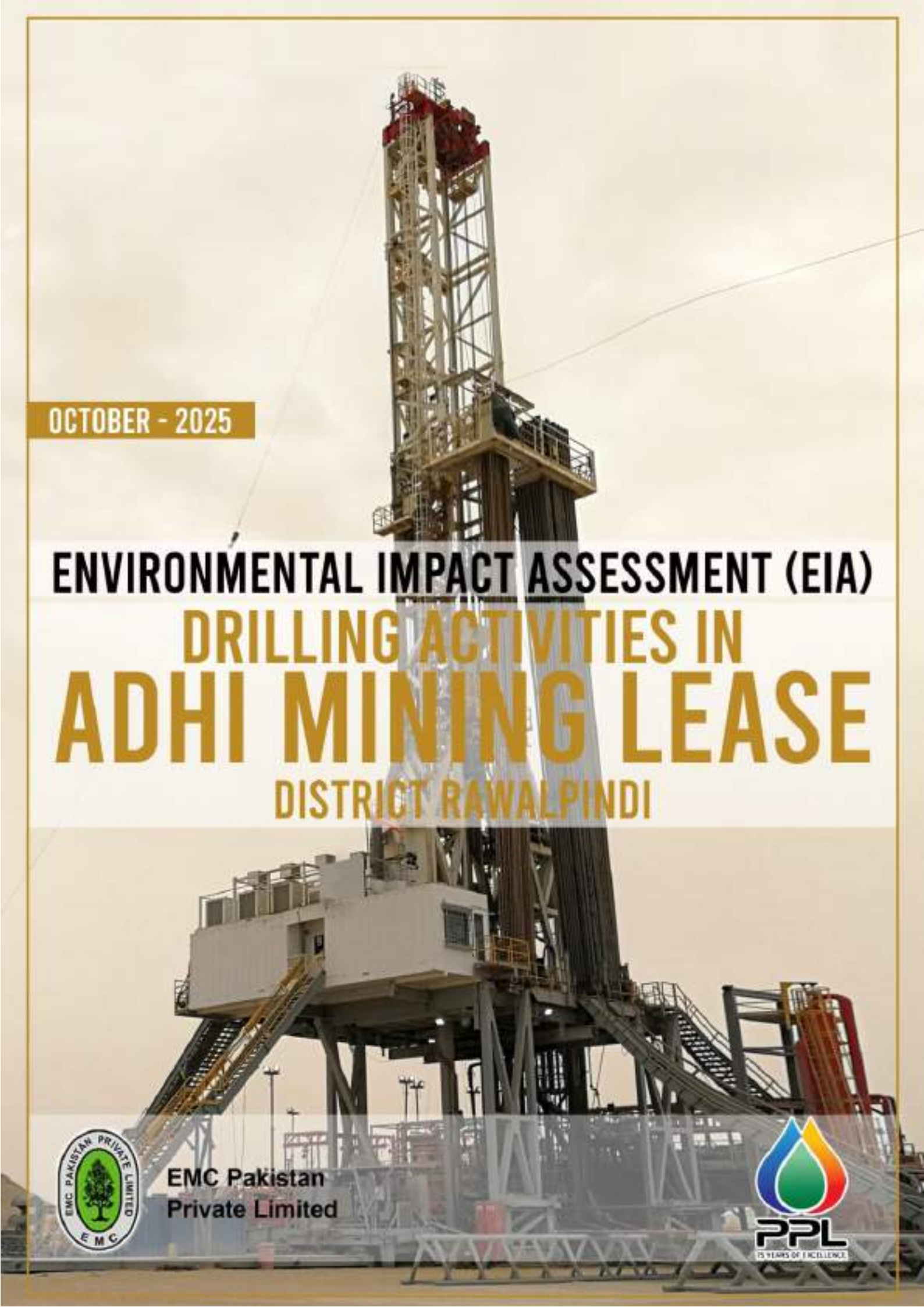


OCTOBER - 2025

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

DRILLING ACTIVITIES IN

ADHI MINING LEASE

DISTRICT RAWALPINDI

EMC Pakistan
Private Limited

PPL
75 YEARS OF EXCELLENCE

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

DRILING ACTIVITIES IN ADHI MINING LEASE, DISTRICT RAWALPINDI, PUNJAB

Final Report
October 2025
Ref: EMC/25/09/61

EMC PAKISTAN PVT. LTD.
503, Anum Estate, Opp. Duty Free Shop, Main Shahrah-e-Faisal, Karachi.
Phones: 9221-34311466, 34324680, Fax: 9221-34311467.
E-mail: mail@emc.com.pk, info@emc.com.pk
Website: www.emc.com.pk

DOCUMENT ISSUE & REVISION RECORD

REFERENCE NO.	EMC/25/09/61
TITLE	Environmental Impact Assessment (EIA)
SUBJECT	Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab
CLIENT	Pakistan Petroleum Limited

REVISION RECORD

Rev.	Date	Issue, Modification	Prepared	Checked	Approved
01	08-10-2025	Comments have been addressed	Dr M Mohiuddin	Farhat Shaheen	Asif Shuja Khan

APPENDIX-I: GLOSSARY & DEFINITION

Client /Proponent:	Pakistan Petroleum Limited
Proposed Project:	Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab
Environmental Consultant:	EMC Pakistan Private Limited
Project Site/Area:	District Rawalpindi, Punjab
EPA	Environment Protection Agency
Study	Environmental Impact Assessment (EIA)
Campsite	A self-contained facility established at project site to support work over activities and provide essential services and facilities to enable efficient and safe execution of the work
Drilling	Drilling refers to the process of boring a hole through soil and rock to access geologic reservoirs that contain oil and gas.
Work over activities	Work Over is a term used in the oil and gas industry to describe the maintenance and repair of existing wells
Water Base Mud (WBM)	Water-base mud (WBM) is defined as a drilling mud in which the continuous phase is water.
Reservoir	A subsurface accumulation of hydrocarbons contained in a porous or fractured rock formation.

APPENDIX-II: ABBREVIATIONS

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

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

Secondary Stakeholders		
S. No.	**Stakeholder Groups**	**Department**
1	*Government Departments*	*Environmental Protection Agency*
2	*Environmental practitioners and experts*	Associate Professor, Department of Environmental Sciences, NUST, Islamabad

Primary Stakeholders






Written Feedback Form: Consultation with Local People
Project: EIA of Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab

Sr No	Name	Occupation	Area/Residence	Feedback	Signature
1	Hassan	Farmer	Cheehi Nian	Problem of clean drinking Water	
2	Shahwaiz	Labour	"	Loadshedding	
3	M. Hassan	Driver	"	No proper Hospital available	
4	Abdul Wahab	Labour	"	No job/work opportunities	
5	Abbass	Labour	"	No clean drinking water.	
6	M. Sardar	Private job	"	No Hospital, Loadshedding.	
7	M Mohsin	Farmer	"		
8	Munir	Labour	"		
9	Bilal	jobless	"	No job opportunities.	
10	Shakeel	Labour	"	No gas, Loadshedding	

Written Feedback Form: Consultation with Local People
Project: EIA of Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab

11	Younis	Labour ~~Dhoong~~	Dhoong		
12	Ijaz Ahmad	Farmer	Dhoong		
13	Maqbool	Shopkeeper	"		
14	Noor Khan	Shopkeeper	"		
15	Arif Ali	Shopkeeper	"		
16	Naqeeb	Private job	"	No proper road infrastructure	
17	Fareed	Labour	"		
18	Murad Shah	Labour	"		
19	Imran	Shopkeeper	"		
20	Bashir	Labour	"		

APPENDIX IV: SOURCES OF DATA AND REFERENCE MATERIAL

- Geological survey of Pakistan
- Pakistan Meteorological Department
- Field surveys conducted in project area
- Environmental monitoring conducted in project area
- Pakistan Social and Living Standards Measurement Survey
- Pakistan Bureau of Statistics
- Punjab Bureau of Statistics
- Punjab Agriculture Department
- Revenue Department, Government of the Punjab
- Official website of PPL https://www.ppl.com.pk/

APPENDIX V: TERMS OF REFERENCE

Title: Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab

Location: District Rawalpindi

Project Proponent: Pakistan Petroleum Limited (PPL)

Project Description:

This report presents the Environmental Impact Assessment (EIA) study conducted by EMC Pakistan (Pvt.) Limited for the proposed drilling and workover activities in the Adhi Mining Lease, District Rawalpindi, Punjab, on behalf of Pakistan Petroleum Limited (PPL). The Adhi Mining Lease spans an area of 199.68 square kilometres across the Rawalpindi and Chakwal districts of Punjab Province.

PPL intends to drill two new wells, namely Adhi South-10 and Adhi-36, for hydrocarbon extraction and to lay associated feeder lines. In addition, workover activities are planned at Adhi South-2 to restore production. All the proposed well sites are located within District Rawalpindi.

The project activities include:

- Mobilization of personnel and equipment
- Construction & Refurbishment of campsites
- Civil Works
- Drilling and Work over activities
- Feeder lines laying
- Decommissioning/Demobilization
- Restoration and rehabilitation

EIA Requirement:

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

Objectives:

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

Scope of EIA:

- Complete description of the project
- Collection, analysis and presentation of baseline data
- Identification of significant environmental issues
- Assessment of direct, indirect impacts on environment
- Mitigation measures to minimize predicted adverse impacts
- Review of the relevant Policies, Legislations and Regulations
- Environmental Management and Monitoring plan
- Conclusion & Recommendations

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

S#	Name of Experts	Qualification	Position in EIA Study Team	Role and Responsibility
1.	Mr. Syed Nadeem Arif	BS Civil Engineering	Project Manager	• Overall Project Head
2.	Mr Shayan Ansari	ME Environmental Engineering	Environmental Engineer/ Team Leader	• Manage the team
3.	Ms. Farhat Shaheen	MSc Environmental Sciences	Senior Environmentalist	• Manage the team • Technical Review of Report
4.	Dr. Muhammad Mohiuddin	PhD Environmental Sciences	Senior Environmentalist	• Overall team coordination • Technical Review of Report
5.	Mr. Owais Ahmad	MS Environmental Sciences	Environmentalist	• Baseline Survey and monitoring • Assistance to senior team members in data collection • Reporting • Risk Assessment • Development of EMP
6.	Ms. Ayesha Noor	MS Environmental Sciences	Environmentalist	• Assistance to senior team members in report writing • Secondary data collection

APPENDIX-VII: APPROVALS FROM CONCERNED DEPARTMENTS

- Approval from EPD has been applied.

EXECUTIVE SUMMARY

Project Title:	Drilling Activities in Adhi Ining Lease, District Rawalpindi, Punjab
Proponent:	**Pakistan Petroleum Limited** **Address:** PIDC House, Zia Uddin Road, PO Box 3942, Karachi 75530, **Phone :**(+) 9221-111 568 568 **Fax:** (+) 92- 21-35680005 **Website:** www.ppl.com.pk **Email:** info@ppl.com.pk
EIA Consultant:	**EMC Pakistan Pvt. Limited** **Address:** Office # 503, Anum Estate Building, Main Shahra-e-Faisal, Opposite Duty-Free Shop, Karachi, Pakistan. **Phone:** +92-21-34311466, 34321532 **Fax:** +92-21-34311467 **Website:** www.emc.com.pk **Email:** mail@emc.com.pk; info@emc.com.pk

This report presents the Environmental Impact Assessment (EIA) study conducted by EMC Pakistan (Pvt.) Limited for Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab proposed by Pakistan Petroleum Limited (PPL). The Adhi Mining Lease is located in the Rawalpindi and Chakwal Districts of the Punjab Province expanded over an area of 199.68 square kilometers. The drilling of Adhi South-10 and Adhi-36 will be undertaken along with the laying of associated feeder lines, while workover activities will be carried out at the Adhi South-2 well site to restore hydrocarbon production. All these well sites are situated within District Rawalpindi.

The current EIA scope covers the Drilling and laying of feederline in District Rawalpindi of the Punjab Province. The aim of the drilling activities is to explore new hydrocarbon resources in the project area while the workover activities will be carried out to enhance the production of hydrocarbon from existing wells. The current production of crude oil from Adhi South-2 is ~ 10 barrels/day. After the work over activities/ side track drilling activities, it is expected that the production of crude oil from Adhi South-2 will increases up to 300 barrel/ day/ well. Thus, this EIA Report has been prepared to comply with Section 12 of Punjab Environmental Protection Act 1997 (amended 2012 & 2017).

The surface coordinates for drilling and workover activities are provided in **Table ES-1** while project location map is given as **Figure ES.1**. These coordinates are the tentative and may be changed up to 1 km.

Table ES-1.1: Project Location

S. No	Well-ID	GPS Coordinates
1	Adhi South-2	Latitude: 33°05’41.4373"N, Longitude: 73°06’47.139"E
2	Adhi South-10	Latitude: 33° 5'34.43"N Longitude: 73° 6'17.28"E

3	Adhi-36	Latitude: 33° 6'26.73"N Longitude: 73° 6'21.37"E

Feederlines will be laid down for Adhi 36 and Adhi South 10 wellsites to connect it with the main trunk line. The details of the feederlines are as under:

Table ES-1.2: Project Location

S. No	Project Component		Starting Coordinates	Length (m)
1	Adhi-36 feederline	Start	Latitude: 33° 5'34.43"N Longitude:73° 6'17.28"E	860 m
		End	Latitude: 33° 5'22.88"N Longitude:73° 6'23.43"E	
2	Adhi South-10 feederline	Start	Latitude: 33° 6'26.65"N Longitude: 73° 6'21.38"E	504 m
		End	Latitude:33°6'16.55"N Longitude: 73° 6'6.06"E	

The location and length of the feederlines are tentative and subject to change.

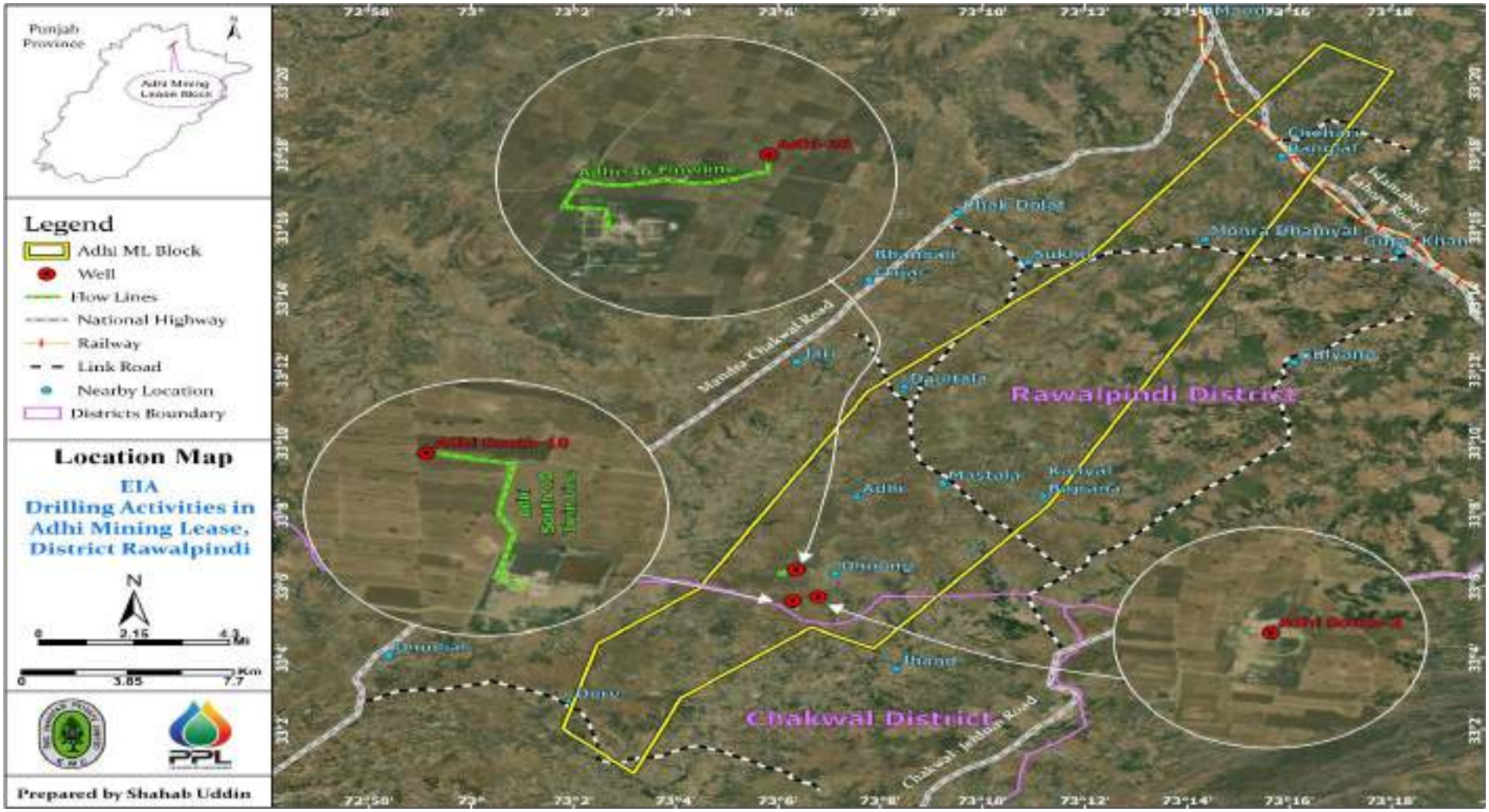


Figure ES 1: Map showing Adhi South-2, Adhi South-10 and Adhi-36 wells location in Adhi Mining Lease, District Rawalpindi, Punjab

Land will be acquired on lease basis for drilling of Adhi South-10 and Adhi-36 wells. No new land acquisition will be required for the work over activities as the Adhi South-2 ST1 well site is already in the possession of PPL. The tentative duration of key activities is provided below:

Table ES-2: Implementation Schedule

Activity	Estimated Time Required (Days)
Mobilization of Construction Contractor/Team	5
Civil Works (Adhi South 10, Adhi 36 and Adhi South 2)	**Adhi 36 & Adhi South** 10: ≈ 60 - 80 days **Adhi South 2:** ≈ 35 - 60 days
Drilling & Workover Activities	50
Feederlines laying	≈ 60 - 90 days for 1.5 km flow lines
Demobilization	10

Potential Impacts and Mitigation Measures

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

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

- The proposed activities may have adverse impacts which can be mitigated by adopting best industrial practices and restoration of the area after activity.
- Fuel or oil leakage or spill during the project activities can result in contamination of soil and water and can be categorized as minor, moderate or major.
- Proper implementation of plan for hazardous waste management will reduce the soil and water contamination.
- Impacts on air quality during project activities would include emissions and dust from earth-moving equipment, and vehicles. By minimizing the disturbance using dust control techniques, following restoration and using well maintained machinery and vehicles can effectively reduce the impact on air quality.
- The primary impacts due to noise pollution generated by project activities would be localized.

Screening of potential environmental and socio-economic impacts resulting from various activities associated with the project reveals that majority of the impacts will occur on temporary basis and will be reduced with adaptation of good industrial practices, mindful planning, design and control of operations in each phase.

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

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

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

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

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

- The project's impacts on the ambient environment will be short term and mostly localized.
- Animal density in the project area is very low due to current land use pattern. Wild animals are limited to small mammals and reptiles while domestic animals are found in the nearby villages.
- Impact from project related transportation activities can occur in areas falling close to communities. Adoption of safe driving practices and careful scheduling of activities will be required near these areas.
- The project's water requirement will be met through procurement from local sources. However, water conservation measures will be implemented to prevent any unanticipated impacts.
- No protected area falls near 1 km of well sites.
- Socioeconomic impacts on micro-scale would be insignificant if any. Social issues like removal of existing business, property and resettlement are not anticipated from any project activity.

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

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

A series of mitigation and monitoring measures have been included to address the concerns for these measures. Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental Management Plan, the adverse environmental and social impacts of the proposed project activities are likely to remain within the acceptable limits. The project is not expected to have long-term significant or irreversible negative environmental impacts neither at the construction, nor at operation phases. The environmental Monitoring plan has been devised and provided in table ES-3-5.

Table ES-3: Environmental Monitoring Plan for Well Site Construction and Well Drilling

S. No.	Monitoring Aspects	Monitoring Locations	Parameters	Frequency	Responsibility	Documentation
1.	Ambient air Quality Monitoring	Well site, camp site surrounding	SO2, NO, NO2, SPM, PM10, PM2.5, O3, Pb, CO	Once during the well drilling	Contractor	Laboratory test Reports
2.	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Once during the project	Contractor	Laboratory test Reports
3.	Waste water	Campsite	Effluent Flow, Temperature, pH, COD, BOD_5, TSS, TDS, Oil & Grease, Chloride & Phenolic Compounds	Quarterly (if wastewater discharged into any nullah)	Contractor	Laboratory test Reports
4.	Noise level	Boundaries of the well and camp sites	Noise level (dBA)	Once in a project during construction and drilling operations (when work is started)	Contractor	Internally / externally
5.	Solid Waste	Project site	Solid waste collection, storage, transportation and disposal	During routine monitoring	Contractor	Complete record waste generation record, waste disposal record & disposal certificate)
6.	Drilling Mud	Drilling Site	Collection, storage, transportation and disposal	During routine monitoring	Contractor / HSE Monitor	Complete record
7.	Occupational Safety	Well sites, campsite, project roads	HSE Records, Incidents and injuries	During routine monitoring	Contractor	Record of observations.

Table ES-4: Environmental Monitoring Plan for Construction and Commissioning Phases of Feeder Lines

S. No.	Monitoring Aspects	Monitoring locations	Parameters	Frequency	Responsibility	Documentation

1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Once during the project	Contractor	Laboratory test Reports
2	Noise Levels	Along pipeline route, nearest to sensitive receptors like communities and at boundary of camp site.	Noise Level dBA	Once in a project when work is started.	Contractor	Internally / externally
3	Feeder line / Pipeline Hydrostatic Testing Wastewater (during commissioning)	Waste discharge point	Effluent Flow, Temperature, pH, COD, BOD5, TSS, TDS, Oil & Grease, Chloride and Phenolic Compounds	One time during hydrostatic testing (if wastewater discharged into any nullah)	Contractor	Laboratory test Reports
4	Solid Waste	Project Site	Solid waste collection, storage, transportation and disposal.	During routine monitoring	Contractor	Complete record (waste generation record, waste disposal record & disposal certificate)

Table ES-5: Environmental Monitoring Plan for Operation & Maintenance Phase of Oil/Gas Wells and associated Feeder Lines

S. No.	Monitoring Aspects	Monitoring locations	Parameters	Frequency	Responsibility	Documentation
1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Once in a year Once in a quarter	Adhi Field Incharge	Laboratory test Reports
2	Soil Survey / Visual Inspection	Along the Feeder line route and Well Sites	Visual inspection on monthly basis. Contaminated soil will be replaced with native soil and disposal of contaminated soil through PEPA approved waste contractor.	Monthly Basis On need basis.	Adhi Field Incharge	Record of observations

3	Solid Waste	Along the feeder line Route and Well Sites	Solid waste collection, storage, transportation and disposal.	During routine monitoring	Adhi Field Incharge	Complete record (waste generation record, waste disposal record & disposal certificate)

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

TABLE OF CONTENTS

ANNEXURES

1. INTRODUCTION

1.1. Purpose of Report

This report presents the findings of an Environmental Impact Assessment (EIA) study conducted by EMC Pakistan Pvt. Ltd. for the Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab. The EIA study of the Drilling & work over well sites have been carried out in accordance with Section 12 of Punjab Environmental Protection Act, 1997 (amended 2012 and 2017) and rules and regulations enclosed thereunder.

1.2. Identification of Project, Proponent and Consultant

Project Title:	Drilling Activities in Adhi Mining Lease, District Rawalpindi
Proponent:	**Pakistan Petroleum Limited** **Address:** PIDC House, Zia Uddin Road, PO Box 3942, Karachi 75530, **Phone :**(+) 9221-111 568 568 **Fax:** (+) 92- 21-35680005 **Website:** www.ppl.com.pk **Email:** info@ppl.com.pk
EIA Consultant:	**EMC Pakistan Pvt. Limited** **Address:** Office # 503, Anum Estate Building, Main Shahra-e-Faisal, Opposite Duty-Free Shop, Karachi, Pakistan. **Phone:** +92-21-34311466, 34321532 **Fax:** +92-21-34311467 **Website:** www.emc.com.pk **Email:** mail@emc.com.pk; info@emc.com.pk

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

This document presents the findings of an Environmental Impact Assessment (EIA) conducted by EMC Pakistan (Pvt.) Limited for the project "Drilling Activities in the Adhi Mining Lease, District Rawalpindi, Punjab," proposed by Pakistan Petroleum Limited (PPL). The project includes Drilling and associated activities at Adhi 36, Adhi South 10 along with laying of feederlines and sidetracking activities at Adhi South 02 well site.

The well sites location coordinates are provided in Table-1.1 while Geographic location map of proposed well site provided is given as Figure-1.1. These coordinates are the tentative and may be changed up to 1 km.

Table 1.1: Project Location		
S. No	**Project Component**	**Coordinates**
1	Adhi South-2 ST1	Latitude: 33°05'41.4373"N Longitude: 73°06'47.139"E
2	Adhi South-10	Latitude: 33° 5'34.43"N Longitude: 73° 6'17.28"E
3	Adhi-36	Latitude: 33° 6'26.73"N Longitude: 73° 6'21.37"E

*These coordinates are the tentative and may be changed up to 1 km.

Feederlines will be laid down for Adhi 36 and Adhi South 10 wellsites to connect it with the main trunk line. The details of the feederlines are as under

Table 1.2: Project Location				
S. No	**Project Component**		**Starting Coordinates**	**Length (m)**
1	Adhi-36 feederline	Start	Latitude: 33° 5'34.43"N Longitude:73° 6'17.28"E	860 m
		End	Latitude: 33° 5'22.88"N Longitude:73° 6'23.43"E	
2	Adhi South-10 feederline	Start	Latitude: 33° 6'26.65"N Longitude: 73° 6'21.38"E	504 m
		End	Latitude:33°6'16.55"N Longitude: 73° 6'6.06"E	

The location and length of feederlines are tentative and subject to change.

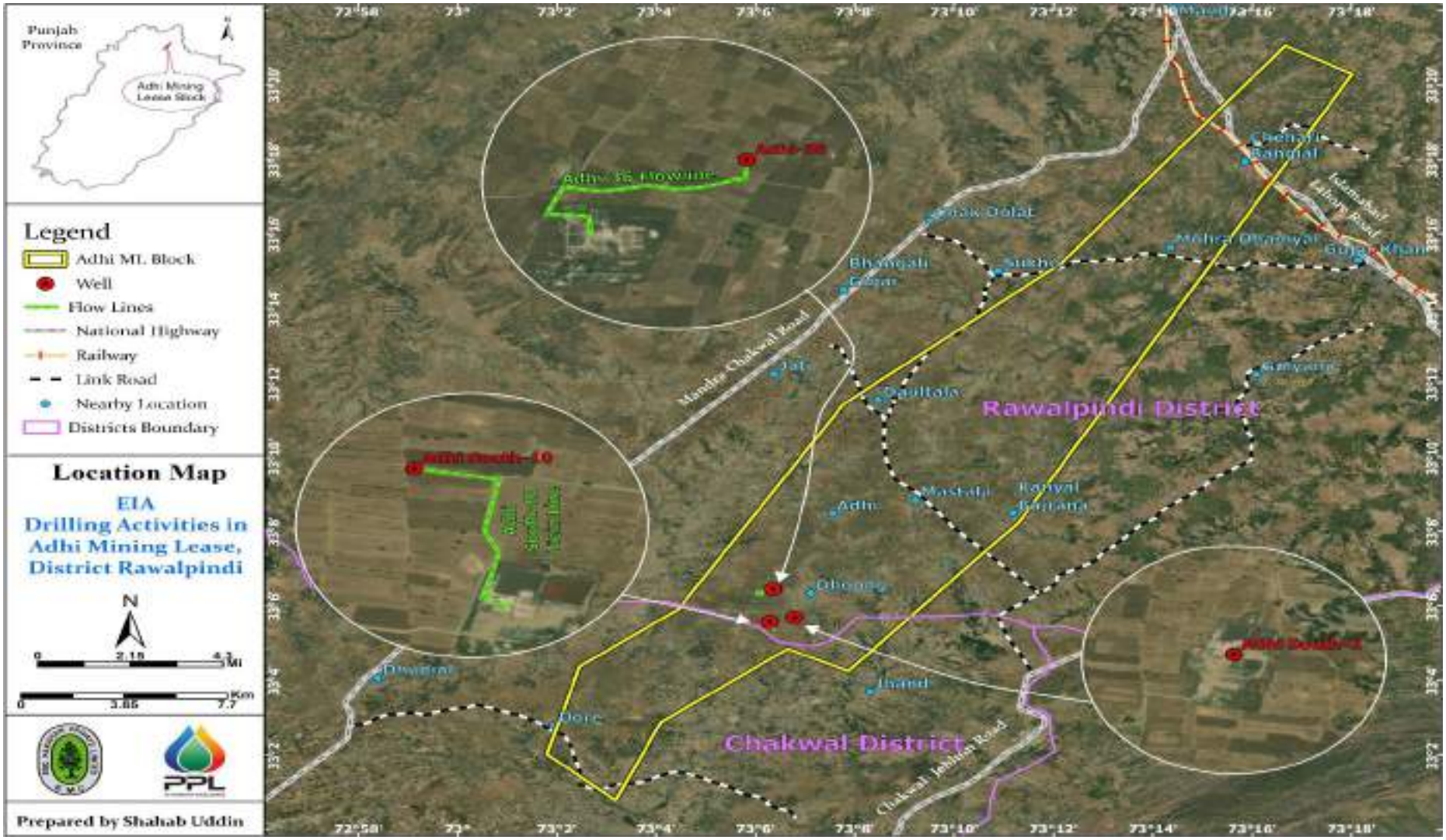


Figure 1.1: Location Map of Proposed Project

1.4. Project Proponent - Pakistan Petroleum Limited (PPL)[1]

The pioneer of the natural gas industry in the country, Pakistan Petroleum Limited (PPL) has been a frontline player in the energy sector since the mid-1950s and has recently completed its Platinum Jubilee with 75 promising years of ensuring energy security for the country. As a major supplier of natural gas, PPL today contributes nearly 20 percent of the country's total natural gas supplies besides producing crude oil, Natural Gas Liquid and Liquefied Petroleum Gas.

The company's history can be traced back to the establishment of a public limited company in June 1950, with major shareholding by Burmah Oil Company (BOC) of the United Kingdom for exploration, prospecting, development and production of oil and natural gas resources. In September 1997, BOC disinvested from the Exploration and Production sector worldwide and sold its equity in PPL to the Government of Pakistan. Subsequently, the government reduced its holding through an initial public offer in June 2004, which was further decreased with the initiation of the Benazir Employees Stock Option Scheme (BESOS) in August 2009 when PPL employees were allotted 12 percent shares from the government's equity. More recently, GoP further disinvested its 5 percent shares, around 3.55 percent of the total paid-up capital, in PPL through Secondary Public Offering in 2014. Currently, the company's shareholding is divided between the government, which owns about 67.51 percent, PPL Employees Empowerment Trust that has approximately 7.35 percent — being shares transferred to employees under BESOS — and private investors, who hold nearly 25.14 percent.

PPL acquired 100 percent shareholding of MND E&P Limited, a company incorporated in England and Wales. The name of the subsidiary was changed to PPL Europe E&P Limited.

The company also established a wholly-owned subsidiary, PPL Asia E&P B.V. with corporate seat in Amsterdam, Kingdom of Netherlands. The subsidiary focuses on exploration and production of oil and gas in the region.

In August 2021, a PPL-led consortium was awarded Offshore Block 5 in Abu Dhabi's second competitive exploration block bid round. The consortium includes four leading national E&P companies, PPL as operator, Oil and Gas Development Company Limited (ODGCL), Mari Petroleum Company Limited and Government Holdings (Private) Limited (GHPL) with an equal shareholding of 25 percent. To this end, a new company Pakistan International Oil Limited (PIOL) was incorporated in the UAE with PPL as the management shareholder entered into the concession agreement with Abu Dhabi National Oil Company. More recently, a Production Concession Agreement was signed for development of three pre-existing discoveries in Offshore Block-5, Abu Dhabi. The agreement secures PIOL's 40% working interest in partnership with Abu Dhabi National Oil Company (ADNOC) and where ADNOC Offshore is the operator.

PPL operates 17 producing fields across the country at Sui (Pakistan's one of the largest gas field) and holds working interest in 26 partner-operated producing fields, including Qadirpur the country's second largest gas field.

As a major stakeholder in securing a safe energy future for the country, PPL pursues an aggressive exploration agenda aimed at enhancing hydrocarbon recovery and replenish reserves. PPL together with its subsidiaries has a portfolio of 51 exploration assets of which the company

[1] https://www.ppl.com.pk/content/corporate-profile-overview

operates 28, including an offshore Block 5 in Abu Dhabi, UAE and a local offshore lease in Pakistan, while 23 blocks, comprising an onshore concession in Yemen, are operated by joint venture partners.

As part of its diversification strategy, PPL has strengthened its mining operations through Bolan Mining Enterprises (BME), established in 1974 with an equal shareholding of 50 percent each between PPL and Government of Balochistan (GoB). The GoB and PPL has recently signed a firmed up agreement for Bayrite-Lead-Zinc Project.

More recently, PPL in collaboration with ODGCL and GHPL (collectively, the SOEs), entered into agreements for the reconstitution of the Reko Diq project with Barrick Gold Corporation, Balochistan Mineral Resources Limited and Government of Balochistan in December 2022. The project is managed through Pakistan Minerals (Private) Limited, which holds a 25 percent equity stake in the project. Reko Diq is one of the world's largest copper and gold mines.

Over the years, PPL has developed a reliable foundation and infrastructure for providing clean and safe energy through sustainable exploitation of indigenous natural resources while adhering to best practices of corporate governance and employee health and safety and constraining the ecological footprint of its operations. As a result, its 15 field and facilities stand certified for ISO 9001 Quality Management System and 13 each for ISO 14001 Environmental Management System and ISO 45001 Occupational Health & Safety Management System.

PPL has played a significant role as a responsible corporate citizen since the inception of its commercial activities in Sui by establishing the Sui Model School in 1957 for children of workers and local communities. In order to ensure geographical and thematic diversity, the company's CSR programme focuses on education, healthcare, infrastructure development and socio-economic uplift of disadvantaged communities living in and around its operating areas as well as other parts of the country. The company also initiated Corporate Donations programme to reach deserving population in urban areas. To this end, PPL has earmarked at least 1.5 percent of its annual pre-tax profit for CSR initiatives with actual spending crosses Rs. 4-billion-rupee mark.

Vision

Empowering sustainable growth through integrated energy solutions and beyond.

Mission

Transform into a dynamic energy and minerals company focused on innovation and strategic diversification.

Corporate Social Responsibility[2]

Pakistan Petroleum Limited (PPL)'s Corporate Social Responsibility (CSR) programme dates back to the start of PPL's commercial operations in Sui in the 1950s when the company established a school for children of workers and local communities. Since then, CSR has been entire piece of PPL's corporate ethos. In 2001, the PPL Welfare Trust (PPLWT) was founded to provide geographic and thematic diversity to the company's CSR programme, which includes education, health, infrastructure development, socio-economic uplift of disadvantaged communities, particularly those living in and around its operating areas, and post-disaster rehabilitation.

[2] https://www.ppl.com.pk/content/overview

Need analysis, scoping, planning and execution of CSR projects is carried out through strategic local partnerships. To ensure swift delivery, maximum on-ground impact and sustainability of its social investments, all interventions occur after due consultation and mutual agreement with stakeholders, including community representatives, local governments and non-governmental organizations.

To further strengthen PPL's CSR portfolio and access the underserved in non-operational urban areas, the company has initiated Corporate Donations Programme in 2016-2017.

As one of the leading corporate providers of social development and welfare services in some of the most remote swathes of the country, PPL has received Pakistan Corporate Philanthropy Award for 14 consecutive years from 2004 to 2017.

Sr #	Description of Field, Sector & Scheme by PPL in ADHI FIELD, District Rawalpindi & District Rawalpindi
	EDUCATION
1.	Installation of solar system at Govt. Girls Elementary School, Chechi Noor
2.	Repair, renovation, boundary wall at Govt. Model Primary School, Dhok Mannah.
3.	Quality interventions at Govt. Boys elementary School, Mastala and Govt. Girls Elementary School, Chak Naban
4.	Construction of 02 classrooms at Govt. Girls Elementary School, Chak Naban (Work in progress)
5.	Construction of 1 Classrooms at Govt. Model Primary School, Dhok Budhal (work in progress)
6.	Construction of 02 classrooms and toilet block at Govt. Girls High School, Domali.
7.	Furniture to 05 Government Schools in the area.
8.	School bags to 1000 local students.
9.	05 Higher Professional Education Scholarships to students of tehsil Gujar Khan.
	Health
10.	Construction of dispensary building at Nirali
11.	Operating medical dispensary at village Mastala.
12.	Holding surgical eye camps at Dhong, Naban Janjua and Daultala.
13.	Holding ENT camps at Dhong, Adhi, Nirali and Naban Janjua.
14.	Support in-kind to BHU Dhong.
15.	Vaccinations of locals.
	Water & Environment
16.	Installation of water filtration plant at Nirali.
17.	Maintenance of Park at Dhong.
18.	Tree Plantation at Schools
	Infra-structure Development

19.	Repair of black top road to Naban Janjua & Naban Sayedah
20.	Construction of PCC streets at Mastala and Dhok Budhal.

Quality, Health, Safety and Environment[3]

Pakistan Petroleum Limited (PPL) strives to maintain international standards and best industry practices to ensure consistency in provision of safe energy from indigenous sources. The company recognizes that operational safety and health for staff and contractors, maintaining quality of processes and outputs and constricting the ecological footprint of operations promotes excellence and corporate responsibility.

Quality, Health, Safety and Environment (QHSE) function was established to provide integrated support for assurance and control of technical and administrative operations, works performance and asset integrity besides, inculcating safety awareness and adopting best operational practices in strict compliance with statutory Health, Safety and Environment standards.

For consistency in implementation of standard QHSE practices, staff capacity building sessions on emergency response, asset integrity and process safety are regularly held. Moreover, safety guidelines are provided to staff, contractors and guests visiting fields and office locations. QHSE practices and tools are integrated into the management and operational processes, including SAP audit management and quality modules, to obtain tangible benefits through efficient monitoring. On the conservation front, reporting to relevant provincial environmental protection agencies or EPAs is carried out through the Self-Monitoring and Reporting Tool for compliance with the National Environmental Quality Standards. Initial Environment Examination and Environment Impact Assessment studies are mandatory prior to initiating new projects/ development work.

As a result, 13 assets and departments are certified for ISO 14001 Environmental Management System (EMS) and 17 for ISO 9001 Quality Management System (QMS) and 14 for ISO 45001 Occupational Health & Safety Management System (OHSMS).

In order to sustain and update compliance, all certified facilities and departments undergo regular internal and external surveillance audits, following which corrective measures are implemented, if required.

Employees from various technical departments are qualified lead auditors for ISO 9001 QMS, ISO 14001 EMS and ISO 45001 OHSMS to assists in executing audits.

In recognition of its efforts to ensure operational health, safety and environmental conservation, PPL has received the Employers' Federation of Pakistan's prestigious Occupational Safety, Health and Environment Best Practices Awards in 2012 and 2014.

[3] https://www.ppl.com.pk/content/health-safety-environment-overview

PPL

Quality, Health, Safety & Environment Policy

Pakistan Petroleum Limited (PPL) is a frontline oil and gas exploration and production company in the country. At PPL, management is committed to maintaining and continually improving Quality, Health, Safety and Environment (QHSE) standards in all spheres of our business activities.

We firmly believe that implementation of QHSE Management System augment continual improvement in all business processes and add value to external stakeholders.

Function, Asset and Department Heads are accountable to ensure QHSE and legal compliance in their respective areas of responsibility and demonstrate pivotal leadership role in promoting QHSE culture within the organization. Whereas, all employees and contractor's staff are responsible to implement QHSE requirements in their own benefit as well as of colleagues, contractors, visitors and community.

To carry out this Policy, PPL shall:

- Define SMART QHSE objectives and targets aligned with organizational goals and monitor performance for continual improvement.
- Conduct risk assessments, incident reporting & investigations and occupational health surveillance to identify preventive measures and capture improvement opportunities.
- Fulfill its QHSE legal and other compliance obligations.
- Reward and recognize QHSE proactive efforts and initiatives of individuals.
- Protect environment and ensure minimum environmental footprint of its business activities.
- Ensure that seat belt is fastened on all seats of vehicle by employees, contractors, and visitors.
- Permit smoking in designated areas only at PPL Fields and Locations.
- Continually improve QHSE standards by adopting new techniques, approaches and best industry practices addressing various business processes.

Working safely is a condition of employment at PPL.

Imran Abbasy
Managing Director and Chief Executive Officer

October 2022 Rev: 03

1.5. Screening

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

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

1.6. Scoping

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

Scoping for the project was conducted to identify the key issues that need to be covered in the EIA and determine the scale and magnitude of same for further planning and management. The proposed project comprises extraction activities for the untapped hydrocarbon resources in Adhi Mining Lease, District Rawalpindi, Punjab.

1.6.1. Spatial and Temporal Boundaries for Environmental Assessment

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

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

The EIA study aims to provide complete environmental assessment of the Drilling & Well Work Over Activities in Adhi Mining Lease, District Rawalpindi, Punjab. The assessment covered the project's anticipated impacts on the surrounding biological, physical and socio-economic environment. Overall scope of the EIA study included:

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

1.6.2. Important issues and concerns raised during consultation

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

- Noise abatement technologies shall be used during work over activities.
- The hazardous waste should be disposed of via EPA approved waste contractor.

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

1.6.3. Significant impact and factors to be considered

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

- Project area's physical environment
- Waste generation
- Ergonomical Hazards
- Safety Hazards

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

1.7. Methodology for Environmental Impact Assessment (EIA)

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

1.7.1. Understanding of the Proposed Project

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

1.7.2. Review of National Legislation and Guidelines

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

1.7.3. Collection of Secondary Data

Available published and unpublished information pertaining to physical, biological and socio-economic micro & macro environment was obtained and reviewed. It includes previous environmental studies and baselines conducted at Adhi Mining Lease Area.

1.7.4. Collection of Field Data

This study is based on findings from site visits conducted by the EMC. The baseline visits were carried out in September to collect primary data on environmental (both physical and biological) and social aspects. The team also consulted with local residents to gather area-specific information, including their views and concerns regarding the proposed project's activities. Both primary and secondary sources of information were used to develop the baseline for the area. Secondary data includes information taken from literature, reports, and websites.

Access Road

Public consultation

Environemtnal sampling in the area

Figure 1.2: Field survey and monitoring activities during EIA study

Source: Primary and secondary data

1.7.5. Baseline Environmental Profile of Project Area

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

1.7.6. Stakeholder Consultation

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

1.7.7. Impact Identification and Evaluation

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

1.7.8. Recommendations to Mitigate Impacts

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

1.7.9. Environmental Management Plan (EMP)

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

1.7.10. Report Compilation and Review

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

Structure of the EIA Report

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

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

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

Section 3: Describes the alternatives analyzed for the project

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

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

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

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

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

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

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

2. DESCRIPTION OF PROJECT

2.1 Project Objectives and Overview

This document presents the findings of an Environmental Impact Assessment (EIA) carried out by EMC Pakistan (Pvt.) Limited for the project "Drilling & Work Over Activities in Adhi Mining Lease, District Rawalpindi, Punjab", proposed by Pakistan Petroleum Limited (PPL).

Pakistan Petroleum Limited aims to perform drilling of Adhi South-10 and Adhi-36 wells and work over activities on the existing well Adhi South-2 in Distirct Rawalpindi. The project also involves laying of feederlines to connect with trunk line for the transport of hydrocarbon in case of discovery.

These activities are critical for maintaining and enhancing the productivity of existing oil and gas wells. By carefully planning and executing these activities, PPL can optimize the performance of its existing wells, extend wells productive life and maximize hydrocarbon recovery. These activities will help in increasing the production of hydrocarbon resources in the District Rawalpindi.

Table 2.1: Description of the Project

Particular	Description
For Work Over Activities	
Current Depth of Adhi South-2	3450 m
Current Production	10 Barrels/day
Proposed Depth	3459m
Expected Crude Oil production after Work Over Activities	~ 300 barrels / day
For Drilling and Work Over Activities	
Use of Mud	Water Based Mud
Presence of H2S	No
Handling of WBM	LSO 29 B / PPEPCA Guidelines will be followed for handling and disposal of WBM.
Duration of activities	24/7
Description of Drilling/Workover Setup	
Rig Type	Electrical 2000 Hp, ~ 50 days for Adhi South 2 Workover from spud to rig release (i.e. including well testing as well).
Source of Power	5-7 Diesel Generators
Handling of Hazardous Waste	Via EPA Approved Waste Management Contractor
Specification of the Feederliness	
Diameter of pipes	6 inch
Depth (in case buried)	4.5 feet
Width of ROW	40 feet
Tentative Length of feederliness	1364 meters
Material to be transported	Crude Oil, Gas and Condensate
Corrosion Protection of Pipelines	CP System

Standards of Pipelines to be followed (ASTM etc.)	Subject to material specifications, the following standards shall be followed: API 5L Grade B, X-42, X-46, X-52, X-60, X-70, and X-80; Low Alloy Steel; BE (Beveled Ends); and factory-coated with 3-layer PE or PP.
Flow Pipelines Material (including strength and life)	6 inches and SCH-80 line pipe (Life + 5 years)
Estimated Volume of water for hydrostatic testing	6575 gallons for 1.364 km pipe length.

2.2 Project Location

The proposed project includes drilling and well work over activities which will be carried out in Adhi Mining Lease, District Rawalpindi, Punjab. PPL will carry out drilling of Adhi-36 and Adhi South-10 and work over activities on Adhi South-2 ST1 for the revival of production of hydrocarbons.

The wellsite's location is given below in Table-2.2 while project location map of wells is given as Figure-2.1.

Table 2.2: Project Location

S. No	Project Component	Coordinates
1	Adhi South-2 ST1	Latitude: 33°05'41.4373"N Longitude: 73°06'47.139"E
2	Adhi South-10	Latitude: 33° 5'34.43"N Longitude: 73° 6'17.28"E
3	Adhi-36	Latitude: 33° 6'26.73"N Longitude: 73° 6'21.37"E

* These coordinates are the tentative and may be changed up to 1 km.

Feedlines will be laid down for Adhi 36 and Adhi South 10 wellsites to connect it with the main trunk line. The details of the feederlines are as under

Table 2.3: Feederlines

S. No	Project Component		Starting Coordinates	Length (m)
1	Adhi 36 feederline	Start	Latitude: 33° 5'34.43"N Longitude:73° 6'17.28"E	860 m
		End	Latitude: 33° 5'22.88"N Longitude:73° 6'23.43"E	
2	Adhi South-10 feederline	Start	Latitude: 33° 6'26.65"N Longitude: 73° 6'21.38"E	504 m

The location and length of the fedderlines are tentative and subject to change.

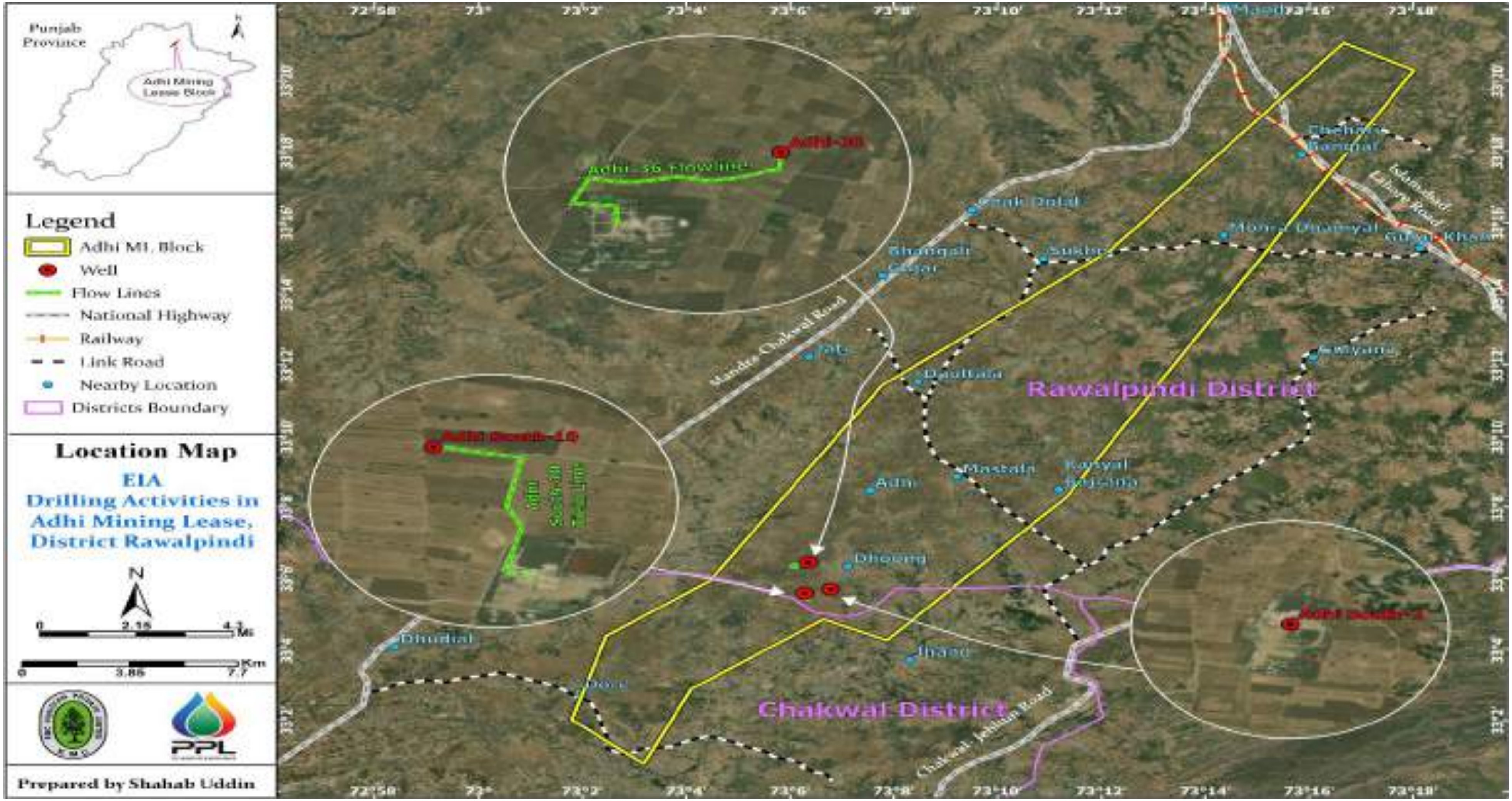


Figure 2.1: Location Map of the Proposed Project, District Rawalpindi

2.3 Site Layout

The Campsite will be established at the Adhi South-2 well site to accommodate staff for the proposed drilling and workover activities at the Adhi South-2. The construction and drilling personnel for Adhi South 10 will be accommodated at South 3 well sites while construction and drilling personnel for the Adhi 36 will be accommodated on the Adhi 17.

A dirt access road already exists and is in use by PPL; therefore, no new road will be required for material transportation and crew movement. As the Adhi South 2, Adhi South-3 and Adhi-17 well sites (Campsite) are already under the possession of PPL, no additional land will be required for establishing the Campsite or stockpiling of tools and materials.

The total area required for the establishment of the Campsite is 400 ft x 400 ft. The GPS coordinates of the campsites is as under:

Table 2.4: Location of Campsites	
Description	GPS Coordinates
Campsite (Adhi South-3)	Latitude: 33° 5'22.42"N Longitude:73° 6'24.10"E
Campsite (Adhi-17)	Latitude: 33° 6' 16.47" N Longitude: 73° 6' 6.85" E

The campsites will accommodate security personnel employed to provide security to the rig and project personnel. Camp facilities will include living accommodation, power generation, catering, washing and laundry facilities.

Figure 2.2: Map showing the Campsites location

2.4 Land Use of the project area

Adhi South-2, Adhi South-10 and Adhi 36 well sites are located in District Rawalpindi. The land in the Adhi Mining Lease itself is primarily used for oil and gas infrastructure, such as well pads, pipelines, processing facilities and other related infrastructure.

However, the surrounding area of the well sites are predominantly agricultural land, with crops like wheat and barley commonly cultivated and there are few settlements nearby.

Table 2.5: Land use pattern near the project area	
Adhi South-2	
Nearby Road	10 m
Agricultural land	Adjacent
Nearby Settlement	Dhoong- 1.10 km
Adhi South-10	
Nearby Road	144 m
Agricultural land	Adjacent
Nearby Settlements	1.62 km
Nearby Villages	Dhoong
Adhi-36	
Nearby Road	80 m
Agricultural land	Adjacent
Nearby Settlement	Cheechi Noor- 1.62 km
	Dhoong- 970 m

Adhi South-10

Adhi-36

Adhi South-2 (Workover)

Proposed Project Sites

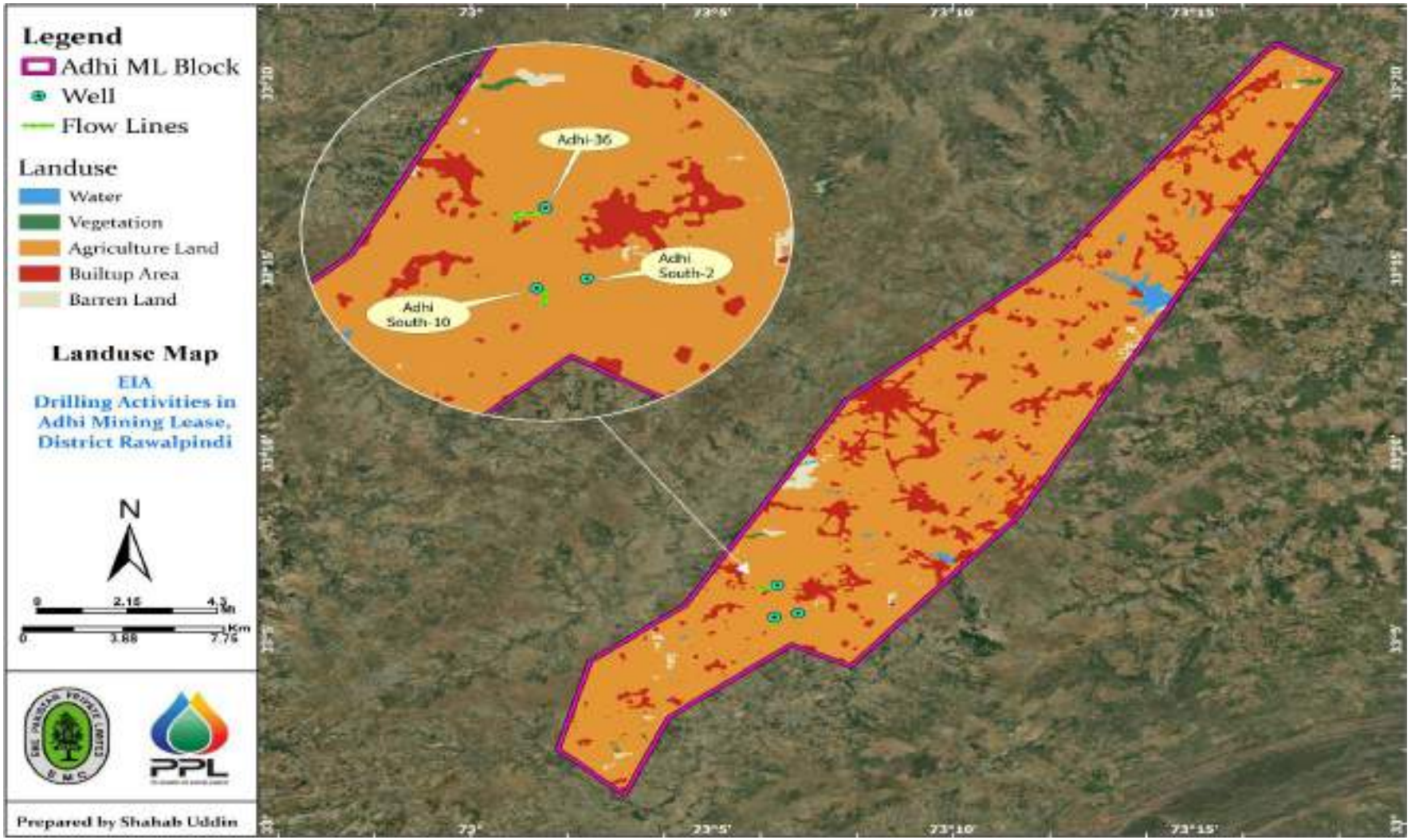


Figure 2.3: Land Use Map of Project Area

2.5 Road Access

The project will make maximum use of existing road infrastructure. However, if necessary, temporary tracks will be established for vehicle movement.

The project site is located in Tehsil and District Rawalpindi, Punjab. Access to the area is via the N-5 highway, which connects to Mandra-Chakwal Road and then to Doltala Rawalpindi Link Road. The area has a good road network, with main roads being two-way and blacktopped, while community roads are single-lane. Some of the roads are not in good condition.

To access the proposed wellsites, the PPL has developed a dirt access road which is used to commute between the wellsites.

Figure 2.4: Common condition of road network in project area

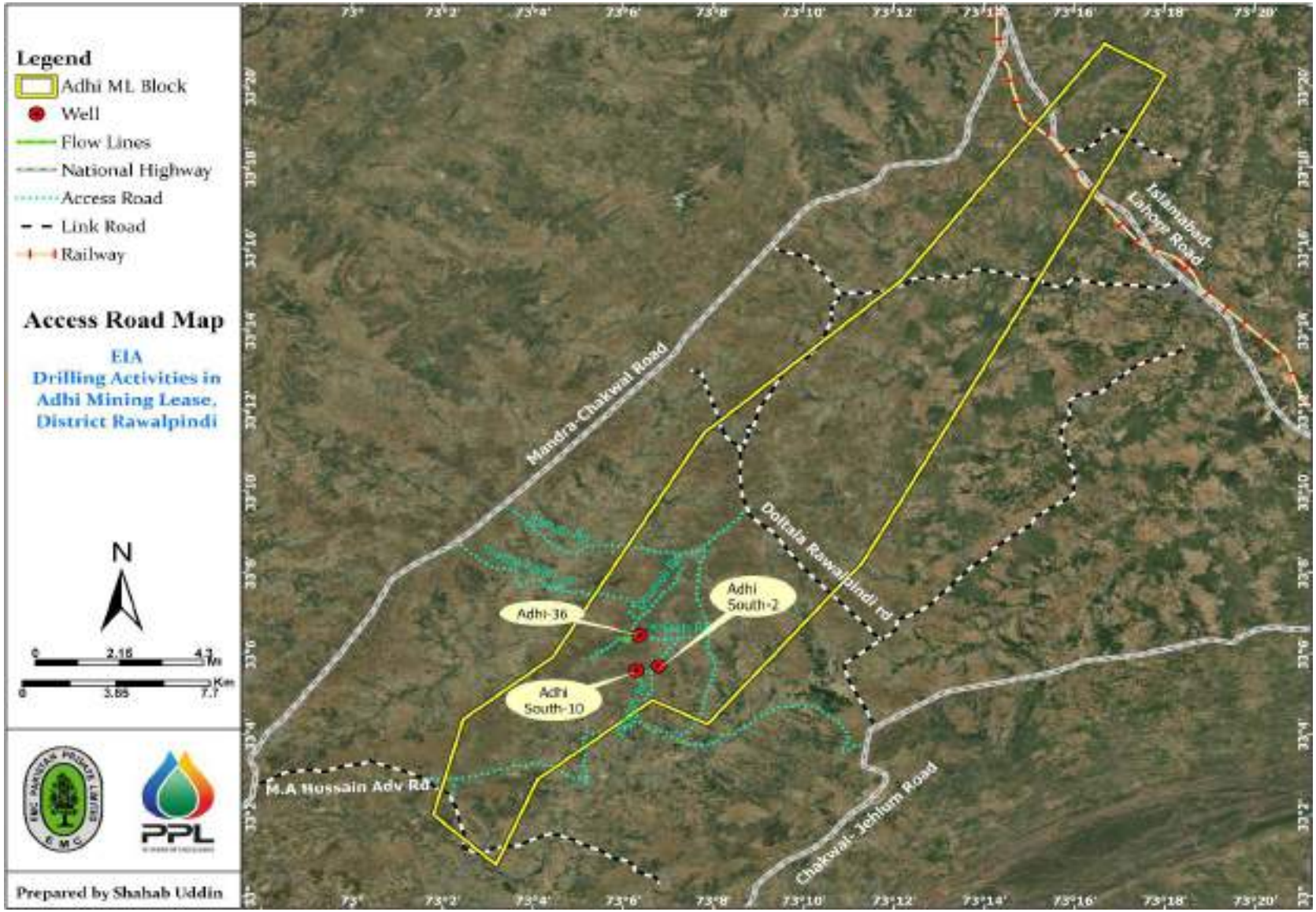


Figure 2.5: Access Road Map of Project Area

2.6 Vegetation feature of the site

Vegetation of District Rawalpindi consists primarily of subalpine conifer forests in its elevated areas, transitioning to diverse herb, shrub, and tree species influenced by the Pothohar Plateau's rugged terrain and humid sub-tropical climate. Soil conditions, particularly low potassium and high electrical conductivity, along with significant human activities like grazing and urbanization, profoundly shape the plant life, leading to both native flora and invasive species such as Parthenium hysterophorus. The landscape features a mix of trees, shrubs, and a large number of herbaceous species adapted to these dynamic environmental factors.

No tree are found on the proposed wellsite of Adhi 36 and Adhi South 10 wellsites while the Adhi south 2 wellsite is already in possession of the PPL.

Figure 2.6: Floral Diversity of District Rawalpindi

2.7 Site Suitability

The project site was allocated to Pakistan Petroleum Limited (PPL) for oil and gas exploration by the Government of Pakistan. The land for the Adhi South-10 and Adhi-36 well sites will be leased through the Lands and Licenses Department of PPL, while the Adhi South-2 well site is already under PPL's possession.

The project area is characterized by a sparse population, with villages located at a safe distance of more than 500 metres from the proposed wellsites. The land is primarily agricultural, with scattered vegetation. No tree cutting will be required, and therefore, the proposed sites are not expected to pose any significant threat to the environment or nearby human settlements.

2.8 Description of Project Activities

PPL plans to perform Drilling & work over activities along with laying of feederlines in Adhi Mining Lease, in district Rawalpindi, Punjab. The basic objective of the drilling of new wells is to increase the production of oil and gas and to maximize hydrocarbon recovery and work over activities on the existing well is to optimize the performance of existing well. The details of the activities that will be carried out during the drilling and work over activities are as under:

- Mobilization of personnel and equipment
- Refurbishment of campsites
- Civil Works
- Drilling and Work over activities
- Feederlines laying
- Decommissioning/Demobilization
- Restoration and rehabilitation

The proposed drilling and work over activities will entail the following activities:

2.8.1 Construction Activities

a) Civil Contractor's Mobilization and Camp Establishment

The civil contractor's mobilization will be the first activity of the proposed drilling project. Personnel, construction machinery, and camp equipment will be transported using trailers, ordinary trucks and pickups. During the civil works, construction camp will not be established and the civil contractor will rent out the nearby area to house their crew. However, 30-40 POB will be there for refurbishment of the camp and rig sites.

b) Access Road

All equipment, supplies and personnel will need to he moved to and from the selected site by existing dirt access road. Only cut and fill will be required where necessary.

c) Civil Works

The steps to be taken during site preparation are expected to be as follows:

- Leveling of area.
- Clearing of all remaining vegetation.
- Construction/repairing of auxiliary facilities, such as residential camps, equipment and supplies storage yard, drilling mud pit, water pit, waste pits and flare pit.
- Construction/repairing of the drilling rig foundation.
- Rehabilitation of Fencing off the entire area.
- Dozers, graders, excavators and jackhammers will be used, wherever necessary, to break the ground for leveling and excavation.

d) Flare Pit/Mud Pit Construction

A flare pit will be constructed with earthen embankments to minimize visibility and noise from the flare. The flare pit will be constructed/repaired and lined with brick lining. The mud and water pits will be

lined with impervious, high-density polyethylene (HDPE) liner to prevent soil and ground water contamination from seepage.

e) Rig Camp and Security Camp Construction

The camps will be rehabilitated at Adhi South-2, Adhi 17 and Adhi South 3 to accommodate the drilling and workover crew for proposed project.

f) Civil Contractor's Demobilization

The contractor will demobilize after the completion of drilling and work over activities.

2.9 Drilling Operations

2.9.1 Rig Mobilization

Following the construction of the well site, camp site and access road, mobilization of the rig and related machinery and equipment will commence. Mobilization will involve the transportation of the following to designated drilling location;

- The drilling rig;
- Ancillary equipment such as power generators, mud pumps, mud tanks, shale shakers, cementing unit, drill pipe and collars;
- Porta-cabin style camp, complete with all catering, power generation, laundry and other facilities;
- Drilling and other necessary support personnel; and
- Drilling material such as casing and associated accessories, well heads, drill bits, drilling fluid chemicals, liner hanger equipment

The drilling rig will be transported to the site using 40 ft. long trailers. Depending on the type of rig, approximately 80 to 150 truckloads of equipment will be transported during mobilization. The rig will be assembled and erected over the well location.

2.9.2 Drilling Scheme

Table 2.6: Drilling Scheme

S #	Description	Details
1	Well depth	3,459 m
2	Distance of surface point from subsurface point	100 m
3	Number of wells	03
4	Type of Rig	Top Drive System
5	Drilling Mud Type	WBM
6	Material requirement and mobilization	Through drilling contractor
7	Power Supply	Diesel based Generators

8	Water supply	Commercial hydrants via local tankers
9	Duration of drilling	24/7
10	Waste Management	Pits, waste containers/bins

2.9.3 Rig System

Drilling will be carried out using conventional equipment, techniques and practices for hydrocarbon exploration and production. A rotary drilling rig will be used in this operation; the derrick will be mounted on a steel platform known as the rig floor. The rig floor will provide working area for the drilling operations and personnel. A hoisting drum called draw works will be mounted on the rig floor at the base of the derrick. A wire rope called the drilling line will pass from the draw works to the top of the derrick through a system of pulleys called the crown block and will be attached to a further system of pulleys known as the hook and block. The whole system of wire rope and pulleys will operate like a crane. A drill string made up of uniform lengths of hollow steel pipes will be suspended from the hooks. Suspended from the drill string will be the drill bit. The drill bit will drill through the formations by the combined effect of the weight of the drill collar and the rotary action provided to the bit by a rotary table mounted on the rig floor. Rotation of the drilling bit and string is achieved by means of powerful electric motors on the surface.

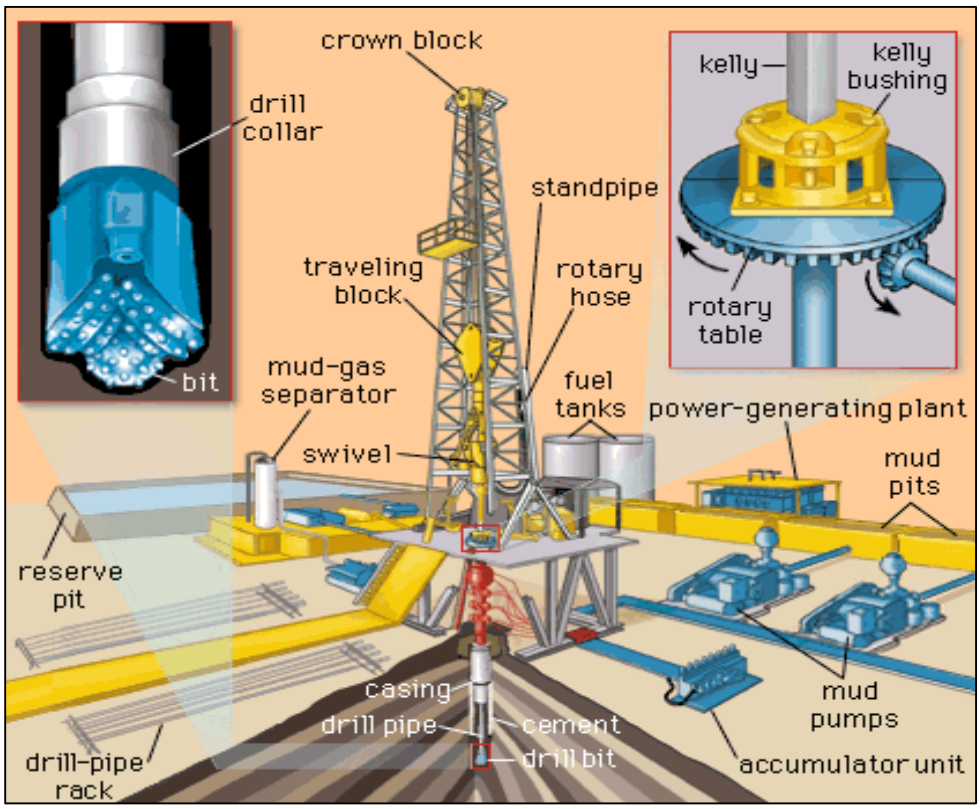


Figure 2.3: Anatomy of a rotary drilling rig

As drilling progresses in a given section of the well the length of the drill string will be increased by the addition of new lengths of pipes. Steel pipes known as casing will be lowered into the hole to line the sides of the well and prevent the hole from collapsing. At the end of drilling each section, these steel casings will be cemented into place by pumping cement into the space between the casing and the surrounding strata. The sections of the well will be drilled in this manner until the desired target depth is achieved.

2.9.4 Drilling Mud

Drilling of wells requires specially formulated muds which basically comprise inert earth materials like Bentonite, barite in water with several additives to give mud weight, fluidity and filter cake characteristics while drilling. Several additives are mixed into the mud system to give the required properties. The drilling muds have several functions like:

- Flushing out drilled solids, from the bottom of the hole and their transport to the surface.
- Lubrication and cooling of the drill bit and string.
- Deposition of an impermeable layer on the wall of the well-bore so as to seal the drilled formations.
- Countering natural formation pressures and preventing an uncontrolled flow of fluid from the formations.

Depending on the type of formation, Water Based Mud (WBM) and Oil Based Mud (OBM) is used for drilling of well. For the proposed project WBM will be used.

2.9.5 Coring and Well Logging

In the potential reservoir section, cores of rock will be taken from the borehole and a number of well logs are performed. Cores and well logs will be used to confirm geology of the structures being bored through and assess the accuracy of the seismic survey data interpretation done before drilling. Coring and well logging will also help identify possible hydrocarbon.

2.10 Well Evaluation

After having drilled to the specified depth, a number of logs for hydrocarbon bearing strata will be taken to accurately measure the pressure and fluid content of the zone. If test results show the presence of hydrocarbons, further tests will be conducted to determine the oil and gas composition and the reservoir's permeability and also to determine whether it is feasible to develop the well.

Once the well evaluation is complete, a decision is taken on the fate of the well. If the well is required for future tests or for potential conversion to production well, mechanical or cemented plugs are installed to prevent blow-out or counter any formation pressures. The drilling rig is then demobilized.

2.10.1 Coring and Well Logging

In the potential reservoir section, cores of rock may be taken from the borehole and a number of well logs performed. Cores and well logs will be used to confirm the geology of the structures being bored through and assess the accuracy of the seismic survey data interpretation carried out before drilling operation. Coring and well logging will also help identify possible hydrocarbons.

2.10.2 Rig Demobilization

Demobilization will involve the dismantling of the rig and residential camp and transporting it out of the project area. It is expected that demobilization will take 15 to 20 days.

2.10.3 Well Completion

Once the temporary or permanent valves are in place, it is ensured that the mud column is more than adequate to counteract any formation pressures that could be released. After that, a mechanical plug is used to plug off the area of the formation being tested, and tubing is run through the plug. A Blow Out Preventer (BOP) is kept in place throughout the test.

After these steps have been taken, hydrocarbons are allowed to flow to the surface and is passed through a 3-phase separator that segregates the formation fluid into water, gas and oil or condensate. Metering devices and valves are used to estimate the gas production rate, after which the gas and associated condensate are flared and water discharged into the mud pit.

2.10.4 Well Control and Blow Out Prevention (BOP)

In addition to careful monitoring and control of the mud system and the installation of casing in each section of the well, a surface wellhead consisting of a series of BOPs will be installed at the top of the casing. The function of the BOP is to prevent uncontrolled flow, otherwise known as kick, from the well by positively closing in the well bore as and when required. The BOP is made up of a series of hydraulically operated rams and is designed to withstand pressures well in excess of those expected to be encountered by the formation.

2.10.5 Hydraulic Fracturing or Fracking

Hydraulic fracturing is a well stimulation technique in which rock is fractured by a pressurized liquid. The process involves high-pressure injection of 'fracking fluid' (primarily water, containing sand or other fracturing proppants" suspended with the aid of thickening agents into a wellbore to create cracks in the deep-rock formations through which Natural gas, petroleum, and brine will flow more freely. When the hydraulic pressure is removed from the well, small grains of Hydraulic fracturing proppants (either sand or aluminum oxide) hold the fractures open.

2.11 Well Abandonment /Site Restoration

In case of unsuccessful drilling, well will be abandoned and the site will be restored. Alternatively, in case further exploration is programed in the area, the well may be plugged for drilling in nearby locations of the underlying reservoir. The producing well after the completion of their utility will be restored as close as to their original condition by carrying out the following activities:

- Plugging the well.
- Excavating the steel cellar pipe.
- Breaking all the concrete structures and disposing off the debris into the waste pits.
- Removing all chemicals, drums, etc. from the well site and transporting them to the waste storage facilities.
- Removing fencing and access gates.
- The top gravel layer is either removed or disposed of into the waste pit or depending on the land owners' consent is left on-site.
- The waste pit is closed on-site along with drill cuttings following relevant procedures.
- The access tracks are restored or left in place for community use.
- The construction base camp and rig camp are restored (if constructed).

2.12 Well Work Over Activities/ Sidetrack Drilling

Sidetracking is an effective technology that allows increasing oil production at old fields. It plays a significant role in development of oil and gas fields among the modern methods. Their use allows companies to solve a large range of problems associated with the increase in oil production on fields that are at a late stage of development and the involvement of hard-to-recover hydrocarbon reserves. Furthermore, the cost and payback period of capital investments for sidetracks is significantly lower than the similar rates of drilling a new well due to the use of a part of existing well and field infrastructure.

Over the years, drilling of sidetracks has become one of the most investment-attractive technologies aimed at stabilizing and further increasing oil production from fields being developed. This method is used to increase the rate of oil extraction from productive formations.

It is anticipated that sidetracking at Adhi South-2 well site can yield approximately 300 barrels of crude oil per well upon successful completion.

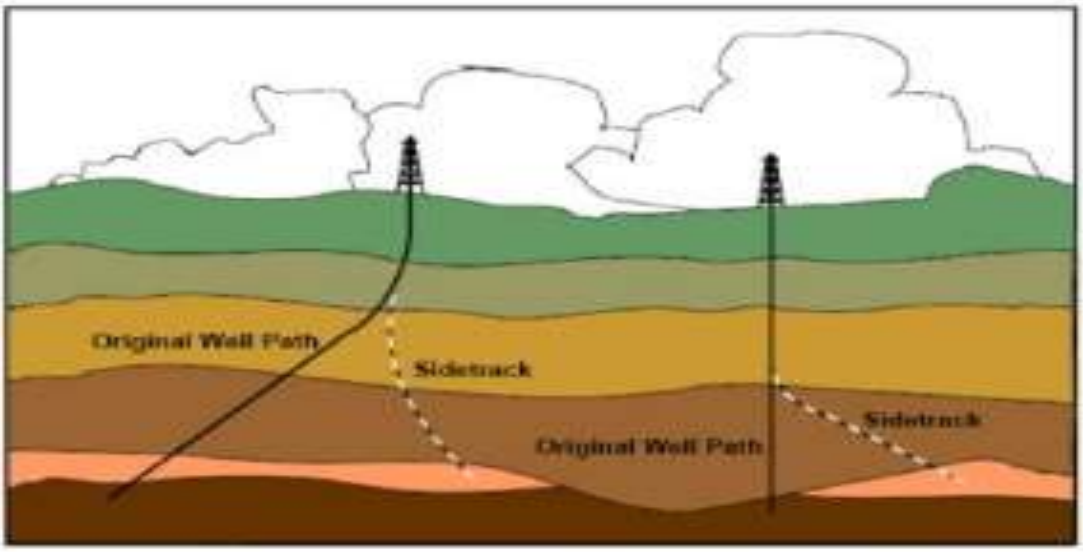


Fig 2.8: Sidetracking activity

The general criteria for the selection of wells for their recovery by sidetrack drilling are:

- Absence of remaining reserves in a well;
- Leak tightness of the production string;
- Borehole profile, allowing to carry out works on the second borehole (intensity of curvature less than 5° by 10 meters);
- Absence of metal patches or cuffs from the pipes above the estimated point of the second sidetrack cutting (the maximum cutting depth of the “window” is 400 m above the roof of the formation);
- Presence and quality of cement stone;
- Absence of accidents in the well that led to its abandonment;
- No production drilling plans in the considered work area.

Disposal of Drilling Wastes

Conventional drilling waste management involves discharging the mud and cuttings into a lined waste pit. After completion of drilling and at the time of complete restoration, the cuttings remaining in the waste pit will be allowed to dry out or wastewater will be treated and disposed of through waste contractor in an environmentally friendly manner. The cutting will be then encapsulated within the HDPE liner and the waste pit will be backfilled with atleast 1 meter of native topsoil cover and levelling the pit with natural ground level.

During partial restoration, either liquid / wastewater and drill cuttings will be removed from the site and disposed off in an environmentally friendly manner or WBM pit will be closed as per details mentioned in above para[4].

In case the drilling mud pit is an agricultural land, the drilling mud should be disposed of as per the applicable and relevant guidelines of LSO 29 B.

Waste Management contractor shall be hired for the disposal of the non-hazardous waste. For the hazardous waste collection and disposal, an EPA approved waste management contractor shall be hired.

2.12.1 Well Completion, Suspension, or Abandonment

Following drilling/workover activities, the well site will be developed for production. During well completion, a completion string comprising a tubing string and items of subsurface equipment (such as a downhole packer) will be installed to enable production from the well. The packer will be installed just above the producing formation. If the well completion is delayed due to design reasons, well may be suspended and left in safe condition to ensure that the well retains pressure integrity and does not flow in case of accidental damage. During completion, a completion fluid will be used to balance the formation pressures and make the operation safe without damaging the producing zones. The use of chloride salts in the completion fluid will be avoided, where possible.

2.13 Staffing

The total number of personnel required for the construction activities of each development well site is expected to be between 30 and 40. For drilling activities, approximately 80 personnel will be needed per well (excluding security guards).

2.14 Water Requirement

The water requirement in a drilling rig mainly meant for preparation of drilling mud apart from washings and domestic use. While the former consumes the majority of water requirement the water requirement for domestic and wash use is very less. Most of the general daily water consumption will be for mud preparation. During construction phase, estimated water requirement is 2000 ~ 2500 gallans / day. The water shall be transported from a nearby source through the contractor after due approvals and recycling of water will be attempted to a maximum extent for resource case evaluation.

4 https://environment.gov.pk/SiteImage/Misc/files/provincial_guidelines/GPetroleumOnshoreVol2Annexures.pdf

2.15 Domestic Wastewater

The operating personnel in the drilling rigs will operate from Drill Site Accommodation (DSA) in the vicinity of the location. Suitable septic tanks and soak pits will be available at the DSA.

2.16 Drilling waste

Water based mud and drill cuttings will be disposed onsite by either allowing the mud / liquid to evaporate (to the extent possible) or wastewater will be treated / disposed off through waste contractor and then burying the dry drill cuttings encapsulated within the HDPE liner and backfilling with atleast 1 meter of top soil cover.

2.17 Chemical Storage

The drilling rig will have normal storage facilities for fuel oil, required chemicals and the necessary tubular and equipment. The storage places will be clearly marked with safe operating facilities and practices.

2.18 Logistics

Crew transfers to and from the drilling rig, materials, diesel and chemicals will be through light vehicles, trucks and trailers.

2.19 Rig Demobilization

Demobilization will involve the dismantling of the rig and residential camp, and transporting it out of the project area. Demobilization will take approximately 10 days.

2.20 Restoration and Rehabilitation

As a minimum, the necessary steps will be undertaken to restore and rehabilitate the area. Allowing for the drying of the drill cuttings and waste fluid, the restoration normally takes approximately one year to complete.

2.21 Activities associated with laying of Feederlines

- **Establishment of Camp**

A small campsite will be established at site to accommodate construction and security personnel.

- **Site Preparation**

Site preparation shall involve removal of shrubs, grasses or other plantation (if required).

- **Trenching**

Trenching will be done for laying of pipeline. This may involve use of trenching machines and excavator. Approximate depth of the trench shall be 4 ft.

- **Pipe Laying**

The pipes would be laid on stands along the trench, once a section has been completed and the trench profile is checked, the stand would be removed and the pipeline will be lowered on the bottom of the trench.

- **Cover and Backfilling**

Minimum depth of cover shall be measured from the top of the pipe coating, to the top of the undisturbed surface of the soil. Back filling involves the dumping of soil back on the pipeline. The working procedure for back filling shall be based on the nature of the soil/terrain. In general, the first stage will be to return the soil in the reverse order.

- **Hydro-testing**

Upon completion of pipe laying works, hydro testing will be done to check pipeline integrity and ensure that weld joints and flanges are fitted properly and there is no leakage.

- **Restoration and Rehabilitation**

Restoration works will be carried out progressively on sections of ROW where construction has completed. Construction crew shall restore the construction right-of-way as near as practical to its original condition. All surplus and defective materials shall be collected and removed from site for disposal/return. All signs and refuse will be removed. It will be ensured that after restoration activities the site is clean and that no refuse has been left behind.

2.22 Noise, Air Emissions, Effluents and Solid Waste Generation

2.22.1 During Campsite Activities

Noise

Noise is likely to be generated by the following during campsite activities:

- Vehicular traffic on the access road;
- Diesel generator operation at the campsites; and

Vehicular traffic is expected to generate 60 to 70 dB(A) of noise and the diesel generators up to 82 dB(A), (measured at a distance of 15 m from the source). Since the generators will operate through the night when noise could be a cause for concern, appropriate noise reduction measures will be implemented if required.

Emissions

- Emissions produced during the campsite activities include:
- Exhaust emissions from the power generators at the camps;
- Exhaust emissions from vehicles and machinery; and

Effluents and Solid Waste

The primary source of waste effluents during the camp site activities will be the domestic sewage generated at camps. Septic tanks of adequate size will be provided at camp for the treatment of sewage. Excess water from the septic tanks, as well as effluents from kitchen and washing areas, will be released into soaking pits. The septic tanks will be restored as per PPEPCA guidelines[5]. Waste lubrication oil from vehicles and machinery will be collected in drums and transported to

5 https://environment.gov.pk/SiteImage/Misc/files/provincial_guidelines/GPetroleumOnshoreVol2Annexures.pdf

recycling contractors or disposed off through Punjab EPA approved waste contractor. The following kinds of solid waste will be generated during the campsite activities:

- Food waste;
- Packing waste;
- Medical waste;
- Excess construction material.

Hazardous waste will be handled by the EPA approved waste management contractor and disposed of in the least environmentally harmful manner possible. Medical waste incinerated at some incinerating facility. Excess construction material will be taken away by the civil contractors from the sites.

2.22.2 During Drilling

Noise

Noise is likely to be generated by the following drilling activities:

- Vehicular traffic on the access road;
- The operation of drilling rig at the well site; and
- The operation of diesel generators and other equipment at the well site and the camp.

Emissions

Emissions produced during the drilling phase will consist of the following:

- Dust emissions from vehicular traffic on the roads;
- Emissions from generators at campsites and the well site;
- Emissions from flares during testing and any abnormal drilling operations

Effluents and Solid Waste

All efforts will be made to minimize the waste generated while the project is in progress. The main types of waste that will be generated are:

- Drill cuttings and mud;
- Formation fluids;
- Fuels, oils, and chemicals;
- Garage waste;
- Sewage;
- Camp waste; and
- Medical waste.

2.23 Waste Management

There are different capabilities and limitations of different Waste Management Options for the various types of wastes generated in order to make cost-effective Waste Management Decisions that are protective of human health and the environment. As a general matter, a Waste Management Hierarchy should be adopted, with a preference for reduction, reuse and recycling options.

These methods would apply to chemical wastes, contaminated soil from oil / fuel spills, drilling pit waste, drums/containers, garbage (inert solid wastes); sanitary; clinical; produced water; and, rainwater drainage etc. A summary of waste management mechanism is presented in Table 2.4.

Table 2.7: List of Different Type of Waste and Disposal Options

Type of Waste	Description	Disposal Options
Food Waste (decayable waste)	Meat, fruit or vegetable residues	• Food waste to be buried safely or handed over to waste contractor
Packaging Waste	Paper, plastic, glass, textiles, cardboard, rubber, wood, tin cans, aluminum cans	• Combustible material that have no reuse will be handed over to waste contractor / vendors for appropriate disposal. • Recyclable and reusable wastes will include glass, metals, aluminum cans etc. These wastes will be sent to a waste contractor, in order to ensure the wastes are recycled or reused properly, without having any effect on the environment.
Medical Waste	Syringes, glass bottles, soiled bandages, expired drugs, dressings	• Syringe needles to be cut with cutter and sent for incineration through Punjab EPA approved waste contractor. • Soiled bandages and dressings and needles to be sent for incineration through Punjab EPA approved waste contractor. • Expired drugs to be taken by contractor for disposal/incineration through Punjab EPA approved waste contractor.
Demolition Waste	Dirt, concrete, plaster, plumbing, heating and electrical parts	• Dirt, concrete and plaster to be buried at site; and • Plumbing, heating and electrical parts to be hauled away by contractor for recycling
Oil spills /soil contaminated by oil leakages or spills	Contaminated soil	• Oil spills will be contained and controlled using shovels, sands, and native soil. The equipment and materials will be made available at camp sites and during the operation. • The contaminated soil will be excavated and temporarily stored in a metal drum or a bunded area lined with an impermeable base. • Finally, the contaminated soil will be disposed of through EPA certified waste contractor.

Well testing waste, well completion waste, testing fluid / brine solution / acid	Completion fluid (completion brine, crude oil and formation / produced water)	• Completion brine is collected in flare pit (made of brick masonry with plastered) for disposal by natural evaporation. Whereas crude oil is collected in storage tanks then transported to nearby operating facility for further processing at Plant. Moreover, formation water, produced during testing, drained into pit provided with impermeable membrane lining for disposal by evaporation.
	Produced Water during hydrocarbon production	• Oil & gas reservoirs contain water known as produced water or formation water produced during hydrocarbon production. Options may include: • Option-1: Injection into the reservoir to enhance oil recovery, • Option -2: Disposal into a dedicated disposal well drilled to a suitable porous subsurface geological formation. • Option-3: Produced water is collected in lined evaporation pits, where the water is evaporated (natural or induced) salt cakes (if any) left behind is disposed through PEPA approved waste contractor. • Option-4: Produced water treatment and then discharges to surface waters or to land. This option is considered only if there is no other option available. Discharged produced water should be treated to meet the PEQS.
Liquid Waste	Wastewater from kitchen and washing area	• Wastewater from kitchen and washing area to be collected in the pits before being sprayed over ground to compact dust • Sewerage waste to be collected in the separate tanks and dispose off wastewater as per PPEPCA guidelines[6].
Appropriate monitoring measures will be adopted to ensure that the material is actually recycled		

6 https://environment.gov.pk/SiteImage/Misc/files/provincial_guidelines/GPetroleumOnshoreVol2Annexures.pdf

2.24 Schedule of Implementation

The Drilling/ workover activities along with laying of feederlines for proposed wells are expected to take about 03-06 months. The tentative duration of key activities is provided below:

Table 2.8: Duration of Activities	
Activity	Time Required (Days)
Mobilization of Construction Contractor/Team	5
Civil Works	**Adhi 36 & Adhi South 10:** 60 - 80 days **Adhi South 2 Workover:** 35 - 60
Drilling	50
Feederlines Laying	60 - 90 days for two feederlines.
Demobilization	10

2.25 Staffing & Supplies

General supplies required for the project activities will include camp (food, etc.), fuels, oils and chemicals, and equipment maintenance parts. Source of water will be bore water which will be sourced through third party contractor. A summary of expected average resource usage during construction and drilling activities is given below.

Table 2.9: Utilities, Staffing and supplies/ wellsite	
Parameter	**Rate**
Construction Phase	
Utility water	~ 2000-2500 gallon / day
Work Force	30-40
Drilling Phase	
Utility water	~ 1000 bbls / day (for 90 days)
Power Generation	5-7 Diesel GenSet (292- 1200 KW)
WBM	4000 bls
Work Force	80 (excluding security guards)
Source of Water	Bore water through third party contractor
Operation Phase	
Security Guards	1-2 per wellsite

2.26 Cost and Magnitude of the project

The estimated cost of drilling and work over activities is USD 4.0 million for Adhi South-2 well site, USD 8 million for Adhi South-10 well site and USD 7 million for Adhi-36 well site. Therefore, the total cost of the project is USD 19 million. Cost of laying feederline is approximately USD 0.1 million.

2.27 Restoration and Rehabilitation Plan

If no indications of a commercial quantity of gas are encountered, the wells will be declared dry, accordingly plugged and abandoned, and the site restored in line with local regulations and good industry practices. As a minimum, the necessary steps will be undertaken to restore and

rehabilitate the area. Allowing for the drying of the drill cuttings and waste fluid, the restoration normally takes approximately one year to complete.

After completion of the FL laying and Hot Tapping operation and hydro-testing, the site will be restored to their original condition. For reference purposes a photographic record of the campsites prior to set-up will be taken.

The following activities will be carried out for site restoration:

- Backfilling of trench.
- Demobilization of all equipment and machinery
- Disposal of any waste material remaining at the time of completion of the operation
- General restoration of the site area including landscaping and restoration of drainage where required.

2.28 Government Approvals

Petroleum Exploration License has been granted by Government of Pakistan to PPL for Oil and gas exploration and production in Adhi Mining Lease, District Rawalpindi, Punjab. The Adhi Mining Lease renewal request to DGPC is attached as **Annex – I.**

3. PROJECT ALTERNATIVES

3.0 Introduction

This section provides a brief description of the various alternatives that were screened and analyzed for the project. An analysis of the available alternatives is necessary to establish the most suitable management and technology options to be adopted for the project.

3.1 Project Options

The two significant management options are the 'No-Project' option and the 'Project' option. The outcomes and implications of adopting each option are discussed below.

3.1.1 No Project Option

Opting for the 'No-Project' option will hinder Drilling & work over activities, resulting in the loss of the opportunity to extract maximum hydrocarbons from Adhi field. The drilling of new wells will provide an opportunity to identify new hydrocarbon resources while the proposed work over activities present a critical opportunity for PPL to revitalize declining wells and optimize hydrocarbon output. If the 'No-Project' option is chosen, PPL will be unable to maximize production and ultimately it will affect the national oil and gas production. Hence no project option is not viable.

3.2 Site Alternatives

The site for oil and gas exploration drilling is always the outcome of extensive seismic data interpretation and other available G&G data evaluations to select most promising surface and subsurface locations. Hence, not many options are available w.r.t selection of subsurface point. However, horizontal drilling offers option to select surface point in case a given surface point is not feasible.

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

Also the work over activities will be carried out on the existing well to revive the well production and Campsite will be rehabilitated at Adhi South-3 well site. In such case, selection of alternate sites is impossible.

3.3 Design /Technology Alternatives

Standard international practices have been employed for the work over activities, and no viable technological or design alternatives are available.

3.4 Environmental Alternatives

Options w.r.t environmental protection and conservation include:

1) Mud types
2) Water source
3) Waste disposal option
4) Environmental sensitivities (location aspect)

3.4.1 Mud Types

Two mud options are commonly used i.e. Water based Mud and Oil based Mud. The selection depends on the geological formations and drilling requirements. The water based mud is always the preferred option due to their cost effectiveness, ease of handling and transportation, and environmental friendly nature. However, sometimes oil based mud has to be used to address the need of drilling at a given geological formation.

3.4.2 Water

Groundwater are available in project area. Water will be sourced from local supply/tankers for drilling, workover and hydrotesting of feederlines.

3.4.3 Disposal Options for Produced Water

For the project, the produced water will not be discharged. It is either reinjected through water injection wells or evaporated through evaporation ponds.

3.4.4 Waste Disposal Options

Disposal of mud cuttings requires prudence to prevent the contamination of soil or groundwater. For this purpose, the drill cuttings will be collected in a pit lined with impermeable plastic, known as HDPE. The waste mud and mud cuttings will be temporarily stored in a separate pit on the well site. For final disposal, the drilling mud should be disposed of as per the relevant guidelines of PPEPCA/LSO 29 B[7].

3.4.5 Presence of environmental sensitivities

The selected well sites offer suitable locations for drilling as the well site are mostly safely located away from key environmental receptors e.g. communities' forests, wildlife habitats, protected areas, rivers etc (>500 m).

3.5 Economic Alternatives

Economic options w.r.t drilling and work over activities include drilling options and waste disposal options. Regarding drilling/work over activities, mainly the subsurface geology is the key driving factor to decide the drilling type instead of cost friendliness. However, for selection of the waste disposal options, many factors including cost, logistics, environmental conservation, time duration of the process etc. have to be considered. For the project, a combination of onsite and offsite waste disposal methods shall be used.

[7] Sectoral Guidelines for Upstream Petroleum Sector - Onshore

4. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 Introduction

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

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

In this section, same methodology would be followed by studying those rules, regulations and laws as well as the institutional set-up that are relevant to the environmental and social aspects of the "Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab". The assessment has been carried out to comply with local, provincial as well as PPL's health and safety guidelines. The main among these are:

- Quality, Environment, Health and Safety (QHSE) Policy of PPL.
- National Environmental Laws & Legislations;
- Provincial Environmental Laws & Legislations;
- Environmental and Social Guidelines;
- International Treaties and Conventions;
- Institutional Setup for Environmental Management;
  PPL's is commitment to the total integration of health, safety and social responsibility to environmental excellence in all aspects of its operations
- Protect the environment, preserve sustainable development;
- Ensure that all operations for the disposal of materials (both hazardous and non-hazardous) are conducted safely, minimizing any potential threats to health, the environment, and safety.
- Adopt appropriate industry and corporate standards where adequate laws or regulations do not exist;
- Stop any operation if the health, environment or safety is at risk; and
- Attain high level of preparedness to manage emergency situation.

4.2 PPL's Policy and Commitment to Quality, Health, Safety and Environment

Pakistan Petroleum Limited (PPL) is a frontline oil and gas exploration and production company in the country. At PPL, management is committed to maintaining and continually improving Quality, Health, Safety and Environment (QHSE) standards in all spheres of their business activities[8].

[8] PPL QHSE Policy, Oct 2022

They firmly believe that implementation of QHSE Management System augments continual improvement in all business processes and add value to external stakeholders.

Function, Asset and Department Heads are accountable to ensure QHSE and legal compliance in their respective areas of responsibility and demonstrate pivotal leadership role in promoting QHSE culture within the organization. Whereas, all employees and contractor's staff are responsible to implement QHSE requirements in their own benefit as well as of colleagues, contractors, visitors and community.

To carry out this Policy, PPL shall:

Define SMART QHSE objectives and targets aligned with organizational goals and monitor performance for continual improvement.

- Conduct risk assessments, incident reporting & investigations and occupational health surveillance to identify preventive measures and capture improvement opportunities.
- Fulfill its QHSE legal and other compliance obligations.
- Reward and recognize QHSE proactive efforts and initiatives of individuals.
- Protect environment and ensure minimum environmental footprint of its business activities.
- Ensure that seat belt is fastened on all seats of vehicle by employees, contractors, and visitors.
- Permit smoking in designated areas only at PPL Fields and Locations.
- Continually improve QHSE standards by adopting new techniques, approaches and best industry practices addressing various business processes.

Working safely is a condition of employment at PPL.

4.3 National Legislations and Guidelines

4.3.1 National Conservation Strategy

The National Conservation Strategy (NCS) is the primary policy document of the Government of Pakistan (GoP) on national environmental issues. The policy was approved by the Federal Cabinet in March 1992. The Strategy also attained recognition by the international donor agencies, principally the World Bank. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas in order to preserve the country's environment.

A mid-term review of the achievement of the NCS in 2000 concluded that achievements under the NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that the NCS was not designed and is not adequately focused as a national sustainable strategy (GoP, November 2000). The need therefore arose for a more focused National Environmental Action Plan (NEAP) required to bring about actual improvements in the state of the national environment with greater emphasis on poverty reduction and economic development in addition to environmental sustainability.

The National Environmental Action Plan was approved by the Pakistan Environmental Protection Council under the chairmanship of the President / Chief Executive of Pakistan in February 2001. NEAP also constitutes the national environmental agenda and its core objective is to initiate actions

that safeguard public health, promote sustainable livelihoods, and enhance the quality of life of the people of Pakistan.

The Government of Pakistan and United National Development Program (UNDP) have jointly initiated an umbrella support program called the National Environmental Action Plan-Support Program signed in October 2001 and implemented in 2002. The development objective supported by NEAP-SP is environmental sustainability and poverty reduction in the context of economic growth. The objective of new policy has total 171 guidelines on sectorial and cross sectorial 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.

4.3.2 Hazardous Substances Rules, 2003

These Rules were notified in 2003 to stream line procedures for issuance of licenses to industries/ businesses that generate hazardous substance / waste and device them methods for the removal of hazardous wastes in an environmental friendly manner. The rules also specify procedures to be adopted for disposal of hazardous waste and identify two hundred and forty-two hazardous substances and synthetic chemicals[9].

4.3.3 Self- Monitoring & Reporting Rules, 2001

Pakistan Environmental Protection Council constituted an Environmental Standards Committee in 1996 to devise realistic modalities for NEQS enforcement and simplified monitoring procedures with the consultation of representatives of industrial interest groups, non-governmental organizations (NGOs) and other stakeholders. Their efforts succeeded in the bringing up of "Self-Monitoring and Reporting System for Industry" in 2001. As per the rules set by this system, industries have to monitor effluents and emissions in compliance with the NEQS and report it to provincial or federal EPAs. This system classifies industry into three categories A, B and C each corresponding to a specified reporting frequency[10].

4.3.4 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.

[9] *Hazardous Substances Rules, 2003, faolex.fao.org/docs/pdf/pak64438.pdf*
[10] *National Environmental Quality Standards (Self-Monitoring and Reporting by Industries) Rule, 2001*

Provisions under this Act relating to environment are no longer being enforced after promulgation of the Pakistan Environmental Protection Act, 1997. However, pollution offences can still be tried under the Pakistan Penal Code, 1860[11].

4.3.5 Antiquities Act, 1975

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

The proponent will ensure safety of the archeological sites that lie within or immediately neighboring the project site and will also immediately stop and report the concerned department if during the excavation process any such discovery is made in future[12].

4.3.6 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been de facto policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties of development projects. It comprises of 55 sections pertaining to areas notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions[13].

4.3.7 The Cutting of Trees (Prohibition) Act, 1992

The Cutting of trees (prohibition) Act, 1992 mandates that no person shall, without prior written approval from authorized officer shall cut, fell or damage trees growing in[14]:

- **First Zone** (Area adjacent to and beyond the external frontier of Pakistan to a line at four kilometers measured from the external frontiers of Pakistan) if the number of remaining trees in any field falls short of the number to be calculated at the rate of fifteen trees per acre; and
- **Second Zone** (Area adjacent to and beyond the first zone extending towards Pakistan to a line at four kilometers measured from the first zone) if the number of remaining trees in any field falls short of the number to be calculated at the rate off ten trees per acre.

This does not apply to a tree growing on land occupied as the site of a town or village or in a dwelling-house.

Section 3: It prohibits any person, without prior approval, from cutting, felling or damaging any tree growing in first and second zones as mentioned above.

Section 4: It imposes penalty of fine which may extend to five thousand rupees for contravention relating to first zone and imposes penalty of fine which may extend to two thousand and five hundred rupees for contravention relating to second zone.

[11] *Pakistan Penal Code (XLV of1860)6th October 1860*
[12] *Act VII of 1976(Gazette of Pakistan, Extraordinary, Part 1, 14th January, 1976*
[13] *The Land Acquisition Act 1894 (Act of 1894)*
[14] *The cutting of Trees (prohibition) Act, 1992, Act No. XVIII of 1992*

No forests have been found near the proposed well sites.

4.3.8 The Canal and Drainage Act, 1873

The Canal and Drainage Act, 1873 prohibits corruption or fouling of water canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage[15].

PPL will accordingly pay due attention to addressing the canal and drainage integrity.

4.3.9 National Biodiversity Strategy and Action Plan (2017-2030)

The Biodiversity Action Plan, 2000 has been the most significant direct step towards addressing the issue of biodiversity loss. Pakistan's Biodiversity Action Plan (BAP) has evolved into its National Biodiversity Strategy and Action Plan (NBSAP) 2017-2030, which addresses threats like habitat loss, deforestation, and pollution by integrating international standards and promoting sustainable resource use, community involvement, and improved conservation programs. While an initial BAP was drafted in 2000, its implementation faced challenges due to a weak institutional framework and insufficient coordination between national and provincial bodies. The current NBSAP aims to overcome these issues and provides a roadmap for conserving Pakistan's rich but threatened biodiversity in line with the Convention on Biological Diversity (CBD) and the Sustainable Development Goals (SDGs).

The Ministry of Environment, Climate Change and Forests (formerly the Ministry of Environment, Local Government and Rural Development) holds the overall responsibility for the NBSAP's implementation[16].

4.3.10 The Forest (Amendment) Act 2022

There is no single "Forest Act of Pakistan" but rather provincial amendments to the existing Forest Act of 1927, such as the Forest (Amendment) Act, 2022 in the Punjab province, which focuses on increasing penalties for forest damage, and the Regulation of Forests in Tribal Areas Act, 2022, passed by the Khyber Pakhtunkhwa provincial assembly to regulate forests in former tribal districts[17].

The Punjab Forest (Amendment) Act, 2022 is an act to amend the existing Forest Act, 1927 (XVI of 1927) by inserting a new clause defining "Department" and modifying Sections 26 and 33 to ensure fines for damage to forest produce are not less than the assessed value of the damage. There are other significant amendments, such as the Forest (Amendment) Act, 2010 which prevented the government from declaring protected forests as unprotected, and the more recent Forest (Amendment) Act, 2016, which outlined conditions under which protected forests could be de-notified for national projects if a suitable substitute forest was provided.

No forests have been found near the Adhi South-2, Adhi South-10 and Adhi-36 well sites.

4.3.11 National Environmental Policy, 2005

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

[15] *The Canal and Drainage Act, 1873*
[16] *National Biodiversity Strategy and Action Plan (NBSAP) 2017-2030*
[17] *The Forest (Amendment) Act 2022*

desertification, natural disasters and climate change. It also gives direction for addressing the cross sectorial issues as well as the underlying causes of environmental degradation and meeting international obligations.

The National Environmental Policy, 2005 while recognizing the goals and objectives of the National Conservation Strategy, National Environmental Action Plan and other existing environment related national policies, strategies and action plans, provide broad guidelines to the Federal Government, Provincial Governments, Federally Administrated Territories and Local Governments for addressing environmental concerns and ensuring effective management for their environmental resources[18].

The National Environmental Policy, 2005 aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life for the citizens through sustainable development.

4.3.12 National Mineral Policy, 1995 and 2013

Realizing the importance of minerals in the development of any country, the Government of Pakistan has formulated National Mineral Policy offering appropriate institutional arrangements, investment friendly regulatory regime and internationally competitive fiscal incentives. The main objectives from expansion of mineral sector activities are expansion of employment opportunities, sustainable development of mineral bearing area, expanded business opportunities, technology transfer and regional infrastructure development etc. Under Constitution, minerals are a provincial subject except oil, gas and nuclear minerals and those occurring in special areas (FATA and NA). Provincial Governments are responsible for development and exploitation of minerals, which fall in their domain. The main sections of National Mineral Policy, 1995 are as mentioned under[19]:

Section 4.3.2: A Mineral Investment Facilitation Authority (MIFA) will be setup in each province headed by Chief Minister and other members such as Minister for Mineral Development, Chief Secretary and Secretary Mineral Development Department etc. MIFA shall ensure regular monitoring and direction of mineral related activities, periodic review of the new regulatory regime and ensure adequate protection of environment etc.

Section 4.3.3: Each mineral rich province will establish a separate Department of Mineral Development under separate Secretary for development of mineral resources, consideration of applications and grant of license and leases, regulating and monitoring mining operations etc.

Section 4.4: Mineral Investment Facilitation Board (MIFB) headed by Prime Minister and members including Federal Minister for Petroleum & Natural resources, Governor KPK, all CMs etc. for development of mineral resources not only on fiscal policies but also in international contacts with donor agencies and negotiation of mineral agreements.

Other Sections: Section 4.5 refers to Public Sector Mineral Corporations, Section 4.6 refers to Geological Survey of Pakistan (GSP), Section 4.7 refers to Geo-Data Centre of Pakistan (GDCP), Section 4.8.3 mentions about Reconnaissance License (RL), Section 4.8.4 refers to Exploration License (EL), Section 4.8.6 enumerates conditions for Mining Lease (ML), Section 4.8.7 covers environmental issues and protection of environment from mining activities etc.

[18] *National Environmental Policy, 2005, Govt. of Pakistan, Ministry of Environment*
[19] *National Mineral Policy, 1995*

Major sections of National Mineral Policy, 2013 related to the proposed project are as described below[20]:

Section 1: The main objective of National Mineral Policy, 2013 is to endeavor for increasing the economy, competitiveness, coordination & exploration, development & production of Pakistan's mineral resources and encouraging small scale mining.

Section 3: Mineral Investment Facilitation Authorities (MIFAs) are established at both Federal and Provincial level. A Licensing Division, the Provincial Directorates General of Mines & Minerals, exploration & Coordination Directorates, Exploration Promotion Divisions, the Directorates General of Mines and Minerals (which will provide interface with international investors; identify mineral prospects; compile, evaluate and disseminate geo-data etc.).

Section 4: A Mineral Investment Board (MIB) headed by Prime Minister (with all CMs as members) will be established as a consultative forum to encourage the flow of investments, assist Provincial Governments, recommend on fiscal and taxation policies etc.

Section 5: Geological Survey of Pakistan (GSP) is charged with the responsibility of availability of geological, geophysical and geochemical maps and reliable geo data and research.

Section 6: A Geo-data Centre of Pakistan (GDCP) will perform the functions such as managing and disseminating geo-data; creating a centralized digital map production and distribution facility; training; links with Provincial Departments etc.

Section 7: The Provincial Mineral Concession Rules, 2002 which flowed out of the 1995 National Mineral Policy, were a positive step towards modernizing the existing regulatory regime, providing for mineral titles, development and exploitation of any mineral deposits; eliminating discretionary powers, and ensuring simplicity and transparency; and updating the mining laws to deal with international mining practices in Pakistan such as open pit mining and working practices.

Companies will be expected to ensure that their mining operations are carried out in an environmentally acceptable and safe manner. The holder of a mineral title shall have certain exclusive rights for example the right to enter upon the licensed/leased area and to carry out reconnaissance etc. The Provincial Governments may enter into an agreement (Mineral Agreement) with an investor, with respect to certain matters relating to the carrying out of operations under license/lease. Any question or dispute shall be handled through dispute resolution mechanism. The award of mineral title would be made through a transparent process.

Section 8: Mining activities being carried out in Pakistan are mainly through small scale mining by sole proprietorships, association of persons (partnerships) and in certain cases by private limited liability companies. These would prepare their financial statements in accordance with International Financial Reporting Standards.

Section 9: Rate of royalty for minerals will be determined by respective governments from time to time.

Section 11: Development of Infrastructure in mineral bearing areas would be given due regard.

Section 17: Provincial Inspectorates of Mines will carry out the various functions such as enhancing health and safety, research and development.

[20] *National Mineral Policy, 2013*

Section 19: Miscellaneous Matters such as protection of Foreign Investment and insurance for mining operators.

Section 20: The respective Federal and Provincial Ministries/Departments will take all measures to give full effect to the provisions of this Policy.

4.4 National Legislation on Oil and Gas Exploration and Production

4.4.1 The Petroleum Act, 1934

This Act deals with the import, transport, storage, production, refining and blending of the petroleum products (chapter 1: Control over petroleum). Chapter 3 of this Act tells about the general penalties for the offenses under this Act, reports of accidents with petroleum and inquiries into serious accidents with petroleum. This Act specifies the nature and condition of pipelines in which the petroleum may be transported and the forms and conditions of licensing for the transport and storage of petroleum products[21].

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

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

4.4.3 The Model Petroleum Concession Agreement, 2013

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

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

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

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

[21] *The Petroleum Act, 1934*

4.4.5 Petroleum Exploration and Production Policy, 2012

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

The principal objectives of this Policy are:

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

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

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

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

The grant of lease for development and production, not exceeding twenty-five years, with certain terms and conditions including the work program shall be granted by the Government on being satisfied that the deposit can be commercially produced. The lease holder shall have exclusive right to perform activities in connection with the development and production including the right to

undertake transportation subject to approval. The holder shall pay royalty at the rate of 12.5 percent of the wellhead value of the petroleum produced and saved. In addition to these powers of Government for recovering yearly lease rent, surface rent and revocation of lease have also been described.

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

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

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

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

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

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

4.5 Provincial and Local Environmental Laws and Legislations

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

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

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

The salient features of the Act are mentioned below:

1. Prevention of polluting discharges and Emissions: Section 11 of the Punjab Environmental Protection Act, amended 2012 & 2017 requires a person to ensure that no release is done to

the environment in the form of harmful discharges / effluents or emissions which could cause degradation of the ambient environmental quality. However, release of effluents/air emissions is allowed if the concentration of its constituents is within the limits as prescribed in the National Environmental Quality Standards.

2. Environmental Quality Standards: The Act provides for fixing the Punjab Environment Quality Standards (PEQS) and their strict enforcement. For default, the Government has been empowered to levy a pollution charge.
3. IEE/EIA: Under Section 12, no project including construction activities or any change in the existing physical environment can be started unless the IEE or EIA has been conducted and its approval obtained from the Responsible Authority, in the present case from Punjab EPA.
4. The imports of hazardous waste into the country has been banned and the transport of hazardous substances and dangerous chemicals or toxic material or explosive substances etc. has been regulated, through licenses, under prescribed rules and procedure.
5. For the effective implementation of the provisions of the law, the Pakistan Environmental Protection Agency, headed by a Director General with other staff has been constituted. This Agency is responsible for enforcing the policy and implementing the provisions of the law. On the same pattern, Provincial Environmental Protection Agencies have been created in each province.

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

These regulations were prepared by Punjab Environmental Protection Department. These regulations divide projects in different Schedules depending upon the severity of environmental impact of the project. The project would fall in Schedule I, if the project has lower environmental impacts and thus requiring an IEE. And, the project would fall in Schedule II, if the project has significant environmental impacts and thus requiring an EIA. But, all projects located in environmentally sensitive areas would require an EIA under these regulations.

The project "Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab" falls in Schedule II requiring an EIA as the project is categorized as:

A. Energy

5. *Oil & gas extraction projects including exploration, production, gathering systems, separation and storage*[22].

4.5.3 Punjab Environmental Quality Standards, 2016

In exercise of the powers conferred under clause (c) of subsection (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the PEQS for Municipal and Liquid Industrial Effluents, Drinking Water, Motor Vehicle Exhaust and Noise, Ambient Air, Noise, and Industrial Gaseous Emissions, with Notification No. SO (G)/EPD/7-26/2013 which were issued in 2016[23].

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

Table 4.1: PEQS for Ambient Air			
Pollutant	**Time-weight average**	**Concentration in ambient air**	**Method of measurement**
Sulfur dioxide (SO2)	Annual average*	80 µg/m^3	Ultraviolet Fluorescence method
	24 hours**	120 µg/m^3	
Oxides of nitrogen as (NO)	Annual average	40 µg/m^3	Gas phase Chemiluminescence
	24 hours **	40 µg/m^3	
Oxides of nitrogen as (NO_2)	Annual average	40 µg/m^3	Gas phase Chemiluminescence
	24 hours **	80 µg/m^3	
Ozone (O_3)	1 hours	130 µg/m^3	Non dispersive UV absorption method
Suspended particular matter (SPM)	Annual average	360 µg/m^3	High volume sampling (Average flow rate not less than 1.1 m^3 /min)
	24 hours**	500 µg/m^3	
Respirable particulate matter PM_{10}	Annual average	120 µg/m^3	Preferably β-Ray absorption method
	24 hours**	150 µg/m^3	
Respirable particulate matter $PM_{2.5}$	Annual average	15 µg/m^3	Preferably β-Ray absorption method
	24 hours**	35 µg/m^3	
Lead (Pb)	1 hours	15 µg/m^3	AAS method after sampling using EPM 2000 or equivalent filter paper
	24 hours**	1 µg/m^3	
	1 hours	1.5 µg/m^3	
Carbon Monoxide (CO)	8 hours	5 µg/m^3	Non dispersive infrared (NDIR) method
	1 hours	10 µg/m^3	

*** annual arithmetic means of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval**
*** 24 hourly /8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days**
Table 3.2 shows Punjab environmental quality standards for municipal and liquid industrial effluents (mg/l, unless otherwise defined)

Table 4.2: PEQS for Municipal and Liquid Industrial Effluents			
No	**Parameter**	**Into in land water**	**In sewage treatment**
1	Temperature or temperature increase	≤3 C	≤3 C
2	pH value (H+)	6-9	6-9
3	Biochemical oxygen demand (BOD5) at 20 C (1)	80	250
4	Chemical oxygen demand (COD)(1)	150	400
5	Total suspended solids (TSS)	200	400
6	Total dissolved solids (TDS)	3500	3500
7	Grease and Oil	10	10
8	Phenolic compounds (as phenol)	0.1	1.3
9	Chloride (as CI-)	1000	1000
10	Fluoride (as F-)	10	10
11	Cyanide (as CN-)total	1.0	1.0
12.	An-ionic detergents (as MBAs)(2)	20	20
13.	Sulfate (SO_4^{-2})	600	1000
14.	Sulfide (S^{-2})	1.0	1.0
15.	Ammonia (NH_3)	40	40

16.	Pesticides [3]	0.15	0.15
17.	Cadmium (Cd)[4]	0.1	0.1
18.	Chromium (trivalent and hexavalent)[4] [1]	1.0	1.0
19.	Copper(Cu)[4]	1.0	1.0
20.	Lead (Pb)[4]	0.5	0.5
21.	Mercury (Hg)[4]	0.01	0.01
22.	Selenium (Se)[4]	0.5	0.5
23.	Nickel (Ni)[4]	1.0	1.0
24.	Silver (Ag)[4]	1.0	1.0
25.	Total toxic metals	2.0	2.0
26.	Zinc (Zn)	5.0	5.0
27.	Arsenic (As)[4]	1.0	1.0
28.	Barium (Ba)[4]	1.5	1.5
29.	Iron (Fe)	8.0	8.0
30.	Manganese(Mn)	1.5	1.5
31.	Boron (B)[4]	6.0	6.0
32.	Chlorine (Cl_2)	1.0	1.0

Table 4.3: PEQS for Industrial Gaseous Emissions

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

Table 4.4: Sulfur Dioxide Background Levels Microgram per cubic meter (ug /m3) Standard				
Background air quality (SO_2 Basis)	**Annual average**	**Max.24 hour interval**	**Criterion I Max. SO_2 emission (ton per day per plant)**	**Criterion II Max. allowable ground level increment to ambient (ug/m^3) (one year average)**
Unpolluted moderately polluted	<50	<200	500	50
Low	50	200	500	50
High	100	400	100	10
Very polluted**	>100	>400	100	10
*** For intermediate value between 50 and 100 µg/m^3 linear interpolations should be used **No project with sulfur dioxide emission will be recommended**				

Table 4.5: Standards for motor vehicle exhaust and noise (for in-use vehicles)				
No.	**Parameter**	**Standards (PEQS Limits)**	**Measuring methods**	**Applicability**
1	Smoke	40% or 2 on the Ringlemann Scale during engine acceleration mode	To be compared with Ringlemann Chart at a distance of 6 meters or more	Immediate effect
2	Carbon monoxide	6%	Under idling conditions: non-dispersive infrared detection through gas analyzer	
3	Noise	85 dB(A)	Sound-meter at 7.5m from the source	

4.5.4 Punjab Local Government Act, 2022

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

The Punjab Local Government Act refers to legislation that establishes and regulates local government bodies in the Punjab province of Pakistan, with the current primary act being the Punjab Local Government Act 2022, which superseded the Punjab Local Government Act 2019 and earlier versions. This act defines the structure, powers, functions, and election processes for various local government units, including Municipal Corporations, Municipal Committees, and

Tehsil Councils, and governs their corporate status, ability to acquire property, and management of local taxes and fees[24].

PPL's Adhi Asset will be responsible to ensure that the proposed activities in Adhi Mining Lease, District Rawalpindi are undertaken in accordance with the environmental management requirements and recommendations given in this EIA as well as the NOC which will be issued for this project.

4.5.5 The Punjab Wildlife (Protection, Preservation, Conservation, and Management) Act, 1974 (Amended October, 2007)

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

Key features of the Punjab Wildlife Protection Act include:

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

Under the powers conferred to the government of Punjab through this Act, the government can declare certain areas reserved for the protection of wildlife and control activities within in these areas. In Punjab, currently there are 58 wildlife protected areas which include national parks, game reserves and wildlife sanctuaries but **none** has been found near the proposed drilling well sites.

4.5.6 The Punjab Special Premises (Preservation) Ordinance, 1985

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

[24] *The Punjab Local Government Act 2022*

4.6 Environmental and Social Guidelines

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

Policy & Procedures for the Filing, Review and Approval of Environmental Assessments, 2000[25]

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

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

Guidelines for Preparation & Review of Environmental Reports

These guidelines require proponents to prepare terms of reference for the environmental assessment reports. It requires that all studies should contain baseline data on the area and must contain an assessment of the potential environmental impacts and the recommended mitigation measures[26].

Guidelines for Operational Health, Safety and Environmental Management, 1996[27]

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

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

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

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

(including pH, metals, oil and grease, sodium adsorption ratio etc.) in the waste or the waste soil mixture[28].

4.7 National Fire Protection Association (NFPA)

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

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

4.8 International Treaties

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

4.8.1 Climate Change

- United Nations Framework Convention on Climate Change, 1992
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997 aims to reduce emissions of six greenhouse gases, including CO_2, methane (CH_4), and nitrous oxide (N_2O) by 2008-2012 and Pakistan has signed and acceded to the agreement.

4.8.2 Waste and Pollution

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

4.8.3 The Convention on Biological Diversity

The Convention on Biological Diversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity, and to integrate these plans into national development programs and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting biological diversity.

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

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

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

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

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

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

4.8.5 Cultural Heritage

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

4.8.6 ILO Conventions

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

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

5. ENVIRONMENTAL AND SOCIAL BASELINE

5.1 General Introduction

This section provides a comprehensive profile of district Rawalpindi (macro environment); where the proposed drilling activities in Adhi Mining Lease, Punjab are to be undertaken by PPL. The study will cover the physical, biological and socio-economic environment of the area prior to the beginning of its various activities.

This categorization would aid in understanding the prevalent macro and micro environment of this project and would enable assessment of possible environmental impacts that may arise as a result of the activities associated with the project. It would also assist the design team in defining the mitigation measures that would be required to minimize if not eliminate the negative impacts which are pointed out in this study.

5.2 Study Area

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

5.3 Methodology

Information for this section was collected from different sources including electronic and print media, secondary data and maps prepared by the Geological survey of Pakistan and soil survey of Pakistan, published literature; District Census Reports (DCRs), studies previously conducted in district Rawalpindi archives of the experts etc.

5.3.1 Project Location

The proposed project includes work over activities which will be carried out in Adhi Mining Lease, District Rawalpindi, Punjab. PPL will carry out Drilling & work over activities on Adhi South-2, Adhi South-10 and Adhi-36 wells for the exploration and revival of production of hydrocarbons.

The wellsite's location is given below in Table-5.1 while project location map of wells is given as Figure-5.1.

Table 5.1: Project Location

S. No	Project Component	Coordinates
1	Adhi South-2	Latitude: 33°05'41.4373"N Longitude: 73°06'47.139"E
2	Adhi South-10	Latitude: 33° 5'34.43"N, Longitude: 73° 6'17.28"E
3	Adhi-36	Latitude: 33° 6'26.73"N, Longitude: 73° 6'21.37"E

* These coordinates are tentative and may be changed up to 1 km.

Feedlines will be laid down for Adhi 36 and Adhi South 10 wellsites to connect it with the main trunk line. The details of the feederlines are as under

Table 5.2: Feederlines

S. No	Project Component		Starting Coordinates	Length (m)
1	Adhi 36 feederline	Start	Latitude: 33° 5'34.43"N	860 m

			Longitude:73° 6'17.28"E	
		End	Latitude: 33° 5'22.88"N Longitude:73° 6'23.43"E	
2	Adhi South-10 feederline	Start	Latitude: 33° 6'26.65"N Longitude: 73° 6'21.38"E	504 m

The location and length of the feederlines are tentative and subject to change.

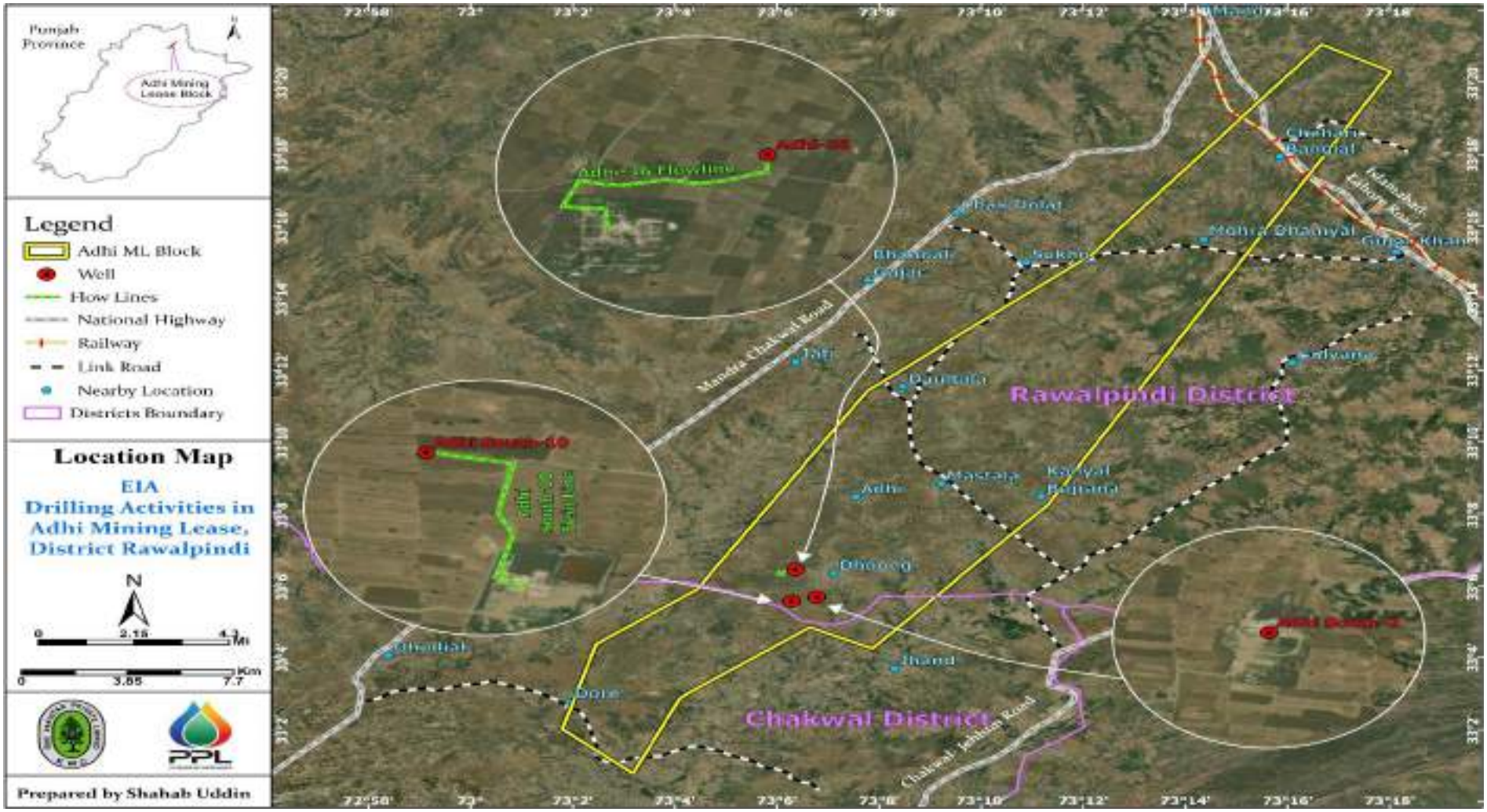


Figure 5.1: Location map of project area

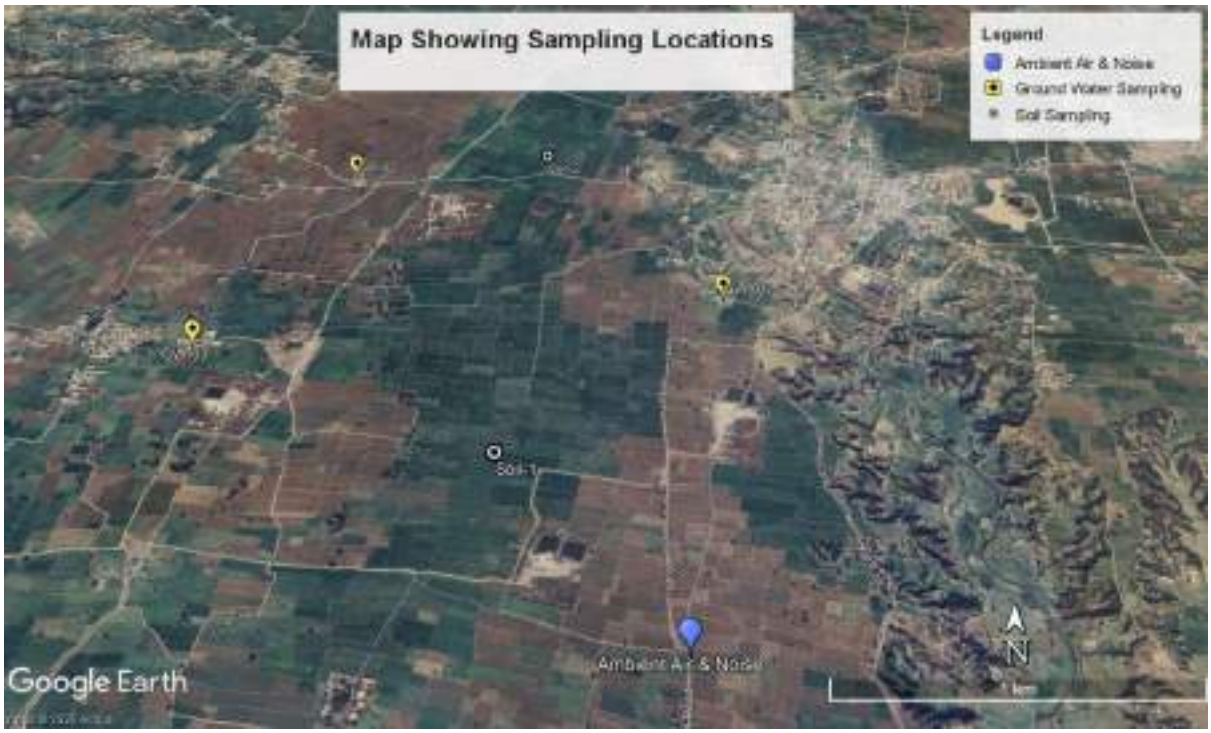
5.4 Suitability of the Site

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

- PPL has already existing wells in the nearby.
- No protected area falls within 1 km radius of the drilling sites
- No surface body is located within 1 km of project sites.
- No form of resettlement or removal of businesses is required for project execution.

5.5 Environmental Monitoring of the area

Environmental monitoring of ambient air, groundwater, and soil samples has been conducted and analyzed from the project area to establish baseline conditions. The monitoring reports, along with the validation performa, are attached as **Annex-II.**



5.6 Physical Environment

Rawalpindi district is in the north of the Punjab province. The highest elevation is 9,210 ft. close to Dunga Gali and in the south it is as low as 1,100 feet. It lies on the Potwar Plateau 9 miles (14 km) southwest of Islamabad, the national capital. The district has an area of 5,286 sq. km. (2,041 sq. mi). Originally, its area was 6,192 km2 (2,391 sq. mi) until the 1960s when Islamabad Capital Territory was carved out of the district, giving away an area of 906 sq. km. (350 sq mi). It is situated on the southern slopes of the north-western extremities of the Himalayas, including large mountain tracts with rich valleys traversed by mountain and rivers. The chief rivers are the Indus and the Jhelum, it is noted for its milder climate and abundant rainfall due to its proximity to the foothills[29].

[29] https://rawalpindi.dc.lhc.gov.pk/PublicPages/HistoryOfDistrict.aspx#:~:text=Rawalpindi%20District%20:%20is%20a%20district,Haider%20came%20from%20Gujar%20Khan

5.6.1 Topography

The topography of Rawalpindi District includes hilly areas and plateaus, situated on the Potohar Plateau at the southern edge of the Himalayan mountain range. It features mountainous terrain, particularly in the Murree and Kahuta areas, with elevations varying significantly, from low points around 1,100 feet to peaks near 9,210 feet. The district is also characterized by dissected plains and is traversed by major rivers, including the Indus and Jhelum[30].

The project area falls in the elevation of 500-524 meters.

[30] https://pakistanalmanac.com/punjab-rawalpindi/#1633497087354-b3c63ef2-64a3

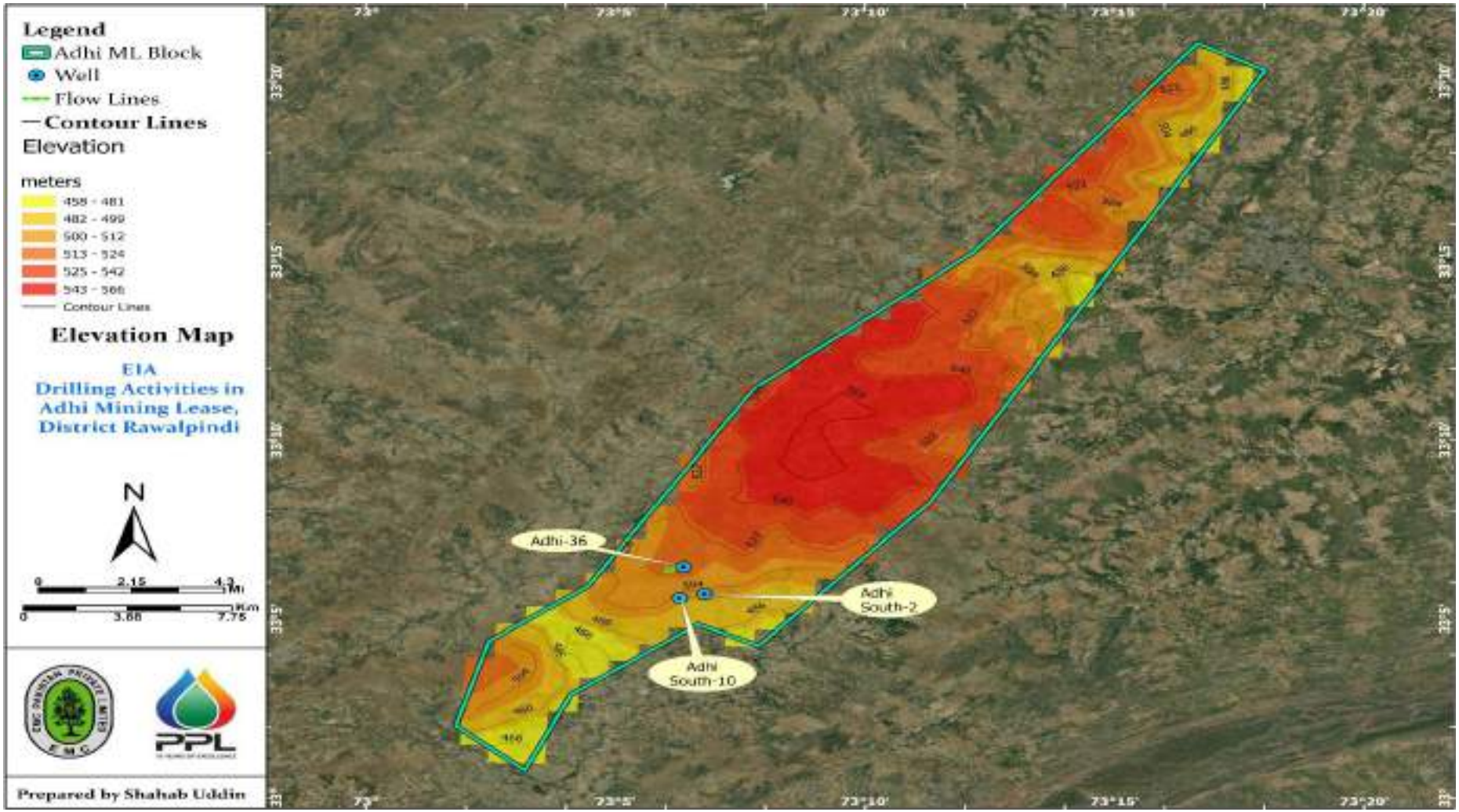


Figure 5.2: Elevation Map of Project Area

5.6.2 Geology

The geology of Rawalpindi district is characterized by sedimentary rocks, primarily the Miocene-aged Rawalpindi Group and the Neogene-Pleistocene Siwalik Group. These formations are composed of sandstones, claystones, and mudstones, deposited in fluvial environments with evidence of past terrestrial and aquatic life. The region is situated on the Potwar Plateau and lies within a seismically active zone, featuring fault lines like the Main Boundary Thrust (MBT), which poses seismic hazards. Geologically, project area falls in Neogene Sediments zone.

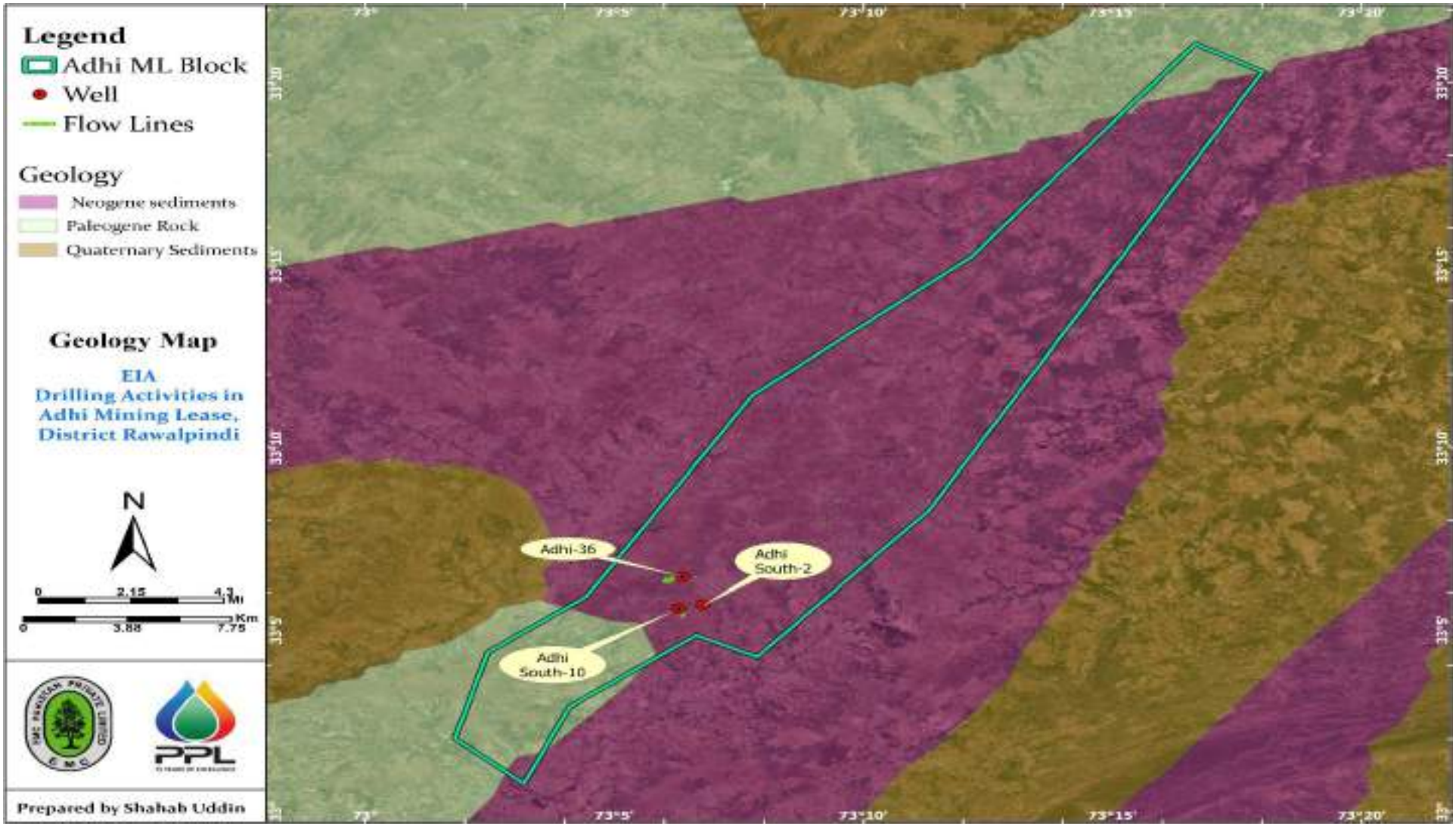


Figure 5.3: Geological Map of project area

5.6.3 Soils

Soil in the area derived from rocks in the province, as well as originates from fluvial deposits. In zones where depositional landforms are present, the surface can be: (i) without any soil development (stream beds, low islands and bars), (ii) covered with fine sand, silt and clay with a relatively high organic content and fertile soil (stream flood plains), (iii) covered with a thin layer of fine-textured soil overlying channel deposits of sand and gravel (stream and fan terraces), and (iv) covered with fertile and easy tilled soil overlying fine silt and clay deposits (loess plains). In areas where erosional landforms are present, the surface can be covered with thin sandy soil derived from weathering of the underlying rock (conglomerates of the Soan formation or Lei conglomerate, Kamlial formation). The soil in the study area varies from sandy loam to sandy clay loam, silty and loamy. The soil type of project area is Calcaric Regosols.

For establishment of the baseline, Soil samples were collected and results of the soil sampling is shown in table 5.2.

Table 5.2 :Sample Details

Sample Date:	01-09-2025		**Sample Matrix:**	**Soil Sample**	
Grab/Composite	Grab Sampling				
Locations	Near Adhi 36 wellsite 33°06'24.2"N 73°06'21.3"E Near Adhi South 10 wellsite 33° 5'34.43"N 73° 6'17.28"E				
Parameters	**Analysis Method**	**Unit**	**LOR**	**Adhi 36**	**Adhi South 10**
Electrical Conductivity	ISO 11265:1994	µS/cm	1	7.79	6.41
pH	USEPA 9045 D	-	0.01	<0.01	<0.01
Oil and Grease	USEPA 9071 B	mg/kg	0.1	0.2901	0.3211
Arsenic	USEPA 3050 B	ppm	0.01	<0.0028	<0.0028
Lead	USEPA 3050 B	ppm	0.013	0.6429	0.4971
Zinc	USEPA 3050 B	ppm	0.0033	ND	ND
Oil and Grease	USEPA 9071 B	%	0.1	0.3777	0.2555
Electrical Conductivity	ISO 11265:1994	mmhos/cm	1.0	<0.0032	0.7521
Moisture Content	In-house	%	-	1.66	1.04
Abbreviations:					
ND: Not Detected					
LOR: Limit of Reporting					
Note:					
**Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement.* *The lab environmental conditions are maintained at 25±5C° and humidity at 50±20mg/kg.* *Disclaimer: The results are solely of the sample provided.*					

Soil Sampling near Adhi 36

Soil Sampling near Adhi South 10

Figure 5.4: Soil Map of project area

5.6.4 Seismicity

The project site falls in the Punjab Plain, which has low to moderate level of seismicity. The project region has been subjected to severe shaking in the past due to earthquakes in the Himalayas. The known main active fault of the Himalayas is the Main Boundary Thrust (MBT). The epicenters of low to moderate magnitude earthquakes, recorded in the Punjab Plain are associated with the subsurface fractures in the basement rocks, which are concealed by thick alluvial deposits.

District Rawalpindi have placed in zone 2B (moderate to severe damage zone) instead of zone 2A (minor to moderate damage zone) in terms of the area's vulnerability to earthquake, according to revised seismic survey. Therefore, project area is located in seismic zone 2B, where 2B represents moderate hazard with minor possible damage.

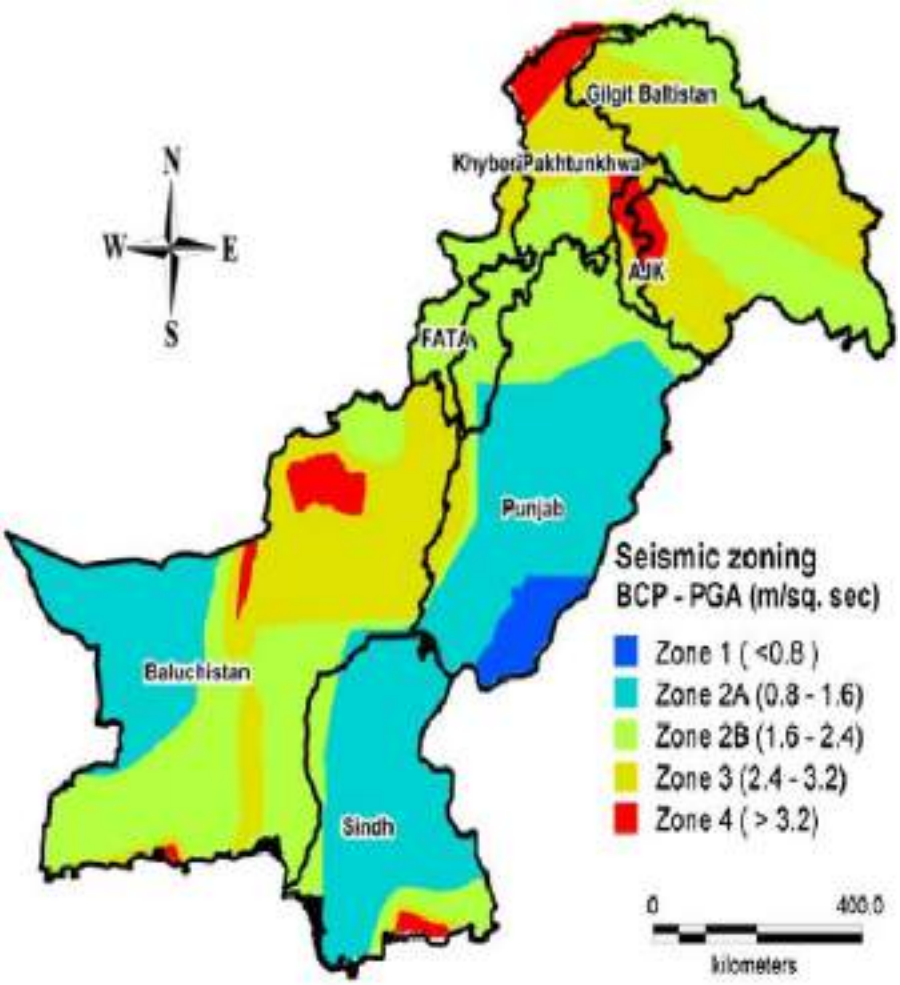


Figure 5.5: Seismic Zoning Map of Pakistan

5.6.5 Climate

Temperature

The hot season lasts for 2.8 months, from May 4 to July 31, with an average daily high temperature above 93°F. The hottest month of the year in Rawalpindi is June, with an average high of 100°F and low of 76°F.

The cool season lasts for 2.9 months, from December 4 to February 28, with an average daily high temperature below 71°F. The coldest month of the year in Rawalpindi is January, with an average low of 40°F and high of 63°F.

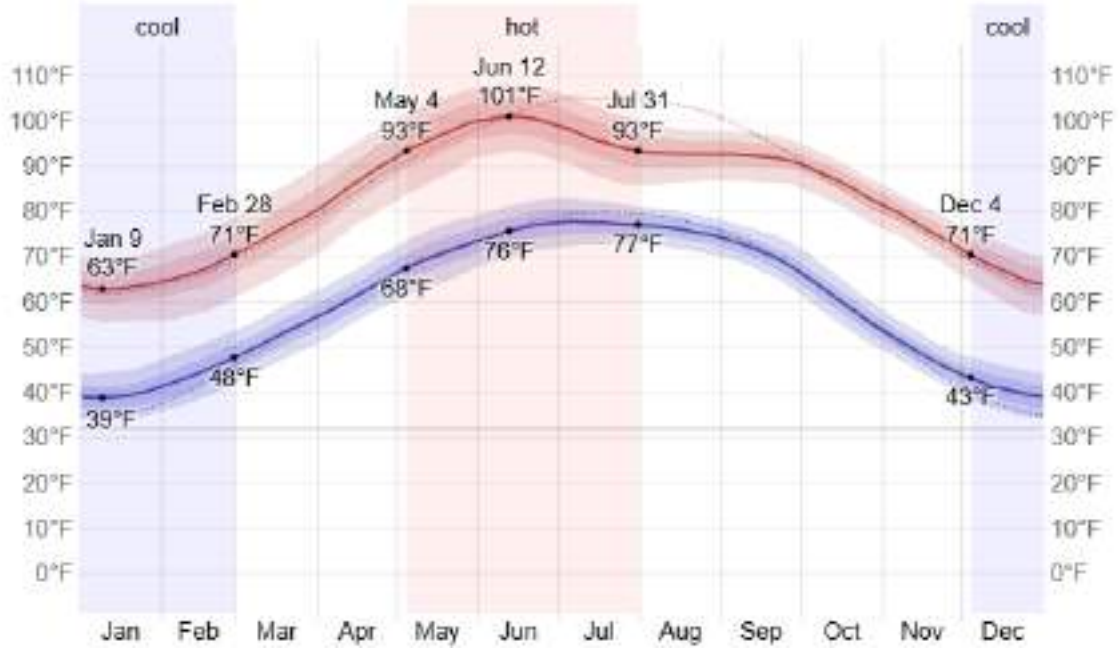


Figure 5.6a: Average High and Low Temperature in District Rawalpindi[31]

Precipitation

The wetter season lasts 2.5 months, from June 23 to September 9, with a greater than 30% chance of a given day being a wet day. The month with the most wet days in Rawalpindi is July, with an average of 15.3 days with at least 0.04 inches of precipitation.

The drier season lasts 9.5 months, from September 9 to June 23. The month with the fewest wet days in Rawalpindi is November, with an average of 1.6 days with at least 0.04 inches of precipitation.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. The month with the most days of rain alone in Rawalpindi is July, with an average of 15.3 days. Based on this categorization, the most common form of precipitation throughout the year is rain alone, with a peak probability of 55% on July 27.

[31] https://weatherspark.com/y/107754/Average-Weather-in-Rawalpindi-Pakistan-Year-Round#Figures-Temperature

Figure 5.6b: Daily Chance of Precipitation in Rawalpindi[32]

Humidity

Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night. Rawalpindi experiences extreme seasonal variation in the perceived humidity.

The muggier period of the year lasts for 3.7 months, from June 12 to October 3, during which time the comfort level is muggy, oppressive, or miserable at least 24% of the time. The month with the most muggy days in Rawalpindi is August, with 28.9 days that are muggy or worse. The least muggy day of the year is February 5, when muggy conditions are essentially unheard of.

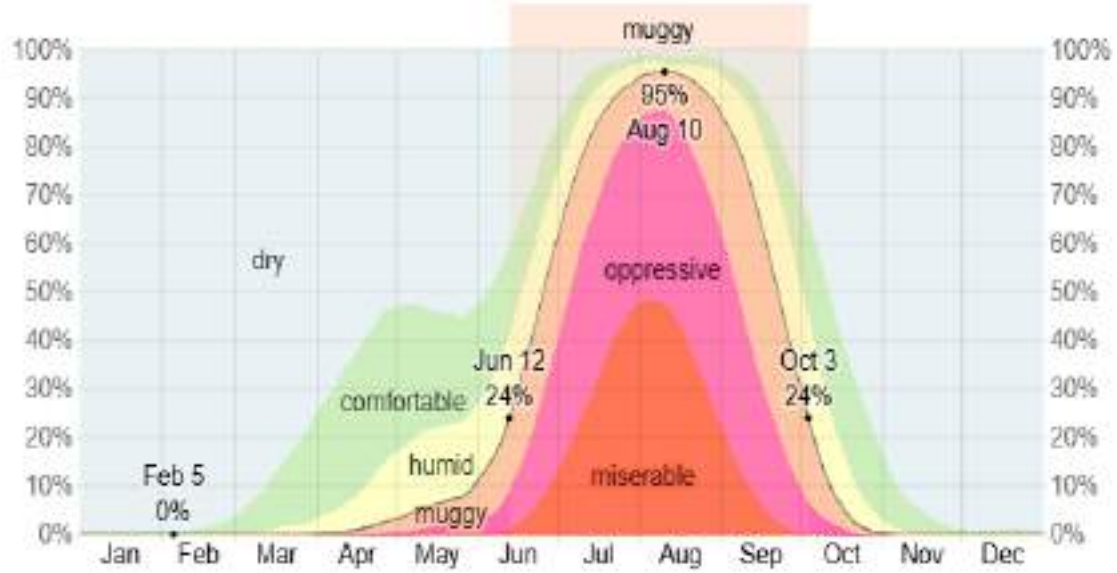


Figure 5.6c: Humidity Comfort Levels in District Rawalpindi[33]

[32] https://weatherspark.com/y/107754/Average-Weather-in-Rawalpindi-Pakistan-Year-Round#Figures-PrecipitationProbability
[33] https://weatherspark.com/y/107754/Average-Weather-in-Rawalpindi-Pakistan-Year-Round#Figures-Humidity

Wind

The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Rawalpindi experiences mild seasonal variation over the course of the year.

The windier part of the year lasts for 5.5 months, from January 12 to June 27, with average wind speeds of more than 5.2 miles per hour. The windiest month of the year in Rawalpindi is May, with an average hourly wind speed of 6.2 miles per hour.

The calmer time of year lasts for 6.5 months, from June 27 to January 12. The calmest month of the year in Rawalpindi is August, with an average hourly wind speed of 4.4 miles per hour.

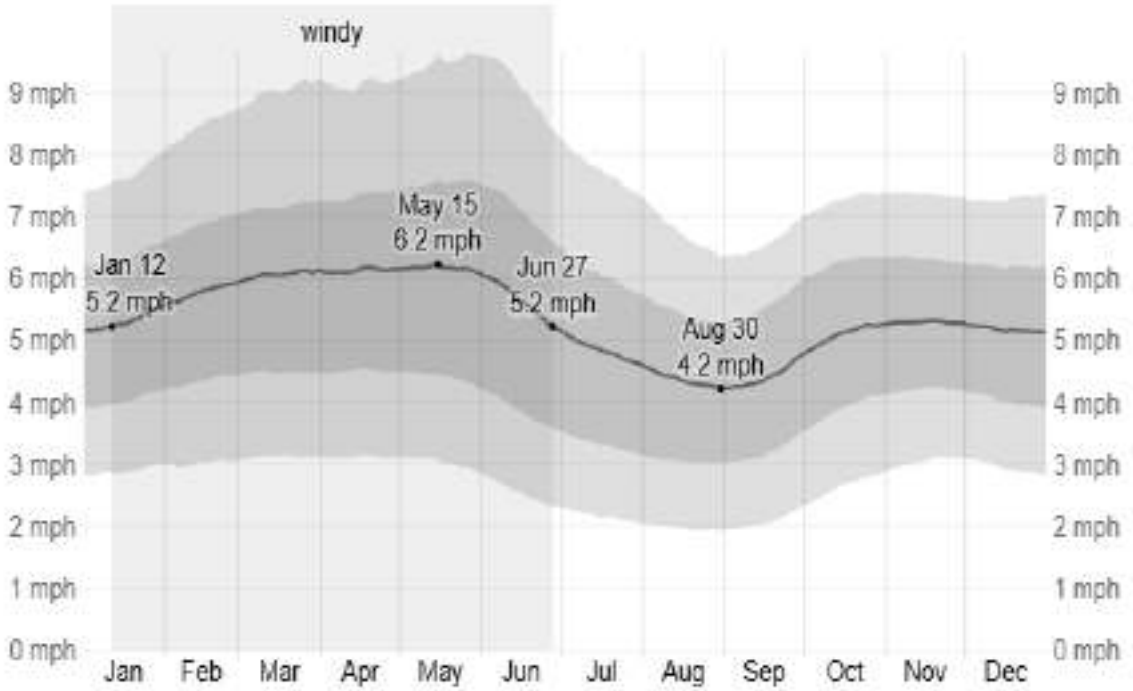


Figure 5.6d: Average Wind Speed in Rawalpindi[34]

The wind rose of district Rawalpindi shows that most of the time wind is flowing towards NNW direction.

[34] https://weatherspark.com/y/107754/Average-Weather-in-Rawalpindi-Pakistan-Year-Round#Figures-WindSpeed

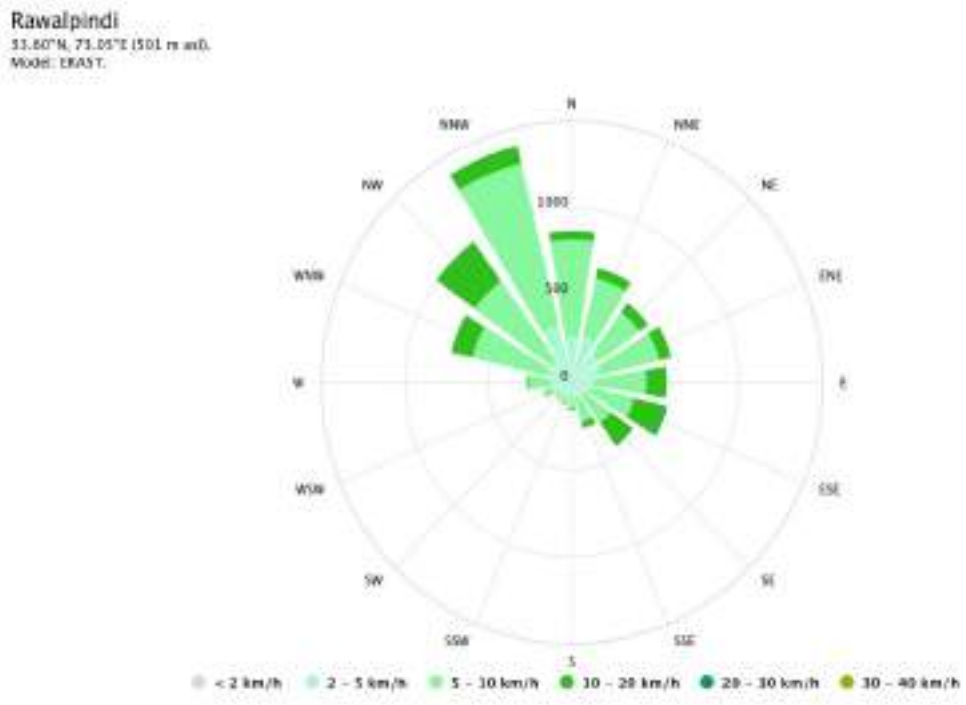


Figure 5.6e: Wind rose of District Rawalpindi[35]

5.6.6 Ambient Air Quality

Generally, the air quality in the project area is very good. However, air quality varies depending mainly on land use. The project area is agricultural, and the slash-and-burn method is commonly used. The analysis showed that $PM_{2.5}$ levels exceed the permissible limits as prescribed in PEQs. Several factors contribute to the higher concentrations of $PM_{2.5}$ such as.

- Slash and Burn methods
- Burning of the cow dung
- Fuelwood burning

Table 5.3: Ambient Air Quality near Project Sites

Monitoring Point			Project Site		
Date of Intervention			01-Sept-2025 to 02-Sept-2025		
Coordinates			33° 5'12.84"N 73° 6'39.33"E		
Parameter	**Unit**	**Monitoring Duration**	**LDL**	**Average Obtained Concentration**	**PEQS**
Nitrogen Dioxide (NO_2)	µg/m^3	24Hours	1	36.85	80
Nitrogen oxide (NO)	µg/m^3	24Hours	1	24.34	40
NO_X	µg/m^3	24Hours	1	61.20	120
Sulphur Dioxide (SO_2)	µg/m^3	24 Hours	1	21.85	120

[35] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/rawalpindi_pakistan_1166993

Carbon Monoxide (CO)	mg/m^3	08 Hours	0.01	1.46	5.0*
Ozone (O_3)	µg/m^3	1 Hours	-	27.93	130.0**
Particulate Matter (PM_{10})	µg/m^3	24 Hours	1	111.65	150
Particulate Matter ($PM_{2.5}$)	µg/m^3	24 Hours	1	34.80	35
Total Particulate Matter (TSP)	µg/m^3	24 Hours	1	181.45	500
Lead Air borne Particles	µg/m3	24 Hours	-	0.16	1.5
Abbreviations:					
LDL= Lowest Detection Limit **PEQS= Punjab Environmental Quality Standards** **(*8 hours standard for CO** ****1 hour standard for O_3)** **µg/m^3= Micrograms per Cubic Meter** **mg/m^3= Milligrams per Cubic Meter**					

5.6.7 Noise Level Monitoring

The existing site is quite calm and the noise quality of the proposed project alignment at present is within NEQS limits at day as well as at night time.

Table 5.4: Noise Monitoring

Monitoring Point	Project Site
Date of Intervention	01-Sept-2025 to 02-Sept-2025
Coordinates	33° 5'12.84"N 73° 6'39.33"E

Sr. #	Time	Method/Technique	Unit	Results	PEQS
				LA_{avg}	**(Commercial)**
Night Time					
1.	23:00	Noise Meter	dB	49.7	**65**
2.	0:00	Noise Meter	dB	45.3	
3.	1:00	Noise Meter	dB	50.3	
4.	2:00	Noise Meter	dB	47.4	
5.	3:00	Noise Meter	dB	55.8	
6.	4:00	Noise Meter	dB	47.2	
7.	5:00	Noise Meter	dB	50.3	
8.	6:00	Noise Meter	dB	47.5	
Night Time Average				**49.19**	
Day Time					

9.	7:00	Noise Meter	dB	56.1	**75**
10.	8:00	Noise Meter	dB	52.4	
11.	9:00	Noise Meter	dB	51.9	
12.	10:00	Noise Meter	dB	47.9	
13.	11:00	Noise Meter	dB	53.0	
14.	12:00	Noise Meter	dB	55.5	
15.	13:00	Noise Meter	dB	60.0	
16.	14:00	Noise Meter	dB	56.7	
17.	15:00	Noise Meter	dB	54.9	
18.	16:00	Noise Meter	dB	56.3	
19.	17:00	Noise Meter	dB	59.3	
20.	18:00	Noise Meter	dB	57.9	
21.	19:00	Noise Meter	dB	55.6	
22.	20:00	Noise Meter	dB	53.1	
23.	21:00	Noise Meter	dB	54.8	
24.	22:00	Noise Meter	dB	52.6	
Average				**54.88**	

Figure: 5.7 Ambient Air & Noise Monitoring of Project Site

5.6.8 Hydrology

The surface water quality is of great importance due to its effects on human health and aquatic ecosystems. Running water is highly vulnerable to pollution attributing to their role in carrying off the municipal and industrial wastewater and run-off from agriculture in its vast drainage basins. Anthropogenic influences, as well as natural processes, deteriorate surface water and impair their use for drinking, industrial, agricultural, recreation or other purposes. In Pakistan, due to lack of proper facilities of waste disposal only 1 % of wastewater is treated before being discharges directly into water bodies. It is general trend that concentration of different pollutants in urban areas is high as compared to suburb and natural environment, which indirectly indicates anthropogenic activities.

People in the project area need to rely on a groundwater. Groundwater is extracted through tube wells and hand pumps for domestic activities as well irrigation purpose.

A. Surface Water

The Soan and Kurang Rivers are the main streams draining the area. Their primary tributaries are the Ling River, draining northwestward into the Soan; Gumreh Kas, draining westward into the Kurang from the area between the Kurang and Soan; and Lei Nala, draining southward into the Soan from the mountain front and urban areas. The Kurang and Soan Rivers are dammed at Rawal and Sambli Lakes, respectively, to supply water for the urban area. Extensive forest reserves in the headwaters of the Kurang and Soan Rivers benefit the quality and quantity of supply. A supplemental network of municipal and private wells as deep as 200 meters (m) produces ground water primarily from Quaternary alluvial gravels. The altitude of the water table decreases from about 600 m at the foot of the Margala Hills to less than 450 m near the Soan River, so that the saturated zone generally lies 2–20 m below the natural ground surface (Ashraf and Hanif, 1980). Lei Nala carries most of the liquid waste from Rawalpindi and contributes greatly to the pollution of the Soan River below their confluence. Solid-waste disposal practices threaten the quality of ground-water reserves.

No drainage pattern exists in 500 m of the area.

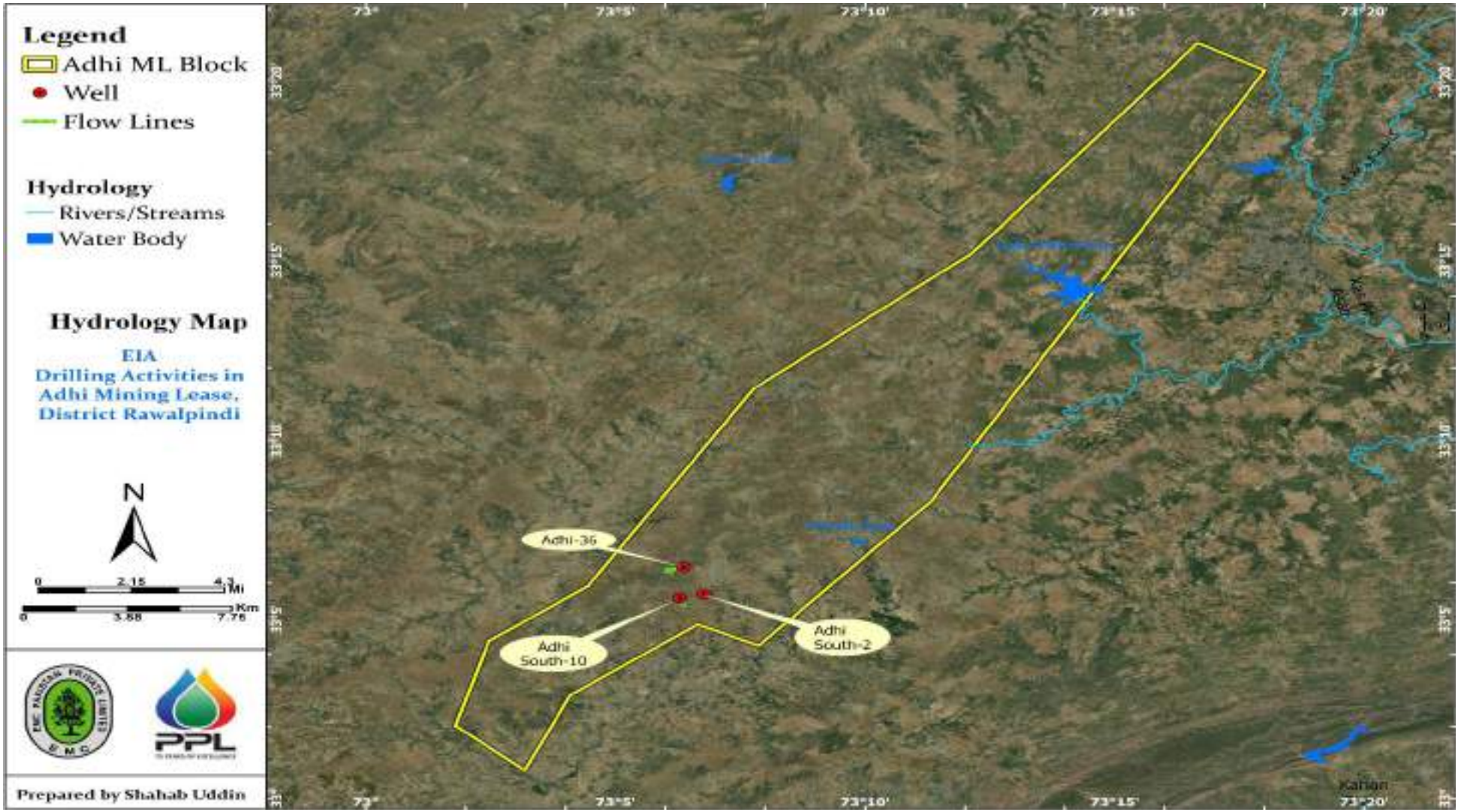


Figure 5.8: Hydrology Map of Project Area

B. Ground Water

Groundwater is abundantly available in the project area; however, the water table has declined in recent decades (Baseline Survey, 2025). At present, groundwater can generally be extracted at depths of 120–140 feet. Freshwater is available in certain parts of the villages, whereas in other locations it is not encountered until depths of up to 300 feet. In Dhoong, many households are connected to government-supplied water lines sourced from a tubewell.

Villages	Depth of Ground Water (ft)
Chechi Noor	120-140
Dhoong	120-140

Two groundwater samples were obtained from the project area for analysis. The results indicate that the sample collected is good for the drinking and meet the requirements as per PEQs. Further details on the groundwater analysis are provided in the table, and the EPD-verified laboratory test along with the validation performa are attached as **Annex II.**

Table 5.5: Groundwater Analysis of Project Area

Date of sampling: 01-09-2025

Nature of Sample: Groundwater

Location:

Sample 1: 33°06'20.8"N 73°05'42.5"E

Sample 2: 33°06'03.5"N 73°06'46.6"E

Parameters	Analysis Method	Unit	LOR	Sample 1	Sample 2	PEQS
PHYSICAL & CHEMICAL ANALYSIS						
pH	APHA-4500H^+ B	-	0.01	7.29	7.1	6.5-8.5
Odor	In-house	-	-	Odorless	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	180.0	176.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	671.0	997.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	<0.002	-
Chloride	APHA-4500Cl^- B	mg/l	0.24	70.44	140.89	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F^- D	mg/l	0.01	<0.01	<0.01	≤ 1.5

Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	<0.01	≤ 3 (P)
Nitrate	APHA-4500NO3 C	mg/l	0.1	3.8	2.4	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	<0.0008	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	ND	ND	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.008	<0.008	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	µg/l	0.1	<0.1	<0.1	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	<0.031	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.0016	<0.0016	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	<0.1	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS						
Total Coliforms	APHA:9222 B	CFU/100ml		Absent	Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	Absent	0/100ml
Abbreviations:						
ND: **Not Detected** LOR: **Limit of Reporting** PEQS: **Punjab Environmental Quality Standards**						
Note:						
**** Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.***						
Disclaimer: ***The results are solely of the sample provided. ** All starred parameters are PNAC accredited.***						

	
Ground Water Sampling (Near Adhi 36 well site)	**Ground Water Sampling (Near Adhi South 10 well site)**

5.7 Biological Environment

The flora and fauna of the areas varies with climate, rainfall, altitude and soils. The climate ranges from tropical at the base of the mountains to permanent ice and snow at the highest elevations. The amount of yearly rainfall increases from west to east along the front of the range. This diversity of climate, altitude, rainfall and soil conditions generates a variety of distinct plant and animal communities.

5.7.1 Floral Attributes of the Project Area

Flora in Rawalpindi district varies with elevation. In the upper reaches of the Murree Hills, the main tree species include deodar (Cedrus deodara), kail (Pinus wallichiana) while Chir pine (Pinus roxburghii) covers the lower hills, along with kao, or wild olive, phulai (Acacia modesta), dharek (Melia azedarach); and sanatha (Dodona viscosa). Vegetation grows for the most part in scattered clumps. At lower elevations and in the plains, the most common trees are shisham (Dalbergia sissoo), mulberry (Morus alba), dharek (Melia azedarach), phulai, (Acacia modesta), ber (Zizyphus mauritiana), pipal (Ficus religiosa), kikar (Acacia nilotica). Non-timber forest products include floral buds of the kachenar, pomegranate, blackberries, raspberries, cranberries, and wild pears. Trees are rare along the field boundaries and in cultivated areas, but stunted trees are common in the ravines. Besides coniferous and sub-tropical dry forests of the region, the Project Area fall in subtropical broad leaved evergreen scrub forest. Dominant tree species include Phulai (Acacia modesta), Wild olive (Olea ferruginea), Hopbush (Dodonaea viscosa), Black berries (Monotheca buxifolia), Reptonia buxifolia, Beri (Zizyphus mauritiana), Royle's Spike Thorn (Gymnosporia royleana), Baikarh (Adhatoda vasica), Zebrawood (Pistacia integerrima), Tecoma undulate, and Capparis decidua on drier slopes[36].

Phulahi (Acacia modesta), sufaida (Eucalptus camaldulensis), Beri (Ziziphus mauritiana), Dharek (Melia azedarach), Shisham (Dalbergia sissoo) and mulberry (Morus alba) have also been observed wildly in the project area.

The proposed Adhi-36 and Adhi South-10 sites do not contain any trees. Therefore, no tree cutting will be required during the proposed drilling, workover, or feeder line laying activities.

The detail of common vegetative species found in the Project Area are given in Table 5.6 below.

[36] https://pakistanalmanac.com/punjab-rawalpindi/?utm_source=chatgpt.com#1633497144852-f0a014d6-aded

Table 5.6: Common floral species		
Sr. No	**Botanical name**	**Local Name**
1.	Eucalyptus camaldulensis	Sufaida
2.	Ziziphus mauritiana	Beri
3.	Populous nigra	Poplar
4.	Ficus carica	Injeer
5.	Acacia modesta	Phulai
6.	Syzygium cumini	Jaman
7.	Melia azedarach	Dharek
8.	Morus alba	Mulberry
9.	Dalbergia sisso	Shisham

(Baseline Survey 2025)

Figure 5.9: Floral Diversity of Project Site

5.7.2 Faunal attributes of the Project Area

The rich biodiversity of Rawalpindi District: Wild Boars, Pangolins, Indian Hares, and Indian Porcupines. The forest also hosts the Grey Francolin, Indian Cobra, Common Krait, Russell's Viper, Monitor Lizard, as well as various tortoises and lizards, creating a rich tapestry of biodiversity in this natural sanctuary[37]. Since the project site is primarily utilized for agricultural production, the faunal species density and diversity are relatively low. Common terrestrial fauna observed in the area include jackals, rats, wild boars, Indian cobra, common krait, Russell's viper, and monitor lizard. The avifauna is represented by species such as crows, chakor, black and grey partridges, doves, and sparrows.

There are no endangered species of fauna in the tract.

5.7.3 Protected Areas

No protected area is present near 1 km of the project site.

[37] https://pwl.gop.pk/tours/rawalpindi-forest/#:~:text=The%20rich%20biodiversity%20of%20Rawalpindi,Indian%20Hares%2C%20and%20Indian%20Porcupines.

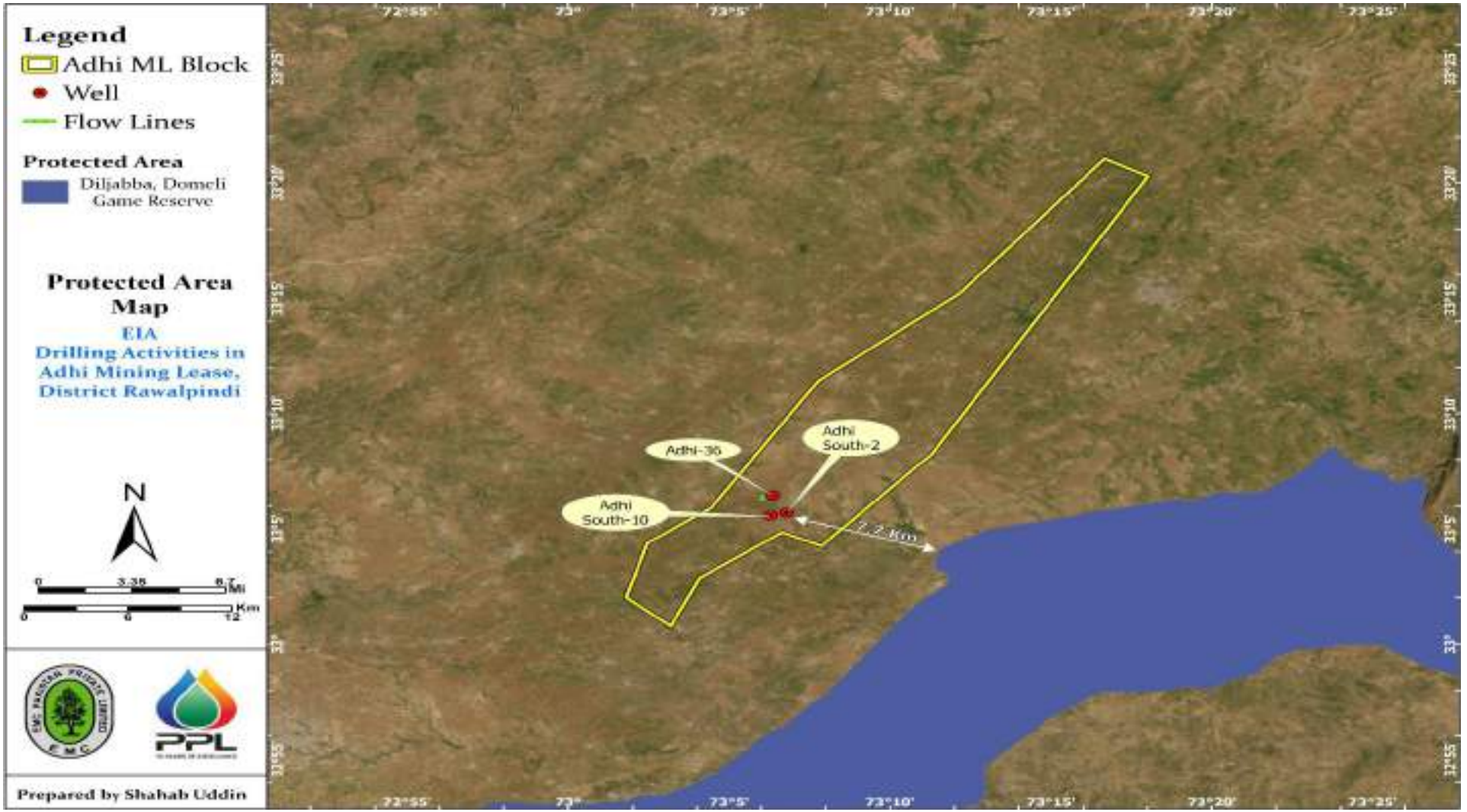


Figure 5.10: Protected Area Map

5.8 Socio- Economic Environment

5.8.1 Population

Rawalpindi Division is now an administrative division of the Punjab province. It is also the capital of the division. According to 2017 Census of Pakistan, the total population of division was 10 million. The reforms of 2000 abolished the third tier of government but the division system was restored again in 2008. The division is composed of four districts i.e., Chakwal, Attock, Jhelum and Rawalpindi[38].

District	Area (Sq. km)	Tehsils	No. of UCs	Population as per Census 2017
Rawalpindi	5,285	09	174	**611,8911**
Jhelum	3,587	04	59	**1382308**
Attock	6,857	06	71	**2170423**
Chakwal	6,525	05	71	**1734854**
Total	**22,255**	**24**	**375**	**10,007,82**

Following two villages are located within a 1-kilometer radius of the project site.

Settlements	No. of Houses	House Hold Size
Chechi Noor	150-200	6-8
Dhoong	250-300	

Source: Baseline Survey Data-2025

5.8.2 Tribes and languages

The major tribes in the Chechi Noor and Dhoong villages include Gujjar, Raja, Jat, and Syed. Punjabi is the mother tongue of the area, and the residents also have a fair understanding of Urdu.

5.8.3 Sources of livelihood

Farming is the primary source of income in the area, with livestock rearing also being common. Other livelihood options include labour, government jobs, and small businesses.

[38]https://rawalpindidivision.punjab.gov.pk/division_profile

5.8.4 Crops Grown

Wheat, pearl millet, Mustard, Maize and peanut are common crops in the project area.

5.8.5 Housing

The housing in the project area consists of semi-pakka to pakka houses, with only about 1% of the houses made of mud.

5.8.6 Road Network

A single blacktopped road runs near the project site, serving as a vital route for local residents commuting between villages and for transporting crops. In addition, a dirt access road exists in the area, connecting various wellsites of PPL in the Adhi Block, which is maintained by PPL. This dirt access track will be utilized by PPL for the mobilization of crew and equipment.


Dirt Access Road in Adhi Block

5.8.7 Mode of Transportation

The common modes of transportation in the area are motorcycles and Suzuki vans. To connect with other parts of Pakistan, locals travel to Rawalpindi City, which is approximately 35 kilometers from the project site. For the transportation of crops and vegetables, locals use donkey carts, tractor trolleys, and trucks.

5.8.8 Health

A Basic Health Unit (BHU) is located in Dhoong village, while private clinics are also available in the area.

5.8.9 Education

Boys' and girls' primary schools are located in each surveyed village.

5.8.10 Archeological and Cultural Sites

No archaeological or cultural sites have been found within 500 meters of the project sites.

5.8.11 Common Social Issues

The common social problems are

- Unemployment in the area
- Non-availability of clean drinking
- Poor Road network in area
- Proper drainage and solid waste system is absent
- Health facilities are absent in the visited villages.

6. STAKEHOLDER CONSULTATION

6.1. Overview and Objectives

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

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

6.2. Primary and Secondary Stakeholders

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

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

Table 6.1a: Primary Stakeholders

S. No.	**Stakeholder Groups**	**Stakeholders**
1	Proponent	PPL HSE team,
2	Settlements near the project area	• Dhoong • Cheechi Noor •
3	Commercial entities	• Small business such as shops, hotels

Table 6.1b: Secondary Stakeholders		
S. No.	**Stakeholder Groups**	**Department**
1	Government Departments	Environmental Protection Agency, Rawalpindi
2	Environment practitioners and experts	NUST Islamabad

6.3. Consultation Methodology

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

6.4. Consultation with Proponent

Starting from the project award to site visits, project understanding, data acquisition, report preparation, review and finalization and report submission, PPL project team and HSE team was in contact with consultant through telecoms and emails. Information was provided by the proponent regarding the proposed plans for environmental management during the project.

6.5. Consultation with Government Departments

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

Table 6.2: Departmental feedback from the concerned departments				
Sr. No	**Departments**	**Date:**	**Feedback**	
1.	EPA Rawalpindi	17-09-2025	• Local wildlife shall not be affected during the drilling activities. • Community grievances shall be addressed during the drilling phase. • Hazardous waste shall not be disposed off outside the well site. • Waste Management contractor shall be hired by the proponent • Pits shall be properly managed and restored upon the completion of work.	

6.6. Consultation with environment practitioners and experts

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

- The noise may cause disturbance in the area. Proper mitigation measures should be implemented by the project proponent.
- The project proponent must ensure that no waste is left behind after the completion of activities.
- All hazardous waste should be disposed of according to best industrial practices and EPA guidelines.

Consultation with Expert

6.7. Public Consultation

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

- Availability of clean drinking water is an issue.
- Unemployment is a serious issue in the area.
- Upgradation of the primary schools of the area.
- Well-equipped medical health center is required in the area.
- No proper waste management system is present in the area.

Written Feedback Form: Consultation with Local People
Project: EIA of Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab

Sr No	Name	Occupation	Area/Residence	Feedback	Signature
1	Hassan	Foremen	Cheehi Nian	Problem of clean drinking Water	
2	Shahwaiz	Labour	"	Loadshedding	
3	M. Hassan	Driver	"	No proper Hospital available	
4	Abdul Wahab	Labour	"	No job/work opportunities	
5	Abbass	Labour	"	No clean drinking water.	
6	M. Sardar	Private job	"	NO Hospital, Loadshedding.	
7	M Mohsin	Farmer	"		
8	Munir	Labour	"		
9	Bilal	jobless	"	No job opportunities.	
10	Shakeel	Labour	"	NO gas, Loadshedding	

Written Feedback Form: Consultation with Local People
Project: EIA of Drilling Activities in Adhi Mining Lease, District Rawalpindi, Punjab

11	Younis	Labour ~~Dhoong~~	Dhoong		
12	Ijaz Ahmad	Farmer	Dhoong		
13	Maqbool	Shopkeeper	"		
14	Noor Khan	Shopkeeper	"		
15	Arif Ali	Shopkeeper	"		
16	Naqeeb	Private job	"	No proper road infrastructure	
17	Fareed	Labour	"		
18	Murad Shah	Labour	"		
19	Imran	Shopkeeper	"		
20	Bashir	Labour	"		






Consultation with Locals

7. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section discusses the potential environmental and socioeconomic impacts that would result due to Drilling, feederlines installation & work over activities at Adhi Mining Lease, waste management (e.g. wastewater and solid waste); and restoration of sites after completion of proposed activities and suggests appropriate mitigation measures in order to reduce, overcome or compensate negative impacts associated with the proposed project.

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

7.1 Methodology for Risk Assessment

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

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

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

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

The entire screening procedure was designed in such a way so as to provide a complete assessment of the impacts on the macro-environment and microenvironment of the project. Impacts may arise during different stages of project phases which are summarized below. The process for identification of potential impact involves understanding of source of effect in relationship between an activity and environmental parameters. The impact assessment criteria is summarized in table 7.1, which as follows:

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

Table 7.2: Checklist for screening of potential environmental impact			
Screening Questions	**Yes**	**No**	**Remarks**
Project Siting **Is the project area…**			
Densely populated?		X	Moderately populated Within 1 km radius few houses of Dhoong and Cheechi Noor are situated
Heavy with development activities?		X	Oil and Gas wellsites are located in the nearby area.
Adjacent to or within any environmentally sensitive areas?		X	No sensitive areas are located near drilling and workover well sites. Settlements are situated at a safe distance from drilling and workover sites. (>500m)
Cultural heritage site		X	There are no cultural heritage sites in the project vicinity.
Protected area		X	No protected areas are located near the proposed workover well sites.
Wetland or water body		X	No wetlands are located within 500 meters of the well sites.
Estuarine		X	Not Applicable
Buffer zone of protected area		X	Not Applicable
Bay		X	Not Applicable
B. Potential environmental impacts **Will the project cause…**			
Dislocation or involuntary resettlement of people?		X	No resettlement will be required. Propsoed drilling and feedline area falls in agricultural area. No tree cutting is involved and no protected area falls within 1 km radius.
Deterioration of environmental conditions of surrounding of project site.	X		Land degradation is possible if the waste produced during the work over activities are not managed properly.
Degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?	X		Land degradation is possible if the waste produced during the work over activities are not managed properly.

Degradation of cultural property, and loss of cultural heritage?		X	Not envisaged. No such sites are found in the project area.
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Not envisaged.
Pollution of receiving waters resulting in impact on residential area, agriculture land, and land resource?	X		Runoff from the pits are possible if not managed properly.
Water resource problems (e.g. depletion / degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?	X		Project is water intensive during the drilling stage but water resource depletion is not envisaged from the project.
Air pollution due to emissions?	X		Temporary and localized impact is anticipated.
Social conflicts between construction workers from other areas and local workers?	X		Local workforce deployment for the project will reduce the risk of social conflicts. This can be further avoided by training of workers on social issues and grievance redressal mechanisms.
Noise and dust from construction activities?	X		Temporary and less significant, can be further minimized through better management practices.
Contamination of surface and ground waters due to improper waste disposal?	X		Possible if waste management is not adequately done.
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		X	The project area is not vulnerable with respect to any demographic or socioeconomic aspects.

7.2 Screening of Potential Environmental and Social Impacts from Project Location

7.2.1 Site Suitability

The project site (Adhi Mining Lease, District Rawalpindi) was allocated to Pakistan Petroleum Limited (PPL) for oil and gas exploration by the Government of Pakistan. Currently, PPL plans to undertake work drilling activities and over activities in the Adhi Mining Lease (Adhi 36 and Adhi

South 10) for the exploration of new hydrocarbon sources in the area while workover activities will be carried out at Adhi South-2 to revive the production of hydrocarbons.

The project area is characterized by sparse population, with villages situated at a safe distance (> 500m) from Adhi 36, Adhi South 10, and Adi South 02 well sites. It is a remote area with little vegetation. The new drilling sites in located in the agricultural land and no tree onsite is present in the area and is away from the communities. Consequently, the proposed project activities are not expected to pose any significant threat to the environment or human settlements.

7.2.2 Protected area and Forest lands

The project site has no protected area such as game reserve, wildlife sanctuary, national parks, archaeological sites or cultural heritage in its vicinity. There is no forest land located within the project site. Therefore, no environmental impacts are envisaged due to the siting of the Project.

7.2.3 Physical Cultural Resources

No structure of historical or cultural significance has been identified close to the well sites.

7.3 Screening of Potential Environmental and Social Impacts from Project Design

7.3.1 Drilling Activities/ Workover Activities

Drilling/ workover activities operations will be carried out using modern rigs and equipment designed to ensure efficiency, safety, and environmental protection. The drilling/ workover activities process aims to access hydrocarbon reserves in targeted formations, enabling sustainable oil and gas production. Advanced well control systems, including blowout preventers, will be employed to minimize risks associated with drilling. The design also incorporates drilling mud systems to stabilize the wellbore and manage cuttings, ensuring safe and controlled operations.

7.3.2 Feederlines Installation

Feederlines installation is planned to establish a reliable connection between the drilled wells and the existing field gathering and processing facilities. This involves trenching, pipe laying, welding, testing, and backfilling, followed by proper restoration of disturbed areas. The feederlines system will be designed to safely transport hydrocarbons while minimizing leakages and losses. Careful routing and engineering design will help reduce land disturbance, avoid sensitive habitats, and ensure structural integrity for long-term operations.

7.4 Screening of Potential Environmental and Social Impacts during construction and Drilling Works

Screening of potential environmental and socio economic an impact resulting from various activities performed in drilling and operations reveals that majority of the impacts will be temporary and will be reduced with adaptation of good industrial practices, mindful planning, design and control of operations in each phase.

Various impacts from exploration and drilling operations along with their mitigation measures are as discussed under:

7.4.1 Impacts on Land

Land related impacts are primarily associated with land disturbance, habitat destruction, soil erosion, alterations in runoff patterns, hydrological changes, project-related emissions, and sediment runoff. Many of these impacts can be minimized or completely avoided if carefully considered during the siting and design phases of the project.

This project involves drilling/workover and feederlines installation. The workover activities do not directly affect land use patterns, drilling and feederlines installation have the potential to cause significant land impacts.

Feeder lines

The depth would be 4.5 feet for the laying of the feeder lines. The feeder lines will be underground and site restoration work can adequately restore the ROW to its natural condition. Therefore, there will be no significant change in existing land use of the area from laying of proposed feeder lines.

Mitigation Measures

- During project activities, movement of vehicle/equipment will be restricted to work areas only to avoid unnecessary disturbance of soils in the project area.
- Access tracks (other than the main access track for the project) to be used by water tankers, dumper trucks and other vehicles shall be monitored by the PPL construction and drilling Department.
- Vehicle speed will be regulated and monitored to avoid excessive dust emissions.
- Stream crossings, when built, shall be such that the slopes of the stream bank are properly adjusted and compacted resulting in a stabilized and sealed surface.
- Photographs will be taken at intervals throughout the project activities to monitor any changes in soil and its conditions.
- Good engineering practices will be adopted during construction activities to ensure that unnecessary clearing of vegetation and disturbance to soils outside work areas are avoided.
- Septic tank and soak pit for disposal of black water and separate soak for disposal of grey water will be constructed/ refurbished.
- Septic Tank shall have concrete construction such that wastewater will not infiltrate into the ground. Septic tank will be provided with inlet and outlet baffle plates.
- Excess grey water from soak pits can be sprinkled provided that it is meeting PEQS limits.
- Wastewater from septic tank and soak pit can be disposed off into nearest municipal drain after taking written approval from TMA/ relevant authority and ensuring quality of wastewater meeting PEQS standards. Dispose wastewater in an environment friendly manner.
- Remove wastewater from septic tank and restore it after dismantling in place (top roof and at least 1 meter wall or more if easily possible) and backfilling with at least 1 meter of soil cover.
- Restore soak pit / holding tank after removal of wastewater & cover and backfilling it with at least 1 meter of soil cover.

- Concrete structure can be disposed of after broken down into nonporous septic tank (below main rooting zone, 1 - 1.5 m).
- Contaminated bricks of black/grey water & others shall not be given to locals for any purpose.
- During construction/refurbishment of well sites and campsite, minimize the alteration to the landscape and disturbance to soil to be ensured.
- The dirt access track shall be properly compacted during the crew and machinery movement and thereafter properly maintained by watering and compaction (where required) throughout the entire construction and drilling operations.
- During construction/refurbishment phase, a single track shall be identified and approved along sections of the main track on which work is in progress. Vehicles shall be allowed to travel only on the approved track.
- Where improvement of existing tracks or development of short lengths of new tracks is unavoidable the width of the access track will not exceed 9-10 meters.
- During construction /refurbishment stage, gravel should not be dumped on or close to the access track being improved or constructed such that it causes hindrance in the movement of vehicles and pedestrians.
- Backfill trenches and restore land contours after feederlines installation.
- Reuse stored topsoil to restore natural vegetation.
- Maintain records of land use changes and rehabilitation progress.

7.4.2 Soil and Water contamination from spills

Fuel or oil stains, leakage or spill during exploration activities can result in contamination of soil and water. The significance of impact is moderate and can be avoided by adopting suggested mitigation measures. From a management perspective these have been categorized as minor, moderate or major and detailed below along with the recommended mitigation measures.

- **Minor Spills:** Leaks from vehicles, equipment, or storage containers at campsites or work areas outside the campsite or oil or fuel stains produced during handling and transfer operations such that the area and depth of soil contaminated is less than 1 square meter and 0.3 m respectively.
- **Moderate Spills:** Oil spills during transfer or handling operations resulting in spillage of no more than 200 liters of fuel or oil.
- **Major Spills:** These may occur during transportation of oil to the camp sites or failure of the oil containment arrangement at the camp sites resulting in spillage of oil significantly more than 200 liters in volume.

  At a given time and location of the project, activities will be undertaken in a confined area of land demarcated by fences/fringes. During the proposed project activities, there is a possibility of

  a) Soil contamination through oil spills and other chemical spills like solvents etc.

b) Water contamination by the runoff from project site which takes away the traces of oil, chemicals or other drilling waste thus contaminating the receiving water bodies mainly the water streams.

Hydro testing water

Hydrotesting (or hydrostatic testing) is the most common method for testing the integrity of the pipelines and checking for any potential leaks (e.g., from faulty welds or cracked pipes) prior to commissioning. The test involves filling water inside the pipelines at a certain pressure to check that the pipelines is not damaged and will not leak during operation. The water used in hydrotesting may be contaminated with oil and grease content, debris, paint or pipes coating material or any other chemical used during the test. Therefore, this water is source of soil and water contamination and handling and disposal of this wastewater must be done with great care.

Mitigation Measures

- Develop a spill prevention and response plan for addressing storage locations of hazardous wastes, spill prevention measures, training requirements, waste-specific spill response actions, spill response kits.
- Provide secondary containment around all the fuel storage tanks and chemical storage area of suitable size (110% of the storage area / largest tank capacity). Fuel storage should be a temporary activity and fuel storage facilities should be removed upon completion of the required activities.
- Document accidental releases so that corrective actions may be taken.
- Vehicles will only be washed in designated areas within campsites.
- Vehicles will be daily checked for fuel or oil leaks. Vehicles with leaks will not be operated until repaired.
- Fuel and oil storage areas will have secondary containment in the form of cemented or brick masonry bunds with plastered. The volume of the containment area will be equal to at least 110 % of the total volume of fuel / oil stored or 110% of the volume of one largest tank.
- All fuel tanks will be properly marked to highlight their contents.
- Fuel tanks will be daily checked for leaks and all such leaks will be plugged immediately.
- Liquid chemicals used during the drilling operation will be stored on brick masonry pads with plastered and contained with bunds.
- The soil contaminated from spills will be collected and handed over to EPA approved waste contractor for disposal.
- Shovels, plastic bags and absorbent material will be present near fuel and oil storage or handling areas to attend spills and leaks.
- Used oil shall be provided to OGRA reclamation license holder Lubricant Recycler for reclamation/recycle. Other option is to dispose of the used oil through EPA approved waste contractor.
- Vehicles related waste (excluding hazardous waste) will be transported / handed over to local contractors for recycling approved by the PPL HSE.

- The produced formation fluid will be disposed-of according to the environmentally sound practice. Completion brine is collected in flare pit (made of brick masonry with plastered) for disposal by natural evaporation. Whereas crude oil is collected in storage tanks then transported to nearby operating facility for further processing at Plant. Moreover, formation water, produced during testing, drained into pit provided with impermeable membrane lining for disposal by evaporation.
- Restore flare pit in an environmentally friendly manner.
- Disposal options for produced water / formation water produced during hydrocarbon production may include injection into the reservoir to enhance oil recovery, or injection into a dedicated disposal well drilled to a suitable receiving subsurface geological formation.
- If reinjection of produced water is not possible then it should be collected in dedicated evaporation pits for natural evaporation and salt cakes (if any) left behind is disposed off through Punjab EPA approved waste contractor.
- Flare pit will be located not less than 90 meters horizontally crosswind or downwind from any source of inflammable gas and vapor.
- The drill cuttings and water-based mud will be disposed into a pit lined with an impermeable geo-membrane. The pit will be of larger than the required capacity to accommodate emergency flows.
- At the time of restoration, the pit will be backfilled with the cuttings encapsulated within the liner and with a topsoil cover.
- In case the drilling mud pit is an agricultural land, the drilling mud should be disposed of as per the applicable and relevant guidelines of LSO 29 B.
- Hydrostatic test water quality should be monitored before discharge (if discharges into any water bodies / nallahs). If water quality is exceeding PEQS limits for effluents then it should be treated to comply with PEQS. Wastewater disposal to local nallah will only be carried out after taken approval from relevant authority / TMA.
- It will be ensured that the used water from hydrotesting is not discharged in nearby canals or other surface water body without meeting the PEQs standards for inland discharges.

7.4.3 Impact from Noise

The primary impacts of noise pollution arising from drilling/ workover, feederlines installation activities would include localized disturbance to wildlife, nearby residents, and recreationists. Major sources of noise during these activities include heavy construction equipment (such as bulldozers, excavators, drill rigs, and diesel engines), as well as vehicular traffic associated with material transport and site operations. Although noise levels would be elevated during active phases, the impacts are expected to remain confined to the immediate vicinity of the project sites and along access routes.

Feeder lines

Major source of noise during feeder lines laying activities include crane used for lifting and lowering of pipes, vehicle used for ground leveling, excavator, trucks used for material transportation etc.

Therefore, mitigation measures have been recommended below for the protection of workers and locals of the project area. The project area has no residential area in close vicinity to the ROW.

Mitigation Measures

- Position all stationary sound-generating equipment (i.e. pumps and generators) as far as possible from nearby residences and other sensitive receptors.
- Whenever feasible, schedule diverse noisy activities (e.g. during refurbishment of sites to occur at the same time, since less-frequent noisy activities would be less irritating than frequent less-noisy activities.
- Schedule all high noise activities to be conducted during daytime i.e. between 6 am to 10 pm when working inside and near the residential area.
- All equipment should have sound-control devices.
- Route heavy truck traffic away from residences and other sensitive receptors.
- It shall be ensured that generators, vehicles and other potentially noisy equipment used are kept in good condition.
- Noise levels at communities nearest to the well site, campsites / housing site and access tracks shall be monitored by Contractor. In case these are found to exceed safe acceptable limits appropriate mitigation shall be taken.
- The use of pressure horns shall not be allowed.
- Movement of all project and personnel vehicles shall be restricted within work areas.
- Generators will be kept within enclosures to minimize dispersion of noise.
- In areas with higher noise levels or longer shifts, use of ear plugs and earmuffs will be ensured among the workers.

7.4.4 Impact on Ambient Air Quality

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

Emissions generated during the drilling/ workover activities & feederlines installation, are expected to arise from multiple sources and processes.

Feeder lines

Major source of noise during feeder lines laying activities include crane used for lifting and lowering of pipes, vehicle used for ground leveling, excavator, trucks used for material transportation etc.

Therefore, mitigation measures have been recommended below for the protection of workers and locals of the project area. The project area has no residential area in close vicinity to the ROW.

Vehicle and Equipment Emissions

Movement of vehicles and the use of heavy machinery (e.g., bulldozers, excavators, cranes, and drill rigs) will result in emissions of nitrogen oxides (NOx), carbon monoxide (CO), sulfur oxides (SOx), particulate matter (PM), and volatile organic compounds (VOCs). Diesel-powered generators and compressors used on-site will further contribute to localized air pollution.

Fuel Storage and Handling

Emissions may also be released during storage, transfer, and dispensing of fuels. Fugitive releases of hydrocarbons can occur from evaporation losses or accidental spills, while poorly maintained equipment can increase emission rates.

Drilling Operations

Drilling activities may generate localized emissions from the combustion of fuels used to power rigs, pumps, and auxiliary machinery. If flare stacks are installed during this stage, additional emissions of carbon dioxide (CO_2), methane (CH_4), NOx, and particulates will be released into the atmosphere.

Feederlines Installation

Excavation, trenching, backfilling, and welding during feederlines installation will generate exhaust emissions from machinery and vehicles. Dust generation will be significant during clearing, grading, and soil handling activities, particularly in dry and windy conditions.

Dust and Particulate Matter

Substantial dust emissions will result from site preparation, land clearing, soil excavation, grading, trenching, backfilling, concrete mixing, and the continuous movement of trucks and equipment. Dust can reduce local air quality and may cause nuisance to nearby communities and ecological receptors.

Cumulative Impacts

Collectively, these activities will contribute to short-term air quality degradation. However, the impacts are expected to be temporary and localized, primarily confined to the immediate project site and along access routes. With appropriate management practices, the intensity and duration of these impacts can be minimized.

Mitigation Measures

- Ensure all construction equipment and vehicles are properly maintained and regularly serviced to minimize exhaust emissions.
- Use low-sulfur diesel and other cleaner fuels where available.
- Prohibit unnecessary idling of vehicles and equipment.
- Store fuels in designated, contained areas with spill-proof facilities.

- Ensure proper labeling, handling, and transfer procedures to prevent leaks and fugitive emissions.
- Provide spill kits and secondary containment at all storage and dispensing points.
- Optimize drilling rig operations to minimize fuel consumption and emissions.
- If flare stacks are used:
    - Employ low-emission flaring technologies.
    - Restrict flaring to emergency or unavoidable operational situations.
    - Monitor emissions regularly to ensure compliance with standards.
- Use well-maintained machinery during trenching, welding, and backfilling to reduce combustion emissions.
- Reuse excavated material where possible to minimize transport-related emissions.
- Sprinkle water on unpaved roads, excavation sites, and stockpiles during dry/windy conditions.
- Cover soil, sand, and other fine material stockpiles with tarpaulin or vegetation.
- Enforce speed limits for vehicles moving on unpaved roads to minimize dust.
- Cover trucks transporting loose construction material to prevent dust dispersion.
- Schedule earthworks and concrete mixing activities to avoid excessively windy conditions.
- Burning of waste and combustible material at the project site will be strictly prohibited.
- Establish green buffers or temporary barriers around high-dust generating areas near sensitive receptors (e.g., villages, agricultural land).
- During operation phase, emissions from all point sources should be monitored to check compliance with PEQS.
- Dust emissions during construction activities should be minimized by good management practices such as locating stock piles out of the wind direction, keeping the height of the stock piles to a minimum, keeping earthwork areas damp etc.
- Train workers to handle construction materials and debris during construction and dismantlement to reduce fugitive emissions.
- Keep soil loads below the freeboard of the truck.
- Well site and Campsites will be located at safe distance away from major residential communities.
- During construction, leveling or widening (for the access road and feeder lines ROW) will be done in sections, immediately followed by sprinkling of water and also preferably compaction (where required).

7.4.5 Impacts on water resources

Extraction of water for drilling/ workover activities and feederlines testing, has the potential to temporarily affect groundwater availability in the project area. Increased water abstraction during

these activities may reduce the volume of groundwater available for surrounding communities who rely on local wells and boreholes for domestic purposes. However, these impacts are expected to be short-term and will not significantly affect the long-term availability of the area's water resources.

Human settlements are present in the surroundings of the project sites, including along the feeder line route, where local communities depend on groundwater for drinking, cooking, washing, and other daily needs. Recognizing this, the project proponent (PPL or its contractors) will outsource/procure the required water from local well owners, with supply and transportation managed through water bowsers. Strict measures will be adopted to ensure that project-related water consumption does not compromise the availability of water for community use.

Mitigation Measures

- Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structures etc.).
- Use special construction techniques in areas of steep slopes, erodible soils and stream crossings.
- Construct drainage ditches only where necessary. Use appropriate structures at culvert outlets to prevent erosion.
- Do not alter or restrict existing drainage systems, especially in sensitive areas such as erodible soils or steep slopes. Cross water bodies at right angles to the channel and/or at points of minimum impact.
- Apply erosion controls relative to possible soil erosion from vehicular movement and during construction activities. The purpose is to retain the soil on disturbed land, such as a construction site, until the activities disturbing the land are sufficiently completed to allow revegetation and permanent soil stabilization to begin.
- Regularly monitor rights-of-way (ROWs), access roads, and other project areas for indications of erosion.
- Use drip pans during refueling to contain accidental releases.
- Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer.
- Reestablish the original grade and drainage pattern to the extent practicable.
- Restore the banks of water bodies to their natural condition as far as possible.
- Ensure that casing is installed from surface to a depth deeper than the target depth to protect the underground water source from contamination with produced water.

7.4.6 Blockage of Natural Drainage

Blockage or disruption of natural drainage patterns may occur during drilling/ workover activities & feederlines installation,. At drilling sites, site leveling, excavation, and construction of mud pits can impede natural runoff. During feederlines installation, trenching, soil stockpiling, and access road construction may obstruct or divert surface drainage channels. Similarly, the establishment of campsites and temporary facilities for workover operations can restrict natural water flow and create

localized waterlogging. Such blockages, if not properly managed, can alter natural hydrology, increase soil erosion, and inconvenience surrounding communities.

Mitigation Measures

- Avoid siting drilling pads, feederlines routes, or campsites on natural drainage channels.
- Provide culverts or cross-drainage structures where feederliness or access roads intersect drains.
- Keep excavated soil and construction material away from water channels.
- Reinstate natural land contours and drainage paths after trenching or drilling.
- Install proper storm water drains around campsites and drilling/workover sites.
- Regularly inspect and clear drains to prevent blockages.
- Prohibit dumping of waste or spoil in natural watercourses.

7.4.7 Impact on Ecology

Potential impacts on ecology from drilling/ workover activities & feederlines laying include disturbance and damage to natural vegetation and wildlife habitats. These may occur due to removal of food and shelter sources, generation of waste, noise and vibrations from machinery, site illumination, human influx, and increased transportation. Such activities can disrupt local wildlife, with small mammals, birds, and reptiles being forced to relocate due to habitat disturbance, destruction of burrows and nests, or indirect stress from noise and vibration caused by heavy equipment and vehicular movement.

Impacts on natural vegetation may arise from dust deposition on crops and plants, spread of invasive and noxious weeds through soil movement, and an elevated risk of accidental fires. However, as the project area is predominantly agricultural land with low levels of natural vegetation, the scale and magnitude of ecological impacts are expected to remain low. These impacts can be further minimized through the effective implementation of the Environmental Management Plan (EMP).

Mitigation Measures

- Clearing of vegetation will be minimized by keeping the road width to 9 to 10 m (except at bends where greater width will be required for safety reasons), and by keeping the length of new sections of the road to a minimum.
- Off-road travel, required at sections of the road where construction work is in progress, will be minimized and if required will be allowed only after approval from PPL Site Management
- During construction/refurbishment good management practices will be adopted to avoid disturbance to areas adjacent to work areas including the access track, well site and camp sites.
- Well site and campsite areas will be kept to a minimum.
- Camp sites established for the purpose of construction will be located in existing clear /open land if possible. Vegetation clearing from these sites will be kept to a minimum.
- Cuttings of trees will be avoided.
- Use of local vegetation as fuel will not be allowed.

- Prior to commencement of construction and drilling operations, awareness trainings will be provided to contractor's management and field crew on matters related to the wildlife protection.
- The total duration of construction/refurbishment and drilling will be minimized by good management.
- All mitigation measures to minimize noise levels, dust emissions, air emissions and waste management required by the EIA will be adhered to.
- Food wastes will not be disposed of in the open area. Food wastes collected in waste segregation units will be buried on site or disposed off through waste contractor.
- Construction work near areas which show small mammal and reptile populations will commence after a soft start up and will be randomly monitored.
- Vehicle speeds on access road will be controlled to avoid incidental mortalities of reptiles. Any such incident will be reported to the PPL Site Management. Vehicle speeds will be randomly checked.
- Cuttings of trees will be avoided. Where it is necessary to cut down trees in government land, relevant department will be taken on board before cutting of trees. In case of private land, compensation will be paid to land owner.
- Movement of all project personnel will be restricted to work areas.
- Movement of project vehicles will be restricted only to the project access road or to routes approved by the PPL Site Management
- Light used at the well site and camp site will be kept to the minimum requirement
- Hunting and trapping of wildlife will be prohibited.
- Feeding or harassment of wildlife will not be allowed
- Restoration and rehabilitation of site will be done once construction is completed.

7.4.8 Impacts due to Hazardous Materials and solid Waste Generated

Solid and industrial wastes will be generated during drilling, feederlines installation, and workover activities. The majority of solid waste is expected to be non-hazardous, including packaging materials, containers, food wrappers, scraps from construction crews, woody vegetation from site clearance, and general domestic waste.

Industrial wastes will include minor quantities of paints, coatings, sandblast media, scrap metals, and spent or unused solvents. Drilling-related wastes are more significant and may include hydraulic fluids, pipe dope, used oils and oil filters, rig wash, spilled fuel, drill cuttings, drilling mud residues, chemical containers, and garbage. These materials may contain oil derivatives (e.g., polycyclic aromatic hydrocarbons—PAHs), suspended and dissolved solids, phenols, and heavy metals such as cadmium, chromium, copper, lead, mercury, and nickel, as well as drilling mud additives (including chromates and barite). If improperly handled, such wastes can pose risks of soil and water contamination, as well as occupational health hazards.

Produced water, which is water that coexists with oil and gas in the formation, may be generated during drilling and well development. Although it generally becomes a larger management concern during long-term operation of an oil or gas field (as water production typically increases with the age

of wells), its generation during development must also be carefully managed. Produced water may contain hydrocarbons, salts, metals, and chemical additives, making it potentially harmful to both the environment and human health if discharged without treatment.

In certain geological locations, produced water may also contain Naturally Occurring Radioactive Materials (NORM), primarily radium-226, radium-228, and their decay products. While much of this material is dissolved in the water, some may precipitate and accumulate as solid scales or sludge in pipelines and storage vessels. Improper management of NORM-bearing wastes can lead to occupational exposure risks, public health concerns, and long-term environmental contamination. Although NORM issues are more common during the operational phase of oil and gas production, they may also arise during the drilling and development stage, requiring strict monitoring and control.

Mitigation Measures

- Prepare a comprehensive list of all hazardous materials to be used, stored, transported and disposed of during all phases of activity.
- Develop a waste management plan identifying anticipated solid and liquid waste streams and addressing determination, inspection and waste minimization procedures, storage locations and waste-specific management and disposal requirements.
- Include a recycling strategy to be practiced by workers during all project phases.
- Develop a spill prevention and response plan for addressing all spill prevention measures, training requirements, waste-specific spill response actions, spill response kits.
- The storm water shall be diverted away from the well sites to prevent it from coming into contact with onsite equipment and pits, ensuring it is directed outside without contamination.
- Train employees to promptly contain, report and/or clean up any oil or hazardous material spill.
- Provide secondary containment around all the fuel storage tanks and chemical storage area of suitable size (110% of the fuel storage area/ largest tank capacity). Fuel storage should be a temporary activity and fuel storage facilities should be removed upon completion of the required activities
- Containerize and periodically remove wastes for disposal at appropriate off-site permitted disposal facilities. The goal would be to minimize the amount of hazardous materials and waste onsite.

7.4.9 Impacts from Waste and Effluent Management

Waste and effluents generated during drilling, feederlines installation, and workover activities will include domestic waste, drill cuttings, produced water, medical waste, contaminated soil from spills, and other construction-related wastes. Improper handling can contaminate soil and water resources, pose health hazards, and degrade the aesthetic quality of the area. Waste management will be carried out on site by PPL and its contractors, with hazardous waste handled through EPA-approved contractors. The overall impact is considered moderate and can be effectively avoided through proper implementation of recommended mitigation measures.

Mitigation Measures

- PPL, construction and drilling contractor will be responsible for the handling of the waste.

- The waste management activities will be monitored on daily basis.
- Record of all waste generation, storage and removal from site will be maintained.
- Any non-compliance related to waste management will be immediately addressed.

7.4.10 Impacts on Occupational /Community Health and Safety

The drilling, feederlines installation, and workover activities involve complex operations, heavy machinery, and hazardous materials, all of which pose potential risks to workers and, indirectly, to surrounding communities. Key impacts include:

Drilling /workover activities

Exposure to Hazardous Substances: Workers may come into contact with drilling fluids, cuttings, hydrocarbons, and chemicals (e.g., barite, chromates, solvents) that can cause skin irritation, respiratory problems, or long-term health issues.

Accidents from Heavy Equipment: Operation of drill rigs, cranes, and lifting devices presents risks of falls, crush injuries, and entanglement.

Fire and Explosion Risks: The presence of flammable gases, fuels, and drilling mud increases the potential for well blowouts, fires, and explosions.

Noise and Vibration: Prolonged exposure to high noise levels from drilling rigs, generators, and compressors can result in hearing impairment and stress.

Ergonomic Hazards: Manual handling of heavy tools and repetitive tasks may lead to musculoskeletal injuries.

Feederlines Installation Activities

Trenching and Excavation Risks: Workers are exposed to hazards of trench collapses, falling into open excavations, and injuries during backfilling.

Vehicular and Transportation Hazards: Increased movement of trucks and heavy machinery along access roads can lead to accidents involving both workers and nearby communities.

Dust and Airborne Particulates: Soil excavation, grading, and backfilling can generate dust, potentially causing respiratory issues if protective equipment is not used.

Welding and Hot Work Risks: Feederlines welding exposes workers to burns, fumes, eye damage, and fire hazards if safety protocols are not followed.

Weather-Related Risks: Outdoor work under extreme heat or cold conditions can result in heat stress, dehydration, or cold stress.

Mitigation Measures

- Use blowout preventers (BOPs) and gas detection systems to prevent well blowouts.
- Provide hearing protection for workers exposed to continuous rig noise.
- Ensure proper handling and storage of drilling muds, cuttings, and chemicals to avoid exposure.
- Regular inspection and maintenance of lifting and hoisting equipment.
- Enforce use of PPE (helmets, gloves, goggles, flame-resistant clothing).

- Protect workers from trench collapses through shoring, shielding, or safe sloping.
- Provide welding PPE (face shields, gloves, fume masks) during pipeline welding.
- Enforce traffic safety measures for heavy vehicle movement near work zones.
- Control dust generation from excavation and vehicle movement by sprinkling water.
- Regular safety checks of hoisting and hydraulic systems.
- Use closed-loop systems to limit exposure to workover fluids and produced water.
- Ensure adequate illumination for night operations.
- Strict enforcement of PPE (coveralls, gloves, goggles, helmets).
- Restrict unauthorized entry to work sites with barriers and warning signs.
- Maintain speed limits for project vehicles in community areas.
- Schedule transport of heavy machinery/materials during off-peak community hours.

7.5 Emergency Scenarios

Earthquake

The Geological Survey of Pakistan classifies the project area as Seismic Zone 2B, which indicates a low to moderate seismic hazard. This means that while the area is considered a low-risk zone for earthquakes, the potential for seismic activity cannot be completely ruled out.

Mitigation Measures

- Design of project units and layout in line with requirements of Seismic Zone 2B.
- Implementation of Emergency response plan.

Fire and Explosion Hazard

Fire is a major hazard associated with drilling operations due to the use and storage of flammable materials. To minimize the risk of potential loss of life and property, it is essential to ensure careful planning and strict implementation of fire safety measures.

Mitigation Measures

- Regular inspection of project activities to detect hazard of fire.
- Placement of fire suppression and control system across project site.
- Potential impacts due to fire and explosion will be minimized through use of leak detection systems and a fire extinguisher system consistent with international guidelines
- Control Systems and Operational Procedures will be in place to minimize the potential for a fire or explosion and the resultant impacts to the operation, population and personnel.

7.6 Impact on Social Environment

Potential social impacts from project activities include:

- Impacts on living areas during transportation
- Potential positive impact from social uplift of area in case of discovery

- Positive impacts from employment and CSR opportunities
- Impacts from resource sharing

Mitigation Measures

- Social liaison with local communities prior to and during the project activities.
- Careful planning and execution of activities of project activities to prevent any possible negative impact on local communities.
- Implementation of EMP

7.7 Potential Impacts during Commissioning of Feeder lines

Succeeding completion of construction work, feeder lines commissioning will be carried out to check whether pipelines and associated facilities are complete in all respect. Activities performed during commissioning would include:

- Hydrotesting of feeder lines
- Flushing and cleaning of feeder lines
- System dry-out
- Inerting

During commissioning activities, the main environmental concerns pertain to:

- Water sourcing
- Disposal of Wastewater from hydrotesting
- Noise
- Vehicular Emissions

7.7.1 Water sourcing and Wastewater from Hydrostatic Testing

It is estimated that 25,000 liters of water would be required for hydrostatic testing of the feederliness. The water procurement will be arranged from local resources to ensure uninterrupted operation.

Hydrotesting (or hydrostatic testing) is the most common method for testing the integrity of the pipelines and checking for any potential leaks (e.g., from faulty welds or cracked pipes) prior to commissioning. The test involves placing water inside the pipelines at a certain pressure to check that the pipeline is not damaged and will not leak during operation. After hydrostatic testing the pipelines is dewatered and dried.

Following guidelines for Hydrostatic Testing should be implemented:

- Water sourcing for hydrotesting purposes should not adversely affect the water level or flow rate of a natural water body, and the test water withdrawal rate (or volume) should not exceed 50 percent of the water source.
- The disposal options for test waters following hydrotesting include (1) injection into a disposal well if one is available or (2) collection in lined pit for natural evaporation or (3) discharge into natural drainage.

- If a disposal well is unavailable and discharge to surface waters or land surface is necessary, the following pollution prevention and control measures should be considered:
    - If chemical use is necessary, carefully select chemical additives in terms of dose concentration, toxicity, biodegradability, bioavailability and bioaccumulation potential;
    - Hydrostatic test water quality should be monitored before discharge (if discharges into any water bodies / nallahs). If water quality is exceeding PEQS limits for effluents then it should be treated to comply with PEQS. Wastewater disposal to local nallah will only be carried out after taken approval from relevant authority / TMA.

Mitigation Measures

The water procurement will be arranged from local resources to ensure uninterrupted operation. It is planned to carefully select chemical additives in terms of dose concentration, toxicity, biodegradability, bioavailability and bioaccumulation potential will be added to the hydrotesting water. Hence, after hydrotesting water can be safely disposed of without treatment. Other measures that will be adopted in this regard include the following:

- Water source will be carefully selected so as not to impact water availability for the local users.
- It will be ensured that the used water from hydrotesting is not discharged in nearby canals or other surface water body.

7.7.2 Noise

During cleaning, Gauging and Hydrostatic Testing activities, ambient noise levels may significantly increase from baseline noise levels. The increase is due to the noise emissions expected from the equipment used during the commissioning and start-up activities.

The impact from noise during commissioning activities will be temporary since the high-pressure discharges during hydrotesting are one-off events at a given testing pipelines section and in general the commissioning and start-up works would be moving along the pipelines route alignment and thus would be at a single location for a short period of time.

Mitigation Measures

- Inform the locals / population living near the feeder lines about the high noise activities.
- Ensure use of appropriate PPEs among the workers to prevent high noise related injuries.
- The contractor should not exceed scheduled period for hydrotesting and this should be minimized as far as practicable.

7.8 Potential Impacts during Operation Phase of the Feeder Lines

Activities during operation phase of the feeder lines will be limited including hydrocarbon transmission, maintenance and monitoring. Consequently, very few environmental impacts are envisaged on the ambient environment during operation. Main scenarios in this regard include:

a) Soil erosion due to movement of vehicle for patrolling and maintenance
b) Small scale hydrocarbon emissions in the event of pipelines leakage
c) Emergency scenarios (Fire and Explosion)

7.8.1 Soil erosion due to movement for patrolling and maintenance

Soil erosion may occur due to movement of patrolling and maintenance vehicle.

Mitigation Measures

- Monitor ROW for signs of soil erosion during routine visits.

7.8.2 Small scale hydrocarbon emissions in the event of leakage

During operation phase of the feeder lines sources of hydrocarbon emissions will be leakage due to rupture of pipelines, spillage during refueling. During potential leakage, small scale gaseous emissions may be release to ambient air. Main constitute of leaked hydrocarbon include mainly methane along with hydrocarbon constituents. The probability of these spills / emissions is low since mechanical integrity program / inspection program will be done.

Mitigation Measures

- Implement mechanical integrity / inspection program during operation phase.
- Any leaks detected will be immediately fixed.
- Site to be restored immediately after repair.
- Use drip pans to during refueling to contain accidental spillage.

7.9 Potential impacts of Feeder Lines Decommissioning and Site Restoration Phase

Feeder lines decommissioning is the termination of all oil and gas transport through pipelines at the end of well life. Decommissioning of pipelines requires adequate planning, manpower, and resources in line with local land use and environmental regulations.

Decommissioning options for pipelines include leaving them in place, or removing them for reuse, recycling or disposal, especially if they are above ground and interfere with human activities. Environmental impacts related with the decommissioning of Feeder lines are

- Oil spillage from pipelines.
- Generation of dust,
- Noise due to the movement/operation of heavy machinery involved in decommissioning activities.
- Vehicular emissions,
- Occupational health and safety risks
- Waste management

A preliminary decommissioning and restoration plan should be developed that identifies disposal options for all equipment and materials, including products used and wastes generated on site. The plan should consider the removal of oil/hydrocarbon from pipelines, pipelines decommissioning and site restoration.

Mitigation Measures

- The exposure of construction workers to dust should be minimized by ensuring dust mask use among the workers.
- Truckloads of loose soil will be covered with tarpaulin.
- Soil and material piles at the site will be barricaded to avoid material escape / generation of dust.

- Construction machinery, vehicles should be properly tuned and kept in good working condition, minimizing exhaust and vehicular emissions. It should be ensured that exhausts from these equipment and vehicles comply with relevant PEQS.
- Revegetation of land where possible.
- Pipelines left in place should be disconnected and isolated from all potential sources of hydrocarbons; cleaned and purged to remove hydrocarbons; and sealed at their ends.
- Repair any damaged property
- Demobilize all materials and equipment from the camp site
- Dispose all left-over wastes
- Feeder lines trench in the residential area should be barricaded to eliminate falling hazard. In addition, the trench should be marked by signage, reflective tapes and lights to prevent fall incidents during night.
- Backfill excavation and trench with topsoil
- Ensure use of appropriate PPE by the workers

High noise activities should be carried out during daytime, especially in the residential area.

7.10 Potential Environmental Enhancement Measures

Tree Plantation

Tree planation will be done by PPL in project vicinity. This will improve the aesthetics of microenvironment and increase local flora. The objective shall be to ensure a green cover providing conducive ambient environment. Suitable tree species need to be selected with adoption of simple techniques which require minimum investment and care. Plants suitable and indigenous to local area will be planted.

Dust suppression

During project associated activities, regular dust suppression using water will be done, where needed, to prevent dust generation. Stock piles shall be covered. Vehicular speed limits shall be implemented and water sprinkling shall be done at unpaved roads and paths.

Resource Conservation

- Water conservation practices shall be followed during construction activities of the project.
- Reduce, reuse and recycle approach shall be implemented to minimize waste generation.
- Recyclable and reusable waste shall be segregated and handed over to recycling contractor.
- Energy efficient equipment and lighting shall be preferred.
- Construction workers shall be sensitized to switch off the machinery/equipment when not in use to save energy and fuel.

Table 7.3: Environmental Impacts & Characterization Matrix

Activity & Source	Nature of Impact	Duration	Extent	Reversibility	Likelihood	Severity	Significance
Noise pollution							
• Transportation of heavy machinery, materials, equipment & personnel. • Drilling/ workover operations. • Trenching and laying of feederline	Direct	Short to medium term	Local	Reversible	Possible	Low	Medium
Dust Emission							
• Vehicular movement on dirt roads • Earthworks and construction/refurbishment for campsite and laying of feederlines • Combustion products (NOx, SO_2, PM, CO and) from diesel generators used in the camps to generate electricity.	Direct	Medium term	Local	Reversible	Possible	Low	Medium
Air Emissions							
• Exhaust emissions produced by generators. • Exhaust fumes from vehicles and construction machinery.	Direct	Short to medium term	Local	Reversible	Unlikely as mitigation measures will ensure that air emissions remain within acceptable limits.	Medium	Medium
Water Abstraction							

• Water required for drilling operation and other project activities (hydrotesting)	Direct	Medium term; depend on the rainfall pattern and recharge regime of the deep aquifer.	Local	Reversible	Possible	Low	Medium
Soil and Water Contamination							
• Domestic waste (sanitary & kitchen discharge). • Oil and grease from vehicles and machinery. • Produced water and drilling mud • Sediments from altered land surfaces (campsite). • Stored fuel, oil and other chemicals. • Disposal of produced water. • Disposal of waste water fromhydrotesting	Direct	Medium term (after implementation of mitigation and control measures)	Local	Reversible	Possible	Medium	Medium
Impacts on Wildlife							
• Movement of vehicles and personnel • Project activities • Removal of vegetation	Direct	Short term to medium term	Local	Reversible	Possible	Low	Low

8. ENVIRONMENTAL MANAGEMENT PLAN

8.1 General

Environmental management is a vital part of project planning and implementation, encompassing policy development, organizational setup, planning activities, defined responsibilities, procedures, and resource allocation to develop, implement, monitor, review, and sustain environmental programs and objectives.

This document has been prepared in line with environmental management guidelines, identifying key aspects in the Environmental Management Plan (EMP) to prevent or mitigate potential environmental impacts of the proposed activities at Adhi South-2, Adhi South-10, and Adhi-36 wellsites and associated feederlines (Adhi 36 & Adhi South 10) in District Rawalpindi.

8.2 Purpose of EMP

PPL has been committed to implementing a comprehensive EMP to help ensure the environmental protection. The purpose of EMP is to:

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

8.3 Environmental Management Framework

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

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

8.4 Structure of EMP

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

- Organizational Structure and Roles and responsibilities;
- Mitigation matrix
- Environmental Monitoring plan
- Waste Management Plan

- Emergency Response Plan
- Site Restoration Plan
- Change Management Plan
- Spill Management Plan

8.5 Organizational Structure and Roles and Responsibilities

8.5.1 Organizational Structure

The proposed project includes the following organizations:

- PPL as the project proponent and owner of the EMP
- Contractor and Subcontractor
- Punjab EPA as regulatory body

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

8.5.2 Contractors and Subcontractors

Contractor(s) will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other codes of conduct required by PPL. Site Manager of the contractor(s) will be responsible for the effective implementation of the requirements of EIA and EMP. However overall responsibility for implementation of EIA and the EMP will rest with PPL's concerned Departments (i.e., Construction, Drilling and Adhi assets).

- Carry out project activities in environmentally sound manner;
- Coordination with the HSE officer to resolve issues arising during project execution;
- Manage construction/refurbishment activities to reduce the environmental impacts;
- Appoint dedicated HSE Officer that will understand and tackle environmental issues more easily;
- Discuss weekly progress report with their management and issues concerned to environmental management.

8.5.3 Environmental Protection Agency

Punjab EPA as regulatory body has the responsibility to ensure project's compliance with local environmental laws. According to Punjab environmental protection act, Punjab EPA has the powers to conduct surprise inspections or visits of the project area to observe the status of environmental compliance of the project.

8.5.4 Roles and Responsibilities of the proponent

For the proposed project, PPL will appoint contractor(s) for the project activities. The contractor(s) will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other operational SOPs required by PPL. However overall responsibility for implementation of EIA and the EMP will rest with PPL's concerned Departments

(i.e., Construction, Drilling and Adhi assets). Some of the responsibilities of PPL's concerned personnel would include:

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

8.5.5 Approvals

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

8.5.6 Contractual Provisions

The requirements of this EIA in terms of environmental mitigation will be incorporated into the operational plans and procedures with the Contractor. It is recommended that environmental management is made a part of the contract to be signed with contractor to legally bound the contractor to ensure sound environmental management during the project.

8.5.7 Training

The key objective of the training program is to ensure that the requirements of the EMP and EIA are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environment related restrictions specified in the EIA and EMP. Contractor's HSE Advisor in coordination with PPL's Site In-charge will determine the training requirements necessary for understanding and effective implementation of the EMP and the EIA. Contractor(s) will be responsible to disseminate the necessary training to relevant personnel.

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

Trainings identified in EMP are given below:

- Site orientation course
- Training for emergency response and preparedness

- Training for familiarization with site environmental controls
- Waste Management
- Social awareness program
- Water and resource conservation
- Job Safety

8.5.8 Communication and Documentation

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

a) Weekly Reports

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

b) Social Complaints Register

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

8.6 Mitigation Matrix

Mitigation Matrix is provided in Table 8.1 and 8.2. The Mitigation Matrix will be used as a management and monitoring tool for implementation of the mitigation measures. It is highlighted that although responsibilities for executing and monitoring mitigation measures have been delegated to different persons/organizations, PPL concerned departments will hold the primary and overall responsibility for ensuring full implementation of the EMP.

8.7 Environmental Monitoring

Monitoring of different activities will be required to assess the impacts of activities on the environment. For this purpose, a monitoring plan has been proposed in the EMP to monitor the implementation of EMP and other plans. It is suggested to:

- Follow the monitoring frequency of selected parameters as per the monitoring plan given in the Table 8.1 (a)(b), 8.2 (a)(b) & 8.3.
- Record all non-conformities observed and report them.
- Report any impact/non-compliances observed along with recommendations for further action.

Contractor(s) shall take note of the recommendations relating to issues arising during monitoring of construction, drilling and associated activities.

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities

No.	Impact and Mitigation Measures	Execution	Action / Monitoring Parameter / Monitoring Method	Timing
1. Impacts on Land				
1.1	Select drilling and feederlines routes to minimize ecologically sensitive areas, fertile agricultural land, and wildlife habitats.	PPL Construction Dept.	Check Compliance	During construction
1.2	Minimize the project footprint by optimizing site layout.	CC, DC, PPL Construction & Drilling Depts.	Check Compliance	During Construction
1.3	Strip and store topsoil separately for later use in site restoration.	CC / PPL Construction.	Check Compliance	During Construction
1.4	Construct temporary drainage channels, silt fences, or sediment traps to control runoff.	PPL Construction Dept. / CC	Control runoff of soil, Check Compliance	During Construction
1.5	Schedule excavation and trenching activities during dry seasons to minimize erosion risks.	PPL Construction Dept. / CC	Avoid excavation and trenching in rainy seasons, Check Compliance	During Construction
1.6	Re-vegetate disturbed land promptly after construction.	PPL Construction Dept. / CC	Restore land	During Operation
1.7	Maintain natural drainage patterns as far as possible.	PPL Construction Dept. / CC	Check Compliance	During Construction
1.8	Design culverts and cross-drainage structures to prevent waterlogging or alteration of local hydrology.	PPL Construction Dept. / CC,	Check Compliance	During Construction
1.9	Prevent stagnant water in trenches to avoid breeding grounds for disease vectors.	PPL Construction Dept. / CC,	Check Compliance	During whole project
1.10	Properly manage drilling cuttings, mud, and feederlines construction waste to prevent soil contamination.	PPL, DC, PPL Construction & Drilling Depts.	Prevent soil from any hazardous contamination, and check compliance	During Construction
1.11	Establish spill prevention and response plans for fuels, lubricants, and chemicals.	PPL, DC, PPL Construction & Drilling Depts.	Prepare Spill Response Plan	During Construction and Operation
1.12	Use impermeable liners for waste storage pits.	PPL Construction Dept. / CC,	Construct Waste Storage Pits	During Construction and Operation

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
1.13	Avoid unnecessary clearing of vegetation.	PPL Construction Dept. / CC,	Avoid deforestation, Check Compliance	During Construction
1.14	Implement buffer zones around natural habitats.	PPL Construction Dept. / CC,	Provide protect natural habitats	During Construction
1.15	Carry out compensatory plantation or habitat restoration where clearing is unavoidable.	PPL Construction Dept. / CC,	Plantation activity	During Construction and Operation
1.16	Backfill trenches and restore land contours after feederlines installation.	PPL Construction Dept. / CC,	Check Compliance	Post Feederlines Installation
1.17	Reuse stored topsoil to restore natural vegetation.	PPL Construction Dept. / CC,	Check Compliance	During Operation
1.18	Monitor reclaimed sites to ensure proper stabilization and vegetation regrowth.	PPL Construction Dept. / CC,	Check Compliance	During Operation
1.19	Conduct periodic inspections to check for soil erosion, sedimentation, or hydrological changes.	PPL Construction Dept. / CC,	Soil Inspection	During Construction
1.20	Maintain records of land use changes and rehabilitation progress.	PPL Construction Dept. / CC,	Land use records	During Construction
1.21	Cutting of vegetation will be kept to the minimum required. Unnecessary clearing within the corridors along the feeder line route or on the periphery of the campsite(s) will be avoided.	PPL Construction Dept. / CC	Monitor land clearing activities	During construction
1.22	The access track / ROW will be properly levelled & graded / compacted at the time of construction and thereafter properly maintained by watering and compaction (where required) during pipeline laying operation.	PPL Construction Dept. / CC	Check compliance	Compaction during construction, dust emissions and loose sections of the track for the entire period of use of the track for this operation
2. Contamination of Soil and Water				
2.1	Approvals to start construction will only be given by PPL Construction Head after ensuring that all waste management facilities (waste segregation units, soak pits, septic	PPL Construction Heads	Approval for waste contractor , waste management systems and start of work	Before construction, Drilling and FL laying activity

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
	tanks etc.), equipment (waste bins, drip pans, tarpaulins etc.) and procedures (approvals for waste contractors etc.) are as per the EIA requirements.			
2.2	Provide secondary containment around all the fuel storage tanks and chemical storage area of suitable size (110% of the storage area / largest tank capacity). Fuel storage should be a temporary activity and fuel storage facilities should be removed upon completion of the required activities.	PPL Construction and Drilling Depts. / CC / DC	Provision of fuel storage tanks	During the entire project activities
2.3	Document accidental releases so that corrective actions may be taken.	PPL Construction and Drilling Depts. / CC / DC	Maintain entries of spill	During entire project
2.4	Vehicles will only be washed in designated areas within campsites.	PPL Construction and Drilling Depts. / CC / DC	Ensure provision of washing areas and maintenance workshops and monitor any non-compliances with the EIA requirement during routine monitoring	During entire operation
2.5	Vehicles will be daily checked for fuel or oil leaks. Vehicles with leaks will not be operated until repaired.	PPL Construction and Drilling Depts. / CC / DC	Randomly inspect vehicles and designated parking areas	During entire operation
2.6	Fuel and oil storage areas will have secondary containment in the form of cemented or brick masonry bunds with plastered. The volume of the containment area will be equal to at least 110 % of the total volume of fuel / oil stored or 110% of the volume of one largest tank.	PPL Construction and Drilling Depts. / CC / DC	Check Compliance	During the entire project
2.7	All fuel tanks will be properly marked to highlight their contents.	PPL Construction and Drilling Depts. / CC / DC	Ensure that proper signs are placed with the tanks	During construction and operation
2.8	Fuel tanks will be daily checked for leaks and all such leaks will be plugged immediately.	PPL Construction and Drilling Depts. / CC / DC	Inspect fuel tanks for leaks	During the entire operation

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
2.9	Liquid chemicals used during the drilling operation will be stored on brick masonry pads with plastered and contained with bunds.	PPL Construction and Drilling Depts. / CC, DC	Ensure provision of brick masonry pads with plastered and bunded.	During construction activity
2.10	The soil contaminated from spills will be collected and handed over to EPA approved waste contractor for disposal.	PPL Construction and Drilling Depts. / CC / DC	Hire EPA approved waste contractor	During the entire project
2.11	Shovels, plastic bags and absorbent material will be present near fuel and oil storage or handling areas to attend spills and leaks.	PPL Construction Dept. / CC	Monitor presence of materials and equipment	During entire operation
2.12	Used oil shall be provided to OGRA reclamation license holder Lubricant Recycler for reclamation/recycle. Other option is to dispose of the used oil through EPA approved waste contractor.	PPL Construction Dept. / CC	Check Compliance	During entire project activity
2.13	Vehicles related waste (excluding hazardous waste) will be transported / handed over to local contractors for recycling approved by the PPL HSE.	PPL Construction and Drilling Depts. / CC / DC	Check Compliance	During the entire project
2.14	The produced formation fluid will be disposed-of according to the environmentally sound practice. Completion brine is collected in flare pit (made of brick masonry with plastered) for disposal by natural evaporation. Whereas crude oil is collected in storage tanks then transported to nearby operating facility for further processing at Plant. Moreover, formation water, produced during testing, drained into pit provided with impermeable membrane lining for disposal by evaporation.	PPL Construction Dept. / CC	Check Compliance	During the entire project
2.15	Restore flare pit in an environmentally friendly manner.	PPL Construction and Drilling Depts. / CC / DC	Check Compliance	During the entire operation

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
2.16	Disposal options for produced water / formation water produced during hydrocarbon production may include injection into the reservoir to enhance oil recovery, or injection into a dedicated disposal well drilled to a suitable receiving subsurface geological formation.	PPL Construction and Drilling Depts. / CC / DC	Propose various disposal options for produced water	During the entire project
2.17	If reinjection of produced water is not possible then it should be collected in dedicated evaporation pits for natural evaporation and salt cakes (if any) left behind is disposed of through Punjab EPA approved waste contractor.	PPL Construction and Drilling Depts.	Hiring of EPA approved waste contractor and construction of evaporation pits for natural evaporation of remained produced water	During the entire operation
2.18	Flare pit will be located not less than 90 meters horizontally crosswind or downwind from any source of inflammable gas and vapor.	PPL Construction and Drilling Depts. / CC / DC	Ensure 90 meters distance between flare pit and inflammable gases and vapors	During entire operation
2.19	The drill cuttings and water-based mud will be disposed into a pit lined with an impermeable geo-membrane. The pit will be of larger than the required capacity to accommodate emergency flows.	PPL Construction and Drilling Depts. / CC / DC	Check Compliance	During construction / drilling
2.20	At the time of restoration, the pit will be backfilled with the cuttings encapsulated within the liner and with a topsoil cover.	PPL Construction and Drilling Depts. / CC / DC	Check Compliance	During restoration
2.21	In case the drilling mud pit is an agricultural land, the drilling mud should be disposed of as per the applicable and relevant guidelines of LSO 29 B.	CC / DC / PPL Construction and Drilling Depts.	Follow the relevant guidelines for disposal of drilling mud	During the entire operation
2.22	Hydrostatic test water quality should be monitored before discharge (if discharges into any water bodies / nallahs). If water quality is exceeding PEQS limits for effluents, then it should be treated to comply with PEQS. Wastewater disposal to local	CC / DC / PPL Construction and Drilling Depts.	Monitoring Compliance	During entire project

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
	nallah will only be carried out after taken approval from relevant authority / TMA.			
2.23	If chemical use is necessary, carefully select chemical additives in terms of dose concentration, toxicity, biodegradability, bioavailability and bioaccumulation potential	CC / DC / PPL Construction and Drilling Depts.	Check Compliance	During entire project
2.24	It will be ensured that the used water from hydrotesting is not discharged in nearby canals or other surface water body.	CC / DC / PPL Construction and Drilling Depts.	Check Compliance	During entire project
3. Noise Pollution				
3.1	Position all stationary sound-generating equipment (i.e. pumps and generators) as far as possible from nearby residences and other sensitive receptors.	PPL Construction and Drilling Depts / CC / DC	Monitor noise levels	Prior to use of machinery and vehicles
3.2	Whenever feasible, schedule diverse noisy activities (e.g. during refurbishment of sites to occur at the same time, since less-frequent noisy activities would be less irritating than frequent less-noisy activities.	PPL Construction and Drilling Depts. / CC / DC	Proposed schedule for noisy activities	During Construction, Drilling and Operation
3.3	Schedule all high noise activities to be conducted during daytime i.e. between 6 am to 10 pm when working inside and near the residential area.	PPL Construction and Drilling Depts. / CC / DC	Ensure that there will be no high noisy activities at the night time	During Construction, Drilling and Operation
3.4	All equipment should have sound-control devices.	PPL Construction and Drilling Depts. / CC / DC	Monitor noise level of equipment	During Construction, Drilling and Operation
3.5	Route heavy truck traffic away from residences and other sensitive receptors.	PPL Construction and Drilling Depts. / CC / DC	Advise all drivers	During Construction, Drilling and Operation
3.6	It shall be ensured that generators, vehicles and other potentially noisy equipment used are kept in good condition.	PPLConstruction and Drilling Depts. / CC / DC	Monitor noise levels	Prior to use of machinery and vehicles
3.7	Noise levels at communities nearest to the well site, campsites / housing site and access tracks shall be monitored by Contractor. In case these are found to	PPL Construction and Drilling Depts. / CC / DC	Monitor noise levels	During Construction, Drilling and Operation

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
	exceed safe acceptable limits appropriate mitigation shall be taken.			
3.8	The use of pressure horns shall not be allowed.	PPL Construction and Drilling Depts. / CC / DC	Advise all drivers	During Construction, Drilling and Operation
3.9	Movement of all project and personnel vehicles shall be restricted within work areas.	CC / DC / PPL Construction and Drilling Depts.	Advise all drivers and investigate non-compliances from staff	During the entire operation
3.10	Generators will be kept within enclosures to minimize dispersion of noise.	CC / DC / PPL Construction and Drilling Depts.	Monitor noise levels	During Construction, Drilling and Operation
3.11	In areas with higher noise levels or longer shifts, use of ear plugs and earmuffs will be ensured among the workers.	CC / DC / PPL Construction and Drilling Depts.	Provision of PPEs to the workers	During Construction, Drilling and Operation
4. Deterioration of air quality				
4.1	Ensure all construction equipment and vehicles are properly maintained and regularly serviced to minimize exhaust emissions.	PPLConstruction & Drilling Depts./CC/DC	Check maintenance logs	During the entire construction and operation
4.2	Use low-sulfur diesel and other cleaner fuels where available.	PPL Construction & Drilling Depts./CC/DC	Check Compliance	During the entire construction and operation
4.3	Prohibit unnecessary idling of vehicles and equipment.	PPL Construction & Drilling Depts./CC/DC	Check Compliance	During the entire construction and operation
4.4	Prefer newer, fuel-efficient engines that meet international emission standards.	PPL Construction & Drilling Depts./CC/DC	Ensure maintenance of engines	During the entire construction and operation
4.5	Store fuels in designated, contained areas with spill-proof facilities.	PPL Construction & Drilling Depts./CC/DC	Design spill proof facilities for fuel storage	During the entire construction and operation
4.6	Ensure proper labeling, handling, and transfer procedures to prevent leaks and fugitive emissions.	PPL Construction & Drilling Depts./CC/DC	Labeling of all the chemicals	During the entire construction and operation
4.7	Provide spill kits and secondary containment at all storage and dispensing points.	PPL Construction & Drilling Depts./CC/DC	Ensuring the secondary containment and provision of spill kits	During the entire construction and operation
4.8	Optimize drilling rig operations to minimize fuel consumption and emissions.	PPL Construction & Drilling Depts./CC/DC	Check Compliance	During drilling

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
4.9	If flare stacks are used: o Employ low-emission flaring technologies. o Restrict flaring to emergency or unavoidable operational situations. o Monitor emissions regularly to ensure compliance with standards.	PPLConstruction & Drilling Depts./CC/DC	Monitoring compliance	During the entire operation
4.10	Use well-maintained machinery during trenching, welding, and backfilling to reduce combustion emissions.	PPL Construction & Drilling Depts./CC/DC	Maintenance of machinery	Prior to use machinery
4.11	Reuse excavated material where possible to minimize transport-related emissions.	PPL Construction & Drilling Depts./CC/DC	If possible reuse the excavated material	During the construction operation
4.12	Sprinkle water on unpaved roads, excavation sites, and stockpiles during dry/windy conditions.	PPL Construction & Drilling Depts./CC/DC	Ensure sprinkling of water	During the construction and operation
4.13	Cover soil, sand, and other fine material stockpiles with tarpaulin or vegetation.	PPL Construction & Drilling Depts./CC/DC	Ensure that the soil/sand should be covered	During construction
4.14	Enforce speed limits for vehicles moving on unpaved roads to minimize dust.	PPL Construction & Drilling Depts./CC/DC	Display speed limits signs and train drivers	During construction and operation
4.15	Cover trucks transporting loose construction material to prevent dust dispersion.	PPL Construction & Drilling Depts./CC/DC	Ensure that the soil/sand should be covered while transporting	During construction
4.16	Schedule earthworks and concrete mixing activities to avoid excessively windy conditions.	PPL Construction & Drilling Depts./CC/DC	Avoid mixing and earthworks in high windy conditions	During Construction
4.17	Segregate and manage waste materials to avoid open burning.	PPL Construction & Drilling Depts./CC/DC	Do not burn waste materials	During construction and operation
4.18	Establish green buffers or temporary barriers around high-dust generating areas near sensitive receptors (e.g., villages, agricultural land).	PPL Construction & Drilling Depts./CC/DC	Check Compliance	During construction and operation

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
4.19	During construction, leveling or widening (for the access road and feeder lines ROW) will be done in sections, immediately followed by sprinkling of water and also preferably compaction (where required).	PPL Construction & Drilling Depts./CC/DC	Inspection	During Construction
5. Use of Water				
5.1	Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, slope angles, and geologic structures etc.).	PPL Construction Dept. / CC	Check compliance	During the entire project activity
5.2	Use special construction techniques in areas of steep slopes, erodible soils and stream crossings.	PPL Construction Dept. / Contractor	Check compliance	During construction
5.3	Construct drainage ditches only where necessary. Use appropriate structures at culvert outlets to prevent erosion.	PPL Construction Dept. / Contractor	Check compliance	Before the start of the operation
5.4	Do not alter or restrict existing drainage systems, especially in sensitive areas such as erodible soils or steep slopes. Cross water bodies at right angles to the channel and/or at points of minimum impact.	PPL Construction and Drilling Depts. / CC / DC	Inspection and check compliance	During the entire construction and operation
5.5	Apply erosion controls relative to possible soil erosion from vehicular movement and during construction activities. The purpose is to retain the soil on disturbed land, such as a construction site, until the activities disturbing the land are sufficiently completed to allow revegetation and permanent soil stabilization to begin.	PPL Construction Dept. / Contractor	Ensure the control of soil erosion	During entire construction
5.6	Regularly monitor rights-of-way (ROWs), access roads, and other project areas for indications of erosion.	PPL Construction and Drilling Depts. / CC / DC	Check compliance	During the entire Construction and Operation

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
5.7	Use drip pans during refueling to contain accidental releases.	PPL Construction and Drilling Depts. / CC / DC	Check Compliance	During Construction
5.8	Closely monitor construction near aquifer recharge areas to reduce potential contamination of the aquifer.	PPL Construction and Drilling Depts. / CC / DC	Monitoring, inspection of construction	During Construction
5.9	Reestablish the original grade and drainage pattern to the extent practicable.	PPL Construction and Drilling Depts. / CC / DC	Restoration of existing drainage pattern	After construction
5.10	Restore the banks of water bodies to their natural condition as far as possible.	PPL Construction and Drilling Depts. / CC / DC	Restoration of water banks	After Construction
5.11	Ensure that casing is installed from surface to a depth deeper than the target depth to protect the underground water source from contamination with produced water.	PPL Construction and Drilling Depts. / CC / DC	Ensure the prevention of groundwater from the contamination with the produced water	During the entire operation
6. Blockage of Natural Drainage				
6.1	Avoid siting drilling pads, feederlines routes, or campsites on natural drainage channels.	PPL Construction Dept. / CC	Check Compliance	During Construction
6.2	Provide culverts or cross-drainage structures where feederliness or access roads intersect drains.	PPL Construction Dept. / CC	Check Compliance	Prior to start construction
6.3	Keep excavated soil and construction material away from water channels.	PPL Construction Dept. / CC	Ensure to not dispose soil or construction materials in the water body	During construction
6.4	Reinstate natural land contours and drainage paths after trenching or drilling.	PPL Construction Dept. / CC	Check Compliance	During Construction
6.5	Install proper stormwater drains around campsites and drilling/workover sites.	PPL Construction Dept. / CC	Construct drains for stormwater	Prior to start construction
6.6	Regularly inspect and clear drains to prevent blockages.	PPL Construction Dept. / CC	Monitor landscaping and any obstruction caused to natural drainage	During Construction and Operation
6.7	Prohibit dumping of waste or spoil in natural watercourses.	PPL Construction Dept. / CC	Do not dispose waste in to water body	During the construction activity
7. Site Restoration- Dry Well				
7.1	All equipment and machinery at the well site will be demobilized	PPL Construction and Drilling Dept. / CC / DC	Check compliance	During site restoration

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
7.2	All wastes at the well site will be disposed of according to the requirements of the EIA.	PPL Construction and Drilling Dept. / CC / DC	Check compliance	During site restoration
7.3	All the fencing / barriers surrounding the base / rig camp areas will be removed and the area will be levelled. The concrete structures if desired by the land owner may be left intact after taking concurrence in the form of NOC from respective land owner and considering that no environmental hazard / issue will occur. Otherwise, the concrete structures will be broken up and disposed or reused for backfilling of pits / septic tanks (below main rooting zone, 1 - 1.5 m) or provided to locals for re-use (backfilling).	PPL Construction Dept. / CC	Check compliance	During site restoration
7.4	All pits at the well site will be backfilled	PPL Construction Dept. / CC	Check compliance	During site restoration
7.5	The areas covered by the portion of the access track that will be of no use for other wells will be restored, in that all gravel topping will be removed. This scenario will be applicable only if the locals require the portions of the track to be restored or otherwise it may be left on the site on the consent of the locals	PPL Construction Dept. / CC	Check compliance	During site restoration
7.6	Remove wastewater from septic tank and restore it after dismantling in place (top roof and at least 1 meter wall or more if easily possible) and backfilling with at least 1 meter of native soil cover. Wastewater and sludge from septic tank & soak pit can be disposed off into nearest municipal drain after taking approval from TMA / relevant authority and ensuring	PPL Construction Dept. / CC	Check compliance	During restoration

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
	quality of wastewater meeting PEQS standards. Dispose sludge in environmental friendly manners.			
7.7	Restore soak pit after removal of wastewater & cover and backfilling it with at least 1 meter of native soil cover. Dispose wastewater of soak pit in an environment friendly manner.	PPL Construction Dept. / CC	Check compliance	During restoration
7.8	Contaminated bricks of black / grey water pits and others shall not be given to locals for any purpose.	PPL Construction Dept. / CC	Check compliance	During restoration
7.9	Water based mud and drill cuttings can be disposed onsite by either allowing the mud / liquid waste to evaporate (to the extent possible) or treated / disposed of through waste contractor and then burying the dry drill cuttings encapsulated within the HDPE liner and backfilling with at least 1 meter of top soil cover.	PPL	Check Compliance, ensure that the HDPE liner is not ruptured and completely wraps the dried mud	During site restoration
7.10	In case the drilling mud pit is an agricultural land, the drilling mud should be disposed of as per the applicable and relevant guidelines of LSO 29 B.	PPL	Check Compliance, Ensure the waste does not contain hazardous compounds	During site restoration
7.11	Restore flare pit in an environmentally friendly manner.	PPL Construction Dept. / CC	Check compliance	During site restoration
7.12	General restoration of the site area and drainage where required.	PPL Construction Dept. / CC	Check compliance	During site restoration
8. Ecology (Flora and Fauna)				
8.1	Clearing of vegetation will be minimized by keeping the road width to 9 to 10 m (except at bends where greater width will be required for safety reasons), and by keeping	PPL Construction Dept. / CC	Check width	During the construction activity

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
	the length of new sections of the road to a minimum.			
8.2	Off-road travel, required at sections of the road where construction work is in progress, will be minimized and if required will be allowed only after approval from PPL Site Management	PPL Construction Dept. / CC	Train drivers and investigate non-compliances	During the entire operation
8.3	During construction/refurbishment good management practices will be adopted to avoid disturbance to areas adjacent to work areas including the access track, well site and camp sites.	PPL Construction Dept. / CC	Train construction supervisors, monitor construction activities	During construction operation
8.4	Well site and campsite areas will be kept to a minimum.	PPL Construction Dept. / CC	Check compliance	After marking of the site layout on ground by the CC and prior to clearing of land at these areas.
8.5	Camp sites established for the purpose of construction will be located in existing clear /open land if possible. Vegetation clearing from these sites will be kept to a minimum.	PPL Construction Dept. / CC	Supervise camp setup	During setup of the construction camps
8.6	Cuttings of trees will be avoided.	PPL Construction Dept. / CC	Supervise land clearing activities	During land clearing for the access track, well site and drilling camp site
8.7	Use of local vegetation as fuel will not be allowed.	PPL Construction and Drilling Depts. / CC / DC	Check compliance	Use of local vegetation as fuel will not be allowed. Check compliance during the entire operation
8.8	Prior to commencement of construction and drilling operations, awareness trainings will be provided to contractor's management and field crew on matters related to the wildlife protection.	PPL Construction & Drilling Depts / CC / DC	Provide environmental awareness training	Before commencement of drilling activity

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
8.9	The total duration of construction/refurbishment and drilling will be minimized by good management.	PPL Construction and Drilling Depts.	Check compliance	During the entire operation for the time specified
8.10	All mitigation measures to minimize noise levels, dust emissions, air emissions and waste management required by the EIA will be adhered to.	PPL Construction & Drilling Depts / CC / DC	Check compliance	During the entire Project
8.11	Food wastes will not be disposed of in the open area. Food wastes collected in waste segregation units will be buried on site or disposed off through waste contractor.	PPL Construction and Drilling Depts / CC / DC	Monitor collection and disposal of food waste	During the entire operation
8.12	Construction work near areas which show small mammal and reptile populations will commence after a soft start up and will be randomly monitored.	PPL Construction Dept. / CC	Check compliance	During construction activity
8.13	Vehicle speeds on access road will be controlled to avoid incidental mortalities of reptiles. Any such incident will be reported to the PPL Site Management. Vehicle speeds will be randomly checked.	PPL Construction and Drilling Depts / DC/ CC	Monitor speed limits	During the entire operation
8.14	Cuttings of trees will be avoided. Where it is necessary to cut down trees in government land, relevant department will be taken on board before cutting of trees. In case of private land, compensation will be paid to land owner.	PPL Construction Dept. / CC	Check compliance	During Construction activity
8.15	Movement of all project personnel will be restricted to work areas.	PPL Construction and Drilling Depts / DC / CC	Check compliance	During entire project
8.16	Movement of project vehicles will be restricted only to the project access road or to routes approved by the PPL Site Management	PPL Construction and Drilling Depts / DC / CC	Check compliance	During entire project
8.17	Light used at the well site and camp site will be kept to the minimum requirement	PPL Construction and Drilling Depts / DC / CC	Ensure that EIA requirements should meet	During the entire project

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
8.18	Hunting and trapping of wildlife will be prohibited.	PPL Construction and Drilling Depts / DC / CC	Check compliance	During the entire operation
8.19	Feeding or harassment of wildlife will not be allowed	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During the entire operation
8.20	Restoration and rehabilitation of site will be done once construction is completed.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	After Construction
9. Hazardous material and solid waste				
9.1	Prepare a comprehensive list of all hazardous materials to be used, stored, transported and disposed of during all phases of activity.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	Before the commencement of activities
9.2	Develop a waste management plan identifying anticipated solid and liquid waste streams and addressing determination, inspection and waste minimization procedures, storage locations and waste-specific management and disposal requirements.	PPL Construction and Drilling Depts / DC / CC	Prepare waste management plan, and check compliance	Before the commencement of activities
9.3	Include a recycling strategy to be practiced by workers during all project phases.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	Before the commencement of activities
9.4	Develop a spill prevention and response plan for addressing spill prevention measures, training requirements, waste-specific spill response actions, spill response kits.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	Before the commencement of activities
9.5	The storm water shall be diverted away from the well sites to prevent it from coming into contact with onsite equipment and pits, ensuring it is directed outside without contamination.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	Before the commencement of activities
9.6	Train employees to promptly contain, report and/or clean up any oil or hazardous material spill.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During the entire project

Table 8.1**: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities**				
9.7	Provide secondary containment around all the fuel storage tanks and chemical storage area of suitable size (110% of the fuel storage area/ largest tank capacity). Fuel storage should be a temporary activity and fuel storage facilities should be removed upon completion of the required activities.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During the construction of the storage tanks
9.8	Containerize and periodically remove wastes for disposal at appropriate off-site permitted disposal facilities. The goal would be to minimize the amount of hazardous materials and waste onsite.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During the entire project
10. Waste and Effluent Management				
10.1	PPL, construction and drilling contractor will be responsible for the handling of the waste.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During entire project
10.2	The waste management activities will be monitored on daily basis.	PPL Construction and Drilling Depts / DC / CC	Monitoring entry of waste management in logbooks on daily basis	During entire project
10.3	Record of all waste generation, storage and removal from site will be maintained.	PPL Construction and Drilling Depts / DC / CC	Maintain log book	During entire project
10.4	Any non-compliance related to waste management will be immediately addressed.	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During entire project
11. Occupational Health and Safety				
11.1	Use blowout preventers (BOPs) and gas detection systems to prevent well blowouts.	PPL Construction Dept.	Check compliance	During operation
11.2	Provide hearing protection for workers exposed to continuous rig noise.	PPL Construction Dept.	Provide PPEs to workers	During drilling
11.3	Ensure proper handling and storage of drilling muds, cuttings, and chemicals to avoid exposure.	PPL Construction and Drilling Depts.	Check compliance	During entire project
11.4	Regular inspection and maintenance of lifting and hoisting equipment.	PPL Construction and Drilling Depts / DC / CC	Inspection and Check Compliance	During entire project

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
11.5	Enforce use of PPE (helmets, gloves, goggles, flame-resistant clothing).	PPL Construction and Drilling Depts / DC / CC	Ensure workers are using PPEs	During entire project
11.6	Protect workers from trench collapses through shoring, shielding, or safe sloping.	PPL Construction Dept. / CC	Check compliance	During construction
11.7	Provide welding PPE (face shields, gloves, fume masks) during pipeline welding.	PPL Construction Dept. / CC	Ensure compliance	During construction
11.8	Enforce traffic safety measures for heavy vehicle movement near work zones.	PPL Construction and Drilling Depts / DC / CC	Ensure compliance	During construction
11.9	Control dust generation from excavation and vehicle movement by sprinkling water.	PPL Construction and Drilling Depts / DC / CC	Ensure compliance	During construction
11.10	Regular safety checks of hoisting and hydraulic systems.	PPL Construction and Drilling Depts / DC / CC	Ensure Compliance	During entire project
11.11	Use closed-loop systems to limit exposure to workover fluids and produced water.	PPL Construction and Drilling Depts / DC / CC	Ensure Compliance	During drilling and workover activity
11.12	Ensure adequate illumination for night operations.	PPL Construction and Drilling Depts / DC / CC	Provision of enough lightning during night time	During construction
11.13	Strict enforcement of PPE (coveralls, gloves, goggles, helmets).	PPL Construction and Drilling Depts / DC / CC	Check Compliance	During entire project
11.14	Restrict unauthorized entry to work sites with barriers and warning signs. Maintain speed limits for project vehicles in community areas. Schedule transport of heavy machinery/materials during off-peak community hours.	PPL Construction and Drilling Depts / DC / CC	Set the speed limit and train the drivers	During construction

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
12. Socio-economic, archaeology and cultural Environment				
12.1	All community grievances will be recorded, addressed and maintained in a Community Complaint's Register.	PPL Construction and Drilling Depts.	Check the provision of complaint register and its access for communities	During the entire operation
12.2	The access road will be watered regularly to minimize the dust emissions (if required).	PPL Construction Dept. / CC,	Check aliment of access routes	During construction activity
12.3	Construction of bypass to all major settlements and where necessary rerouting the access road so that a safe distance is maintained from a settlement.	PPL Construction Dept. / CC	Check alignment of access routes	During construction activity
12.4	Drivers will be trained in responsible and safe driving practices, a speed limit will be set and maintained; in addition, vehicle logbooks will be maintained and inspected for compliance.	PPL Construction and Drilling Depts. / DC / CC	Provide training and monitor compliance	During the entire operation
12.5	Contractors will employ local residents during the project activities as much as possible.	PPL Construction and Drilling Depts. / DC / CC	Monitor adherence with the requirement and maintain record of labor	During the entire operation
12.6	Use of local firewood for cooking by contractor staff will be prohibited	PPL Construction and Drilling Depts. / DC / CC	Monitor adherence with the requirement	During the entire operation
12.7	The vehicle speed for traveling along the access road will be limited	PPL Construction & Drilling Depts. /CC/DC	Monitor speed limits	During the entire operation
12.8	The well site will be located at safe distance away from major residential communities. Thereby mitigating the effect of noise and emissions.	PPL	Check the alignment of access route	Before construction activity
12.9	Generators and vehicles will be maintained and check against PEQS standards to minimize emissions.	PPL Construction & Drilling Depts./DC/CC	Monitor air emissions	During the entire operation
12.10	Any land acquired and distribution of compensation will be carried out transparently based on prevailing market rate and in accordance with the PPL compensation procedures.	PPL	Check compliance	During the entire operation

Table 8.1: Mitigation Matrix for Construction, Drilling and flowline Laying Phase Activities				
12.11	Project staff will respect cultural norms	PPL Construction & Drilling Depts./DC/CC	Check compliance	During the entire operation
12.12	Damage to any artifacts/local old sites during construction will be prohibited and construction activities near these areas will be monitored by PPL.	PPL Construction Dept.	Check compliance	Before and during the construction activity
12.13	The access route ROW will be aligned to maintain safe distance from the edge of any graveyard and shrine (if any).	PPL Construction Dept. / CC	Check distance	Before and during construction
DC = Drilling Contractor; CC = Construction Contractor				

Table 8.2 (a): Environmental Monitoring Plan for Construction Phase of Feeder Lines

S. No.	Monitoring Aspects	Monitoring Locations	Parameters	Frequency	Responsibility	Documentation
1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke, Noise for vehicles CO, NOx, SOx and PM for engines / generators	Once during the project	PPL Construction Site Incharge / Contractor	Laboratory test Reports
2	Noise Levels	Along pipelines route, nearest to sensitive receptors like communities and at boundary of camp site	Noise Level dBA	Once in a project when work is started	PPL Construction Site Incharge / Contractor	Internally / externally
3	Feeder lines Hydrostatic Testing Wastewater (during commissioning)	Waste discharge point	Effluent Flow, Temperature, pH, COD, BOD5, TSS, TDS, Oil & Grease, Chloride and Phenolic Compounds	Quarterly (if wastewater is planned to be discharged into any nallah)	PPL Construction Site Incha	
4	Solid Waste	Project Site	Solid waste collection, storage, transportation and disposal.	During routine monitoring	PPL Construction Site Incharge / Contractor	Complete record (waste generation record, waste disposal record & disposal certificate)

Table 8.2 (c): Mitigation Matrix for Feeder Lines Decommissioning and Site Restoration Phase				
No.	**Impact and Mitigation Measures**	**Execution**	**Action / Monitoring Parameter / Monitoring Method**	**Timing**
1. Air Quality				
	The exposure of construction workers to dust should be minimized by ensuring dust mask use among the workers. Truckloads of loose soil will be covered with tarpaulin. Soil and material piles at the site will be barricaded to avoid material escape / generation of dust. Construction machinery, vehicles should be properly tuned and kept in good working condition, minimizing exhaust and vehicular emissions. It should be ensured that exhausts from these equipment and vehicles comply with relevant PEQS.	PPL, CC	Ensure compliance, monitoring	During and after the decommissioning and dismantling
2. Land Restoration and Soil Erosion				
	The trench should be backfilled with soil ensuring that the top soil is spread at the top and compacted. The natural contour of the land should be restored. The trench, while removing the pipelines, should be barricaded and highlighted with signage, reflective tapes and light to reduce the risk of locals falling it.	PPL, CC	Ensure compliance	During restoration
3. Waste Management				
	Oil should be completely removed before removal of the pipelines to avoid soil contamination. Scrap metal should be segregated.	PPL, CC	Ensure compliance	During dismantling / decommissioning and restoration
4. General mitigation measures include:				
	Pipelines left in place should be disconnected and isolated from all potential sources of hydrocarbons; cleaned and purged to remove hydrocarbons; and sealed at their ends. Repair any damaged property Demobilize all materials and equipment from the camp site Dispose all left-over wastes Ensure use of appropriate PPE by the workers	PPL, CC	Ensure compliance	During dismantling / decommissioning and restoration

Table 8.3 (a): Environmental Monitoring Plan for Well Site Construction and Well Drilling

S. No.	Monitoring Aspects	Monitoring Locations	Parameters	Frequency	Responsibility	Documentation
1.	Ambient air Quality Monitoring	Well site, camp site surrounding	SO2, NO, NO2, SPM, PM10, PM2.5, O3, Pb, CO	Once during the well drilling	Contractor	Laboratory test Reports
2.	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Once during the project	Contractor	Laboratory test Reports
3.	Waste water	Campsite	Effluent Flow, Temperature, pH, COD, BOD_5, TSS, TDS, Oil & Grease, Chloride & Phenolic Compounds	Quarterly (if wastewater discharged into any nullah)	Contractor	Laboratory test Reports
4.	Noise level	Boundaries of the well and camp sites	Noise level (dBA)	Once in a project during construction and drilling operations (when work is started)	Contractor	Internally / externally
5.	Solid Waste	Project site	Solid waste collection, storage, transportation and disposal	During routine monitoring	Contractor	Complete record waste generation record, waste disposal record & disposal certificate)
6.	Drilling Mud	Drilling Site	Collection, storage, transportation and disposal	During routine monitoring	Contractor / HSE Monitor	Complete record
7.	Occupational Safety	Well sites, campsite, project roads	HSE Records, Incidents and injuries	During routine monitoring	Contractor	Record of observations.

Table 8.3 (b): Environmental Monitoring Plan for Construction and Commissioning Phases of Feeder Lines

S. No.	Monitoring Aspects	Monitoring locations	Parameters	Frequency	Responsibility	Documentation
1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Once during the project	Contractor	Laboratory test Reports
2	Noise Levels	Along pipeline route, nearest to sensitive receptors like communities and at boundary of camp site.	Noise Level dBA	Once in a project when work is started.	Contractor	Internally / externally
3	Feeder line / Pipeline Hydrostatic Testing Wastewater (during commissioning)	Waste discharge point	Effluent Flow, Temperature, pH, COD, BOD5, TSS, TDS, Oil & Grease, Chloride and Phenolic Compounds	One time during hydrostatic testing (if wastewater discharged into any nullah)	Contractor	Laboratory test Reports
4	Solid Waste	Project Site	Solid waste collection, storage, transportation and disposal.	During routine monitoring	Contractor	Complete record (waste generation record, waste disposal record & disposal certificate)

Table 8.3 (c): Environmental Monitoring Plan for Operation & Maintenance Phase of Oil/Gas Wells and associated Feeder Lines

S. No.	Monitoring Aspects	Monitoring locations	Parameters	Frequency	Responsibility	Documentation
1	Exhaust and Emissions Monitoring	Vehicles, Generators & Fuel operated Machinery	CO, Smoke and Noise for Vehicles CO, NOx, SO2 and PM for engine / generator.	Once in a year Once in a quarter	Adhi Field Incharge	Laboratory test Reports
2	Soil Survey / Visual Inspection	Along the Feeder line route and Well Sites	Visual inspection on monthly basis.	Monthly Basis	Adhi Field Incharge	Record of observations

			Contaminated soil will be replaced with native soil and disposal of contaminated soil through PEPA approved waste contractor.	On need basis.		
3	Solid Waste	Along the feeder line Route and Well Sites	Solid waste collection, storage, transportation and disposal.	During routine monitoring	Adhi Field Incharge	Complete record (waste generation record, waste disposal record & disposal certificate)

8.8 Waste Management

CCDC Waste management plan provided as **Annex-III.**

8.9 Change Management Plan

8.9.1 Change in Operations

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

8.9.2 Change in Record Register

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

8.9.3 Change in EMP

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

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

8.10 Emergency Response Plan

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

Possible emergency situations during proposed activities include:

- Well blowout;
- Possible risks arising from operational conditions or human error that could result in accidents, such as:
- Uncontrolled material leak into the atmosphere.
- Fire/explosions.
- Occupational accidents (serious or fatal), due to product contamination, failure to comply with operating rules and procedures, negligence of the personnel, falls, onsite accidents caused by equipment, burns, inappropriate use of equipment and personal protection items.

- Environmental Contamination (due to material leaks/spill into the environment). Spillage of fuel, oil, gas, chemicals and hazardous materials;
- Natural Risks that may affect the facilities and their resulting damage to property and the person (Earthquake, Typhoon/Cyclone, Lightening etc.)
- External Risks arising from delinquent actions, terrorism, or vandalism.

Emergency situations are possible even with proper planning, design and implementation of correct procedures and personnel training. Project contractors will develop site specific emergency response plan and submit it to PPL for review.

CCDC Emergency response plan is provided as **Annex-IV.**

Spill Management Plan

The purpose of this Spill Management Plan ("SMP") is to detail spill prevention, preparedness and response requirements to support the safe response to accidental spills, leaks or releases of both hazardous and non-hazardous materials to the environment (releases to land and / or water); to eliminate or minimize the adverse effects should a spill occur and to protect the health and safety of employees and community **(Annex-V).**

8.11 Decommissioning and Site Restoration Plan

8.11.1 Site Restoration after drilling activities

Restoration of the well site and campsite depend on whether the drilled well is a success or failure. The proposed drilling, feederlines installation and work over activities will be carried for producing wells. So, the restoration measures that will be carried out have been listed as follows for the producing well.

Partial Restoration – Producing Well

The well will be secured by running kill sting and well will be partially restored. After availability of required equipment and installation of wellhead and downhole completion equipment, the well will be produced.

- The well site and access roads will be retained to support well access work for further testing.
- The outer chain link fence may be retained as a safety measure to keep wildlife away from the pit areas.
- All wastes at the well site will be disposed of in environment friendly manner.
- Either liquid / wastewater and drill cuttings will be removed from the site and disposed off in an environmentally friendly manner or WBM pit(s) will be closed as per PPEPCA sectoral guidelines. In case the drilling mud pit is an agricultural land, the drilling mud should be disposed after analysis and compliance with permissible limits of LSO 29 B.
- Wastewater and sludge from septic tank & soak pit can be disposed off into nearest municipal drain after taking approval from TMA / relevant authority and ensuring quality of wastewater meeting PEQS standards.
- Contaminated bricks of black/grey water & others shall not be given to locals for any purpose.

8.12 Environmental Budget

The expected unit cost of major component of EMP is given below. Expected cost for the implementation of Environmental Management Plan has been calculated and presented in tables 8.4 & 8.5.

Table 8.4: Cost Estimates for EMP Implementation – Well Site Construction, Well Drilling and Feeder line Installation Activities

Activity	Cost (Rupees PKR)			Remarks
	During Well Construction	Well Drilling	During Feeder-lines Installation	
Training / awareness Program	In house	In house	In house	Dedicated HSEA is deputed by PPL for in-house trainings and awareness programs.
Provision of PPEs (per person x total workforce)	20,000 per PPL staff	20,000 per PPL staff	20,000 per PPL staff	PPEs are provided on yearly basis.
Damage to natural drainage system (tentative cost)	N/A	N/A	N/A	No such damage is envisaged
Water sprinkling	Rs 5 per liter	Rs 6.73 / bbl. / km	Rs 5 per liter	For dust suppression
Ambient air monitoring	N/A	Rs 60,000 per location	N/A	Carried out through PEPA approved Lab to ensure the parameters meet the PEQS limits.
Noise and Emissions from equipment and vehicles	30,000 / engine 2,000 / vehicle	Rs 30,000 / engine Rs 2,000 / vehicle	30,000 / engine 2,000 / vehicle	Carried out through PEPA approved Lab to ensure the parameters meet the PEQS limits.
Testing of drinking water (chemical + biological)	Rs 40,000 per sample	Rs 40,000 per sample	Rs 40,000 per sample	Carried out through PEPA approved Lab to ensure the parameters meet the PEQS limits for Drinking Water.
Disposal, handling and treatment of WBM mud	N/A	Rs 95 / bbl	N/A	WBM is disposed in waste pits as per PPEPCA guidelines.
Provisions for firefighting and emergency response	N/A	Nil	N/A	Firefighting and ER arrangements are included in the drilling rig rental and well construction & feeder-lines installation work contracts respectively.

Table 8.4: Cost Estimates for EMP Implementation – Well Site Construction, Well Drilling and Feeder line Installation Activities				
Provision for detection of H_2S	N/A	Nil	N/A	Not applicable as no H2S is envisaged.
Third Party Trainings (Defensive Driving, First Aid etc.)	N/A	10,000 / person	N/A	External third-party trainings are provided depending upon the job role.
Construction of septic tank / Soak pits	8Lac / 5lac	8lac / 5lac	8Lac / 5lac	Estimated cost for construction of septic tank / soak pits along
Construction of pits (2 nos.) for handling WBM.	Rs 2.84 M without Pit liner	-	N/A	Pit liner cost is approximately 27 PKR / sq. ft.
Flare pit construction cost	Rs 1 M	-	N/A	
Spill containment measures (secondary containment for oil and fuel storage area, spill kit, drip trays etc.)	Rs 5 lac	Rs 5 lac	N/A	
Color coded bins for waste segregation	Rs 7000/piece of 200liter waste bin	Rs 9500 / day	Rs 7000/piece of 200liter waste bin	The waste pits located at existing wells serve as reservoirs for collection of hydro-testing water used in the process of testing feeder lines.
Management / Disposal of hazardous and non-hazardous waste	Rs 500/Kg		Rs 500/Kg	PEPA approved third party contractor is hired for solid waste management services including color coded bins during drilling phase.
Construction of pit for Hydrotesting water (for feeder line)	N/A	N/A	N/A	The waste pits located at existing wells serve as reservoirs for collection of hydro-testing water used in the process of testing feeder lines.
Testing of wastewater (before sprinkling / disposal in Nallah)	Rs 15,000 per sample	Rs 15,000 per sample	Rs 15,000 per sample	Carried out through PEPA approved Environmental Laboratory.

Table 8.4: Cost Estimates for EMP Implementation – Well Site Construction, Well Drilling and Feeder line Installation Activities				
Disposal, handling and treatment of OBM mud	N/A	N/A	N/A	Not applicable on these wells.
Environmental Liabilities including WBM disposal	Rs. 4 million			
Treatment of WBM liquid cuttings	N/A	Rs 95 / bbl	N/A	
Restoration Cost – Civil Structures & Others	Rs 4 M			
Commissioning of feeder lines				
Training / awareness Program	N/A	N/A	In house	
PPEs (per person x total workforce)	N/A	N/A	Rs 20000/person	
Provisions for firefighting and emergency response	N/A	N/A	N/A	The Plant is entrusted with the duty if firefighting and emergency response during commissioning of feeder lines.
Water for hydrotesting	N/A	N/A	Rs 1000 per 3000 gallon bowser	Water to be brought in from outside the block due to water scarcity

Table 8.5: Cost Estimates for EMP Implementation – Operational Phase		
Activity	**Cost (Rupees PKR) Gross**	**Remarks**
Training / awareness Program	-	In-house
PPEs (per person x total workforce)	-	No additional budget required. Routine PPEs and QHSE Plant budget shall be consumed.
Provisions for firefighting and emergency response		
Vehicular emission monitoring once a year	-	No additional budget required. Routine emissions testing as per approved EMP shall be carried out.
Feeder line testing / inspection	-	No additional budget required. Routine testing & inspection budget shall be used.
Land clean up and restoration in case of leak from FL	-	No additional budget required. Routine testing & inspection budget shall be used.

9. CONCLUSION

The present Environmental Impact Assessment (EIA) study has been undertaken for the proposed drilling and workover activities within the Adhi Mining Lease, District Rawalpindi, Punjab. Pakistan Petroleum Limited (PPL) intends to carry out drilling and feeder line installation at Adhi South-10 and Adhi-36, along with workover operations at Adhi South-2, with the objective of enhancing hydrocarbon production from the lease area.

The EIA study aimed at assessment of the environmental and socioeconomic impacts of the proposed project activities. The EIA study also fulfils the legal requirement of Section 12 of Punjab Environmental Protection Act, 2012 (amended 2017). EIA has been conducted to evaluate the impacts and propose mitigation measures. The findings from the study conducted have been categorically recorded and presented in this report.

The project aims to perform drilling and work over activities in Adhi Mining Lease, District Rawalpindi, Punjab. The objective is to increase and revive the production of crude oil wells thus, extending their productive life and maximizing hydrocarbon recovery.

A baseline survey of the project area conducted by the EIA study team to provide the basis of establishing profiles of natural, socioeconomic and cultural environments which might be impacted by project activities. All activities associated with the proposed project have been reviewed and their possible impacts methodically analyzed and mitigation measures have been provided. Major impacts from project activities include changes in physiography from construction works, soil and water contamination from spills, noise, air emissions, impacts on water resources. However, it is anticipated that projects will be mainly localized and of short duration. Since settlements are safely located away from the sites, there will be no direct impact on the communities from drilling activities. Safety of workers will however be required as they will be exposed to safety hazards during drilling.

A comprehensive Environmental Management Plan has been formulated and added in the EIA to provide a program to manage and control the negative impacts. Implementation of EMP along with other PPL safety procedures and PPL QHSE Policy can effectively reduce the scale and magnitude of negative impacts.

Based on the findings of risk assessment, the EIA study concludes that the potential environmental impacts, arising from construction and well drilling and other associated activities can reasonably be mitigated through effective implementation of Environmental Management Plan, Environmental Monitoring Plan, good industry practices and PPL's procedures and protocols for drilling. It is thus recommended that the EIA for the proposed project to be approved with the condition that all corrective and mitigation measures proposed in this report will be implemented with diligence.

ANNEX-I: CONCESSION AGREEMENT

No DGP(1)-5(36)/84-Vol-III-Pt
Government of Pakistan
Ministry of Energy (Petroleum Division)
Directorate General of Petroleum Concessions
03rd Floor, Petroleum House, G-5/2
*****

Islamabad 22nd November, 2019

Managing Director,
Pakistan Petroleum Ltd,
PIDC House, Dr. Ziauddin Ahmed Road,
P.O Box 3942,
Karachi.

Subject: **APPROVAL FOR RENEWAL OF ADHI MINING LEASE**

Dear Sir,

I am directed to refer to your letter No.Adhi/AdhiML-4thRenewal dated 26th July, 2019 and previous correspondence resting on above subject and to say that Government has been pleased to grant five (05) years renewal w.e.f. 13th November, 2019 over Adhi Mining Lease covering an area of 82.195sq Miles, located in districts Rawalpindi & Chakwal, Punjab in accordance with rule-34 of Pakistan Petroleum (Production) Rules, 1949 and Article 51(1) of Adhi Mining Lease Deed subject to the condition that M/s PPL shall fulfill all the existing statutory obligations as per applicable Rules/PCA/lease Deed etc and will clear all outstanding obligation(s), if any, within thirty (30) days from issuance of this letter.

2. All other terms and conditions of the original Mining Lease shall remain applicable.

Yours truly,

(Muhammad Imran Farid)
Deputy Director (Exploration)
For Director General Petroleum Concessions

Copy to:

1. The Chief Secretary, Government of Punjab, Lahore
2. The Secretary Energy Department, Government of Punjab. Lahore
3. The Secretary, Minos & Minerals Development Department Government of Punjab, Lahore
4. The Secretary, Home Department, Government of Punjab, Lahore
5. The Deputy Commissioner. District Rawalpindi, Punjab.
6. The Deputy Commissioner. District Chakwal, Punjab.
7. The Chairman PAEC Post Box No. 1114. Nilore, Islamabad.
8. Director General (Gas). Petroleum House. Islamabad.
9. The Chairperson, OGRA, 54-B, Fazal-e- Haq Road, Blue Are, Islamabad.
10. The Chief Inspector of Mines 2nd Floor, Petroleum House, G-5/2, Islamabad.
11. Director (Database), DGPC, Islamabad.
12. Director (Production), DGPC, Islamabad.

ANNEX-II: ENVIRONMENTAL MONITORING REPORTS

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

EPA

Validation for Monitoring / Sampling of Stack Emission, Noise, Ambient air, Vehicular emissions

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Cautions Related to scope, use & legal foundation of Validation

1. The Validation is quality control check under Regulation 91(d) for sampling & monitoring.
2. The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate.
3. The Scope of quality check of validation does not cover quality check of results declared with Report.
4. "The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. while the report is not valid for Court cases, EPO, compliance reporting for operational Phase approvals, punitive actions such as Smog prevention & control Rules, 2023, complaint cases, etc". The same shall be exhibit at top of Report during its issuance under Regulation 12.
5. The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory.
6. The EPA officer as well as certified Laboratory should also comply directions issued by authority vide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test report.

Nature Of Sample	Stack Emissions	Ambient Air ✓	~~Vehicular Emission~~	Ambient Noise ✓
Description of monitored source / Site	Drilling activities in Adhi Mining Lease			
Name and category of Unit	Pakistan Petroleum Limited, Rawalpindi			
Standard Method	USEPA Standards			
Equipment, Model,	Horiba-370, Noise Meter, AQMS Analyzer.			
Field Tested Parameters,	O_3, CO, SO_2, NO, NO_2, NOX, Noise, PMe, $PM_{2.5}$	Lab Tested Parameters **(Not Validated)**	Declared Results	

Industrial Gaseous Emissions			
Values of tested Field Parameters: CO .....mg/nM3, NOx ...mg/nM3 , excess air (%age):			
(i) 5 min Ramp-Up phase (ii) flow rate & EC Temp. measured during calibration & testing (iii) Data recorded with 15 min interval (iv) complied all QA/QC checks	Yes	NO	NA
Stack Particulate Matter (PM) Monitoring / Sampling under USEPA Method 5 / 17			
(i) Sample train is complete (ii) Leak Test Performed (iii) data sheet filled (iv) "K" & "Y" calculated (v) QA/QC complied (vi) suitability of filter ensured	Yes	No	NA
Stack SOx sampling as per Method 8 (Thorin Indicator Method)			
(i)Absorbent solution available (ii) Flow rate as per method (iii) sampling as per Method	Yes	No	NA
Ambient Air Quality Monitoring by Automatic Monitors for CO, O3, SO2, NOx, PM2.5 & PM10 AA-01			
Zero/span check is performed (ii) CE of NOx 96% - 104.1% , Compliance of Critical Criteria (iii) Compliance of operational Criteria (iv) Comply PEQS measuring technique	Yes ✓	No	NA
Ambient Air Sampling of SPM, PM10, Pb by High Volume Sampler			
(i) The flow rate of sampler 1.1m3/min, (ii) Calibration performed	Yes ✓	No	NA
Vehicular Emissions & Noise Measurement			
Vehicle emissions and noise measurement performed as per method	Yes ✓	No	NA

Remarks:-

Muhammad Ahmad Akram
Research Officer,
EPA (Labs), Lahore

Dated

01-09-2025
02-09-2025

Green Crescent Environmental Consultants Pvt Ltd. PAKISTAN

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

EPA

Validation for Sampling of Wastewater & Drinking Water / Ground water

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Nature Of Sample	**Waste water**		**Drinking Water / Ground water** ✓	
Description of Sample source /Site			Pumps.	
Name and category of Project /Unit	Pakistan Petroleum Limited, Rawalpindi			
Standard Method used for Sampling	APHA – 1060 B&C			
Field Tested Parameters ,	Field Tested parameter	pH Temperature	**Lab Tested Parameters (Not validated)**	

Waste Water Treatment facility	Primary	Secondary	Tertiary
Total WW collected Sample		Total Collected Drinking water samples	GW=02

Sample Tag for testing parameter is assigned on sample container	Yes ✓	NO	NA
Sample is preserved properly for each testing parameter	Yes ✓	NO	NA
Sample size is adequate for testing the target parameters	Yes ✓	NO	NA
Wastewater Flow Measurement performed to ensure sample representativeness	Yes	NO ✓	NA

No. of Waste Water outlets	Waste Water Flow m^3/hr from each outlet (**Optional**)	Water intake m^3/hr(**Optional**)	Water Mass balance (**Optional**)	Sample Type
			Yes No	Grab ✓ Composite

Sample Type: Ground water

Parameter	Matrix W	Matrix WW	Container	Sample Size	Preservation	Yes	NO	NA
Coliform,TotaloFecal	✓		SterileContainer	100mL	Refrigerate6C	✓		
Coliform,TotaloFecal,ChlorinatedWater	✓		Sterile Container	100mL	0.008% Thiosulphate& cooled6C	✓		
Color, Turbidity	✓		P,G	500mL	Cool6C	✓		
Hardness,Total	✓		P,G	500ml	HNO3 to pH<2	✓		
Nitrogen,Nitrate+Nitrite , Phenolic Compounds, Oil & Grease, COD, NH3	✓		P,G	2000 mL	H2SO4 topH <2,Cool6C	✓		
Metals,General	✓		P,G Rinsed1.1 HNO3	500mL	HNO3 topH < 2	✓		
Cyanide,Total	✓		P,G	500mL	NaOHtopH> 12,Cool 6C	✓		
Pesticides,General	✗		Glass	1Liter	Cool6C	✗		

Field Parameters

Field parameter		pH meter, Model Make	Measurement Method	Calibrated in Field	Measured value
pH		Lovibond	APHA 4500 H+B	Yes ✓ NO	7.2
Temp		Digital Thermometer			19.1°C
Cl					

Remarks / Caution: (1) The Validation is quality control check under Regulation 91(d) for sampling & monitoring. (2)The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate (3)The Scope of quality check of validation does not cover quality check of results declared with Report (4) The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. (5) The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory (6) The EPA officer as well as certified Laboratory should also comply directions issued vide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test report.

Muhammad Ahmad Akram
Research Officer,
EPA (Labs) Lahore

Dated

01 - 09 - 2025

Green Crescent Environmental Consultants (Pvt) Ltd. * PAKISTAN *

Green Crescent
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 10127

Monitoring & Test Report

- Ground Water
- Soil Sample
- Ambient Air Monitoring
- Noise Monitoring

PAKISTAN PETROLEUM LIMITED(PPL)

4th Sep. 2025

Job Reference No.: GCEC-PK-PU-283/2025

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore, Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Client Detail:	
Name of Contact Person:	Mr. Mohiuddin
Designation:	Sr. Environmentalist
Contact Number:	+92 51 8744155
Email:	*muhammad.mohiuddin@gmc.com.pk*
Address:	403, Green Trust Tower, Jinnah Avenue, Blue Area, F6, Islamabad

GCEC Details:	
Director:	Mr. Mian Khurram Usman
Telephone:	+92 42 35962885
Fax:	+92 42 35962884
Email:	manager.operations@gcee.ae
Address	House No. 368-B Block B, Canal View, Lahore

Signatories:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Sample Details			
Job Ref. No:	GCEC-PK-PU-283/2025	Client Name:	Pakistan Petroleum Limited (PPL)
Telephone No.	+92 51 8744155	Sample Matrix:	Ground Water Sample
Sample Date:	01-09-2025	Sampled By:	GCEC
Sample Receipt Date:	02-09-2025	Date of Completion of Analysis:	04-09-2025
Grab/Composite:	Grab Sampling		
Sample Identification			
01	Dhoong	Sampling Coordinates:	33°06'03.5"N 73°06'46.6"E

Parameters	Analysis Method	Unit	LOR	Result 01	PEQS
PHYSICAL & CHEMICAL ANALYSIS					
pH	APHA-4500H+ B	-	0.01	7.1	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	176.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	997.0	< 1000
Ammonia	APHA-4500-NH3 B	mg/l	0.002	<0.002	-
Chloride	APHA-4500Cl- B	mg/l	0.24	140.89	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate	APHA-4500NO3 C	mg/l	0.1	2.4	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	ND	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.008	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	µg/l	0.1	<0.1	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.0016	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA-9222 B	CFU/100ml		Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA-9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected **LOR:** Limit of Reporting **PEQS:** Punjab Environmental Quality Standards

Note:
**Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Prepared By:

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt. Ltd. * PAKISTAN *

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Sample Details			
Job Ref. No:	GCEC-PK-PU-283/2025	Client Name:	Pakistan Petroleum Limited (PPL)
Telephone No.	+92 51 8744155	Sample Matrix:	Ground Water Sample
Sample Date:	01-09-2025	Sampled By:	GCEC
Sample Receipt Date:	02-09-2025	Date of Completion of Analysis:	04-09-2025
Grab/Composite:	Grab Sampling		
Sample Identification			
02	Chechi Noor	Sampling Coordinates:	33°06'20.8"N 73°05'42.5"E

Parameters	Analysis Method	Unit	LOR	Result 02	PEQS
PHYSICAL & CHEMICAL ANALYSIS					
pH	APHA-4500H+ B	-	0.01	7.29	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	180.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	671.0	< 1000
Ammonia	APHA-4500-NH_3-B	mg/l	0.002	<0.002	-
Chloride	APHA-4500Cl- B	mg/l	0.24	70.44	< 250
Cyanide (CN)	APHA-4500CN- E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO2 B	mg/l	0.01	<0.01	≤ 3 (P)
Nitrate	APHA-4500NO3 C	mg/l	0.1	3.8	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	ND	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.008	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	µg/l	0.1	<0.1	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.0016	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA-9222 B	CFU/100ml		Absent	0/100ml
Faecal Coliforms (Ecoli)	APHA-9222 D	CFU/100ml		Absent	0/100ml

Abbreviations:
ND: Not Detected LOR: Limit of Reporting PEQS: Punjab Environmental Quality Standards

Note:
*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirements. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.

Prepared By:

Reviewed By:

Approved By:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae @www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

CHEMICAL ANALYSIS TEST REPORT (SOIL SAMPLE)

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Sample Details			
Job Ref. No:	GCEC-PK-PU-283/2025	Client Name:	Pakistan Petroleum Limited (PPL)
Telephone No.	+92 51 8744155	Sample Matrix:	Soil Sample
Sample Date:	01-09-2025	Sampled By:	GCEC
Sample Receipt Date:	02-09-2025	Date of Completion of Analysis:	04-09-2025
Grab/Composite:	Grab Sampling		
Sample Identification			
01	Adhi 36 Wellsite	Coordinates:	33°06'24.2"N 73°06'21.3"E

Parameters	Analysis Method	Unit	LOR	Result	LSO 29-B Limit
				01	
PHYSICAL & CHEMICAL ANALYSIS					
pH	USEPA 9045 D	Standard unit	0.01	7.79	6-9
Arsenic	USEPA 3050 B	ppm	0.01	<0.01	<10
Barium	USEPA 3050 B	ppm	0.031	0.2901	40,000
Cadmium	USEPA 3050 B	ppm	0.0028	<0.0028	<10
Chromium	USEPA 3050 B	ppm	0.0054	0.6429	500
Mercury	USEPA 3050 B	ppm	0.0008	ND	<10
Selenium	USEPA 3050 B	ppm	-	0.3777	<10
Silver	USEPA 3050 B	ppm	0.0032	<0.0032	<200
Zinc	USEPA 3050 B	ppm	0.0033	1.66	500
Oil and Grease	USEPA 9071 B	%	0.1	<0.1	<3
Electrical Conductivity	ISO 11265:1994	mmhos/cm	1.0	0.124	<12
Moisture Content	In-house	%	-	20.0	<50

Abbreviations:

ND: Not Detected

LOR: Limit of Reporting

Note:

**Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Prepared By:

Reviewed By:

Approved By:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore, Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
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CHEMICAL ANALYSIS TEST REPORT (SOIL SAMPLE)

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Emergency Prevention and Control) Rules, 2023 etc.

Sample Details			
Job Ref. No:	GCEC-PK-PU-283/2025	Client Name:	Pakistan Petroleum Limited (PPL)
Telephone No.	+92 51 8744155	Sample Matrix:	Soil Sample
Sample Date:	01-09-2025	Sampled By:	GCEC
Sample Receipt Date:	02-09-2025	Date of Completion of Analysis:	04-09-2025
Grab/Composite:	Grab Sampling		
Sample Identification			
02	Adhi South 10 Wellsite	Coordinates:	33° 5'34.43"N 73° 6'17.28"E

Parameters	Analysis Method	Unit	LOR	Result	LSO 29-B Limit
				02	
PHYSICAL & CHEMICAL ANALYSIS					
pH	USEPA 9045 D	Standard unit	0.01	6.41	6-9
Arsenic	USEPA 3050 B	ppm	0.01	<0.01	<10
Barium	USEPA 3050 B	ppm	0.031	0.3211	40,000
Cadmium	USEPA 3050 B	ppm	0.0028	<0.0028	<10
Chromium	USEPA 3050 B	ppm	0.0054	0.4971	500
Mercury	USEPA 3050 B	ppm	0.0008	ND	<10
Selenium	USEPA 3050 B	ppm	-	0.2555	<10
Silver	USEPA 3050 B	ppm	0.0032	0.7521	<200
Zinc	USEPA 3050 B	ppm	0.0033	1.04	500
Oil and Grease	USEPA 9071 B	%	0.1	<0.1	<3
Electrical Conductivity	ISO 11265:1994	mmhos/cm	1.0	0.143	<12
Moisture Content	In-house	%	-	17.13	<50

Abbreviations:

ND: Not Detected

LOR: Limit of Reporting

Note:

**Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.*

Prepared By:

Reviewed By:

Approved By:

Green Crescent Environmental Consultants Pvt. Ltd. * PAKISTAN *

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
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Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Ambient Air Monitoring Location

NEAR PROJECT SITE

(Rawalpindi)

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
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Usmania Tower, E-11/3 Markaz
Islamabad,
Ph: 051 2375145

Ambient Air Quality Monitoring

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-283/2025
Monitoring Point	Near Project Site
Date of Intervention	01-Sept-2025 to 02-Sept-2025
Monitoring Coordinates	33° 5'12.84"N 73° 6'39.33"E

Sr. #	Time	CO (mg/m³)	NO (µg/m³)	NO_2 (µg/m³)	NO_x (µg/m³)	SO_2 (µg/m³)
1.	10:00	1.24	25.64	37.20	62.85	20.17
2.	11:00	1.33	24.06	34.30	58.36	21.95
3.	12:00	1.66	22.65	39.18	61.83	19.69
4.	13:00	1.47	23.71	37.20	60.91	15.63
5.	14:00	1.54	25.64	38.26	63.90	17.87
6.	15:00	1.69	24.41	34.17	58.58	18.99
7.	16:00	1.28	24.23	33.51	57.74	20.22
8.	17:00	1.41	25.29	34.96	60.25	20.89
9.	18:00	1.38	27.22	38.52	65.75	22.69
10.	19:00	1.70	25.64	34.17	59.81	24.70
11.	20:00	1.14	24.23	35.75	59.99	25.71
12.	21:00	2.18	22.65	34.30	56.95	22.69
13.	22:00	1.17	22.83	36.94	59.77	21.23
14.	23:00	1.23	20.19	38.52	58.71	25.82
15.	00:00	1.75	22.47	40.24	62.71	23.36
16.	01:00	1.18	21.59	38.26	59.85	22.01
17.	02:00	1.51	25.99	37.34	63.33	21.01
18.	03:00	1.49	25.46	39.84	65.31	21.45
19.	04:00	1.52	27.05	37.20	64.25	25.60
20.	05:00	1.23	24.23	38.13	62.36	24.70
21.	06:00	1.58	25.82	37.07	62.89	23.47
22.	07:00	1.64	24.59	34.17	58.76	22.24
23.	08:00	1.32	24.41	36.94	61.35	20.78
24.	09:00	1.35	24.23	38.26	62.49	21.57
Average Concentration		**1.46**	**24.34**	**36.85**	**61.20**	**21.85**

Deputy Analyst:

Reviewed By:

Approved By:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Ambient Air Quality Monitoring

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-283/2025
Monitoring Point	Near Project Site
Date of Intervention	01-Sept-2025 to 02-Sept-2025
Monitoring Coordinates	33° 5'12.84"N 73° 6'39.33"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS
Nitrogen Dioxide (NO_2)	µg/m³	24 Hours	1.00	36.85	80.0
Nitrogen Oxide (NO)	µg/m³	24 Hours	1.00	24.34	40.0
NO_X	µg/m³	24 Hours	1.00	61.20	120.0
Sulphur Dioxide (SO_2)	µg/m³	24 Hours	1.00	21.85	120.0
Carbon Monoxide (CO)	mg/m³	24 Hours	0.01	1.46	5.0*
Ozone (O_3)	µg/m³	24 Hours	-	27.93	130.0**
Particulate Matter ($PM_{2.5}$)	µg/m³	24 Hours	1.00	34.80	35.0
Particulate Matter (PM_{10})	µg/m³	24 Hours	1.00	111.65	150.0
Suspended Particulate Matter (SPM)	µg/m³	24 Hours	1.00	181.45	500.0
Lead Airborne Particles	µg/m³	24 Hours	-	0.16	1.5

Abbreviations:
µg/m³= Micrograms per Cubic Meter
mg/m³= Milligrams per Cubic Meter
LDL= Lowest Detection Limit
PEQS= Punjab Environmental Quality Standards
*08 hour standard for CO
**01 hour standard for O_3

Deputy Analyst:

Reviewed By:

Approved By:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore, Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Meteorological Data

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Job Reference Number	GCEC-PK-PU-283/2025
Monitoring Point	Near Project Site
Date of Intervention	01-Sept-2025 to 02-Sept-2025
Monitoring Coordinates	33° 5'12.84"N 73° 6'39.33"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
10:00	34	SW	3.8	46	754.8
11:00	33	W	4.2	46	754.6
12:00	33	SW	4.0	47	754.5
13:00	33	SW	4.1	50	754.4
14:00	32	S	4.2	54	754.3
15:00	31	SW	5.0	56	754.4
16:00	29	W	3.4	59	754.5
17:00	29	SW	3.1	60	754.8
18:00	29	SW	3.2	62	755.1
19:00	26	S	3.1	64	755.1
20:00	26	SW	3.8	65	755.2
21:00	26	W	3.8	66	755.3
22:00	25	W	3.9	69	755.2
23:00	23	W	3.7	68	754.9
00:00	22	SW	4.0	65	754.7
01:00	21	SW	3.9	62	754.5
02:00	21	S	4.0	61	754.5
03:00	21	SW	4.1	61	754.5
04:00	21	W	3.9	60	754.6
05:00	26	W	3.8	59	755.1
06:00	29	S	3.9	58	755.3
07:00	27	S	4.0	57	755.1
08:00	27	SW	3.9	57	754.9
09:00	30	S	4.0	55	755.1

Deputy Analyst:

Reviewed By:

Approved By:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore, Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae @www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Noise Level Monitoring Report

Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-283/2025
Monitoring Point	Near Project Site
Date of Intervention	01-Sept-2025 to 02-Sept-2025
Monitoring Coordinates	33° 5'12.84"N 73° 6'39.33"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	PEQS (Industrial)
Night Time					
1.	23:00	Noise Meter	dB	49.7	
2.	00:00	Noise Meter	dB	45.3	
3.	01:00	Noise Meter	dB	50.3	
4.	02:00	Noise Meter	dB	47.4	65.0
5.	03:00	Noise Meter	dB	55.8	
6.	04:00	Noise Meter	dB	47.2	
7.	05:00	Noise Meter	dB	50.3	
8.	06:00	Noise Meter	dB	47.5	
Night Time Average			**dB**	**49.19**	**65.0**
Day Time					
9.	07:00	Noise Meter	dB	56.1	
10.	08:00	Noise Meter	dB	52.4	
11.	09:00	Noise Meter	dB	51.9	
12.	10:00	Noise Meter	dB	47.9	
13.	11:00	Noise Meter	dB	53.0	
14.	12:00	Noise Meter	dB	55.5	
15.	13:00	Noise Meter	dB	60.0	
16.	14:00	Noise Meter	dB	56.7	75.0
17.	15:00	Noise Meter	dB	54.9	
18.	16:00	Noise Meter	dB	56.3	
19.	17:00	Noise Meter	dB	59.3	
20.	18:00	Noise Meter	dB	57.9	
21.	19:00	Noise Meter	dB	55.6	
22.	20:00	Noise Meter	dB	53.1	
23.	21:00	Noise Meter	dB	54.8	
24.	22:00	Noise Meter	dB	52.6	
Day Time Average			**dB**	**54.88**	**75.0**

Deputy Analyst: Sufyan

Reviewed By:

Approved By:

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore. Pakistan.
0320 4143519, 0320 4143318
042 35962884-85 0320 4143318
manager.operations@gcee.ae @www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

Pictorial Evidence for Ground Water, Soil Sampling & Ambient Air Monitoring

Figure 1: Ground Water Sampling at Doong

Figure 2: Ground Water Sampling at Chechi Noor

Figure 3: Soil Sampling at Adhi 36 Wellsite

Figure 4: Soil Sampling at Adhi South 10 Wellsite

Figure 5: Ambient Air Monitoring

End of Report

Pakistan Office: House No. 368-B , Block Canal View Housing Society, Lahore, Pakistan.
0320 4143519, 0320 4143318
042 35982884-85 0320 4143318
manager.operations@gcee.ae www.gcee.pk

Islamabad Office:
Flat # 4C, 4th Floor
Usmania Tower, E-11/3 Markaz
Islamabad.
Ph: 051 2375145

ANNEX-II: WASTE MANAGEMENT PLAN

HSE

CNPC CHUANQING DRILLING
ENGINEERING COMPANY LIMITED

WASTE DISPOSAL HANDLING PROCEDURE

HSE-03-022

Prepared By: (HSE Officer)	
Reviewed By: (Director HSE)	
Approved By: (CEO)	
Issue Date:	13-05-2024
Process Owner:	HSE Department

CONTROL OF THIS MANUAL

The HSE Department is responsible for the development and maintenance of this procedure. All subsequent revisions of the procedure shall be approved by the HSE Manager.

REGISTRATION AND DISTRIBUTION

The procedure is issued as follows:

Controlled copies	*The controlled copies are distributed to personnel for regular use and shall be systematically updated. Controlled copies are issued to the CNPC Chuanqing Drilling Engineering Company's library, clients (upon request), all sites/units and major subcontractors.*
Uncontrolled copies	*Uncontrolled copies are distributed for information and information purposes. Such manuals shall be properly marked, and are **NOT** subject to revisions.*

The HSE Department shall keep the track of the registration and distribution of the HSE Procedures. All controlled copies shall be registered and stamped as "CONTROLLED COPY" before delivery to the end user. The end user shall sign upon receipt of the controlled copy of the HSE Procedures. Every controlled copy shall be returned back to the HSE Department if the end user has no any further need for it. The HSE Department is responsible to send updates for all the controlled copies after revisions. This shall be achieved as replacement of the particular pages subjected to the revisions or as a

replacement of the whole Procedure. Uncontrolled copy stamped as ”CONTROLLED COPY” before delivery and is not subject to update upon revisions.

Contents

1 GENERAL

1.1 PURPOSE AND SCOPE

This document describes the waste disposal strategy to be utilized on CNPC Chuanqing Drilling Engineering Company's Rig units.

This Procedure shall form input to the overall waste handling plan for the CNPC Chuanqing Drilling Engineering Company's Rig sites.

The objectives of this Procedure are to:

- identify and describe the types anticipated waste generated
- identify methods for effective management and handling of these wastes
- identify possible waste reduction measures

It is the responsibility of Rig site/Project to prepare detailed waste handling plans in co-operation with Client and local Authorities.

1.2 OBJECTVE

The objective of this waste management procedure is to achieve waste minimization and to maintain compliance with CCDC standards.

1.3 RESPONSIBILITY

- Rig manager is responsible to ensure that the crew has a written Waste Management plan and is implemented.
- Tool pusher is responsible to complete the plan for the location in conjunction with Rig manager and HSE Officer. Tool pusher is also responsible to ensure that the plan is implemented and employees are trained in its use.
- HSE Officer is responsible to support the Rig manager and the responsible person for the plan to complete and implement it.
- HSE Manager is responsible that this procedure is updated after the organizational or operational changes, if necessary.

1.4 NON CONFORMANCE TREATMENT

All deviations from the guidelines given in this procedure shall be treated in accordance with HSE-03-014 "*Non-Conformance and Corrective Action procedure*".

2 WASTE CATEGORIES

During the drilling operation various types of waste may be produced on the Rig site. In order to manage the waste effectively it is necessary to identify these waste types, where they are likely to be generated and in what approximate quantities. This information should then be integrated in the waste management handling plan.

Waste is defined as discarded objects or substances, and includes superfluous objects from service activities, production and treatment plants etc. It does not include wastewater and emissions to air, which are not classified as waste.

Waste can broadly be categorised into:

- consumer waste
- hazardous waste

2.1 Consumer waste

Consumer waste is ordinary waste, including larger objects such as furnishings etc. from households, small shops etc. including offices. From this description it is clear that the number of persons working within the drilling area largely dictates the amount of consumer waste generated. This varies with the on-going activity since the amounts of consumer waste fluctuates. The following is a list of materials, which are usually categorized as consumer waste:

- Paper and cardboard
- Metal
- Plastic
- Wooden waste
- General waste, such as empty paint tins, light bulbs, clothes, shoes, small disposable batteries etc.
- Electrical waste
- Glass
- Food waste
- Medical waste

2.2 HAZARDOUS WASTE

Hazardous waste may be defined as waste "which can not be appropriately treated together with consumer waste because of its size, or because it may lead to serious pollution or risk of injury to persons or animals". The following is a list of materials, which are usually categorized as a consumer waste:

- Battery
- Paint
- Spray can/aerosol
- Fluorescent light tube
- Oil contaminated material
- Chemical (pure product)
- Chemical mixture
- Drilling waste
- Low radiation waste / contaminated scale type waste

3 CHARACTERISTICS OF HAZARDOUS WASTE

Hazardous waste and materials often represent an environmental risk as well as a potential health and safety concern. For this reason it is essential that all appropriate personnel understand and comply with the rules, guidelines and regulations pertaining to hazardous waste management. A waste can be considered hazardous waste either due to characteristics or being included on a list created by environmental agencies.

3.1 Characteristics that cause a waste to be hazardous are:

3.1.1 IGNATIABILITY:

Ignitable waste produces a risk of fire during routine handling operations. Included are liquids with flash point less than 140°F. (60°C), a solid that can cause fire easily and burn vigorously, or gases that ignite and burn readily. Rig waste could include:

- Ignitable paint waste,
- Thinner and brush cleaners,
- Stripping agents,
- Ethanol, Ethylene Dichloride, Isopropanol, Kerosene, Petroleum Solvents,
- Epoxy resins, adhesives, rubber cements, glue.

3.1.2 CORROSIVITY:

Corrosive wastes are those that can eat through standard containers and causes release into the environment. A waste is considered corrosive if it has a PH of 2 or less or a PH of 12.5 or more. Rig waste could include:

- Spent Acids/Bases: Nitric Acid, Ammonium Hydroxide, Sulfuric Acid, Sodium Hydroxide,
- Rust removers containing Acid-Base Solutions,
- Corrosive cleaning solutions,
- Alkaline degasser

3.1.3 REACTIVITY:

Reactive waste tends to be unstable, may react with water or capable of generating toxic gasses or vapors. These wastes tend to explode during routine handling. Rig waste could include:

- Chromic Acids
- Hypochlorite
- Organic Peroxides
- Sulfides

3.1.4 EP-TOXICITY:

EP-Toxicity refers to extraction procedures as it relates to the hazards of waste leaching toxic substances through soil and into ground water. Rig waste could include:

- Batteries containing lead
- Paint waste containing certain metals such as lead and chromium
- Parts soak tank bottoms containing lead
- Insecticides
- Pipe dope containing lead

4 WASTE HANDLING

4.1 GENERAL

This chapter describes the expected segregation and collection of the waste generated. The measures shall to some degree depend upon the storage facilities available. Segregation and storage should be provided.

4.2 WASTE SEGREGATION

Waste segregation should be standard practice for most of the CNPC Chuanqing Drilling Engineering Company’s Rig sites. It is important that the segregation takes place as close as possible to the source. This should be balanced against the problem of having large numbers of small waste containers located at numerous sites around.

4.2.1 SEGREGATION OF CONSUMER WASTE

Appendix 2 gives the waste separation and collection options.

Paper and cardboard: collection points in mud logging office areas and possibly the Rig Manger's office and control room. Cardboard for shaker screens is re-used to transport shaker screens and shall not be separated from the screens. Intermediate collection should be taken to a main collection point outside.

Metal, wood, glass, plastic, electronic waste can be collected on an "as required" basis. Special provisions may have to be made for the collection of the metal barrels used to transport the polymer additive for the slurrification unit. Depending upon the polymer type this waste may be classified as hazardous.

General waste: collection containers/skippers should be provided at each Rig site. They should be easily identifiable.

4.2.2 SEGREGATION OF HAZARDOUS WASTE

Reference is made to Appendix 1 which describes the types of recognised hazardous waste. Hazardous waste shall be separated from other waste types and handling. Hazardous waste shall not be mixed or stored with other waste types. The degree of segregation shall be dictated by the amount of any one particular hazardous waste being generated, and the by type of segregation taking place on the rest of the platform.
Separate hazardous waste collection points shall be located at each Rig site should be easily identifiable and accessible for deposit and removal.

In reference to oil based mud and various oil, glycol and hydraulic fluid spills which may occur; the Rig site/Project shall be equipped with a portable fluid recovery unit (or called slop-tank), which shall collect the spill. This collection shall then be disposed in a hazardous drain area or transported away to a disposal site. Waste from wash down of the spill area, or other oil contaminated area (e.g. pump areas) shall be contained by bund walls, which enable collection with the recovery unit. Bunded areas are also drained to the hazardous drain system.

Oil contaminated drill cuttings shall be collected in big-bags for disposal.

4.3 STORAGE FACILITIES FOR WASTE

Dedicated spaces for the storage of waste should be assigned and located as close as possible to the drilling area to enable effective deposition from the collection points.

4.3.1 STORAGE FACILITIES FOR CONSUMER WASTE

Smaller consumer waste bins/containers shall be strategically located throughout the Rig site and shall be periodically emptied in the appropriate storage container elsewhere.

4.3.2 STORAGE FACILITIES FOR HAZARDOUS WASTE

Oil contaminated cutting shall be collected in big-bags or holding tanks and transported to a suitable disposal site.

The remaining hazardous wastes generated shall be collected in clearly marked dedicated bins. This marking shall follow the Client system.

5 WASTE DISPOSAL

5.1 PACKING AND MARKING

- Hazardous waste shall be declared in accordance to the Declaration sheet.
- Hazardous waste shall be packed to ensure safe storage and transport.
- Unused chemicals shall be returned in intact packing to avoid leakage.
- Marking shall be visible.

5.2 TRANSPORTATION

Before the transportation of the waste the packing, marking and documentation shall be controlled. Hazardous waste shall be delivered to an approved landfill. If hazardous waste has to be stored at Rig site, specified by the Contract, then it shall be stored in protected areas.

Container bins used for transportation and storage shall be cleaned after usage. Empty bins, which are not cleaned, shall be treated as hazardous waste.

6 WASTE REDUCTION

Opportunities for the reduction of waste generation can be evaluated on an on-going basis.

Source reduction is a waste management technique, which reduces the amount and/or the toxicity of the waste being generated. Options available include:

- substitution of environmentally damaging chemicals with more benign substances
- bulk packaging of consumables may reduce packing waste
- plastic packaging should be avoided and re-usable packaging encouraged from suppliers
- evaluate efficiencies in procedures which can generate leaks
- require vendors to take back packaging

Recycling is another method whereby waste may be reduced. Opportunities for recycling waste should be investigated and procedures for the segregation of waste to be recycled should be implemented.

7 GENERAL WASTE MANAGEMENT GUIDELINES

- Effective waste management involves a cradle to grave approach to the generation, tracking and disposal of wastes. A waste management plan should consider opportunities to minimize waste generation and storage
- All waste shall be managed in a way that minimizes the potential or adverse impact to the surrounding human as well ecological environment.
- Appropriate personnel should be aware of the fact that the liabilities associated with storage, transportation and disposal of wastes are not readily transferred to others.
- Training is on of the best waste minimization opportunities. A company's efforts to minimize waste and gain the associated benefits will only be effective if the people in the field understand waste classification and the concept of waste minimization.
- Personnel should be encouraged to minimize waste disposal through materials management and reuse/recycling programs.
- Waste reduction is best achieved by evaluating all processes. Some specific actions includes ordering materials in appropriate quantities without excessive packaging.
- Where possible, returning containers, packaging, etc. to the suppliers for reuse or recycling.

- Substituting materials that are more readily recycled or that generates fewer or less hazardous waste products where feasible.
- Reusing is another best method in waste management, in which the life cycle, environmental and cost implication of a product are considered. For example, having a filter system on a parts washing tank may allow the solvent to be reused and extends usable life of the solvent. Other example of reuse may includes papers, cotton racks, black oil can be reused for lubrication, pit water can be treated and used for sprinkling the surface etc.
- Waste can be recycled which may includes plastic, scrap metal, tires, glass, and used oil, certain types of solvents, batteries and paper products.
- Recyclable wastes are subjected to some restrictions, therefore careful sorting and segregation of recyclable material is required. For example, waste oil that has been mixed with cleaning solvents, transmission fluids or coolants may not be acceptable for refining.

8 APPENDIX

Appendix 1: Categorization of hazardous waste
Appendix 2: Collection and separation
Appendix 3: Declaration sheet

8.1 APPENDIX 1: CATEGORIZATION OF HAZARDOUS WASTE

Waste type	Description	Hazardous waste ?	Container / transport
Battery	Small disposable	no	general (no recyc)
	Rechargeable, with heavy metal, Ni,Cd	yes	hazardous waste
	Mercury battery (button size)	yes	hazardous waste
	Rechargeable lithium	yes	hazardous waste
	Lead battery (back up)	yes	hazardous waste
Paint	Solvent-based, fluid (unhardened)	yes	hazardous waste
	2 component fluid (unhardened)	yes	hazardous waste
	Solid (hardened)	no	rest
	Empty can with hardened paint film on wall & bottom	no	metal
Spray can/ aerosol	Empty can	no	hazardous waste
	With residual / rest	yes	hazardous waste
Fluorescent tube / light bulb	Used tubes	yes	hazardous waste
	UV bulbs / lamps, containing Hg	yes	hazardous waste
Oil contaminated material	Oil filter	yes	hazardous waste
	Rags, absorbents, gloves with oil	yes	hazardous waste
	Waste from pigging	yes	hazardous waste
	Used hydraulic oil	yes	hazardous waste
	Used gear / motor oil	yes	hazardous waste
	Empty drum / can	no	return trans. cont.
	Drain waste / slop	yes	tank
Chemical (pure product)	w/o halogen, w/o added metals from well, prod., maint., pipeline, injection	yes	original packing
	Other w/halogen e.g. fire exting, cooling medium (Cl,Fl,Br)	yes	original packing
	Other with heavy metal	yes	original packing
	Empty drum, can	no	metal / plastic
Chemical mixture	Chemical from laboratory analysis	yes	original packing
	Bulk w/o halogen, w/o added metal, not drill fluid e.g. from frac,stim compl.	yes	tank/haz. waste
	With halogen (Cl,Fl,Br) incl.mixtures with saltwater	yes	tank/haz. waste
	Mixtures with heavy metals	yes	tank/haz. waste
Drilling waste	Used drill fluid, e.g. oil based mud and pseudo based mud	yes	tank
	Oily cuttings	yes	big bags / cont.
	Samples for analysis e.g. toxicity testing	no	return trans.cont
Medical waste	Waste from hospital, medical treatment	yes	hazardous waste
LSA / NORM	Piping & other equipment contaminated with scale	no	dangerous goods
Sandblast waste	Sand and material with heavy metal content <X (see limits in regulation)	no	rest
	Sand and material with heavy metal content >X (see limits in regulation)	yes	hazardous waste
Explosive		no	dangerous good

8.2 APPENDIX 2: COLLECTION AND SEPARATION

Category	Collection sign text colour	Examples	Location on drilling unit where waste shall be concentrated
Metal and scrap metal	Metal (green)	metal constructions, pipes, flanges etc. used food tins cable wire empty cans empty paint tins with hardened paint on walls	No major sources expect in the drilling area.
Waste contaminated with food residue	Food waste (green)	waste contaminated with food Plastic sacks collected from coffee shop, canteen etc.	No major sources expected in the drilling area.
Wood	Wood (green)	Wood with nails,, palettes.	No major sources expected in the drilling area.
Paper/cardboard	Paper (green)	brown paper, cartons white paper, magazines.	Driller's control room, MWD office, mud logging office
Glass	Glass (green)	bottles, broken glass etc.	No major sources expected in the drilling area.
Hard plastic	Hard plastic (green)	plastic cans and bottles.	No major sources expected in the drilling area.
Soft plastic	Soft plastic (green)	packaging, saran wrap, empty bags.	Small amounts in offices. Possible larger amounts at slurrification unit.
General waste	General waste (green)	cans, buckets with hardened remnant content e.g. paint, light bulbs (not UV or strip light), insulation, clothes, shoes (without plastic)	MWD office on drill floor driller's control room on drill floor. Mud loggers office on lower drill floor. Slurrification unit. Drill floor area and drill floor work shop. Shaker refuge Coffee rooms.
Hazardous waste	Hazardous waste (red)	spray cans with or without remnants, paint cans with residue etc. see table 2.1	See hazardous waste section.
Electronic waste	EE waste (green)	cables, leads, high and low voltage equipment, motors, pumps, instruments.	No major sources expected in the drilling area.
Low radioactive waste	Dangerous goods	pipes and other metal objects and remnants with scale	See hazardous waste section.

8.3 APPENDIX 3: DECLARATION SHEET

Filling out the declaration sheet

Each hazardous waste form has a unique declaration number. The completed form must be delivered with the hazardous waste, which is packaged and marked with the appropriate hazard symbol, and the declaration number before transport. Hazardous waste shall be received with complete and correct forms for direct transport to its final destination site. The waste treatment facility can return a copy of the form to the Waste Producer to verify the waste's final treatment and destination.

The following practice is recommended when filling out cells in the form:

Waste Producer	Waste material generator
Address	Address of the waste material generator
Contact Person	Person who fills out the form
Telephone Number	Relevant telephone number to the Waste Producer
Code/type number	According to the requirements from the local Authorities.
Amount kilo / liter	Amount is to be specified as whole kg (e.g. for all waste with specific gravity of 1 or heavier), except for oils which are to be specified in liter (e.g. all waste with specific gravity of less than 1). Weight must include packing material with the exception of bulk waste.
Additional information	Waste type and description (see Appendix 1), or if a Material Safety Datasheet is available, write "see attached datasheet." Write the Rig site name (place) where the waste was generated.
Transport Classification	Waste type and transport classification (see Appendix 1), or if a Material Safety Datasheet is available, write "see attached datasheet."
Date and Signature	Defined qualified person who quality controls the forms before transport

HAZARDOUS WASTE DECLARATION

Waste producer :		**Contact person :**	
Address :		**Phone Nº :**	
Code/Type No :		**Transport Classification :**	
Additional Infromation :		**Amount :**	
		kilogram ☐ **litter** ☐	
Date :		**Signature :**	

ANNEX-IV: EMERGENCY RESPONSE PLAN

HSE

CNPC CHUANQING DRILLING
ENGINEERING COMPANY LIMITED

EMERGENCY RESPONSE AND DRILL PROCEDURE

HSE-03-008

Prepared By: (HSE Officer)	
Reviewed By: (Director HSE)	
Approved By: (CEO)	
Issue Date:	22-05-2024
Process Owner:	HSE Department

CONTROL OF THIS MANUAL

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CONTENT

1 GENERAL

1.1 PURPOSE AND SCOPE

Drills are means of practicing emergency response, building teamwork and providing training in basic safety and other elements of emergency response.

The purposes of emergency drills are;

- To provide opportunities to practice emergency procedures in a safe and simulated environment.
- To check the performance of emergency teams and make sure they are not making any mistakes. (Even, if mistakes are made those mistakes can be corrected by trainings).
- To check the efficiency of emergency arrangements and procedures those are in place.

CCDC's principal objective for emergency response exercises is to verify that:

- Plans and procedures are suitable for fighting potential hazards and accidents and for proposing improvements where required.
- Personnel with emergency response roles are familiar with and capable of performing their duties.
- Emergency response equipment and facilities are appropriate for their purpose.
- Interaction between the first, second and third line emergency response organizations and relevant collaborating companies, public rescue services and government authorities functions as it should, and that the same applies to contact with the media.

1.2 RESPONSIBILITY

HSE Manager is responsible that this procedure is updated after the organizational or operational changes, if necessary.

1.3 NON CONFORMANCE TREATMENT

All deviations from the guidelines given in this procedure shall be treated in accordance with HSE-03-014 "Non-Conformance and Corrective Action procedure".

EMERGENCY DRILL REQUIREMENTS

1.4 REGULATORY REQUIREMENTS

CCDC's operations outside China must take account of the requirements for emergency response exercises laid down by the authorities in each country.

1.5 ANNUAL PROGRAMME FOR EXERCISES

Each level in CCDC's emergency response organization must draw up a program for the coming year's exercises by the end of December. This program will form part of the HSE program for each Project in the line organization.

1.6 RIG SITE DRILL TYPES

The following emergencies and drill frequencies will be considered or according to Client's requirement:

Fire	Weekly
Rig evacuation	Monthly
Well control/Gas alert	Monthly
Personal Injury	Once per Crew Shift
H_2S	Weekly in H_2S environment, Monthly in non-H_2S environment

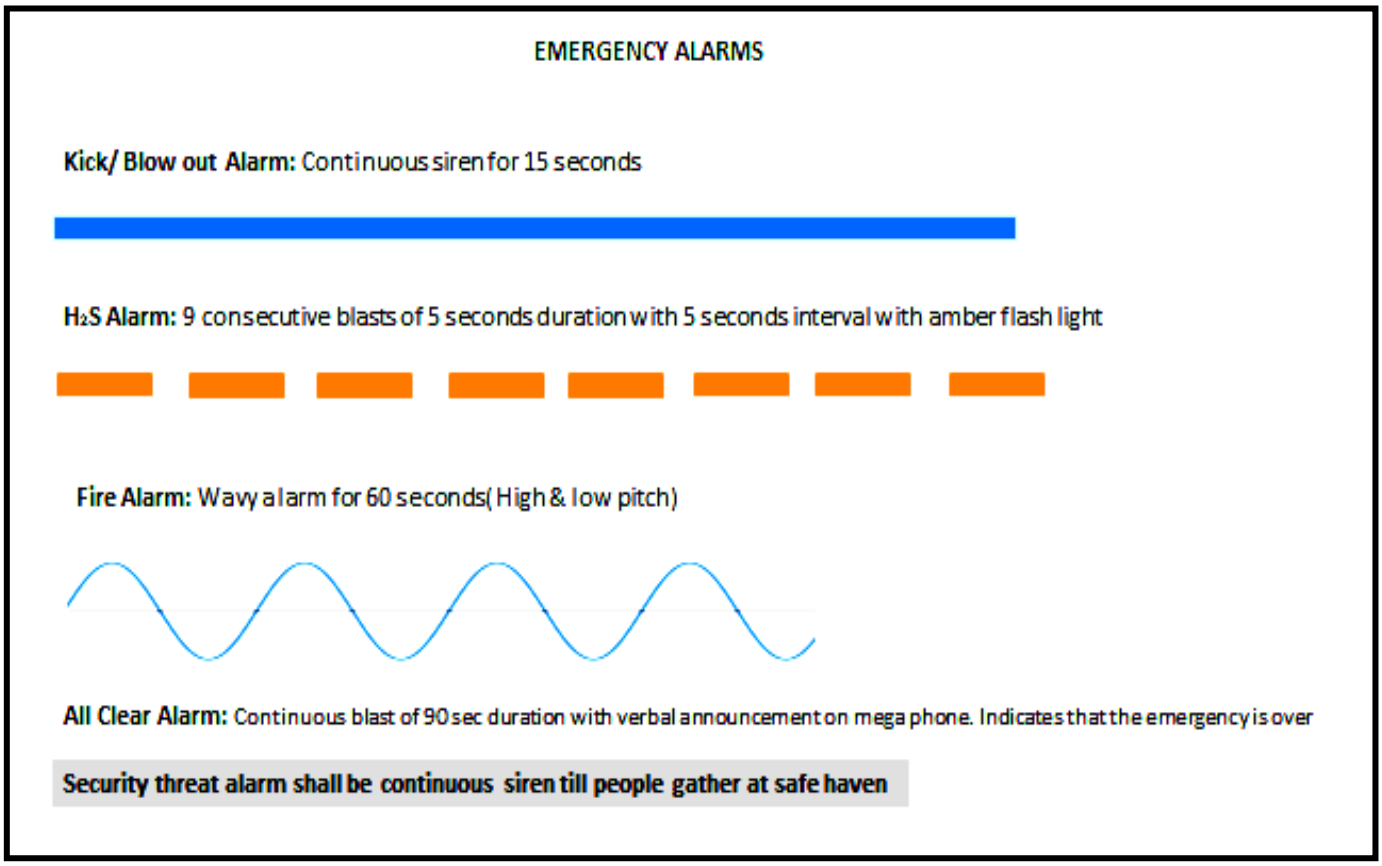
Timing of the drill should be properly selected so that normal operations do not be interrupted.

1.7 DRILLS AND EMERGENCY SIGNALS

Emergency signal and drill requirements:

- All signals are sounded on the general alarm
- After the emergency signal is sounded, an announcement will be made on the public address system to explain the nature of the emergency
- Fire and emergency signal: Intermittent sounding of the General alarm or a period of not less than ten seconds, accompanied by an announcement of the emergency condition over the PA system
- Gas alert signals: Continuous sounding of the rig floor horn or gas detection system alarm
- Emergency muster signal: announced on the public address system
- Abandon rig site signal: Continuous sounding of the General alarm bell

- Dismissal: A series of three short soundings of the general alarm, repeated two times, and followed by announcement on the public address system.



1.8 DRILL REQUIREMENTS

- Drills are primary training tools to instruct the crews in reaction to emergency situations
- Drills will utilize the signals listed above
- Following the emergency signal sounding, the Rig Manager will announce on the PA system "THIS IS AN EMERGENCY! THIS IS AN EMERGENCY!"
- All drills conducted will be registered in a log books
- The weekly safety meeting shall evaluate the drills held in the last week.
- A different alarm station shall be used each time to check operability of individual stations
- Drills should be carefully observed to emphasize key learning points
- When conducting an emergency drill, make sure that the appropriate alarm for that emergency type is sounded

1.9 EMERGENCY CREW ASSIGNMNET

Rig Manager has the complete authority in all the drills.

Each rig will have an established Emergency Crew Assignment list. All employees will read, understand and learn their duties pertaining to the emergency list.

The list will be present in the following locations on every rig:

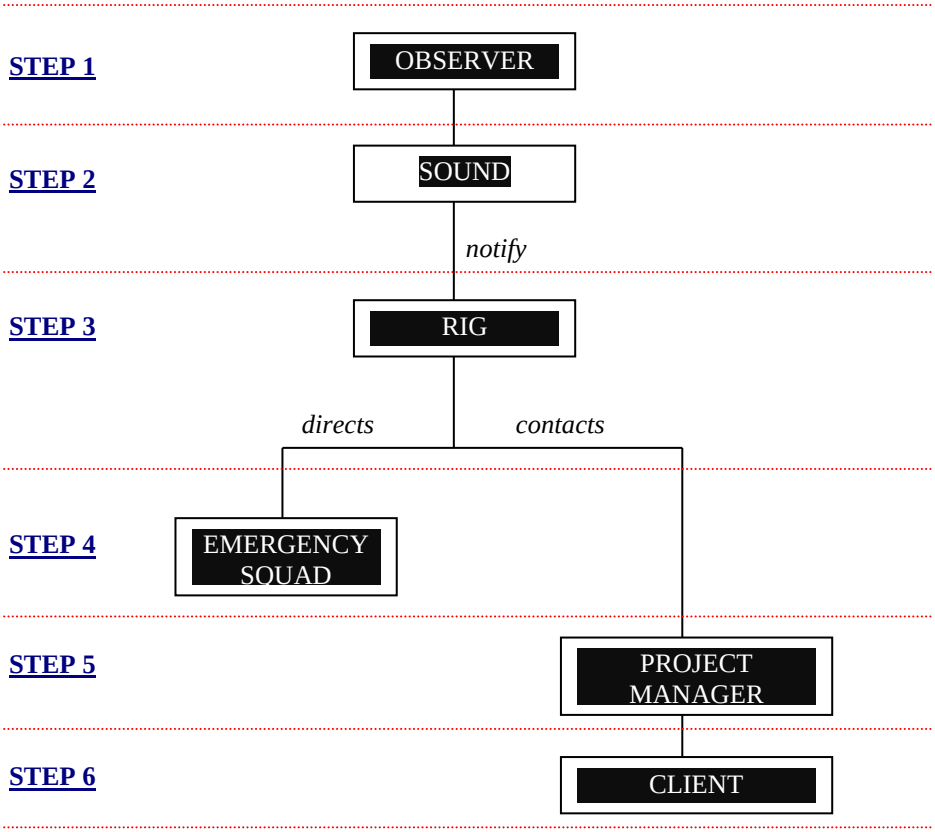
- Rig Managers office
- Meeting room
- Recreation room
- Rig floor
- Any other gathering places
- Any other places specified by the Client

The list shall contain:

- Description of alarm signals, which shall be in compliance with those prescribed on all stations.
- Assigned groups/fire stations of personnel (such as fire fighting group, rescue group etc.)
- Assembly area/station for off duty personnel and visitors
- Other emergency information required by the Client.
- Layouts showing location of muster points and emergency exits.

FIRE EMERGENCY RESPONSE

Rig Manager is the person in charge.



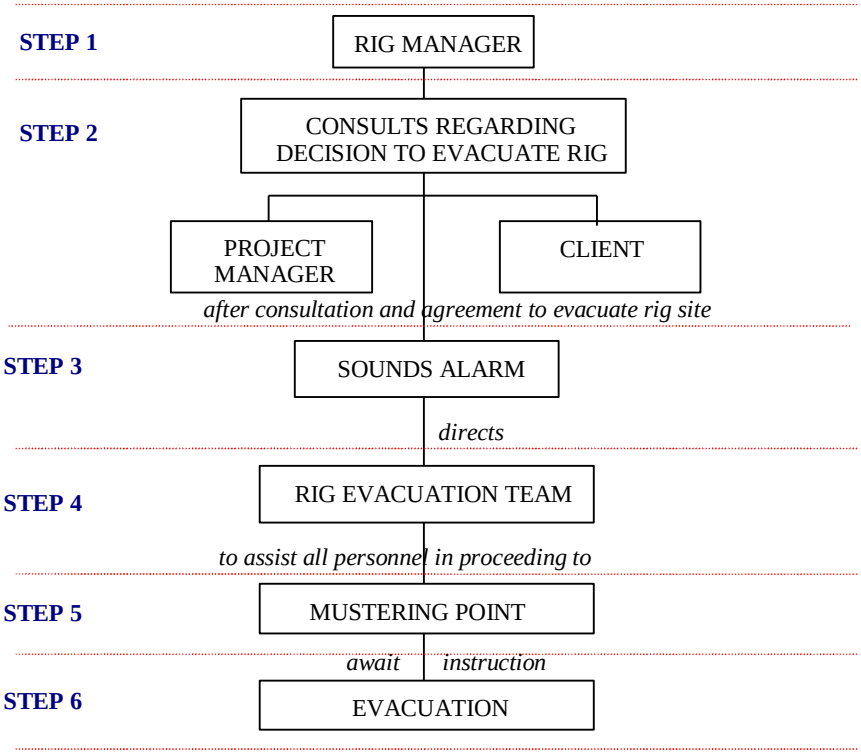
STEP 1: Observe fire or emergency situation
STEP 2: Observer shall sound alarm
STEP 3: Observer shall notify Rig manager
STEP 4: Rig manager shall direct the emergency squad's actions
STEP 5: Rig manager shall contact fire fighting services and project manager
STEP 6: Rig manager shall contact the Client

Emergency Squad

Emergency team will consist of, as a minimum of Rig manager, and minimum four fire team members (Floor men/Roustabouts)

The second emergency squad – fire emergency squad will consist of the off-duty Driller (on scene leader) and his drill crew. Second emergency squad shall assemble at a predetermined point and shall be mustered and received briefing by the Rig Manager.

2 RIG SITE EVACUATION PROCEDURES



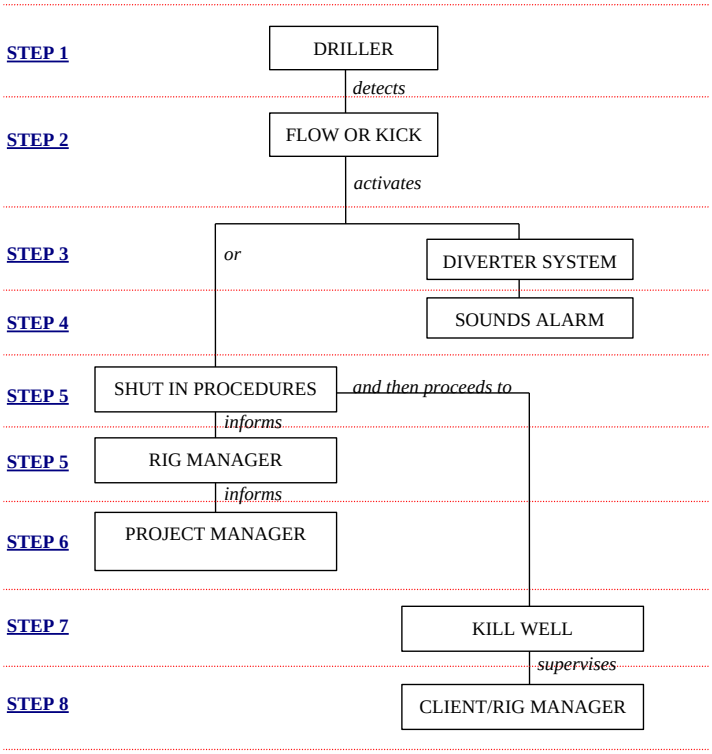
Rig Manager is the person in charge.

STEP 1: Rig or life threatening event occurs
STEP 2: Rig manager consults with Client
STEP 3: Rig manager sounds rig abandonment alarm
STEP 4: Rig manager directs/consults with rig evacuation team
STEP 5: All personnel assemble at mustering point awaiting for instruction.
STEP 6: All personnel abandon rig site

Rig Site Evacuation Team

Rig Site Evacuation Team consists of: Rig Manager (in-charge), a minimum of number of team members corresponding to the number of mustering stations.

3 WELL CONTROL AND GAS ALERT PROCEDURE



Rig Manager is the person in charge.

STEP 1: Driller suspects kick and checks for flow
STEP 2: Driller confirms flow
STEP 3: Driller closes the BOP
STEP 4: Driller sounds the well control alarm
STEP 5: Driller informs Rig manager
STEP 6: Driller, Rig manager and Client representative figure out kill sheet
STEP 7: Rig manager informs project manager
STEP 8: Client/Rig Manager supervises operation

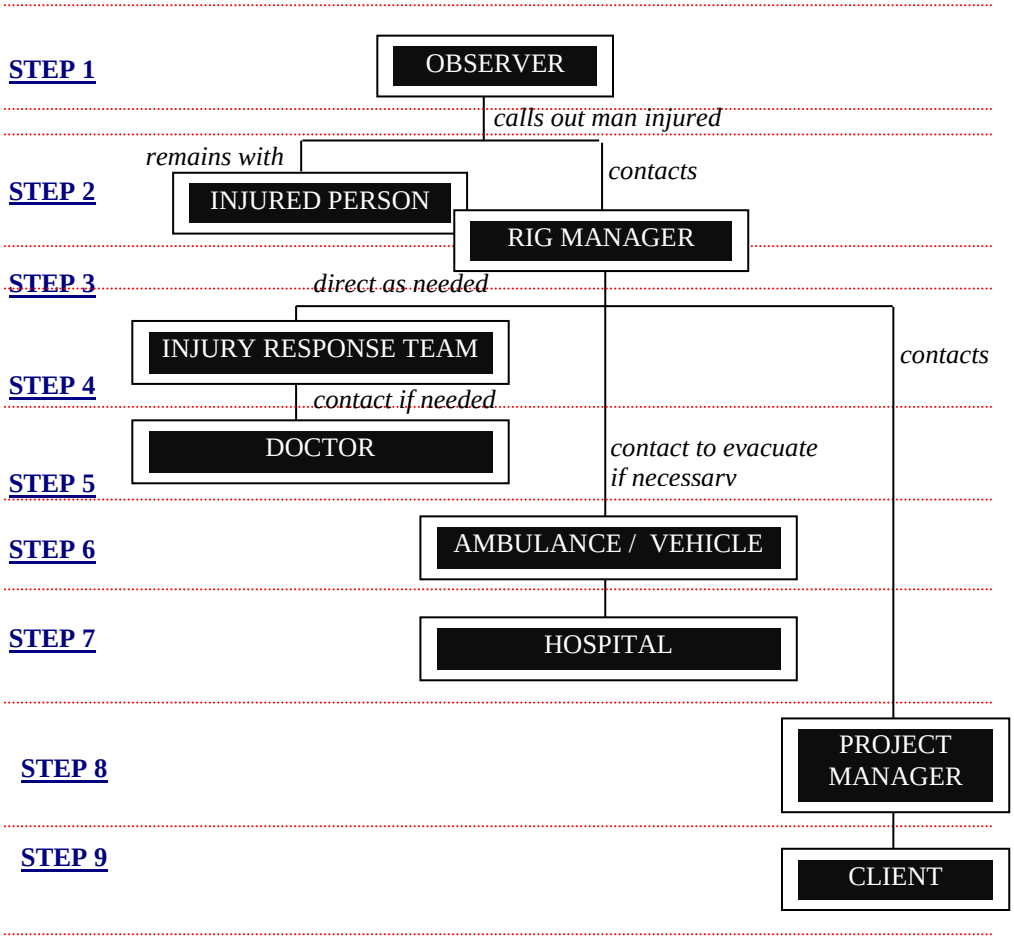
Well Control Drill Team

Drill team shall consist of, as a minimum:

- Rig Manager: Initiates drill
- Driller: Recognize/detect indication of kick
- Assistant Driller: Check equipment for possible failure
- Derrick man: Mans the mud room
- Floorman: Check flowline, BOP, hydraulic lines, kill/choke manifold and mud samples

4 PERSONAL INJURY PROCEDURES

Rig Manager is person in charge.



STEP 1: Witness observes injury
STEP 2: The observer notifies Rig manager
STEP 3: Witness remains with the injured person
STEP 4: Rig manager directs Injury Response Team
STEP 5: Rig manager, with help of Medic, contacts hospital if necessary
STEP 6/7: Rig manager contacts appropriate evacuation transportation
STEP 8: Rig manager contacts Project manager
STEP 9: Rig manager informs Client of the injury situation

4.1 INJURY RESPONSE TEAM

Injury Response Team shall consist of, as a minimum:

- Rig manager — directs operation
- Medic — on scene leader
- Messenger (Floorman) — relays messages
- Floorman (3) on duty — assists as directed
- Crane operator on duty — assists as directed

4.2 INJURY RESPONSE TEAM TRAINING

- CCDC's Policy requires that the Rig manager and one additional person (medic, Crane operator) will attend First Responder Training
- After training, these two individuals (Rig manager, Medic if assigned, if no Medic Crane operator) establish an Injury Response Team training program.
- This program consists of Primary survey evaluation including evacuation methods: once completed, the individual is considered as "First responder"
- The First responder's authorized standing orders are: "The First responder renders aid to injured personnel initially based on facts gained through a "primary and secondary accident victim survey" as described below
- The Paramedical trained personnel's authorized standing orders are: "Personnel certified as having paramedic training shall complete all procedures necessary within the scope of his training to stabilize injury"

4.2.1 ACCIDENT VICTIM SURVEYS

Primary accident victim survey

- speak to the patient and assess responsiveness
- if patient responds, Primary survey is completed
- if patient is unresponsive, proceed with survey as follows:
  A) AIRWAY – assess airway. Make sure airway is open. If cervical spinal injury is suspected, use jaw lift
  B) BREATHING. Make sure patient is passing an adequate volume of air. If not, begin mouth to mouth resuscitation.
  C) CIRCULATION. Evaluate carotid pulse in neck. If pulse absent, begin cardiac compressions. Control bleeding if necessary

Secondary accident victim survey

Initiate a through and systematic examination of the injured patient. As problems are found, they shall immediately be treated or stabilized.

5 H_2S ALERT RESPONSE PROCEDURE/DRILL

- If H2S is detected, the Driller will immediately raise the alarm (9 consecutive blasts of 5 second on and 5 seconds off with amber flash point)
- Tool pusher will mask up SCBA and will determine the source of H2S.
- Tool pusher will then assemble all the personnel at muster point.
- If anybody found missing after roll call, two designated personnel will mask up SCBA and conduct a search of the area.
- Assistant Driller and one Floor man will don SCBA and help Driller in securing the well.
- Rig Doctor on duty will immediately report to muster point along with respirators and stretchers to carry out safe and effective rescue.
- Motorman and mechanic will put on SCBA and will remain stand-by near SCR, Generators and Koomey Unit.
- Electrician will put on SCBA and will remain stand-by near the SCR, Generators and Koomey Unit.
- Roustabouts will report to muster point and designated roustabouts will mask up SCBA and conduct search and rescue if required.
- Driller to activate the alarm (Continuous Siren and Flashing Lights).

Referring to HSE-03-026 Hydrogen sulfide procedure.

ANNEX-V: SPILL MANAGEMENT PLAN

HSE

CNPC CHUANQING DRILLING
ENGINEERING COMPANY LIMITED

OIL SPILL CONTINGENCY PLAN PROCEDURE

HSE-03-009

Prepared By: (HSE Officer)	
Reviewed By: (Director HSE)	
Approved By: (CEO)	
Issue Date:	13-05-2024
Process Owner:	HSE Department

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CONTENT

1 GENERAL

1.1 PURPOSE AND SCOPE

This Procedure details response procedures for oil spill situations arising out of any CCDC drilling operation activity.

The “Oil Spill Contingency Plan” is part of the CCDC Emergency Response Documentation (ref. HSE-03-007).

Response capabilities and times (if applicable) are outlined in the well specific environmental risk analysis, which are usually provided by the Client. These analyses include details of the means to comply with, or exceed, the minimum requirements for oil spill recovery capability.

1.2 RESPONSIBILITY

HSE Manager is responsible that this procedure is updated after the organizational or operational changes, if necessary.

1.3 NON CONFORMANCE TREATMENT

All deviations from the guidelines given in this procedure shall be treated in accordance with HSE-03-014 “Non-Conformance and Corrective Action procedure”.

1.4 SPILL SCENARIOS

The risks of spill on Rig sites include, but are not limited, to the following scenarios:

Table 1 Possible Spill Scenarios

Source	Potential Event
Storage Tanks	Storage tank leak Catastrophic tank failure Storage tank overfill
Loading/Unloading	Bowser leak Bowser Overfill Transfer hose leak or failure Valve leak or failure
Vehicle Refueling	Vehicle overfill Transfer hose leak or failure Pipeline leak or failure
Bowser transportation	Leak in tank or valve or even rupture Bowser Rollover Traffic accident
Flow lines	Rupture of pipes Valve leak or failure

2 DEFINITIONS

For the purpose of response planning, CCDC will recognize two categories of oil spill:

1. Minor
Spill can be handled by Rig site and/or area resources or it will disperse naturally and rapidly without posing any threat to sensitive areas or vulnerable resources.
2. Major
This category includes large incidents or ongoing spills (e.g. blowout) which have the potential to cause significant pollution impact. Spills which cannot be immediately dealt with using unit and/or area resources and require the mobilization of external equipment and personnel to facilitate clean-up and recovery. The term oil spill includes accidental or deliberate discharge of diesel,

refined oils, crude, condensate, water with an oil content above statutory discharge limits, drilling mud base oils and oil based mud, drop-out from flares, chemicals etc.

3. Acute pollution

Acute pollution means significant pollution that occurs suddenly and that is not permitted. A spill greater than 1 m^3 (35 cf.) must always be considered as acute pollution.

4. Oil

Oil includes crude and refined hydrocarbons such as diesel, hydraulic fluid, and lube oil. It can also include oily sludge, oil refuse, or other petroleum-related products or by-products.

5. Hazardous substances

Hazardous substances include glycol, methanol, drilling mud, seawater, corrosion inhibitors, and produced water, essentially anything other than potable water. All chemical spills should be reported so that potential exposure hazards can be evaluated, and disposal can be managed safely.

6. On pad

On pad includes gravel pads and roads, well houses and unlined well cellars. Depending on the type of construction, some cellars are considered secondary containment.

7. Secondary containment

Secondary containment means built-in pits, dikes, berks, portable drip pans, liners, metal skids, or other impermeable devices. Reporting is required to ensure proper cleanup and disposal, but spills in secondary containment are not necessarily reportable to the local government.

3 SPILL PREVENTION AND CONTROL

- Each Rig or facility should have a Spill Control and Countermeasure Plan or procedure to follow in the event of spill. Generally, a plan will provided to well sites by HSE management for controlling a spill.
- Employees should be familiar with their roles should a pollution event occur.
- If there is an incident, and if it is safe for the employee or will not create great hazard for rig personnel employees should do whatever is necessary to control the spill, blowout, or rupture to protect personnel and environment, as well as notify the immediate supervisor.
- In case of spill, limit the spill area by blocking, diverting, or confining the spill. Use contained absorbents including sand, mud or spill kits (most effective for spill control). Stop the flow of liquid before it has the chance to contaminate the ground and water.
- Oil spill can occur from diesel tanks due to the rupture of tank or leakage from tank bottom or overflow from tank during filling, so the tanks must have

proper dyke around tanks so spill will be contained in it. However, spilled oil will sweep into soil and groundwater, if the dykes are unlined.

4 FLUID TRANSFER GUIDELINES

Any incident that releases a contaminant into the environment can be considered a spill, and will be taken very seriously by CCDC. The regulations that apply to spill prevention, reporting, and response are complex, and the penalties for noncompliance are severe.

Most of spills are small drips and leaks onto gravel pads, from vehicles and equipment, but preparation must be made to respond to the most catastrophic event. All spills in operating areas must be cleaned up to the satisfaction and the appropriate regulatory agencies.

Prevention shall be the first and most effective line of defense against spills and it is everyone’s responsibility.

Many spills occur during routine fueling, pumping, and other fluid transfer operations. Most of these spills can be avoided by paying attention and taking simple precautions. CCDC has established field-wide fluid transfer guidelines, which are summarized below.

1. Check all vehicles and equipment. If a leak is apparent, or there are other obvious problems with the equipment stop the job and have repairs done.
2. Surface liners or dip trays may be used to contain leaks for a short time during critical operations; however, liners are not an acceptable substitute for maintenance.
3. Park vehicles and equipment away from water bodies, forest and wildlife habitat. Do not park on the edges of pads.
4. Position equipment so that valves, piping, tanks, etc are protected from damage by other vehicles or equipment.
5. Verify that adequate surface liners and sorbents are on hand.
6. Inspect hoses, connections, valves, etc., before starting any fluid transfers. Be sure that valves are in the proper on/off position and each connection is tightened properly.
7. Before starting, check all tank and container levels, valves, and vents to prevent overfilling or accidental releases.
8. Surface liners are required under all potential spill points.
9. Maintain a constant line-of-sight with critical components throughout the transfer procedure. Be prepared to stop the transfer immediately if you notice any leak. Do not attempt to fix a leak while fluid is being transferred.
10. Never leave fluid transfer operations unattended.

11. After the transfer is complete, continue to take these precautions while breaking connections.
12. When finished, check the area for spills. Report all spills immediately to the appropriate number in your operating area.

5 LINER USE PROCEDURE

Operating procedure for liner use must be followed at all Rig sites.
Each operating area can add site-specific requirements to the requirements for liners use.

Liners are not a substitute for good maintenance. Any unit that is dripping or leaking must be repaired as soon as possible.

5.1 OFF THE PAD

Maximum protection of the soil and surface waters is the primary objective. Appropriately sized liners must be placed under the radiator, engine, or other areas of potential leakage whenever equipment is operating, or parked and running. Liners should be used as needed to prevent drips and small spills under parked and non-operating equipment. Equipment with known leaks must be immediately released from the job.

Liners are specifically required as follows:

- Under all support equipment (heaters, compressors, generators, etc.)
- Under heavy and light duty parked equipment (dozers, loaders, cranes, trucks, etc.)
- During all fluid transfers, at all connection points, from the beginning of hook-up through disconnection
- Under fuel/fluid storage containers

5.2 ON THE PAD

Gravel protection, good housekeeping, and spill prevention are the primary objectives. Equipment with known leaks must be immediately released from the job if liners are not available and properly used.

Surface liners or drip pans should only be used as a temporary measure until the equipment is repaired. “Known leakers” that are not repaired promptly will be removed from the job.

Appropriately sized liners must be placed under the radiator, engine, or other areas of potential spills/leaks as follows:

- Under well service equipment (wireline, slickline, coil tubing, etc.)
- Under all support equipment without built-in containment systems (heaters, compressors, bleed tanks, etc.)
- Under all stationary heavy equipment (loaders, cranes, etc.)
- During all fluid transfers, at all connection points, from the beginning of hook-up through disconnection
- Under all drums used as primary containment for waste fluids (bleed backs, pressure relief, temporary storage)

5.3 PARKING AREAS

Appropriately sized surface liners or drip pans are required under any parked vehicle or equipment, whether it is running or not, if it is dripping engine oil or other fluids.

6 SECONDARY CONTAINMENT

Secondary containment is required by law around many above ground storage tanks. In general, containment must be able to hold 110% of the volume of the largest tank.

All oil storage tanks larger than 660 gallons require impermeable containment (e.g., dikes or catchment basins) sized for the largest single compartment or tank. These tanks should be located to ensure that oil will not reach navigable water. All tanks larger than 10,000 gallons, including portable tanks, which contain petroleum-based products, must have 110% containment.

Well cellars and well houses

Most new wells are equipped with steel- or concrete-lined cellars that effectively contain fluid. However, many older wells have unlined cellars that are not considered secondary containment. Well houses are not considered secondary containment either.

Temporary containment

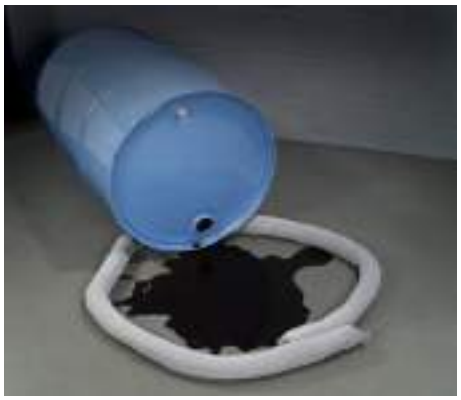
Surface liners and drip pans provide portable protection under leaking equipment or connections. Secondary containment that is damaged, collapsed, or full of water cannot do its job.

7 HOW TO USE SPILL KIT SORBENTS

- Clean all sorbents, rags and other debris from the area.
- Place a sorbent directly on top of problem area. Watch as it pills in liquid into the sorbent.
- When the pad or roll is fully saturated, simply pick it up and dispose it off. You will know when its fully saturated when you see liquid pudding around or passing underneath the sorbent. Do not forget to replace it with a fresh sorbent.
- Cover a spill evenly; making sure even stray droplets are covered.
- For best results, use white sorbents for oil-only applications (will repel water) and gray or yellow for universal or hazardous applications.
- Although the sorbents themselves are not hazardous, the liquid they absorb might be. A sorbent will take on the hazardous characteristics of anything it absorbs. Therefore, it is important that you dispose of the sorbent in a manner that is consistent with liquid itself.

8 HOW TO USE SPILL KIT SOCKS

- Clean all sorbents, rags and other debris from the area.
- Place an absorbent sock around the problem area. Watch as it pulls in liquids to center of the sock.
- When the sock is fully saturated, simply pick it up and dispose it off. You will know when it's fully saturated when you see liquids pudding around or passing underneath the sock. Do not forget to replace it with a fresh sock.
- When placing socks, it helps to hold the sock at each end and shake filler until it is even.
- For best results, do not stack sock on top of loose absorbents or each other.
- When using more than one sock to surround a problem area, make sure you overlap the edges by 3 inches. This will prevent leaking between the socks.



9 NOTIFICATION AND REPORTING

Any party responsible for a spill greater than 1 m^3 (35 cf.) has a duty to provide immediate notification in accordance with the applicable regulations.

Responsible for notification and reporting during activities is the Project manager. Normally it will be agreed with the Client that the Rig Manager will be delegated the responsibility for these activities.

Details of responsibility definition for notification and who should be notified are given in the flow sheet in Appendix 1.

The following documentation contains information on notification and reporting of accidents/incidents in general:

1. Blowout Emergency Response procedure (HSE-03-019)
2. Emergency drill procedure (HSE-03-008)
3. Reporting, Handling and Documenting Accidents/Incidents procedure (HSE-03-013)
4. Investigation of the Major Accidents (HSE-03-025)

All serious accidents and near misses including spills during drilling activities shall be notified to the Authorities.

10 RESPONSE

The appropriate response to a spill will depend on a number of factors and is situation specific.

10.1 REPORTING PROCEDURE

To report a spill, call the appropriate number and provide the following information:

- Person responsible
- Contact phone number
- Substance spilled
- Location of spill
- Approximate amount spilled
- Possible cause of the spill
- Cleanup activities under way

A follow-up written report may be required. Documentation procedures vary between Projects depending on the law requirements and contract/Client requirements.

CCDC requires reporting within 30 minutes of all spills, discharges, and releases of oil and hazardous substances in our operating areas. This ensures proper response, cleanup, disposal, and timely agency reporting.
ADEC interprets “immediate” to mean.

Minor spills are not reportable to regulatory agencies, and some will not be counted as recordable incidents.

Spills that are on the pad, contained, under control, small in volume, and can be cleaned up by the spiller or the CCDC site personnel, must be reported to the following Rig Manager, HSE Supervisor or Project Manager.

Spills involving injuries, fires or safety hazards, uncontrollable or continuously releasing material, blowouts, or spills into waterways must be reported to the following emergency number by Rig Manger/HSE Supervisor:

Position	Phone No:
Government Agency	
Client representative	
HSE dept.	

10.2 MINOR SPILLS WHICH DO NOT ENTER THE ENVIRONMENT

The "spiller" may be able to take care of the minor spill cleanup, but Rig Manager and HSE supervisor should always be consulted.

Cleanup workers must be equipped with the correct personal protective equipment, such as rubber gloves, overall and boots. Spill may be collected mechanically in to the waste container bins or may be washed down with appropriate detergents and spilled by clean water, or recovered by using absorbents and steam cleaners. Use of detergents shall be minimized as much as possible.

Report to the Rig Manager and fill the form in accordance to HSE-03-013 Reporting, handling & documenting of accidents and incidents procedure.

10.3 MINOR SPILLS WHICH ENTER THE ENVIRONMENT

Response at Rig site

Access the rate of oil dispersion due to wind and wave action. If the spill threatens flora and fauna, the Rig manager will notify Project manager.

Maintain observation of spill status. Log events and keep the Client manager advised. Take corrective action to minimize further spill risk from similar sources.

10.4 MAJOR SPILL WHICH ENTER THE ENVIRONMENT

Response

In the case of spills greater than 1 m^3 (35 cf.) wind and weather conditions, the type of oil spilled, characteristics and location will determine the most appropriate response to the situation.

It will be the responsibility of the Project Manager, after consideration of all the facts, and following discussions with the Client representative, to initiate the appropriate response.

Response at Rig site

Issue notification and assess the rate of spill dispersion due to wind and weather action. Advise with the Project Manager about the spill status and the requirement to mobilize oil spill clean-up equipment. If clean-up equipment is

available at Rig site, commence deployment. Maintain observation of spill status. Log events.

Response in Headquarters

Notify Authorities and mobilize the appropriate Emergency Response Team. Review the spill status and plan the most appropriate course of action. Mobilize resources as required. Establish the necessary support organization. On completion of the spill clearance operations, investigate and fully report the incident in accordance to HSE-03-013 *Reporting, handling & documenting of accidents and incidents procedure*.