.2. *Safety and Security*

The operations may affect the safety and security of the inhabitants of the areas by affecting road safety, creating conflicts between residents and the contractors, safety and security issues pertaining to the carriage of firearms on the site. Community sensitive project planning and implementation as prescribed through the recommended mitigation measures will minimize the occurrence of any such impacts.

#### 6.5.2.3. *Disturbance from Noise and dust*

Communities that are located close to the access road may be exposed to increased dust emissions and noise from seismic activities. If the mitigation measures relating to the control of dust emissions, oil or fuel spills, and project wastes are followed, no impacts will occur. Local complaints of dust emissions shall be noted and addressed immediately. Community complaints shall be duly addressed and appropriately resolved. Impact of noise will be very low to negligible since the activities will be located at safe distance from communities (around 500m). Therefore, there will be no effect of the project noise on the local communities.

##### **Mitigation Measures**

- Communities will be kept informed about all project activities and possible disturbance in advance.
- Although all project drivers will adopt safe driving practices, special care will be taken while passing by the settlements, and will reduce speed as required.
- Any new tracks will be aligned as far away from settlements as possible, even if this results in longer routes.
- If alternative routes exist, existing tracks passing close to settlements will not be used.

#### 6.5.2.4. *Interactions with Communities/gender issues*

Except for the presence of local people hired for the project, very little interaction is expected between seismic survey crews and local communities. However, the influx of outsiders may affect the mobility of local women. The seismic survey workers will not be confined to one particular area for more than a few days; the interaction will therefore be limited. Moreover, the personnel will be instructed to limit their interaction with the locals to a level which is not perceived as disturbing to them.

### 6.6. **Impacts on Sensitive Sites**

It is possible that the seismic survey may damage structures, if seismic lines are located too close to structures, or if the existing tracks are excessively used by the project vehicles.

A number of cultural, recreational and ecological sites are found in the Shakarparian area as described in the previous sections. Safe distances will be maintained from these sites during the exploration activity to prevent any sort of impact from the project activities on these sites. Less intensive and non-destructive methods like Vibroseis will be selected close to these sites. Vibroseis is highly suitable for built-up, urban, and environmentally sensitive areas. Unlike explosive sources (dynamite), which create a single, high-intensity shockwave, vibroseis uses hydraulic trucks to generate controlled, low-frequency, sustained vibrations (known as a "sweep"). Since the energy is controlled, it poses low risk of damage to buildings, infrastructure, or underground utilities compared to impulsive sources.

#### **Mitigation Measures**

To reduce the chances of damage, a safe distance between the seismic lines and the structures will be maintained. In addition, the following mitigation measures will apply:

- If tracks used by local people are damaged, they will be restored / repaired as part of the restoration plan.
- Compensation will be paid for any structures damaged due to the seismic survey.

No known archaeological sites are present in project area. Religious and cultural sites include mosques, shrines, graveyards etc. Access track shall be located at appropriate distances from such sites to avoid damage to access of local communities to these sites.

#### **Mitigation Measures**

- All sensitive sites in the vicinity of the project area will be identified before the survey.
- Any site that is located in any project activity or facility will be cordoned off so that they do not get accidentally damage.
- No seismic shooting will take place within a circle of 'safe' radius from the sites as defined in EMP. The safe radius will be determined on the basis of the quantity of explosive used.
- Communication will be established with the local spiritual leader and the communities to explain about the activities near the religious sites.
- To reduce the chances of damage, a safe distance between the seismic lines and the sites will be maintained.

### **6.6.1. Employment opportunities**

While generally a positive of any development project, hiring non-local workforce for jobs can create resentment among local workforce and may give rise to conflicts. It is important that hiring process takes into consideration the local availability of workforce and prefers hiring from local communities as much as possible.

#### **Mitigation Measures**

- A transparent process of employment will be adopted.
- Non-local workforce will be trained on interaction with locals and movement across project area.

### **6.7. Occupational Health and Safety Hazards**

The potential impacts on human health and safety resulting from exploration activities could include:

- Occupational accidents and injuries
- Road accidents
- Health effects from dust generation and emissions
- Exposure to weather extremes
- Wildlife encounters
- Trips and falls on uneven terrain and
- Contact with hazardous materials (e.g. from spills) etc.

The potential for these impacts to occur would be low because of the limited range of activities and number of workers required during exploration. Communities residing near the site are also susceptible to the spread of contagious diseases from the project personnel on site.

#### **Mitigation Measures**

- Conduct Job Hazard Analysis for all critical jobs.
- Develop and implement a health and safety program for workers and the public, addressing all of the safety issues identified in the assessment and all applicable safety standards.
- Consult with local planning authorities regarding traffic and traffic hazards. Address specific issues in a traffic management plan or in the health and safety program.
- Use appropriate procedures for storage and transportation of blasting equipment and explosive materials, including appropriate signage indicating their locations.
- Safe driving practices will be implemented. Special care will be taken while passing by the settlements, and speed will be reduced as required.
- If alternative routes exist, existing tracks passing close to settlements will not be used.

<b>Table 6.1: Environmental Impacts &amp; Characterization Matrix</b>						
<b>Activity &amp; Source</b>	<b>Nature of Impact</b>	<b>Duration</b>	<b>Extent</b>	<b>Likelihood</b>	<b>Severity</b>	<b>Significance</b>
<b>Noise &amp; Vibrations</b>						
<ul style="list-style-type: none"> <li>Generators, Transportation of heavy machinery, materials, equipment &amp; personnel.</li> <li>Vibration along the road and the seismic activity area.</li> <li>Vibroseis and dynamite shooting.</li> </ul>	Direct	Short term	Local	Medium	Medium	Medium
<b>Dust Emission</b>						
<ul style="list-style-type: none"> <li>Dirt tracks by project related vehicles.</li> <li>Drilling of deep holes.</li> <li>Shooting.</li> </ul>	Direct	Short term	Local	Low	Low	Low
<b>Air Emissions</b>						
<ul style="list-style-type: none"> <li>Exhaust emissions produced by generators.</li> <li>Exhaust fumes from vehicles and equipment.</li> <li>Shooting</li> </ul>	Direct	Short term	Local	Medium	Low	Low
<b>Water Abstraction</b>						
<ul style="list-style-type: none"> <li>Water required for seismic operation and other project activities.</li> </ul>	Direct	Medium term	Local	Low	Medium	Low
<b>Soil and Water Contamination</b>						
<ul style="list-style-type: none"> <li>Domestic waste (sanitary and kitchen discharge).</li> <li>Oil and grease from vehicles and machinery.</li> <li>Stored fuel, oil and other chemicals.</li> </ul>	In direct As it is a temporary activity	Short term	Local	Low	Medium	Low
<b>Impact on Birds (resident &amp; migratory), Mammals, aquatic fauna, and flora including sensitive species</b>						
<ul style="list-style-type: none"> <li>Access roads.</li> <li>Clearing of vegetation for seismic survey.</li> </ul>	Direct	Short term to medium term	Local	Low	Low to Moderate / Short-term	Medium
<b>Social Impacts</b>						
<ul style="list-style-type: none"> <li>Land permitting</li> <li>Site preparation</li> <li>Water sourcing</li> <li>Transportation</li> </ul>	Direct	Short term	Local	Medium	Medium	Medium
<b>Occupational Hazards</b>						
<ul style="list-style-type: none"> <li>Exposure to hazardous substances and conditions</li> </ul>	Direct	Short term	Local	Medium	Medium	Medium

**Table 6.1: Environmental Impacts & Characterization Matrix**

Activity & Source	Nature of Impact	Duration	Extent	Likelihood	Severity	Significance
<ul style="list-style-type: none"> <li>Accidents</li> <li>Work in high temperature or uneven terrain</li> <li>Animal hazard</li> </ul>						

**Criteria:**

		Likelihood frequency				
		Very High (1)	High (2)	Medium (3)	Low (4)	Very Low (7)
Consequences / severity	Very high (1)	VH X VH (1)	H X VH (2)	L X VH (3)	L X VH (4)	VL X VH (7)
	High (2)	VH X H (2)	H X H (4)	M X H (6)	L X H (8)	VL X H (14)
	Medium (3)	VH X M (3)	H X M (6)	M X M (9)	L X M (12)	VL x M (21)
	Low (4)	VH X L (4)	H X L (8)	M X L (12)	L X L (16)	VL X M (28)
	Very Low (7)	VH X VL (7)	HX VL (14)	M X VL (21)	L X VL (28)	VL X VL (49)

	VERY HIGH	HIGH	MEDIUM	LOW	VERY LOW
<b>LIKELIHOOD / PROBABILITY</b>	<ul style="list-style-type: none"> <li>The occurrence during abnormal /unplanned event on monthly basis or</li> <li>During normal activity, the aspect occurs continuously as a result of normal operating condition</li> </ul>	<ul style="list-style-type: none"> <li>The occurrence during abnormal /unplanned event is once per quarter or</li> <li>During normal activity, the aspect occurs twice a month</li> </ul>	<ul style="list-style-type: none"> <li>The probability of occurrence during abnormal / unplanned events is once every six months or</li> <li>During normal activity, the aspect occurs once a month</li> </ul>	<ul style="list-style-type: none"> <li>The occurrence of aspect during abnormal or unplanned event with the probability of occurrence of once per year or</li> <li>During normal activity, the aspect occurs once in six months</li> </ul>	<ul style="list-style-type: none"> <li>The occurrence of aspect is only during abnormal or unplanned event with the probability of occurrence less than once per year</li> </ul>



## 7. ENVIRONMENTAL MANAGEMENT PLAN

### 7.1. General

This section presents the Environmental Management Plan (EMP) as the implementation mechanism to manage the environmental and social issues identified in Section 7 of the EIA report during the various activities of the project.

The EIA for the proposed Seismic survey has identified a number of impacts from the project activities. The EIA has examined biophysical and socio-economic effects of the proposed activity from site clearance and preparation of the site and testing through to abandonment, demobilization and restoration. On evaluation of environmental impact, it is observed that the real benefits of proposed activity can result only if the risks of pollution are minimized. This can be accomplished through implementation of adequate preventive and control measures.

The Environmental Management Plan (EMP) describes both generic good practice measures and site-specific measures, the implementation of which is aimed at mitigating potential impacts associated with the seismic surveys.

### 7.2. Objectives of Environmental Management Plan

The EMP provides a delivery mechanism to address potential adverse impacts, and to introduce standards of good practice to be adopted for all project work. The EMP can be developed into a standalone document covering each stage of the project.

The EMP will help MOL Pakistan, the Proponent in managing the environmental impacts of the project, enhance project benefits, and implement standards of good environmental practice. The primary objectives of the EMP are to:

- Assist the proponent in environmental management during the project by providing framework for environmental management w.r.t project.
- Define the responsibilities of key players including project coordinators, contractors and other players.
- Provide plan for implementation of mitigation measures identified in the EIA, and providing an implementation schedule.
- Define a monitoring mechanism and identify monitoring parameters to ensure that all mitigation measures are completely and effectively implemented.
- Ensure that after completion of Project, restoration of site and rehabilitation work will be carried out
- Identify the required human and technical resources for implementation of EMP.

### 7.3. MOL Group's HSE and Social Impact Policy

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 6.1 shows the HSE Policy of MOL Group.

## 7.4. Scope of EMP

For each stage of the activity, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. For each action, or operation, which could otherwise give rise to impact, the following information is presented:

- A comprehensive listing of the mitigation measures
- The parameters that will be monitored to ensure effective implementation of the action
- Timing for implementation of the action to ensure that the objectives of mitigation are fully met.

The EMP comprises a series of components covering direct mitigation and environmental monitoring, an outline waste management plan and restoration plan. The project program has been designed to avoid or minimize impacts to the environment. Where residual impacts remain, which may have moderate or significant impacts on the environment, mitigation measures have been prescribed in this EIA, which will either reduce the impact to an acceptable level or adequately offset it. Based on the impacts identified, a Environmental Management Plan (EMP) is recommended as below.

## 7.5. Structure of EMP

The EMP consists of the following components:

1. Organizational Structure and Responsibilities
2. Management Plan
3. Environmental Monitoring Plan
4. Emergency Response and Contingency Plan
5. Waste Management Plan
6. Change Management Plan

## 7.6. Organizational Roles and Responsibilities

Key players for implementation of EMP will be:

- MOL Pakistan
- Contractors and subcontractors
- EPA

### 7.6.1. MOL Group

As project proponent, MOL Pakistan will be responsible for ensuring the implementation of the EMP. Project Manager will be responsible for the overall environmental performance of the project. He will monitor the environmental performance of the project to ensure that the project is carried out in accordance with governing legislation, MOL Pakistan's corporate policies and

recommendations of this EIA. This will be done through MOL's HSE department that will manage and supervise the environmental management issues during the course of the project.

### **7.6.2. Contractors and subcontractors**

Contractors will be responsible for implementation of, or adherence to, all provisions of the EMP and with any environmental and other codes of conduct required by MOL Pakistan. Overall responsibility for environmental performance of the operation will rest with the senior management of the contractors. Site managers of the contractors will be responsible for the effective implementation of the EMP.

### **7.6.3. EPA**

EPA as regulatory body has the responsibility to ensure project's compliance with local environmental laws is always ensured by the proponent. Under Section 7 of environmental protection act, 1997, EPA has the powers to conduct surprise inspections or visits of the project area to observe the status of environmental compliance of the project.

## **7.7. Management Plan**

The EMP will be implemented during all activities of the project to meet the following requirements.

### **7.7.1. Planning and Design of the Proposed Operation**

#### **1. Design of the Operation**

Design of the operation includes the selection of the data acquisition and exploration technique and other ancillary operations discussed in the EIA. Following approval, if any design parameter is changed the proponent will assess the environmental impacts that may arise from such change(s). If the impacts are found to be different and in excess of those mentioned in the report, MOL will develop mitigation measures to minimize these impacts and seek approval of the required change from Environmental Protection Agency.

#### **2. Approvals**

Obtaining Environmental Approval from EPA does not relieve the proponent of other obligations and hence MOL Pakistan and the contractor will obtain all relevant clearances and necessary approvals required by the government prior to commencing the survey operation.

#### **3. Contractual Provisions**

The requirements of this EIA in terms of environmental mitigation shall be made part of contractual agreement with the contractor.

### **7.7.2. Implementation of the Seismic Survey**

#### **1. Communication**

For effective monitoring, management and documentation of the environmental performance during the operation, environmental matters will be discussed during daily meetings held on-site. Environmental concerns raised during the meetings will be mitigated after discussions between MOL Pakistan and the contractors. Any issues that require attention of MOL Pakistan higher

management will be communicated to them for action. MOL Pakistan and its contractors will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the project. MOL Pakistan will ensure that co-ordination required with the project stakeholders on environmental and social matters as required by the EMP is maintained throughout the operation.

## 2. Environmental Management Systems

MOL Pakistan and the contractors will ensure that the mitigation measures mentioned in the EIA are adhered to and HSE Management System are implemented during the proposed project. The contractors will abide by the relevant contractual provisions relating to the environment.

## 3. Monitoring

MOL Pakistan and its contractors will ensure that monitoring of the project activities is carried out according to the monitoring program given in the EMP.

## 4. Emergency Procedures

MOL Pakistan / seismic contractor will prepare contingency plans to deal with any emergency situation that may arise during the exploration activities e.g. fire, major oil spills, medical evacuation and communicate these to the regulatory agencies if required by these agencies.

## 5. Training

MOL Pakistan and its contractors and suppliers will be responsible for the selection and training of their staff who are capable of completing the project activities in an environmentally safe manner. MOL Pakistan and its contractors and suppliers will be responsible for providing induction to their staff members on the EIA, the EMP and their implementation provided in the EMP. HSE Induction will be provided to all the staff. ERP is developed and emergency drills are carried out on regular basis and frequency.

A proposed training program is given in table below:

S#	Training subject	Description	Target group	Timing
1	EIA and EMP	EIA recommendations EMP EMP communication, documentation and monitoring requirements	Project staff and contractor	Prior to start of work
2	HSE plan and protocols	Site induction training on Health Safety and Environment system and requirements at project site. Environmental sensitivities of the project area. Waste management Oil spill contingency	Site personnel	Prior to start of work
3	Emergency Preparedness	Firefighting. Emergency response including oil and chemical spill.	Emergency response team	Prior to start of work / at the time of induction
4	Road safety	Road safety. Road restrictions. Vehicle restrictions. Waste disposal.	Drivers	At the time of induction of drivers

S#	Training subject	Description	Target group	Timing
		Defensive driving.		
5	Restoration activities	Restoration requirements.	Restoration team	Prior to start of restoration activities

### 7.7.3. Noise & Vibration Management

- While procuring major noise generating equipment such as diesel generators etc. it will be checked that all mufflers are in good working order and that the manufacturers have taken the normal measures for minimizing the noise levels.
- Limiting vehicle traffic with restrictions on the hours that industry employees are allowed to use residential roads to access wells and facilities (except in emergency situations).
- Installing sound barriers and sound-absorbing insulation at generator sites.
- Noise monitoring at regular frequency (monthly) shall be carried out.
- A quiet-mode for all seismic survey activities between 7 p.m. and 7 a.m.
- Continuous noise monitoring at sensitive receptors.

### 7.7.4. Environmental Protection and Reclamation

**Restoration of native vegetation:** Priorities replanting with indigenous species to rebuild canopy cover and ecosystem resilience.

**Rigorous environmental monitoring:** Implement systematic biodiversity and habitat health monitoring to track ecological trends over time.

**Strengthened legal compliance:** Ensure all development activities within or adjacent to the protected area are subject to comprehensive environmental impact assessment and regulatory oversight.

**Public engagement:** Encourage community stewardship, environmental education and transparent reporting on conservation initiatives.

## 7.8. Mitigation Matrix

Mitigation matrix as a key component of EMP, that lists all the potential impacts of project activities and associated mitigation measures identified in the EIA. Plan for management of different environmental areas is given below.

<b>Aspect/Impact</b>	<b>Mitigation Measures</b>	<b>Execution</b>	<b>Monitoring</b>	<b>Action</b>	<b>Timing</b>
<b>Soil Erosion</b>	Clearing of vegetation will be kept to a minimum. Access tracks will weave around patches of vegetation and trees to avoid unnecessary clearing of vegetation.	SC	MOL	Monitor land clearing activities	During land clearing
	The width of lines cleared for Vibroseis will be limited to 4m to minimize clearing of vegetation and disturbance to soil.	SC	MOL	Randomly check width of seismic lines	During line preparation
	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
	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 4 m.	SC	MOL	Supervise preparation of access tracks and randomly check width of access track	Prior to and during track preparation
	Off-road travel will be strictly prohibited and observance of this will be monitored during the seismic activities	SC	MOL	Approve access track and monitor off road travel	During entire operation
	Photographs will be taken before any activity to record the conditions of work sites, 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 project
<b>Soil &amp; Water Contamination</b>	All fuel and oil storage areas will have a concrete pad / suitable containment underneath to prevent soil contamination in case of leaks or spills.	SC	MOL	Ensure provision of concrete pad	During camp set-up and project activities
	All fuel storage areas will be properly marked to highlight their contents.	SC	MOL	Check signs	During the entire operation
	Fuel and oil storage areas will have secondary containment in the form of concrete or brick masonry bunds.	SC	MOL	Check containment volume of the bunded area	At the time of setting up storage area
	Fuels areas will be daily checked for leaks and all such leaks will be plugged immediately.	SC	MOL	Inspect fuel areas for leaks	During the entire operation
	The soil contaminated from minor and moderate spills will be removed and handed over to waste contractor for safe disposal.	SC	MOL	Check compliance	During the entire operation
	The soil contaminated from major spills will be removed and handed over to waste contractor for safe disposal.	SC	MOL	Monitor and supervise special treatment, if any	During the entire operation

<b>Aspect/Impact</b>	<b>Mitigation Measures</b>	<b>Execution</b>	<b>Monitoring</b>	<b>Action</b>	<b>Timing</b>
	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 project
	Used oil and vehicle related waste will be transported to local contractors for recycling.	SC	MOL	Check compliance	During the entire operation
	During fuel and oil transfer operations such as re-fueling vibroseis through a dedicated fuel vehicle, drips and spills will be avoided and drip pans will be used	SC	MOL	Ensure provision of drips pans, provide training on safe re-fueling practices, monitor oil or fuel stains	During the entire operation
<b>Use of Water</b>	Local commercial hydrants having sufficient yield will be used during seismic operation	SC	MOL	Check local demand and water abstraction	During entire operation
	For all water obtained from local wells, the owner will be paid for water abstracted at the market rate and as per mutual agreement.	SC	MOL	Check compliance	During entire operation
	The quantity of water used during project will be kept to the minimum by taking prudent water conservation measures on site	SC	MOL	Monitor water consumption and advise water conservation measures	During the entire operation
	A complete record of water consumption will be maintained	SC	MOL	Check records	During the entire operation
<b>Air Quality</b>	All equipment and machinery and vehicles used during seismic operations will be maintained in a good condition to ensure that emissions are kept to a minimum level	SC	MOL	Check maintenance logs	During the entire operation
	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
	During seismic activities 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
<b>Noise</b>	All equipment, machinery and vehicles will be maintained in a good condition to ensure that noise from them is kept to a minimum level.	SC	MOL	Monitor noise levels	During the entire operation
	The use of horns by project vehicles will be minimized. The use of pressure horns will not be allowed.	SC	MOL	Train drivers, check vehicles and record non-compliances	During the entire operation

**Table 7.2: Mitigation Matrix for Seismic Activities**

Aspect/Impact	Mitigation Measures	Execution	Monitoring	Action	Timing
	Generators will be kept within enclosures to minimize dispersion of noise.	SC	MOL	Check compliance	During the entire operation
	Movement of all project vehicles and personnel will be restricted to within work areas	SC	MOL	Advise all drivers, and monitor non-compliances	During the entire operation
<b>Flora</b>	Avoid core conservation and sensitive habitats during survey design.	SC	MOL	Check areas	Prior to start of work
	Crew personnel while working along seismic lines will concentrate within a corridor of 4m.	SC	MOL	Supervise line clearing operation	Before and During land clearing operation
	Restrict seismic line width and avoid unnecessary clearing.	SC	MOL	Check compliance	During entire operation
	Restore disturbed areas through re-vegetation after survey completion.	SC	MOL	Approve access tracks and check road travel	During the entire operation
	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 4 m.	SC	MOL	Supervise preparation of access tracks and randomly check width of access track	Prior to and during track preparation
	Ensure vegetation regrowth through assisted plantation if required.	SC	MOL	Approve access track and monitor off road travel	During entire operation
	The cutting of trees will be minimized. If clearing of vegetation is unavoidable the rootstock will be left in place to encourage better regeneration of vegetation.	SC	MOL	Supervise land clearing activities	During land clearing
	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
<b>Fauna</b>	Hunting, feeding, trapping or harassment of birds and animals will be strictly prohibited.	SC	MOL	Check compliance	During the entire operation
	Avoid surveys during breeding and nesting seasons.	SC	MOL	Check compliance	During the entire operation
	Use low-impact Vibroseis methods instead of explosive sources where possible.	SC	MOL	Check distances from surface water bodies	During the entire operation
	Maintain buffer zones around wildlife habitats and nesting sites.	SC	MOL	Check compliance	During land clearing
	Limit operation hours to daytime only.	SC	MOL	Approve access track and monitor off road travel	During entire operation



<b>Aspect/Impact</b>	<b>Mitigation Measures</b>	<b>Execution</b>	<b>Monitoring</b>	<b>Action</b>	<b>Timing</b>
	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
	Seismic deep holes and up-holes will avoid disturbing live bird nests and small mammal and reptile holes.	SC	MOL	Check compliance	During seismic
	Food wastes will not be left in the open.	SC	MOL	Check compliance	During the entire operation
	Waste management plan will be implemented.	SC	MOL	Check compliance	During the entire operation
	Night time activities will be avoided as much as possible.	SC	MOL	Check compliance	During the entire operation
	Plan seismic lines to avoid key wildlife corridors.	SC	MOL	Check maintenance logs and ensure the provision of muffles	During the entire operation
	Keep access routes temporary and rehabilitate immediately after use.	SC	MOL	Check development and clearance of access track	During the entire operation
	Clearing of dense patches of vegetation will be avoided	SC	MOL	Check development and clearance of access track	During the entire operation
	Conduct post-survey monitoring and rehabilitation.	SC	MOL	Check proposed time of operation and plan	During the entire survey
<b>Social issues</b>	All community grievances will be recorded and maintained in a Community Complaint's Register.	SC	MOL	Check the provision of complaint register and its access for communities	During the entire operation
	Compensation amounts for land leased for various project components will be disbursed in an equitable and transparent manner.	SC	MOL	Check compensation records	During the entire operation
	Compensation amounts will be paid within one month of receipt of valid claims.	SC	MOL	Check compensation records	During the entire operation
	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
	Compensation amounts will be settled based on prevailing market rates and will be settled after an agreement is reached between the local residents and the client.	SC	MOL	Check compensation records	During the entire operation

**Table 7.2: Mitigation Matrix for Seismic Activities**

Aspect/Impact	Mitigation Measures	Execution	Monitoring	Action	Timing
	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
	Labor from local communities will be recruited equitably (depend on availability of required staff / labor). The employment procedures will be transparent.	SC	MOL	Check compliance	During all operations
	Strict compliance with seismic contractor's and MOL's HSE guidelines will be observed.	SC	MOL	Check compliance	During all operations
	Drivers will be trained in responsible and safe driving practices; safe speed limits for vehicles will be followed.	SC	MOL	Provide training and monitor compliance	During the entire operation
	All project personnel should be screened for communicable diseases prior to induction.	SC	MOL	Check medical records	Prior to start of different operations
	All project facilities, seismic lines and access roads will maintain the following minimum distances from cultural, Religious and archaeological sites; unless community demands greater distance from e.g. graveyards or mosques. - Seismic lines – 50 m - Access roads – 100 m - Camp sites – 100 m	SC	MOL	Check distances	During the entire operation

Note: SC: Seismic Contractor



### 7.8.1. Spill Management Plan

In the event of an oil or chemical spill, the spill contingency procedure (Annex-IV) will be implemented.

## 7.9. Waste Management Plan

### 7.9.1. Sources of Wastes

The main sources of wastes at field locations are seismic activities. Waste is classified as Hazardous and Non-hazardous by identifying the physical, chemical and toxicological properties. A system to categorize wastes streams according to their health and environmental hazards is then developed. Designated drums, containers, bins etc. with specific labels are placed as collection methods at the wastes generating areas. Color coding of drums, containers, bins etc. for various type of wastes is done.

### 7.9.2. Waste Management Plan

MOL Pakistan Waste Management Plan provided at Annex-III will be implemented.

## 7.10. Emergency Response Plan (ERP)

As part of MOL Pakistan Emergency Response Manual, an emergency response plan is required to develop for all activities to be undertaken by MOL Pakistan under its direct control. Accordingly, Emergency Response Plan (ERP) will be developed for the project and implemented.

The ERP will identify the roles and responsibilities of all personnel involved in handling of emergency situation by means of a bridging document between MOL Pakistan site management and contractor's emergency response procedures.

The ERP will also highlight reporting requirements and necessary actions to handle emergency situation during exploration and associated activities in close coordination with contractor's emergency response procedure and MOL emergency response manual.

The ERP will be implemented under following scenarios:

- a. Response to Medical Emergencies
- b. Response to Road Vehicle Accident
- c. Response to Fire and Explosion (use of explosives)
- d. Response to Fire and Explosion (Camp)
- e. Response to Condensate / Diesel Spill
- f. Natural Disasters (earthquake and floods)
- g. Security emergencies

MOL Pakistan Emergency Response Plan is attached as Annex-II.

## 7.11. Occupation Hazard Management

Health Hazard will be managed by adopting following measures:

- Prioritize the health hazards based on their risk potential.
- Identify specific work groups affected by each hazard.

- Determine the controls required to manage these identified hazards. The cost of each identified control versus benefits of its implementation may be evaluated.
- Develop an action plan identifying work to be done

It is recommended that all employees undergo a periodic medical examination. The record of the health checkup will be maintained centrally off site in confidential file by the medical section. The medical officer at base recommends appropriate treatment for the persons found to be having any health problems requiring attention.

## 7.12. Environmental Monitoring Program

The Environmental Monitoring Plan will be used as a management and monitoring tool for implementation of the mitigation measures identified by the EIA. The monitoring matrix lists down:

- The parameters, which will be monitored to ensure compliance with the mitigation measures;
- The person / organization directly responsible for adhering to or executing the required mitigation measures and monitoring adherence to the mitigation measures;
- The timing at which the mitigation or monitoring has to be carried out

MOL will hold primary and overall responsibility for ensuring full implementation of the EMP. The Environmental Monitoring Plan has been provided for the proposed project activities in Table 7.5.

S. #	Monitoring Aspects	Locations	Parameters	Frequency	Responsibility	Document
1	Ambient air Quality Monitoring	Survey site	CO, NO, NO <sub>2</sub> , SO <sub>2</sub> , PM	Once during the project	Contractor	Laboratory test Reports
2	Exhaust and Emissions Monitoring	Vehicles, Generators, Fuel operated Machinery	Smoke, CO, Noise	Once during the project	Contractor	Laboratory test Reports
3	Noise	Along Seismic Survey lines & near communities	Noise Level (dBA)	During routine monitoring	Contractor	Record of observations;
4	Solid Waste	Project site	Solid waste collection, storage, transportation and disposal	During routine monitoring	Contractor	Complete record
5	Occupational Safety	Survey sites, project roads	HSE Records, Incidents and injuries	During routine monitoring	Contractor	Record of observations.

## 8. FINDINGS, RECOMMENDATIONS & CONCLUSION

EIA Study was conducted for the proposed Seismic activities in Shakarparian area, Margalla Block. The EIA study has evaluated the project activities in detail and impacts from these activities have been considered and mitigation measures are proposed therein. The report includes a comprehensive environmental management plan to be owned and implemented by MOL Pakistan during the time frame of the project as a tool to enable sustainable exploration activities.

### 8.1. Summary of Findings

Assessment of environmental aspects and screening of potential impacts from proposed project activities reveals following observations:

- Seismic surveys can reveal potential oil and gas reservoirs in the area which can be manifested to expand the oil and gas resources of the country. The project is therefore needed in the national interest to contribute to local hydrocarbon production.
- Project area being a sensitive area due to location in MHNP, requires careful planning and execution of project activities to protect the sanctity of the area.
- Protection of green cover and vegetation in the area is important and project planning must address this in its layout and designs. This is possible as seismic survey design offer flexible in the layout such that dense vegetation patches may be protected.
- Noise and vibration associated with data acquisition can impact local wildlife, hence planning and project timing is important. The survey schedules need to factor in the breeding, and nesting windows of the local wildlife.
- Land and water contamination from project activities is possible during fuel and chemical handling activities including storage. This is avoidable through careful implementation and monitoring.
- The impact on local communities is possible during movement and transportation activities. Planning and scheduling of these activities in a sensitive manner can address this issue and prevent undesirable impacts.
- Mitigation measures have been suggested in the report for the sensitive operations and it is possible for operations to proceed without any significant long-lasting impacts to the macro-environment.
- Land permits will be acquired for areas of proposed seismic activities and compensations will be provided for the affected amenities in the area
- General impacts from exploration activities such as noise, wastewater generation and impacts from human activity would occur when exploration activities begin in the area. However, the impacts are manageable and can be reduced down to acceptable limits upon implementation of EMP by responsible on-site staff and supervisor.
- Occupational Health and Safety risks are likely to arise from exploration activities, the management responsibility of which lies with HSE Officer/manager and site supervisor. MOL Pakistan HSE Policy and international EHS guidelines and best practices will be followed.
- Ecology of the microenvironment will be protected as priority. Vegetation will only be removed from seismic lines. Sites will be restored to the original landform when the activities come to an end.

- MOL Pakistan will undertake all measures to protect the local ecology, drainage pattern, and social aspects of relevance to the project.
- Sustainable exploration activities are possible under the condition that mitigation measures and EMP is being adhered to in its essence during project course.

## 8.2. Recommendations

A number of proactive and preventive measures have been suggested in the EIA report in planning and executing the exploration activities, which should be considered for implementation. In order to ensure mitigation is successful and impacts are minimized, the focus should be on ensuring operations follow the established procedures, training of key personnel in emergency preparedness and response including oil spill response is carried out and exercises are run to ensure that all personnel receive basic environmental awareness training and contingency plans are in place to deal swiftly with any potentially polluting incidents.

## 8.3. Conclusion

In conclusion, there is obvious dedication by MOL Pakistan to carrying out these activities to a high environmental standard. Given the current operational commitments and proposed mitigation measures, it is considered that the project activities can be undertaken without significant impacts to the project's macroenvironment provided that necessary safety protocols are implemented and potential emergency situation are prepared for.

The Study therefore recommends that the EIA Report may be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management Plan will be followed in letter and spirit.

## **ANNEX I: EXPLOSIVE SHOOTING PROCEDURE**

## **Title: Magazine Entrance procedure**

***Application: Magazine Accountant & Loading Crew***

### **Purpose**

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

### **Scope**

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

### **PPE & Other Requirements**

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

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

### **Procedure for Visitors:**

- Any visitor going to magazine camp will be given Magazine pass from HSE Office.
- On Arrival at Magazine camp Magazine pass is provided to security staff for authorisation.
- Security staff will enter the name in security record register.
- All metallic & prohibited items (Jewellery, Watch, Mobile, Belt and any other metallic or material having ignition potential) is kept at main security reception.
- Security staff will scan the body by metallic scanner.
- Security staff will allow visitor under supervision of Magazine accountant.
- Gate will be locked after entrance by security.
- Visitors have to release static charge by touching anti static pole and dip shoes in water pot for static charge removal before entering in storage area.
- Only Three persons at one time are allowed in storage area.
- While coming outside Security staff will scan and check the visitors 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 security staff.
- Security staff checks persons according to the list.
- Only authorized persons are allowed under supervision of Magazine accountant.
- Workers have to release static charge by touching anti static pole and dip shoes in water pot for static charge removal before 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 returning 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 of explosive received.
- For Daily Usage Magazine accountant will issue explosive as per field requirement to Loading Foreman.
- Each Loading Foreman has two Vehicles. One for Dynamite & other for Detonator.
- Magazine accountant will note all details and quantity issued to Loading Foreman in his record register.
- Loading Foreman will issue to loading Foreman on Line and maintain the record as per the format.
- After field work completion Loading Foreman will return the remaining 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 end of Day Shift.
- Chief Geophysicist cross check the quantity and usage in Field area.
- Chief Geophysicist Cross check the record on random basis.

### **RECORD FORMATS:**

- 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 charge failing to explode when fired.

### **GENERAL INFORMATION**

#### ***Definition of a Misfire***

A shot shall be deemed a misfire if it fails to explode when the 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 procedures than to have to implement this misfire procedure.

Every effort must be made to avoid misfires by carefully following 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 charges 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 followed.

### **MISFIRE HANDLING**

1. Disconnect the firing line from the blaster and short the wires together.
2. Inform the observer.
3. Wait 5 minutes.
4. The circuit should then be tested, using a safety galvanometer. It is most important that all testing is done from a safe place (preferably the firing point) and that all personnel are safe from any possible explosion which might occur during testing.
5. If a fault is discovered, one person may then approach the shot 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 blaster unit while personnel are in the shot point area. It must be shorted at all times.

6. Keep the shot point areas clear except for the person conducting 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 blaster 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 observer 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 left 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 misfire location is properly marked and fenced off. Any warning signs or barriers as required by law must also be posted around the misfire location.

Observers must maintain a record of all misfires. Information required 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 trained, experienced, conscientious and careful personnel may deal with them. No one is allowed to approach a misfired shot until a period of at least five minutes has elapsed in the case of electrical shot firing and not less than 30 minutes in the case of shots fired by safety fuse. Until such time as the misfire has been remedied, no drilling or 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 are as follows:

1. Current Leakage - Although a blaster unit of sufficient capacity must always be used, damp or wet conditions may cause current leakage to earth or a short across connections. This may result in insufficient current passing through some of the detonators, thereby giving rise to misfires. This fault can be eliminated by covering all joints with joint 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 commences. 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 bare or broken wires before it is used again. Check the firing line every morning and at any time there is a blow out.

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 firing circuit is not tested, loose or dirty connections may introduce high resistances that will pass undetected and cause a misfire. In very large patterns, detonators may be mistakenly omitted from the circuit, and occasionally some detonators may be connected together in a closed circuit and not 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) shall be obtained prior to construction of the magazines.
- The location of the magazine shall be away from buildings or any area to which the public has access. Full advantage should be taken of the natural features for protection 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 locations.
- The Magazines shall be free of natural hazards such as trees, overhanging 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 the 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 anybody from dropping anything into the 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 lightning conductor shall be fitted.

#### **Storage Procedures**

- The magazines will not be filled with any explosive materials until the license and local NOC has been obtained.
- Under no circumstances will the explosive stock exceed the licensed storage limits.
- Explosives shall be stored off the ground on sound pallets.
- Explosives shall be put in shelves or stacked in piles (interlaced 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 other than explosives stored in or around the magazine.
- No energy sources such as matches, cigarettes, naked fire, batteries, 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 fight 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 hours a day.
- A proper number of armed security people shall be deployed at the 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 Magazine 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 delivered 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 explosives received, issued and returned 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 the 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 materials during the course of operation.

### **ORGANIZATIONAL UNITS AFFECTED:**

**Crew management and explosives vehicle drivers.**

### **POLICY:**

- Transport of explosives shall comply with local / government regulations governing the movement of explosives at all times and they will obtain a valid license for transportation of explosives along with "E Form" and a route map of the area.
- Are vehicles used in the transport of the explosives shall be mechanically well maintained.
- All vehicles used for explosives transport shall be diesel powered (not petrol) and dedicated to this purpose.
- The driver of the explosives vehicle shall be trained in explosives 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 explosives, the explosives are to be covered with a water resistant tarpaulin, or put in well designed and made wooden boxes with padlocks. The wooden container shall have a security fitted lid and securely fastened to the bed 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 for 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 Explosive 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 vehicles. 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 vehicle 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 service 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 protected from direct contact with explosives.
  - d. Plastic containers of any description shall be strictly prohibited for the transportation or carriage of detonators.
- Explosives fitted with detonators shall never be carried or transported.
- Explosives and detonators shall always be carried in separate containers.
- 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 eliminate 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 protection 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 that position while the observer sends a tone. Do not release the switch until 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 which is going to be fired

On deep hole shots, the detonator wires must be separated and connected 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 NEAR 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 CIRCUIT 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 REMAIN 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.

## **ANNEX: II: 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 regular basis.

Under no condition the plan should be changed without the information 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 regarding 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 CONTRACTOR FIELD 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 mentioned 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 snake bite 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 snake bite cases will be referred to nearest hospital. Field doctor will accompany the victim to the hospital and will return after ensuring that the right person has started the proper 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 assessment 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 management 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 advice 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, using 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 will be evacuated and transported to medical facility in the nearest city. Hospital assurance 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 emergencies like fire fighting, oil spill 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, Manager 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 reported 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 declared.

## **Responsibilities**

### **TEAM Leader**

Team Leader holds the ultimate responsibility of safe and earliest evacuation in case of medical emergency. He will be heading the EMT and will 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 ADMINISTRATION***

Party Chief/Party manager and Crew Administrator are responsible 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 in case of any emergency and will ensure the safe and quick evacuation of casualty.

## ***MANAGER ADMINISTRATION ISLAMABAD OFFICE***

In coordination with other members of EMT, Manager Administration 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.

## ***MEDICAL 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 to 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 general 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 the fire team member not present.

- 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 pandemic COVID -19 all the workers are not allowed to gather at 1 muster point. In fact 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 near 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 spontaneously. Do not leave the scene until it is assured that the fire is out and will 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 them.
- 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 situation somebody has been able to put the fire out while it is minor.

A fire fighting team will be set up from available personnel. This 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 should 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. If 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 Room, 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 your 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 aware 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 lose 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 better.
- 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 notified 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 each 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 person (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 initially 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 staff 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 possibility of 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 extremely 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 calculate 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 made 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 impaired, 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 followed:

- 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 the 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 request 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 Party 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 evacuation 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 electrical equipment's are in working condition and shock free in waters and must be alert all the time.
  - 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 local 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 locate 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 that 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 the 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 and 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 another problem. In some cases, this may require evacuation of the waste to a suitable site designated by the authorities. In conclusion, you must do everything 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 PREVENTION BEGINS FROM A STRICT DISCIPLINE ON BOARD.*

Passengers must remain seated and never move from their assigned position on board. Life jackets must be worn and attached before embarkation (passengers and crew). All personnel boarding a boat must be given the necessary HSE and 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 individual 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 the water must remember: The human 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 etc. 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 OVER 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 available 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 firm flat surface, clear the respiratory air ways and apply artificial respiration.

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

*Note:* It is necessary for the cable chief or drilling supervisor to send 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 incident
- 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 instances will be dictated largely by the circumstances encountered and equipment on hand. Determining factors such as weather and river state, the risk of fire and the physical state of the casualty must be taken into account. [2]

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 crew will assist the 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 <sup>2</sup>

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 III: WASTE MANAGEMENT PORECDURE**

**Waste Management Procedure**  
(Local Operative Regulation)

Responsible for creation and maintenance of this Regulation:



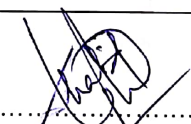

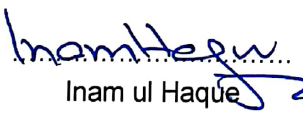

  
.....  
**David Clegg**  
Head SD&HSE

Approved by:   
.....  
**Graham Balchin**  
Managing Director/ CEO

**RELATED HIGHER LEVEL REGULATIONS**

HSE_1 Health, Safety and Environment Management System (Group Guideline)
US_1_G1_MOLPA1 Environmental Standard in E & P (Local Operative Regulation)

**COMPLIANCE SIGNATURES**

Finance	Production	P&FE
 ..... Andras Rudner Chief Financial Officer	 ..... Muhammad Zaheer Alam Director Production	 ..... Khalid Iqbal Director P&FE
Drilling	SOD	Administration
 ..... Muhammad Tashfeen Head Drilling	 ..... Inam ul Haque Head SOD	 ..... Ishtiaq Ahmed Head Administration

*Handwritten initials*

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## **1. DEFINITION OF SCOPE AND RESPONSIBILITY**

### **1.1 Objective of the Regulation**

The purpose of this procedure is to provide guidelines and simplify the process of categorizing, quantifying, managing, treating and disposing wastes. Waste management is a critical component of MOL Pakistan operating policies. Waste management includes the proper handling, accumulation, storage, manifesting, transportation, and disposal/recycling of the waste generated. The procedure is designed to assist in a company wide effort to provide protection for the environment and to comply with MOL corporate requirement, environmental laws and regulations regarding proper waste management.

### **1.2 Scope of this Regulation**

Waste streams generated as part of drilling, production and projects operations and from field camps shall be managed as per this procedure. Guidelines for proper handling, categorization, recording, minimization, recycling and disposal of all types of waste associated with MOL Pakistan operations and projects are part of this procedure.

This procedure shall be followed at all MOL Pakistan sites by all MOL personnel and contractors working for MOL Pakistan.

### **1.3 Date of effect**

From the Date of effect, **29 December 2017**, the provisions of this Regulation are obligatory and binding for affected employees.

### **1.4 Responsibilities**

Head SD&HSE is responsible for the creation, maintenance and supervision of implementation of this Regulation.

### **1.5 Access restrictions**

Access to this Regulation is not restricted within MOL Pakistan. If external use of this Regulation is requested, it has to be approved in written form by the Head SD&HSE.

## **2. REGULATION DESCRIPTION**

### **2.1 Detailed description of the Regulation**

#### **2.1.1 Definitions**

##### **Waste**

Any material, for which no further use is intended, is considered a waste. It can be solid, semi-solid or liquid. Additionally, abandoned materials and materials intended to be recycled are considered wastes. It is very important to understand this concept, because even though something is going to be recycled, it must be managed as a waste until it is actually recycled.

##### **Hazardous Waste**

Waste is categorized as a hazardous waste if it has one or more of the following properties:

- Ignitability (flash point less than 60°C);
- Corrosivity (pH less than or equal to 2.0, or greater than or equal to 12.5);
- Reactivity (inherently unstable under ordinary conditions or when exposed to water);
- Toxicity (may present an unreasonable risk of injury to health or the environment.)

### **Non-hazardous Waste**

The wastes are categorized as Non-hazardous wastes, if they do not possess any of the hazardous characteristics as defined above. However, non-hazardous waste may still present hazards to employees who handle them. All recommended safety and handling practices must be followed.

### **2.1.2 Legal Requirements**

Waste disposal in Pakistan is regulated through the following legislations:

- Pakistan Environmental Protection Act 1997.
- Khyber Pakhtunkhwa Environmental Protection Act, 2014
- Pakistan Environmental Protection Agency (Review of IEE & EIA) Regulations, 2000
- The Pollution Charge for Industry (Calculation & Collection Rules), 2001.
- Hazardous Substances Rules, 2003
- Environmental Sample Rules, 2001
- National Environmental Quality Standards (Self-Monitoring and Reporting by Industries) Rules, 2001.
- Environmental Tribunal Rules, 1999

### **2.1.3 Procedure**

Priorities to manage the waste are listed below:

- Eliminate waste production. Use the material for its intended purpose on site, if possible.
- Minimize waste production.
- Reuse whereby waste is re-used in its original form.
- Recycle waste by which waste can be reformed to their original state or reprocessed to form another non-waste product.
- Dispose of waste in a proper waste disposal facility.

#### **2.1.4 Waste Minimization**

To minimize waste, the following steps shall be taken by all personnel working on MOL Pakistan sites:

- Only the needed amount of materials shall be ordered. Before purchasing hazardous material, all alternatives for non-hazardous material should be explored.
- Prior consideration shall be given to the sizes of containers available when ordering products that could potentially generate waste. The intent is to avoid unused products and/or their containers from becoming wastes that require special handling.

#### **2.1.5 Waste Categorization**

All wastes generated at MOL Pakistan facilities shall be categorized in two major categories (i.e. Hazardous wastes and Non-hazardous wastes) as per the definitions in Section 3. Each category has different types of requirement for handling, storage and disposal. Table 1 shows the categories of most of the waste generated at MOL Pakistan sites/ facilities/ camps.

#### **2.1.6 Segregation / Labelling**

Waste management becomes very complicated if different types of waste are mixed together. A small amount of hazardous waste, mixed with a non-hazardous waste or recyclable material, can make the whole mixture a hazardous waste. Disposal costs and liabilities for hazardous waste are very high, so it is extremely important to identify wastes and keep them segregated.

The scheme of segregation is as follow:

- (i) All hazardous waste shall be segregated from other types of hazardous waste as well as non-hazardous wastes.
- (ii) At all facilities, following types of containers, with color coding for easy identification, shall be kept to collect and segregate common wastes:
  - Wood, and Paper Waste - Green
  - Glass, Plastic and Metal – Yellow
  - Cartridge, chemical and oily rags - Red
- (iii) Food waste shall be collected in separate containers.
- (iv) Medical waste shall be separately collected, labelled and stored near medical facility.
- (v) All containers must be properly and clearly labeled. The label must clearly mention the name or type of waste. Also, if the waste is hazardous, it should be

clearly labeled on the container along with its hazardous characteristics (e.g. flammable, toxic, radioactive, etc.). This is important to workers and to emergency response teams, who need to know what they are dealing with. Missing or unreadable labels must be replaced.

- (vi) At field locations, all the waste shall be collected at site in bins, from where it shall be transported to main camp for segregation, handling and disposal accordingly.

### **2.1.7 Storage and Handling**

- (i) Sufficient number of waste bins shall be placed all across the facility for collection of waste. All field waste shall be collected and transported back to camp/facility.
- (ii) All the waste generated shall be regularly collected from bins and segregated.
- (iii) All the segregated waste shall be properly placed at waste storage facility.
- (iv) Waste that will be sent for recycling or off-site disposal shall be temporarily stored at waste storage facilities available at different sites such as Junkyard, Scrap yard, pits, etc.
- (v) The oily sludge, contaminated soil and other hazardous liquid waste (e.g. rinsate, chemicals, etc.) shall be stored in labelled drums.
- (vi) All other wastes awaiting disposal shall be kept in closed containers separately. Care must be taken to prevent wastes giving rise to secondary environmental problems, such as odors or soil and groundwater pollution through rainwater leaching.
- (vii) All stored wastes must be clearly labeled with type of waste and warning signs. (For guidance on each type of waste refer Annexure-A).
- (viii) All workers handling wastes shall use proper PPE and properly trained.
- (ix) Waste shall not be accumulated or temporarily stored for more than one year or as per the manufacture directions.
- (x) All wastes packaging containers shall not have any MOL Pakistan marking / logo to ensure no liability is directly or indirectly imposed on MOL Pakistan.

### **2.1.8 Recycling**

Recycling and reuse minimizes the quantity of waste requiring disposal. Some of the wastes can be reused within MOL Pakistan facilities while others can only be recycled at off-site recycling centers. For example, recycling of used oil is possible in some of the Lube Oil Recycling companies; batteries may be sent back to manufacturer or distributor for recycling.

Waste shall not be sold to the unauthorized contractors / companies, who may not have proper recycling facilities, to avoid misuse and to reduce associated liabilities. The possibilities of recycling of each waste are discussed in Annexure-A.

### **2.1.9 Treatment**

Some of the wastes, such as wastewater from camps, oily wastewater from process, etc., require proper treatment before disposal. The treated water should comply with National Environmental Quality Standards (NEQS). Potential treatment options include:

- Biological methods (waste water treatment, composting, tank-based reactors).
- Bio-remediation.
- Thermal methods (thermal desorption and detoxification).
- Chemical methods (precipitation, extraction, neutralization)
- Incineration.
- Physical methods (gravity separation, filtration, encapsulation centrifugation).

### **2.1.10 Disposal**

Disposal becomes the only available alternatives, if reuse and recycling options are exhausted. A material should be classified as a waste for disposal only if no other useful purpose can be identified and if the material cannot be beneficially reused or recycled. The choice of a suitable disposal option for any waste depends on both environmental and economic considerations. The final disposal can be either at on-site disposal facilities or at off-site disposal facilities.

#### **2.1.10.1 On-site disposal facilities**

##### **Burial Pits**

Only segregated food waste shall be buried in burial pits. Buried waste should be covered with a thin layer of soil to reduce the environmental problems, such as odour from decaying of waste, spreading of waste into other areas due to wind, etc. The burial pit should be located away from the camp area and downwind of the residential area. The burial pit shall be located at least 500m away from the local communities or as per the requirements of EMP.

##### **Reserve Pits**

These pits are used to temporarily store drilling waste, chemical waste, oily sludge and contaminated soil. The pits should be properly designed and lined with HDPE liner to avoid soil, groundwater and surface water contamination.

### **Incineration**

Trash can be disposed of by burning at waste incinerator. Recyclable waste such as; plastics, metal, glass and any other hazardous item should be segregated prior to incineration and should not be burnt. Any hazardous waste such as dry batteries etc. should not be burnt in incineration. Ash of the incinerator shall be buried in the approved lined landfill.

### **Evaporation Ponds**

The evaporation ponds are used to dispose of produced water at some facilities by evaporation. All evaporation ponds should be properly designed and lined with HDPE liner.

### **Injection and Disposal Wells**

These wells are primarily used for re-injection or disposal of produced water. However, some of the wells could be chosen to dispose drill cutting, oily sludge and other hazardous liquids. Tubing and casing integrity of such disposal wells should be verified as per international standards.

### **Lined Landfills**

At the moment there is no properly designed landfill available in Karak for the disposal of such wastes which cannot be reused or recycled or sold to third party contractors because of its hazardous characteristics.

For the time being, two options are available with MOL Pakistan; i.e. either temporarily store all those wastes or dispose of through approved contractors at off-site disposal facilities.

#### **2.1.10.2 Off-Site Disposal Facilities**

In Pakistan, properly designed and well-operated commercial waste disposal facilities are very limited. All such facilities are being explored and evaluated for possible future use.

#### **2.1.11 Waste Management Options**

Waste management options for each type of waste are listed in the following Table (Table 1) along with the category of waste. Detailed data sheets for each type of wastes are attached as Appendix 2.

**Table 1 - Summary of Waste Management Options**

<b>S. No.</b>	<b>Waste Type</b>	<b>Category</b>	<b>Disposal Options</b>	<b>Ownership/ Responsibility</b>
1	Aerosol Cans (Empty)	Non-hazardous	Empty canisters can be recycled through contractor.	Camp Admin.
2	Asbestos	Hazardous	Lined landfill (HSE will advise suitable location).	Concerned Team Leader handling the job
3	Batteries (Dry)	Hazardous	Recycle batteries with the distributor or manufacturer or contractor.	Warehouse
4	Batteries (Lead Acid)	Hazardous	Recycle batteries with the distributor or manufacturer.	Warehouse
5	Chemical Spills (corrosion inhibitors, emulsifiers, scale inhibitors etc.)	Hazardous Depending on the chemical spilled. (refer to MSDS)	Disposal by incineration at properly designed off site hazardous waste incinerator.	Concerned Team Leader handling the job
6	Clinical Waste	Hazardous	Incinerate at off-site incinerator.	Field Doctor
7	Construction / Demolition Debris including Scrap	Non-hazardous	Recycle, reuse or sell to third party contractor.	Concerned Team Leader handling the job
7	Construction / Demolition Debris including Scrap	Non-hazardous	Recycle, reuse or sell to third party contractor.	Concerned Team Leader handling the job
8	Crude Oil / Condensate Waste	Hazardous	Return crude oil liquid and condensate to the appropriate production stream or incinerate	Production, Business Support
9	Descaling Acids	Hazardous	Reuse when possible. Dispose of in disposal / injection well.	Production
10	Drilling Fluids / Solids	Hazardous	Dispose of drilling wastes (fluids and solids) in the lined waste pit. Treat oil based mud at Bioremediation site.	Concerned Team Leader/ Drilling
11	Empty Drums and Containers	Non-hazardous	Cleans drums at drum draining pit. Crush metal drums in Drum Crusher and cut plastic drums. Disposed them off through recycler.	Concerned Section In Charge/ Ware House / Material Man
12	Filters	Non-hazardous	After draining oil, recycle drained oil as used engine oil. Sell the drained filters through approved contractor.	Ware House

S. No.	Waste Type	Category	Disposal Options	Ownership/ Responsibility
13	Fluorescent Light Tubes	Hazardous (if contain mercury)	Send fluorescent tubes to manufacturer. Dispose of mercury-free lamps in a landfill.	Warehouse Camp Admin.
14	Food Waste	Non-hazardous	Incinerate or burial in ground Dispose of through contractor.	Camp Admin.
15	Glycols	Non-hazardous	Reuse if viable. Return to vendor for recycling.	Concerned Section In Charge / Ware House
16	Laboratory Wastes	Hazardous	Sell or exchange excess unused chemicals. Incinerate at off-site incinerator.	Concerned Section In Charge
17	NORM Containing Waste (Tubulars / Equipment / Scale / Sludge)	Hazardous	Use concrete or properly designed lined tanks to temporarily hold the sludge or other liquid waste with NORM. Reinject, if viable. Incinerate sludge at off-site incinerator. Immobilize scale by mixing with cement / concrete.	Concerned Section In Charge (Production, Drilling)
18	Oil Contaminated Soil	Hazardous	Recover free liquids and recycle in production streams. Treat at bioremediation site.	Concerned Section In Charge
19	Oily Rags (Used)	Hazardous	Incinerate at off-site incinerator. Dispose of through contractor.	Concerned Section In Charge
20	Paraffins	Hazardous	Return to production stream. Incinerate at off-site incinerator.	Concerned Section In Charge
21	Produced Water	Non-hazardous	Inject produced water in disposal or injection wells. Use produced water for hydro-testing pipelines, equipment, tanks.	Concerned Section In Charges (Production, Drilling)
22	Rig wash	Non-hazardous	Collect and reuse for subsequent rig wash downs or for first stage washing of equipment. Dispose of rig wash in the lined waste pit.	Drilling
23	Sand Blasting Wastes	Non-hazardous Hazardous due to possibility of lead in old lead containing paints.	Disposal along concrete debris. Use in concrete as fine aggregate.	Concerned Team Leader handling the job
24	Sanitary Wastewater	Non-hazardous	Treat wastewater in ETP or septic tanks before disposal.	Camp Admin / Production

S. No.	Waste Type	Category	Disposal Options	Ownership/ Responsibility
25	Scale (Pipe and Equipment)	Non-hazardous	Recover all free oils and return back in production stream or Incinerate. Immobilize scale by mixing with cement / concrete.	Production
26	Septic Pit Bottom Sludge	Non-hazardous	Disposal by burial into earthen pit at site	Camp Admin.
27	Sludge	Hazardous	Reinject, if viable. Incinerate at off-site incinerator.	Concerned Section In charge
28	Trash	Non-hazardous	Segregate glass, metal, plastic from trash. Recycle all recyclable items. Burn remaining trash in incinerator or dispose of through contractor. Bury ash from incinerators in a properly designed lined landfill.	Camp Admin.
29	Used and Torn HDPE Liner	Non-hazardous if clear from contaminations	Disposal by auction from Junk Yard to recycling contractors. Larger pieces can be utilized for lining of ash burial pits.	Production Team Leaders / Ware House
30	Used Computers and Electronic Equipment's	Hazardous if broken Non-hazardous	Disposal by auction from Junk Yard to recycling contractors. Off spec equipment to be sent back to vendor	Ware House/ IT
31	Used Cooking Oil From Kitchen	Non-hazardous	Disposal by off-site incineration	Camp Admin
32	Used Engine Oil	Hazardous	Recycle used engine oil through the approved recycling contractor.	Ware House/ Concerned Section In Charge/ Material Man

*Note: The disposal techniques shall comply with NEQS limits*

### 2.1.12 Training

Adequate training shall be provided to all employees and contractors involved in generating, handling and managing wastes by the contractor and field staff. Recommended training to be provided shall include, but not limited to the following areas:

- Identification of waste types
- Chemical and physical properties of the waste
- Proper use of emergency equipment and personal protective equipment
- Procedures for proper handling and storage of waste
- Legal requirements and / or industrial standards
- Notification and consignment / manifest document requirements and

- Emergency procedures for responding to spills, accidental / releases or fires involving hazardous wastes

### 2.1.13 Recording and Reporting

MOL Pakistan has to record the information about source, composition, quantity, and final disposition of the waste. This information is needed for regulatory compliance, risk assessment and setting reduction targets and objectives as well as corporate statistics. The Waste Tracking Form, as shown in the following page shall be used to record this information by all MOL Pakistan teams, while waste is being dispatched outside facility or MOL Pakistan controlled location. It is the responsibility of the Team Leader to assign a suitable person (such as Lead Operator at all manned fields) to sign off the *Waste Tracking Form*, before the waste is dispatched outside.

## 3. RELATED REGULATIONS (EXTERNAL AND/OR INTERNAL)

The following external regulations (laws) and/or internal Regulations on the same and/or lower level are in connection with and have impact on this Regulation.

Identifier and Title	Description of relationship
US_1_G1_MOLPA1 Environmental Standard in E&P	This LOR defines the management of environmental impacts.

## 4. ANNULMENT(S)

By the issue of this Regulation, no Regulations have been annulled.

## 5. APPENDICES

Appendix number	Appendix title
Appendix 1	Glossary
Appendix 2	Waste Data Sheets - Guidelines for Waste Management
Appendix 3	Waste Tracking Form

***List of Acronyms***

<b>Acronym</b>	<b>Definition</b>
ACM	Asbestos-Containing Materials
CO <sub>2</sub>	Carbon Dioxide
E&P	Exploration and Production
EIA	Environmental Impact Assessment
EMP	Environment Management Plan
EPA	Environmental Protection Agency
H <sub>2</sub> S	Hydrogen Sulfide
HSE MS	Health Safety Environment Management System
IEE	Initial Environmental Examination
MSDS	Material Safety Data Sheet
NEQS	National Environmental Quality Standards
NORM	Naturally Occurring Radioactive Material
P&FE	Projects & Facility Engineering
PPE	Personal Protective Equipment
SOD	Sub-Surface Operation & Development
TDS	Total Dissolved Solids

## ***Waste Data Sheets - Guidelines for Waste Management***

### **Aerosol Cans**

Description	Container used for spraying various substances with pressurized gas as propellant.
Components	<ul style="list-style-type: none"><li>• Container</li><li>• Paints, starter fluids, oils, insecticides, etc.</li></ul>
Waste Category	<ul style="list-style-type: none"><li>• Canister shall be considered hazardous waste if not empty or still pressurized.</li><li>• Aerosol cans are non-hazardous if there is no propellant or product inside.</li></ul>
Analysis	No laboratory analysis required. Identify the components by referring label and/or Material Safety Data Sheet (MSDS).
Ownership / Responsibility	Camp Administrator
Accumulation/ Storage	Store empty can in recycling bin for metals (make sure it is a non-burnable trash).
Waste Reduction	<ul style="list-style-type: none"><li>• Use all of the contents.</li><li>• Order only the quantity needed.</li></ul>
Disposal Options	<ul style="list-style-type: none"><li>• Empty canister can be recycled through contractor.</li><li>• For contents of aerosol can, refer appropriate sheet.</li></ul>

**Asbestos**

**Synonyms: Actinolite, Chrysotile, Tremolite**

Description	White, or greenish-blue, or gray green fibrous, odorless solid.
Components	<ul style="list-style-type: none"> <li>• Polytetrafluoroethylene Teflon™.</li> <li>• All the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-granerite, anthophyllite, and actinolite-tremolite.</li> </ul>
Waste Category	Hazardous Waste
Analysis	No analysis is required.
Ownership / Responsibility	Concerned Team Leader handling the job
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Store in rigid, leak-tight containers, such as metal, plastic or fiber drums, or bags or non-rigid containers that are dust and sift-proof.</li> <li>• Asbestos storage containers must be marked with the following: <ul style="list-style-type: none"> <li>➤ CAUTION; HAZADOUS WASTE</li> <li>➤ CONTAINS ASBESTOS FIBERS;</li> <li>➤ AVOID CREATING DUST</li> </ul> </li> <li>• If asbestos or asbestos-containing materials (ACMs) are spilled, then the following actions must be completed: <ul style="list-style-type: none"> <li>➤ Sweep all spilled substance into sealable containers (if appropriate, moisten first to prevent dust formation); and</li> <li>➤ Carefully transfer to a safe place for storage.</li> </ul> </li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Asbestos is a human carcinogenic substance, so use the proper personal protective equipment (PPE) when handling.</li> <li>• Prevent dispersion of dust;</li> <li>• Avoid contact;</li> <li>• Wear protective clothing;</li> <li>• If clothes become contaminated, rinse with plenty of water;</li> <li>• Wear a self-contained full face respirator or air-purifying full face respirator with a high-efficiency particulate filter; and</li> <li>• Wash hands thoroughly after handling.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Purchase asbestos-free products and equipment.</li> <li>• Conduct routine maintenance on ACMs to prevent exposure of asbestos.</li> </ul>
Disposal Options	ACMs to be removed by trained personnel and disposed in a lined

	landfill.
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**Batteries (Dry)**

**Synonyms: Nickel, Cadmium, Mercury, Lithium, Silver-oxide batteries**

Description	<ul style="list-style-type: none"> <li>• A dry electrical storage battery.</li> <li>• Used in consumer goods; some are rechargeable.</li> </ul>
Components	Nickel, cadmium, mercury, lithium, silver/silver oxide.
Waste Category	<ul style="list-style-type: none"> <li>• Dry cell batteries containing hazardous components (i.e., nickel, cadmium, mercury, lithium, silver oxide, etc.) are hazardous waste.</li> <li>• Some dry cell batteries used in consumer goods (e.g., AA, D, C, etc.) do not contain hazardous components (i.e., they are free of nickel, cadmium, mercury, etc.) and therefore considered as non-hazardous waste. If unsure about the battery components, consult the original package to see if there is any hazardous component in the battery.</li> </ul>
Analysis	No analysis is required.
Ownership / Responsibility	Warehouse
Accumulation/ Storage	<p>Hazardous batteries must be accumulated / stored as follows:</p> <ul style="list-style-type: none"> <li>• Label each container with “Hazardous Waste – Battery(ies)”;</li> <li>• Label containers with the date on which the first battery became a waste;</li> <li>• Do not accumulate waste batteries for more than one year.</li> <li>• Place damaged, ruptured, or leaking batteries in a closed, structurally sound, and compatible container to prevent releases to the environment;</li> <li>• Pack batteries without other materials in container or package;</li> <li>• Protect batteries in order to prevent short circuits. Insulate at least one terminal of each battery with electrical tape to prevent short circuits and possible fire; and</li> <li>• Do not use battery terminals to support any weight.</li> </ul>
Waste Handling	<p>Handle batteries in the following manner to prevent exposure:</p> <ul style="list-style-type: none"> <li>• Wear impervious gloves if handling broken units; and</li> <li>• Wear safety glasses, face shield, or goggles when handling damaged batteries.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Use rechargeable batteries wherever possible.</li> <li>• Arrange for battery exchange or credit from dealer or sale to approved contractor</li> </ul>
Disposal Options	Recycle batteries with the distributor or manufacturer or through contractor.

**Batteries (Lead Acid)**

**Synonyms: wet cell battery, electric storage battery**

Description	<ul style="list-style-type: none"> <li>Liquid-filled or gel-filled lead acid batteries.</li> <li>Used in vehicle engine starting and uninterrupted power supply systems.</li> </ul>
Components	<ul style="list-style-type: none"> <li>Lead/lead oxide.</li> <li>Sulfuric acid.</li> </ul>
Waste Category	Hazardous waste.
Analysis	No analysis is required.
Ownership / Responsibility	Ware House
Accumulation/ Storage	<p>Batteries waste must be accumulated / stored as per following instructions:</p> <ul style="list-style-type: none"> <li>Label each container with “Hazardous Waste – Battery(ies)”;</li> <li>Label all containers storing several batteries with the date on which the first battery became a waste;</li> <li>Label all batteries stored individually with the date on which the battery became a waste;</li> <li>Do not accumulate for more than one year;</li> <li>Damaged, ruptured, or leaking batteries must be placed in a closed, structurally sound, and compatible container to prevent releases to the environment;</li> <li>Pack batteries without other materials in the container or package;</li> <li>Protect batteries in order to prevent short circuits. Insulate at least one terminal of each battery with electrical tape to prevent short circuits and possible fire;</li> <li>Do not use battery terminals to support any weight; and</li> <li>Draining the electrolyte due to Safety consideration after being neutralized.</li> </ul>
Waste Handling	<p>Used batteries should be handled in a manner to prevent exposure to skin and inhalation:</p> <ul style="list-style-type: none"> <li>Wear impervious gloves if handling broken units;</li> <li>Wear safety glasses, face shield, or goggles for handling damaged product; and</li> <li>Wear respirator with an acid-mist cartridge if there is a risk of acid release.</li> </ul>
Waste Reduction	Arrange for battery exchange or credit from dealer.
Disposal Options	Recycle batteries with the distributor or manufacturer or contractor.

### **Chemical Spills**

Description	Chemical spills and contaminated soils from chemical spills (corrosion, scale inhibitors; biocides etc.
Components	<ul style="list-style-type: none"> <li>Chemicals</li> </ul>
Waste Category	<ul style="list-style-type: none"> <li>Hazardous</li> <li>Depending on the chemical spilled. (refer to MSDS)</li> </ul>
Analysis	No analysis is required.
Ownership / Responsibility	Concerned Team Leader
Accumulation/ Storage	<ul style="list-style-type: none"> <li>Collect all chemical spilled and chemical contaminated soil.</li> <li>Store at waste storage sites in bins with lids.</li> <li>Label each storage containers with name of chemicals spill stored, along with hazard signage. (refer to MSDS for labeling info)</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>Do not mix one type of chemical with another type of chemical.</li> <li>Do not mix with oil sludge or oil contaminated soil.</li> <li>Wear appropriate (to the contaminants) personal protective equipment while handling chemical spills and chemical contaminated soil.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>Proper storage and handling of chemicals.</li> <li>Secondary containment for chemical storage areas.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>Disposal by incineration at properly designed off site hazardous waste incinerator.</li> </ul>

### **Clinical Waste**

**Synonyms: Medical waste, Hospital waste, Infectious waste, Expired medicines**

Description	Waste generated from field clinics.
Components	Used cotton and bandages, expired medicines, used syringes, etc.
Waste Category	Hazardous
Ownership / Responsibility	Field Doctor
Analysis	No analysis is required.
Accumulation/ Storage	Collect and seal in polythene bags
Waste Reduction	Do not mix with other wastes (such as paper)
Disposal Options	Incinerate at off-site incinerator. Field clinic also required to send the clinical waste to off-site incinerator and keep the record of incineration.

**Construction / Demolition Debris**

**Synonyms: Metal Scrap, Wood Scrap, Spoil, Vegetation**

Description	Scrap metal, wood, or other materials from a construction or demolition site.
Components	Components depend on the material.
Waste Category	Construction and demolition debris that is not contaminated by chemicals, asbestos, oil, or NORM is a non-hazardous waste.
Ownership / Responsibility	Concerned Team Leader handling the job
Analysis	If material is suspected of NORM contamination, measure the contamination level (count/sec) with contamination monitors. If the readings are twice or above the background levels then refer the Waste Data Sheet on NORM for more details.
Accumulation/ Storage	If the construction or demolition debris is not contaminated with other substances (i.e., chemicals, oils, NORM, etc.), it doesn't need any special handling. However care must be taken so that the dust emanating from the debris is well under control.
Waste Reduction	Recycle material when possible.
Disposal Options	If construction and demolition debris is not contaminated with other substances, the following disposal options are applicable: <ul style="list-style-type: none"> <li>• Recycling, reusing or selling to a third party contractor; and</li> <li>• Disposal in a landfill.</li> </ul>

**Crude Oil and Condensate Waste**

Description	Crude oil and natural gas condensate waste generated due to spills, leaks.
Components	Hydrocarbons.
Waste Category	Hazardous waste
Analysis	No laboratory analysis is required.
Ownership / Responsibility	Concerned Team Leaders / Production/ Business Support
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Return crude oil and condensate to the production system or incinerated</li> <li>• Label each storage container with the name of the material in the container and the appropriate hazard warnings (Flammable).</li> <li>• Store crude oil and condensate in a structurally sound and compatible container.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Use appropriate PPE (e.g., gloves, boots, etc.) when handling crude oil and condensate.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Prevent leaks or spills by carrying out regular inspection and maintenance of all surface lines and facilities.</li> <li>• Return crude oil liquid and condensate to the appropriate production stream.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Return crude oil liquid and condensate to the appropriate production stream.</li> </ul>

	<ul style="list-style-type: none"> <li>If crude oil is not being recycled to the production stream due to excessive water content, separate the water and crude through any appropriate separation mode and recycle the crude oil.</li> </ul>
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### Descaling Acids

Description	<ul style="list-style-type: none"> <li>Liquid.</li> <li>Used for pipe and vessel descaling, cleaning agent for laboratory equipment.</li> </ul>
Components	Depends on the type of acid and contaminants.
Waste Category	Hazardous waste (Corrosive)
Analysis	No analysis is required.
Ownership / Responsibility	Concerned team Leader
Accumulation/ Storage	<ul style="list-style-type: none"> <li>Store in sealed containers, which are compatible with acids.</li> <li>Store in containers that are properly constructed and do not contain leaks, corrosion, gouges, bulges, or creases.</li> <li>Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage.</li> <li>Protect from physical damage.</li> <li>Keep out of direct sunlight and away from heat, water, and incompatible materials.</li> <li>Do not wash out container and do not use for other purposes.</li> <li>When diluting, always add acid slowly to water and in small amounts; never use hot water and never add water to acid.</li> <li>Label each container with the name of the material in the container and the "Hazardous Waste".</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>Consult the MSDS for the proper personal protective equipment (PPE) required when handling this chemical.</li> <li>Use non-sparking tools when opening metal containers.</li> <li>Wear rubber or neoprene gloves, impervious boots, apron, or coveralls to prevent skin contact.</li> <li>Use chemical safety goggles and/or a full-face shield when there is a possibility of splash.</li> <li>Maintain eyewash fountains and quick-drench facilities in work area.</li> <li>Neutralize prior to disposal.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>Neutralize acids in pipe cleaning process.</li> <li>Do not order more than needed.</li> <li>Reuse as pH control whenever possible.</li> <li>Use for neutralization of caustic wastes.</li> </ul>

Disposal Options	<ul style="list-style-type: none"> <li>• Reuse when possible.</li> <li>• Dispose of in disposal / injection well.</li> </ul>
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**Drilling Fluids/Solids**

Description	<ul style="list-style-type: none"> <li>• Water or oil-based mud returned from down hole;</li> <li>• Cuttings from down hole removed when reconditioning returned mud;</li> <li>• Unused drilling chemicals.</li> </ul>
Components	<ul style="list-style-type: none"> <li>• Muds and solids.</li> <li>• Cement returns.</li> <li>• Saltwater.</li> <li>• Oil.</li> <li>• Formation cuttings.</li> </ul>
Waste Category	Hazardous waste
Analysis	No analysis is required.
Ownership / Responsibility	Concerned Team Leader/ Drilling
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Store drilling fluids in the reserve pit.</li> <li>• Store lubricating oil separately from drilling fluids</li> <li>• Store chemicals separately from drilling fluids in leak-proof containers and label each container with the name of the material in the container and the appropriate hazard warnings.</li> <li>• Segregate lubricating oil and chemicals for disposal so that they do not enter the reserve pit.</li> <li>• Use De-watering system to de-water mud pits for immediate pit closure.</li> </ul>
Waste Handling	Wear protective clothing and avoid eye or skin contact.
Waste Reduction	<ul style="list-style-type: none"> <li>• Prevent spills and leaks.</li> <li>• Optimize solids control equipment.</li> <li>• Substitute less toxic products and additives.</li> <li>• Use a closed-loop mud system whenever possible to reduce volumes of drilling fluid wastes.</li> <li>• Minimize use of oil-based drilling fluids.</li> <li>• Use inventory control and careful planning to avoid accumulating unused materials.</li> <li>• Minimize water usage and excess chemical and additives.</li> <li>• Transfer unused additives for use at other sites.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Dispose of drilling wastes (fluids and solids) in the lined reserve pit.</li> <li>• Reuse water-based mud whenever possible.</li> <li>• Reuse waste drilling mud for upcoming well spudding or plugging operations.</li> </ul>

	<ul style="list-style-type: none"> <li>Encapsulate surplus additives and oil-based mud to avoid it mixing with other environmental mediums.</li> </ul>
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### **Drums and Containers**

Description	Drums and containers either empty or having some residue.
Components	Packaging components and residue.
Waste Category	<ul style="list-style-type: none"> <li>Drums and containers containing hazardous material would only be considered empty, if no more than 1 inch of residue remains in the container.</li> <li>Empty drums and containers after cleaning are considered as non-hazardous waste.</li> </ul>
Analysis	No analysis is required.
Ownership / Responsibility	Concerned Section In Charge/ Ware House / Material Man
Accumulation/ Storage	<ul style="list-style-type: none"> <li>Drums / containers should be checked to verify that they are empty.</li> <li>All drums that are not empty must be marked with legible labels.</li> <li>Store drums on pallets, racks, or other structures to keep them from direct contact with the soil.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>Cleans drums at drum draining pit.</li> <li>Take proper pre-cautions when handling &amp; emptying the drums or containers that contain hazardous material.</li> <li>Consult relevant MSDS for PPE when emptying drums of hazardous material.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>Switch to purchase of materials and chemicals in bulk containers, reducing the amount of drums requiring handling. Additionally, less drum handling reduces the chance of spills and releases requiring cleanup.</li> <li>Purchase materials in returnable or recyclable drums / containers.</li> <li>Reuse uncontaminated drums for other purposes (e.g., storage and transfer of non-hazardous waste).</li> </ul>
Disposal Options*	<ul style="list-style-type: none"> <li>Crush metal drums in Drum crusher and cut plastic drums</li> <li>Disposed them off through recycler</li> <li>Drums that are not empty should not be disposed of.</li> </ul>

### **Filters**

Description	<ul style="list-style-type: none"> <li>Used oil filters from gasoline, diesel, vehicle, and generator engines.</li> <li>Fuel oil filters.</li> <li>Glycol filters.</li> <li>Production filters.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Chemical filters.</li> </ul>
Components	Filter media. Residue from waste stream.
Waste Category	Used oil filters are considered non-hazardous waste, if the filter is punctured.
Analysis	No analysis is required.
Ownership / Responsibility	Ware House
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• All filters must be punctured, drained, and free of any liquids prior to accumulation and disposal.</li> <li>• Drained oil from filters is handled as used oil.</li> <li>• Place drained filters in a labeled and closed container.</li> <li>• Label each storage container with the name of the material in the container and Hazardous Waste.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Place drained fuel and oil filters in a labeled and closed container for recycling.</li> <li>• Do not mix drained liquids from filters with other materials.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• When handling filters, take care to prevent oil spillage and the contamination of soil.</li> <li>• Change filters only when necessary; use differential pressure as an indicator of needed change.</li> <li>• Where possible, use reusable filters.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• After draining oil, dispose of oil as used engine oil. (Refer Data sheet for Used Engine Oil.)</li> <li>• Recycle drained liquids (chemicals) back into production stream.</li> <li>• Sell the drained filters through contractor.</li> <li>• Send filters free of liquid to off-site incinerator.</li> </ul>

### **Fluorescent Light Tubes**

Description	Light tubes or ballasts.
Components	<ul style="list-style-type: none"> <li>• Glass.</li> <li>• Chemicals associated with fluorescent tube; may contain mercury.</li> </ul>
Waste Category	<ul style="list-style-type: none"> <li>• Fluorescent light tubes containing mercury are hazardous waste.</li> <li>• Mercury-free fluorescent light tubes are non-hazardous.</li> </ul>
Analysis	No analysis is required.
Ownership / Responsibility	Camp Admin
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Do not accumulate wastes for more than one year after the generation;</li> <li>• Contain unbroken lamps in closed packages that minimize breakage during normal handling conditions;</li> <li>• Contain broken lamps in packaging that minimize releases of lamp fragments and residues.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Cleanup and place any broken light tubes in a structurally sound container that will prevent escape of any material into the environment.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Use mercury-free light tubes whenever possible.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Send fluorescent tubes to a lamp recycler or manufacturer.</li> <li>• Dispose of mercury-free lamps in a landfill or through contractor.</li> </ul>

### **Food Waste**

Description	Waste generated from Kitchen.
Components	Non-recyclable food waste
Waste Category	Non-hazardous waste.
Analysis	No analysis is required.
Ownership / Responsibility	Camp Admin
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Store separately.</li> <li>• Do not mix with trash.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	Segregate all recyclable items e.g. plastic bottles, glass bottles.
Disposal Options	Incinerate. Dispose off through contractor.

**Glycols**

**Synonyms: Ethylene Glycol, Propylene Glycol, Triethylene Glycol (TEG)**

Description	<ul style="list-style-type: none"> <li>• Colorless, odorless liquid.</li> <li>• Ethylene glycol or propylene glycol is used as anti-freezing agent in heat exchange operations.</li> <li>• Triethylene glycol is used for dehydration of natural gas.</li> </ul>
Components	<ul style="list-style-type: none"> <li>• Constituents depend on the glycol material being used.</li> <li>• Waste glycols may be contaminated with light hydrocarbons and salts.</li> </ul>
Waste Category	Non-hazardous waste.
Analysis	No analysis is required.
Ownership / Responsibility	Concerned Section In Charge / Ware House
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Do not mix waste glycols, because each glycol must be recycled separately.</li> <li>• Store glycols in a structurally sound and compatible container.</li> <li>• Label each storage container with the name of the material in the container.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Observe the following requirements when handling this material: <ul style="list-style-type: none"> <li>➤ Wear protective gloves and coverall;</li> <li>➤ Use chemical safety goggles; and</li> <li>➤ Maintain eyewash fountain and quick-drench facilities in work area.</li> </ul> </li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Properly maintain and operate dehydration units to minimize waste and emissions (e.g., flow rates and temperatures).</li> <li>• Regenerate waste glycols for reuse.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Return to vendor for recycling.</li> <li>• Dispose with spilled soil / sludge.</li> </ul>

**Laboratory Waste**

**Synonyms: Laboratory Chemicals**

Description	Waste resulting from sample testing
Components	Depends on sample tested and chemicals used
Waste Category	Hazardous waste
Analysis	Refer MSDS to determine the characteristics of chemical and materials tested.
Ownership/ Responsibility	Concerned Section In Charge
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Do not mix waste chemicals.</li> <li>• Store wastes in appropriate containers (e.g., non-metal</li> </ul>

	<p>containers for corrosive substances).</p> <ul style="list-style-type: none"> <li>Label each storage container with the name of the material in the container and the appropriate hazard warnings.</li> </ul>
Waste Handling	Consult the appropriate MSDS for personal protection and safety requirements when handling specific chemicals.
Waste Reduction	<ul style="list-style-type: none"> <li>Buy only the required amount.</li> <li>Minimize testing by conducting analysis of only required samples.</li> <li>Use test methods that generate less or no waste.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>Sell or exchange excess unused chemicals.</li> <li>Dispose off laboratory wastes (acid, base and test material) after neutralizing.</li> <li>Non-hazardous waste such as rinsed chemical and acid empty bottles sent to waste contractor for recycling.</li> <li>Incinerate at off-site incinerator.</li> </ul>

**NORM Containing Waste (Tubulars, Equipment, Scale, Sludge, etc.)**

Description	NORM (Naturally Occurring Radioactive Materials) may be present in oil and gas operations at some locations. NORM can be found in down hole tubing, produced water, above-ground processing equipment, contaminated soils (well work overs, tank cleaning, and saltwater leaks), pipe cleaning, and other associated operations.
Components	Radioactive material generally consists of radionuclides: uranium, thorium, and radium (radium-226 and radium-228).
Waste Category	Hazardous Waste
Ownership / Responsibility	Concerned Section In Charge (Production, Drilling)
Analysis	Measure the contamination level (count/minutes) using contamination monitors. If the readings are twice or above the background levels then composite sample shall be collected for radio-chemical analysis.
Accumulation/ Storage	<ul style="list-style-type: none"> <li>All NORM-contaminated equipment, whether in service or not, should be labeled.</li> <li>All out-of-service NORM contaminated equipment should be segregated and labeled.</li> <li>Use concrete or properly designed lined tanks to temporarily hold the sludge or other liquid waste with NORM.</li> <li>Wear protective clothing</li> </ul>
Reporting Requirement	It is recommended that concerned supervisor maintain records of types, volumes, analytical data, destinations, and transportation mechanism of NORM wastes and reports the same to HSE Team.
Waste Handling	Proper industrial hygiene and necessary precautions and equipment are required. Consult the MOL Pakistan NORM management procedure for drilling activities.
Waste Reduction	<ul style="list-style-type: none"> <li>Do not accept any used equipment that contains NORM.</li> </ul>

	<ul style="list-style-type: none"> <li>• Use scale inhibitors where NORM scale accumulates.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• NORM wastes can be reinjected in abandoned wells.</li> <li>• Contaminated soil and sludge can be incinerated at off-site incinerator.</li> <li>• Immobile scale by mixing with cement / concrete.</li> <li>• Engage specialized contractor for disposal</li> </ul>

### **Oil Contaminated Soil**

Description	Soils that have been contaminated due to a release of oily compounds or products (i.e., condensate, produced water, hydrocarbons, etc.).
Components	<ul style="list-style-type: none"> <li>• Soil.</li> <li>• Hydrocarbons</li> </ul>
Waste Category	Hazardous waste
Analysis	Not required
Ownership / Responsibility	Concerned Section In Charge
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Contaminated soil must be stockpiled in a bunded area that is lined.</li> <li>• Contaminated soil may be temporarily stored in designated drums with lid</li> </ul>
Waste Handling	Prevent skin contact with contaminated soil by wearing impervious clothing, gloves, and boots.
Waste Reduction	<ul style="list-style-type: none"> <li>• Prevent soil contamination by: <ul style="list-style-type: none"> <li>➢ Properly maintaining equipment and pipes to prevent leaks and spills; and</li> <li>➢ Using containment devices in chemical storage areas.</li> <li>➢ Using good quality transport bowsers.</li> </ul> </li> <li>• Use leak detection equipment.</li> <li>• Use appropriate measures to stop and contain spill or leak if one occurs.</li> <li>• Pick up free liquids or solids spilled as soon as possible after the spill is contained and recycle.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Recover free liquids and recycle in production streams.</li> <li>• Treat at Bioremediation site.</li> </ul>

### **Oily Rags**

#### **Synonymous: Absorbent Pads**

Description	Oily rags or absorbent pads are used to clean up: Crankcase oil; Crude oil; Diesel fuel; Hydraulic fluid; and Other petroleum products.
Components	<ul style="list-style-type: none"> <li>• Hydrocarbons.</li> <li>• Rag or absorbent material.</li> </ul>
Waste Category	Hazardous waste.
Analysis	No analysis required.

Ownership / Responsibility	Concerned Section In Charge
Accumulation/ Storage	<ul style="list-style-type: none"> <li>Place oily rags in a closed container and keep the drum closed unless materials are being added or removed.</li> <li>Add enough absorbent at the time of packing to soak up free liquid.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>Return liquid to the crude oil stream if it is crude oil, crankcase oil, diesel fuel, hydraulic fluid, or other non-hazardous petroleum distillates.</li> <li>Do not return halogenated solvents (e.g., “chloro”, “flouro”, or “bromo” in the name on the MSDS) to the crude oil stream.</li> <li>Prevent skin contact with oily rags and if skin contact should occur, wash skin.</li> <li>Wear protective clothing</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>When possible, use absorbents that can be wrung out and reused. This reduces the volume of waste pads.</li> <li>If possible, return free liquids to the production stream.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>Send for incineration.</li> </ul>

### Paraffins

Description	<ul style="list-style-type: none"> <li>Component of crude oil, which can be shipped to a refinery by drum as “crude oil” if not suitable for pipeline.</li> <li>Accumulate in pumps, tubing, surface equipment, and tank bottoms.</li> </ul>
Components	Oily waste
Waste Category	Hazardous
Analysis	No analysis required.
Ownership / Responsibility	Concerned Section In Charge
Accumulation/ Storage	<ul style="list-style-type: none"> <li>Store paraffins in a structurally sound and compatible container to prevent releases into the environment.</li> <li>If the paraffin has thickened, thin the paraffin by mixing with a solvent and recycle in the production stream.</li> <li>Label each storage container with the name of the material in the container and the appropriate hazard warnings.</li> </ul>
Waste Handling	Wear protective clothing and avoid eye and skin contact.
Waste Reduction	<ul style="list-style-type: none"> <li>Recycle by adding to the production streams.</li> <li>Minimize overuse or excessive usage.</li> <li>Use hot-oil treatment to dissolve paraffin in well and flow lines; send to production.</li> <li>Use paraffin inhibitor chemicals.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>Return to production stream.</li> <li>Incinerate at off-site incinerator.</li> </ul>

**Produced Water**

Description	Water brought up from the hydrocarbon-bearing strata during the extraction process.
Components	<ul style="list-style-type: none"> <li>• Formation water.</li> <li>• Injected water.</li> <li>• TDS.</li> <li>• Petroleum hydrocarbons.</li> <li>• Naturally occurring metals.</li> <li>• Additive chemicals.</li> </ul>
Waste Category	Non-hazardous (if no oil present)
Analysis	Analysis required
Ownership / Responsibility	Concerned Section In Charges (Production, Drilling)
Waste Reduction	<ul style="list-style-type: none"> <li>• Use rock plugging with gel slugs to block off water production in completions where there is a separation of the oil and water zones.</li> <li>• Dually complete the oil zone and water zone to allow water to be produced simultaneously but separately from oil and allow control of water coning.</li> <li>• Carefully plan well completions.</li> <li>• Re perforate well to reduce water production.</li> <li>• Drill wells to minimize water production.</li> <li>• Optimize production rate to minimize influx of water.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Inject produced water into disposal or injection wells.</li> <li>• Disposal into lined evaporation pits.</li> <li>• Reuse produced water whenever possible.</li> <li>• Use produced water for hydro-testing pipelines, equipment, tanks.</li> </ul>

**Rigwash**

Description	Water used to wash down the rig floor.
Components	<ul style="list-style-type: none"> <li>• Water.</li> <li>• Detergents.</li> </ul>
Waste Category	Non-hazardous if it doesn't contain spilled chemicals and oils.
Analysis	No analysis required.
Ownership / Responsibility	Drilling
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Collect rigwash in the waste pit.</li> <li>• Collect oily layer through absorbent pads.</li> <li>• Store any segregated used oil appropriately</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• When handling rig wash, avoid eye and skin contact.</li> <li>• Segregate any used oil and paint solids before disposing of rigwash in the reserve pit.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Use water wisely in rig maintenance.</li> </ul>

	<ul style="list-style-type: none"> <li>• Use high-pressure, low-volume hose nozzles with automatic cutoffs.</li> <li>• Set up a regular maintenance program for water systems to reduce leaks and drips.</li> <li>• Reduce rigwash use by sweeping or other dry cleaning when feasible.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Collect and reuse rigwash for subsequent rig washdowns or for first stage washing of equipment.</li> <li>• Use as make-up water in drilling and completion operations.</li> <li>• Dispose of rigwash in the lined reserve pit.</li> </ul>

### **Sand Blasting Waste**

Description	Grit from sand blasting operations
Components	<ul style="list-style-type: none"> <li>• Sand / grit</li> <li>• Surface coating over metal, paints &amp; metal oxides.</li> </ul>
Waste Category	<ul style="list-style-type: none"> <li>• Non-hazardous</li> <li>• Hazardous due to possibility of lead in old lead containing paints.</li> </ul>
Analysis	No analysis is required.
Ownership / Responsibility	Concerned Team Leader handling the job
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Collect and store in a bin with proper lid.</li> <li>• Label storage containers with the words "Sand Blasting Waste."</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Do not mix with other trash.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	Sand blasting to be performed where needed.
Disposal Options	<ul style="list-style-type: none"> <li>• Disposal along concrete debris.</li> <li>• Use in concrete as fine aggregate.</li> </ul>

### **Sanitary Wastewater**

Description	Wastewater from camps.
Waste Category	Non-hazardous
Analysis	Analysis required Physical monitoring /inspection as per guidelines for operations and maintenance of septic tank system.
Ownership / Responsibility	Camp Admin
Waste Handling	When handling sanitary wastewater, protect yourself from direct contact by using appropriate personal protective equipment.
Waste Reduction	Reduce water use.
Disposal Options	Treat wastewater in ETP or in septic tanks before disposal after complying NEQS.

**Scale (Pipe and Equipment)**

Description	Formed during the production process within wellbores and production equipment due to temperature and pressure changes.
Components	<ul style="list-style-type: none"> <li>• Barium sulfate.</li> <li>• Iron sulfide.</li> <li>• Calcium carbonate.</li> <li>• Other inert materials.</li> <li>• Some may contain NORM.</li> </ul>
Waste Category	Non-hazardous unless it exhibits hazardous waste characteristics.
Analysis	If material is questionable for NORM contamination, measure the contamination level (count/sec) using contamination monitors. If the readings are twice or above the background levels then composite sample shall be collected for radio-chemical analysis. (See the Waste Data Sheet on NORM for more details.)
Ownership / Responsibility	Production
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Store scale in a structurally sound and compatible container to prevent releases to the environment.</li> <li>• Returned to the production stream or Incinerate.</li> <li>• Label each storage container with the name of the material in the container and the appropriate hazard warnings.</li> </ul>
Waste Handling	Wear protective clothing and avoid eye and skin contact.
Waste Reduction	<ul style="list-style-type: none"> <li>• Use scale inhibitors.</li> <li>• Avoid mixing incompatible produced waters that can result in scale formation.</li> <li>• Design facility to reduce locations prone to scale formation (i.e., avoid large pressure drops and unnecessary pipe elbows).</li> <li>• Reduce the volume of water produced.</li> <li>• Coat material surfaces with chemicals at critical points in the production system to reduce the availability of nucleation points for scale formation.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Recover all free oils and return back into production stream.</li> <li>• Immobilize scale by mixing with cement / concrete.</li> <li>• For NORM contaminated scale, refer sheet on NORM Containing Waste.</li> </ul>

**Septic Pit Bottom Sludge**

Description	Septic pit
Components	Decomposed human excreta, water, scum, and suspended solids
Waste Category	Non-hazardous
Analysis	No analysis is required.
Ownership / Responsibility	Camp Admin
Accumulation/ Storage	Do not accumulate and dispose immediately after removal.

Waste Handling	<ul style="list-style-type: none"> <li>Do not mix septic tank (sludge) with other wastes</li> <li>Wear appropriate PPE.</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>Routine maintenance of septic pits</li> <li>Regular inspections</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>Disposal by burial into earthen pit at site or to municipal drain after approval from municipal authorities.</li> </ul>

### Sludge

Description	Material (sediment and water) originally from downhole or that gathers on the bottom of treatment and storage tanks (i.e., production separator fluid treating vessels).
Components	<ul style="list-style-type: none"> <li>Sands.</li> <li>Oils.</li> <li>Solids.</li> <li>Emulsions.</li> </ul>
Waste Category	Hazardous Waste
Analysis	<ul style="list-style-type: none"> <li>Test a material that may contain NORM in the following manner: <ul style="list-style-type: none"> <li>➤ Measure the contamination level (count/sec) using contamination monitors. If the readings are twice or above the background levels then composite sample shall be collected for radio-chemical analysis.</li> </ul> </li> </ul>
Ownership / Responsibility	Concerned Section In charge
Accumulation/ Storage	<ul style="list-style-type: none"> <li>Reprocess material if possible:</li> <li>Return free oil to process stream; and</li> <li>Dispose of water as produced water.</li> <li>Material that cannot be reprocessed must be contained in drums, tanks, or containers or in properly lined pits.</li> <li>Label each storage container with "Oily Sludge – Hazardous waste".</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>Do not mix NORM containing sands or solids with other produced sand.</li> <li>Wear protective clothing</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>Separate solids and liquids to minimize volumes</li> <li>Design perforations in completion operations to minimize sand production.</li> <li>Modify process to reduce waste (e.g., tank bottom accumulation).</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>Reinject, if viable.</li> <li>Send for offsite incineration.</li> <li>For NORM contaminated sludge, refer sheet on NORM Containing Waste.</li> </ul>

### Trash

**Synonyms: domestic, office, warehouse, maintenance trash**

Description	Trash and paper products.
Components	Constituents depend on the item.
Waste Category	Non-hazardous waste.
Analysis	No analysis is required.
Ownership / Responsibility	Camp Admin
Accumulation/ Storage	Segregate and store trash in the drums or covered bins.
Waste Handling	<ul style="list-style-type: none"> <li>• Use caution to avoid splinters, cuts, and general harm.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	<ul style="list-style-type: none"> <li>• Recycle.</li> <li>• Limit use of styrofoam and/or paper.</li> </ul>
Disposal Options	<ul style="list-style-type: none"> <li>• Segregate glass, metal, plastic from trash.</li> <li>• Recycle all recyclable items.</li> <li>• Burn reaming trash in incinerators.</li> <li>• Bury ash from incinerators in a properly designed lined landfill.</li> </ul>

### Used and Torn HDPE Pit Liner

Description	Used / recovered HDPE pit liner from evaporation and other pits.
Components	<ul style="list-style-type: none"> <li>• High Density Polyethylene</li> <li>• Contaminations</li> </ul>
Waste Category	Non-hazardous if clear from contaminations
Analysis	No analysis is required.
Ownership / Responsibility	Production team leaders/Construction Team
Accumulation/ Storage	Store at designated area, along with other reusable items at site.
Waste Handling	<ul style="list-style-type: none"> <li>• Care to be taken if any contaminants are present on the used HDPE liner.</li> <li>• Wear appropriate (to the contaminants) personal protective clothing while handling used HDPE liner.</li> </ul>
Waste Reduction	Recycle at other locations; such as used as secondary containment during temporary storage of chemicals and materials. Regenerate waste glycols for reuse.
Disposal Options	<ul style="list-style-type: none"> <li>• Disposal by auction from Junk Yard to recycling contractors.</li> <li>• Larger pieces can be utilized for lining of ash burial pits.</li> </ul>

**Used Computers and Electronic Equipment**

Description	Used computers and computer accessories and other electronic equipment such as communication devices, toners, etc.
Components	<ul style="list-style-type: none"> <li>• Plastics, metals, glass</li> <li>• Electronic circuitry</li> </ul>
Waste Category	<ul style="list-style-type: none"> <li>• Hazardous if broken</li> <li>• Non-hazardous</li> </ul>
Analysis	No analysis is required.
Ownership / Responsibility	Ware House/ IT
Accumulation	<ul style="list-style-type: none"> <li>• Store at suitable location; away from direct sunlight, rain water and extreme temperature.</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Handle with care, specially monitors etc. to avoid breaking.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	Minimize generation of this stream by properly utilizing the equipment.
Disposal Options	Disposal by auction from Junk Yard to recycling contractors.

**Used Cooking Oil**

**Synonyms: cooking oil, edible oil**

Description	Used cooking oil from kitchen.
Components	Edible cooking oil
Waste Category	Non-Hazardous Waste
Analysis	No analysis is required.
Ownership / Responsibility	Camp Admin
Accumulation/ Storage	<ul style="list-style-type: none"> <li>• Collect and store in a container with lid, container should be in good condition and not leaking.</li> <li>• Label storage containers with the words "Used Cooking Oil."</li> </ul>
Waste Handling	<ul style="list-style-type: none"> <li>• Do not mix used cooking oil with any other materials.</li> <li>• Wear protective clothing</li> </ul>
Waste Reduction	Minimize volume of used oil discarded.
Disposal Options	Disposal by offsite incineration.

**Used Engine Oil**

**Synonyms: lube oil, engine oil, motor oil, lubricating oil**

Description	Used oil generated when maintaining and lubricating production, drilling, workover, and gas plant equipment.
Components	<ul style="list-style-type: none"> <li>• Hydrocarbons.</li> <li>• Process contaminants.</li> </ul>
Waste Category	Hazardous waste
Analysis	No analysis is required.
Ownership / Responsibility	Ware House/ Concerned Section In Charge/ Material Man

Accumulation	<ul style="list-style-type: none"><li>• Collect and store in oil barrels /drums that are in good condition, and not leaking.</li><li>• Label storage containers with the words “Used Oil.”</li></ul>
Waste Handling	<ul style="list-style-type: none"><li>• Do not mix used oil with any other materials.</li><li>• Avoid contamination with other materials.</li><li>• Wear protective clothing and avoid eye and skin contact.</li></ul>
Waste Reduction	<ul style="list-style-type: none"><li>• Minimize volume of lube oil by extending its use and using high-grade oil.</li><li>• Use oil additives that improve oil performance.</li></ul>
Disposal Options	<ul style="list-style-type: none"><li>• Sell to the approved recycling contractor for recycling.</li><li>• Disposed in facility skim pit for final disposal into production stream.</li></ul>

**Waste Tracking Form**

Location of Generation:			
Reporting Team:			
Submitted by (Name):			
Submitted on (Date):			
Waste	Unit	Approx. Quantity	Disposal Location
Aerosol Cans (Empty)			
Asbestos			
Batteries (Dry)			
Batteries (Lead Acid)			
Chemical Spills (corrosion inhibitors, emulsifiers, scale inhibitors etc.)			
Clinical Waste			
Construction / Demolition Debris including Scrap			
Crude Oil or Condensate Waste			
Descaling Acids			
Drilling Fluids/Solids			
Drums and Containers (Empty)			
Filters			
Fluorescent Light Tubes			
Food Waste			
Glycols			
Laboratory Wastes			
NORM Containing Waste			
Oil Contaminated Soil			
Oily Rags (Used)			
Paraffins			
Produced Water			
Rigwash			
Sand Blasting Wastes			
Sanitary Wastewater			
Scale (Pipe and Equipment)			
Septic Pit Bottom Sludge			
Sludge			
Trash			
(i) Glass			
(ii) Metal			
(iii) Plastic			
(iv) General Trash			
Used and Torn HDPE Liner			
Used Computers and Electronic Equipment's			
Used Cooking Oil From Kitchen			

Used Engine Oil			
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Checked and Signed: \_\_\_\_\_

Dated: \_\_\_\_\_