Hagler Bailly Pakistan

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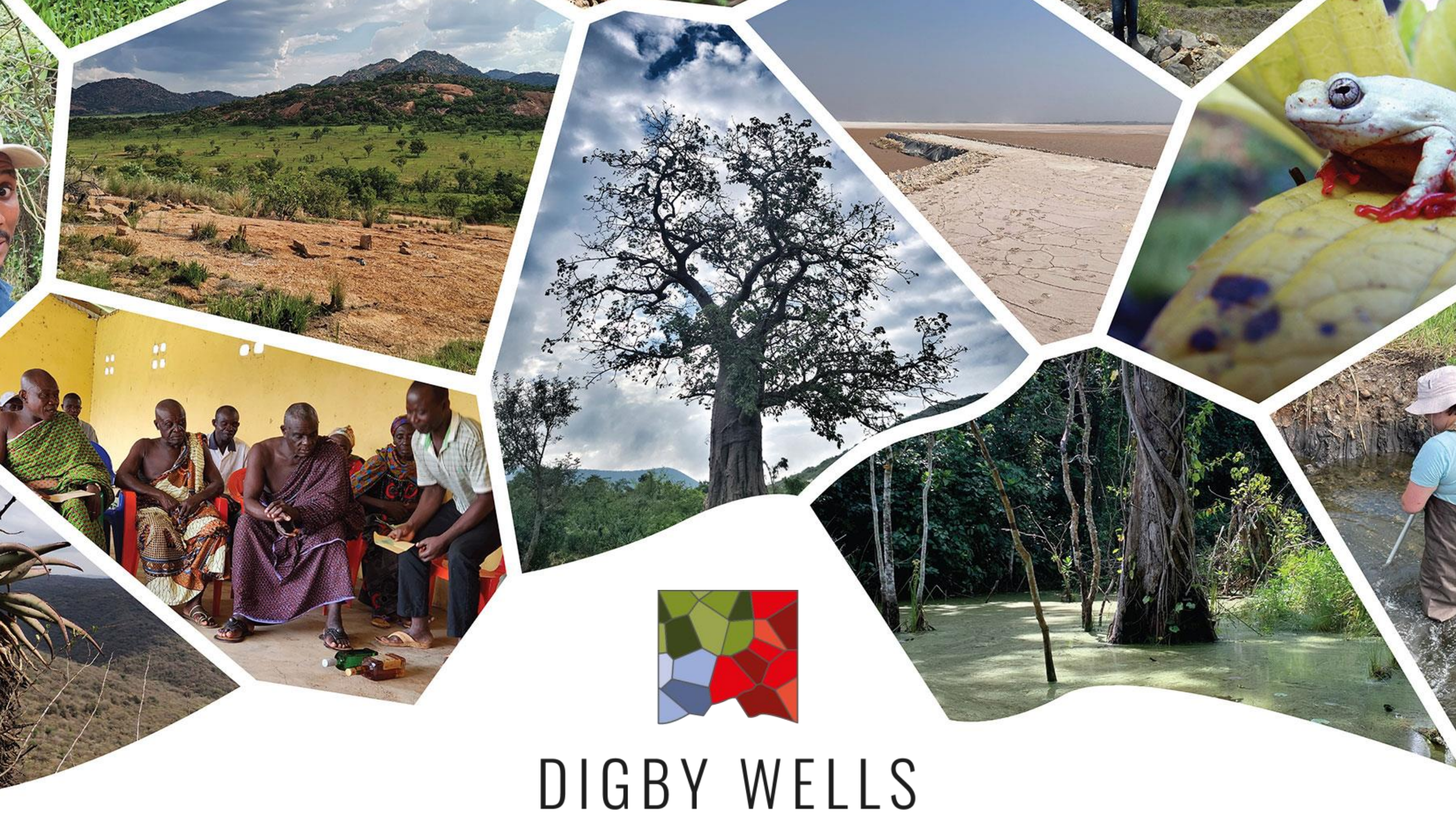
# Appendix W: Closure Plan



DIGBY WELLS
ENVIRONMENTAL

# Reko Diq Mining Project, Pakistan

## Initial Closure Planning Report

**Prepared for:**

Reko Diq Mining Company

**Project Number:**

BAR7212

August 2024



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This document has been prepared by Digby Wells Environmental.

| | |
|---|---|
| **Report Type:** | Initial Closure Planning Report |
| **Project Name:** | Reko Diq Mining Project, Pakistan |
| **Project Code:** | BAR7212 |

| Name | Responsibility | Signature | Date |
|---|---|---|---|
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# Executive Summary

## Introduction

As part of the Environmental and Social Impact Assessment (ESIA), Digby Wells Environmental (Digby Wells) have developed a conceptual Closure Plan (CP for the proposed project at Reko Diq. This conceptual CP was developed as a desktop study and no site visit was undertaken by the team compiling the report, but the report reviewers have been to site.

## Project Area

The proposed Reko Diq Mine will be in the Nok Kundi tehsil, which is in the Chagai district of Balochistan province. It is located in the western part of the Chagai district between the Iran (approximately 40 kilometres (km) away) and Afghanistan (approximately 35 km away) borders. Nok Kundi is the nearest town to the project at about 40 km away (Figure 2-1). There are no doorstep communities to the proposed Reko Diq Mine Site, with the nearest community being Humai approximately 20 km away.

The site is in an area which can be characterised as harsh stony desert with frequent dust storms. Average annual rainfall is 32.7 millimetres (mm), the elevation is around 915 m above mean sea level (mamsl) and temperature extremes vary from -14ºC to 50ºC. While there is groundwater located within the mine site, it is generally greater than 20 m below ground level and highly saline.

The mine is planned to operate for 38 years and there is the potential to increase the proposed Life of Mine (LoM) in the future.

## Closure Legal and Corporate Framework

This initial CP is developed within the framework of the Pakistan legislation and the Barrick Mine Closure Standard. The requirements of the Global Industry Standard on Tailings Management (GISTM) have also been considered (which are generally reflected in the Barrick Closure Standard). The Barrick mine closure approach is closely aligned with International Guidelines and industry good practice (i.e., International Council for Mining and Metals - Integrated Mine Closure: Good Practice Guideline (ICMM, 2019)). The approach is aimed at leaving a positive legacy post-mining and indicates that "mine closure begins before mining starts, carries on throughout each mine's life and reflects our goal of sharing benefits and maximising value for local communities" (Barrick website).

The Barrick Mine Closure Standard (revised in 2020), requires the following (summarised):

- Application of a mitigation hierarchy to manage negative environmental impacts, to avoid these wherever possible and minimize those which cannot be avoided;
- Minimize the use of water and control impacts on water quality;

- Engage with stakeholders including local communities to support sustainable management of resources for the benefit of all local users; and
- Use energy as efficiently as possible.

Key commitments for Reko Diq include the following aspects:

- Develop and regularly update site wide Closure Plans and supporting studies to deliver a cost-effective and sustainable final closure strategy;
- Develop detailed and quantifiable concurrent rehabilitation plans for each year and integrate with quarterly and annual business planning cycles ;
- Closure Plans are designed to be dynamic and agile, and should identify opportunities and actions to be taken throughout mine life to deliver safe and sustainable closure from an environmental perspective, as well as elements of social closure; and
- Regularly review and update the CCA for each operation and update the budgets and financial planning accordingly. The reviews are undertaken internally by Barrick specialists, and by external consultants and audited.

## Closure Objectives

The closure objectives as set out in the Barrick Mine Closure Standard are adopted for the project, and include:

- Ensure that all reclaimed properties support productive uses considering pre-mining conditions;
- Ensure safety & health of workers during closure activities;
- Ensure that local communities utilizing the site after closure are not exposed to unacceptable risks;
- Properly manage all reagents and chemicals. Neutralise or control-and-treat all potentially harmful residual discharges from decommissioned facilities so that water and land resources are properly protected;
- Physically and chemically stabilize remaining structures to ensure proper drainage, minimize erosion and sedimentation and to limit the quantity of water requiring management;
- Reclaim mine properties to protect and enhance pre-existing flora and fauna communities;
- Utilise closure strategies that relinquish properties in a self-sustaining condition with little or no need for ongoing care and maintenance;
- Understand & address community concerns regarding closure. Safeguard the sustainability of community interest to the greatest extent practicable; and

- Comply with mine closure permitting and regulatory requirements and obtain documented confirmation of meeting all closure requirements.

The overall, long term post-closure land use objective for the site is to return it to a self-sustaining condition suitable to support pre-mining land use activities, such as subsistence agriculture, with the final landform not adversely affecting water resources and air quality.

## Current and Proposed Post-Closure Land Use

A final land use plan is yet to be developed for the project. To ensure that areas are not rehabilitated in isolation, it is recommended that a cohesive site wide CP and Final Land Use Plan be developed for all future mining areas. It is important that all mining and rehabilitation actions are geared towards achieving the end land use incrementally over time. The following is noted regarding current land uses (Biodiversity - Fauna, 2024) and (Biodiversity – Flora, 2024):

- The Gravel Plains and Mountains/Hills habitat types dominate the landscape, with Dry Streambeds running through the Gravel Plains (>95%);
- Approximately 0.003% of the ecological area is currently being used for agricultural areas/ date palms, which is a mix of planted and natural vegetation, while only 0.01% area is classed as built-up areas, all of which fall outside of the Project area; and
- With the above as reference, the most probable end land use for the mining site is wildlife habitat, with potential for limited grazing and /or a mix of small scale agricultural and subsistence activities.

## Closure Risk Assessment

A preliminary environmental risk assessment was compiled and is based on the related specialist studies undertaken as part of the current ESIA. The risk assessment currently shows no residual risks that could potentially require long term management measures.

| TERMS AND ABBREVIATIONS | |
|---|---|
| **Terms** | |
| **Rehabilitation maintenance** | The action is performed over rehabilitated areas and includes application of soil ameliorants (fertiliser, manure, irrigation etc.) and any minor corrective action that may be required over the rehabilitated area. |
| **Closure** | The time at which the mine reaches its life of mine due to resource depletion or economics are no longer favourable. |
| **Rehabilitation** | A process undertaken to rehabilitate disturbed land to a functional end use, which usually includes soil amelioration, ripping, soil placement and seedings to establish a vegetation cover. |
| **Planned closure** | The year the mine plans to cease production after life of mine has been reached, as per the current mine plan. |
| **Immediate closure** | The closure scenario for unexpected closure of the mine for whatever reason. |
| **Site relinquishment** | The mine closure period that commences once all rehabilitation and post-closure activities are complete. |
| **Abbreviations** | |
| **AMD** | Acid Mine Drainage |
| **ARP** | Annual Rehabilitation Plan |
| **CP** | Closure Plan |
| **CRA** | Closure Risk Assessment |
| **Digby Wells** | Digby Wells Environmental |
| **ESIA** | Environmental and Social Impact Assessment |
| **FLFD** | Final Land Form Design |
| **FLUP** | Final Land Use Plan |
| **HBP** | Hagler Bailey Pakistan |
| **GIS** | Geographic Information System |
| **GISTM** | Global Industry Standard on Tailings Management |
| **I&APs** | Interested and Affected Parties |
| **ICMM** | International Council for Mining and Metals |

| TERMS AND ABBREVIATIONS | |
|---|---|
| **IUCN** | International Union for the Conservation of Nature |
| **KP** | Knight Piésold |
| **LoM** | Life of Mine |
| **MAMSL** | Metres Above Mean Sea Level |
| **MAP** | Mean Annual Precipitation |
| **MRA** | Mining Right Area |
| **RA** | Risk Assessment |
| **SRK** | SRK Consulting |
| **SWMP** | Stormwater Management Plan |
| **TDS** | Total Dissolved Solids |
| **TSF** | Tailings Storage Facility |
| **WRD** | Waste Rock Dump |
| **Units of Measure** | |
| **%** | Percent |
| **Bt** | Billions of tonnes |
| **°C** | Degree Celsius |
| **km** | Kilometre |
| **$km^2$** | Square kilometre |
| **m** | Metre |
| **m/s** | Metres per second |
| **$m^2$** | Square metre |
| **$m^3$** | Cubic metre |
| **mg/l** | Milligram/litre |
| **mm** | Millimetres |
| **Mt** | Millions of tonnes |
| **Mtpa** | Mt per annum |

| TERMS AND ABBREVIATIONS | |
|---|---|
| **NOx** | Oxides of Nitrogen |
| **PM $_{2.5}$** | Particulate Matter 2.5 microns |
| **PM $_{10}$** | Particulate Matter 10 microns |
| **t** | Tonne |

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# 1. Introduction

Barrick Gold Corporation (Barrick), through its subsidiary Reko Diq Mining Company (RDMC), is developing the Reko Diq Mining Project (the Project).

RDMC appointed Digby Wells Environmental (Digby Wells) and Hagler Bailly Pakistan (HBP) as the environmental practitioners for the Project and to assist in securing the necessary environmental approvals from the Balochistan Environmental Protection Agency (BEPA) and the Sindh Environmental Protection Agency (SEPA).

As part of the Environmental and Social Impact Assessment (ESIA), Digby Wells compiled a conceptual Closure Plan (CP) for the Project (this report).

# 2. Project Description

The Project is located near Nok Kundi in the Chagai District of the Balochistan Province of Pakistan (Figure 2-1). The Project is a Copper-Gold mining operation with an onsite processing plant to produce a high-quality copper-gold concentrate (the Concentrate) that will be exported for final processing into various products. The current Life-of-Mine (LoM) is 38 years in terms of defined resources (resources that have been identified already) with significant exploration upside.

The construction phase is anticipated to take approximately 40 months, including pre-stripping. The mine will be a truck-and-shovel open pit mining operation with processing facilities that include crushing, grinding, and flotation. The final Concentrate will be railed to Port Qasim for final export by ship.

The mine will be developed in two phases, Phase 1 is expected to have a capacity of 45 Mt per annum (Mtpa) and Phase 2 is expected to have a combined processing capacity of 90 Mtpa. Phase 1 operations are anticipated to commence in 2028 and Phase 2 operations in 2030.

## 2.1. Reko Diq Mine Site and Associated Facilities

Figure 2-2 provides an overview of the RDMS and the major proposed infrastructure.

The core infrastructure that will be established at the RDMS includes:

- Two main pits, Western Porphyry and Tanjeel (Figure 2-2). The mining method of these pits will be a 24-hour open-pit shovel and truck operation;
- Two designated Waste Rock Dumps (WRD) for the waste rock from the Western Porphyries pit. The Tajeel Pit will have a separate WRD in its proximity.
- Tailings storage facility (TSF).
- A processing plant.

### 2.1.1. Supporting Infrastructure

The proposed supporting infrastructure at the RDMS includes:

- Several sources for power supply will be utilised for the Project. The Project's estimated peak power requirements will be 183 megawatts (MW) in Phase 1 and 348 MW in Phase 2:
  - Diesel generators during the early works and construction phases until the establishment of the Heavy Fuel Oil (HFO) power station;
  - A Solar Photovoltaic (PV) system with an installed capacity of 183 MW in Phase 1 and 384 MW in Phase 2;
  - It is anticipated that the Project's energy requirements will be met through a grid connection from Year 15 (operational phase).
- Diesel, HFO and other sources of fuel will be railed to the site from Port Qasim and stored in bunded contained atmospheric tanks at the designated storage areas.
- Accommodation Facility to provide on-site accommodation for all employees and contractors;
- Security infrastructure;
- Waste management facilities.

### 2.1.2. Water Supply and Management

Water for the Construction Phase, Phase 1 and Phase 2 of the Project will be sourced from a sedimentary groundwater system located approximately 70 km to the northwest of the mining area referred to as the Northern Groundwater System Figure 6-1. The system represents a small and isolated part of a much larger basin and there are no communities or community water sources located within the proposed borefield and its area of influence.

Water in the system is saline and challenging to access, and as such is not suitable for human consumption or most agricultural or industrial uses without significant treatment and abstraction infrastructure. There are currently no planned developments or users of the target groundwater system, and the scope of the Project would not preclude future use of the broader basin by others. Independent international best practice environmental and social impact assessment and hydrogeological studies, using physical surveying and remote sensing techniques, have demonstrated that there are no surface expressions of the groundwater system and no known dependent biodiversity.

This groundwater system is considered capable of enabling development and sustaining operation of the Project, which is expected to add significantly to the socio-economic advancement within the region and country through employment, infrastructure, and services.

## 2.2. Transport and Marine Port

The Project will use the existing road and rail networks to transport materials during construction and operational phases and utilise the air transportation option for personnel. The main Project transport routes (Road Transport Route and Rail Transport Route) are shown in Figure 2-1.

### 2.2.1. Transport of Concentrate to Port Qasim

The Concentrate will be transported from the RDMS processing plant to Port Qasim via an existing railway line, passing through the Balochistan and Sindh provinces. The existing rail route is approximately 1,350 km in length as outlined in Figure 2-1. The new rail section is shown in Figure 2-3.

The Project will make use of the existing PIBT Terminal where all facilities are owned and operated by PIBT. An area will be leased to RDMC for the construction of a Concentrate storage shed.

An extract of the onshore and offshore layout is shown in Figure 2-4.

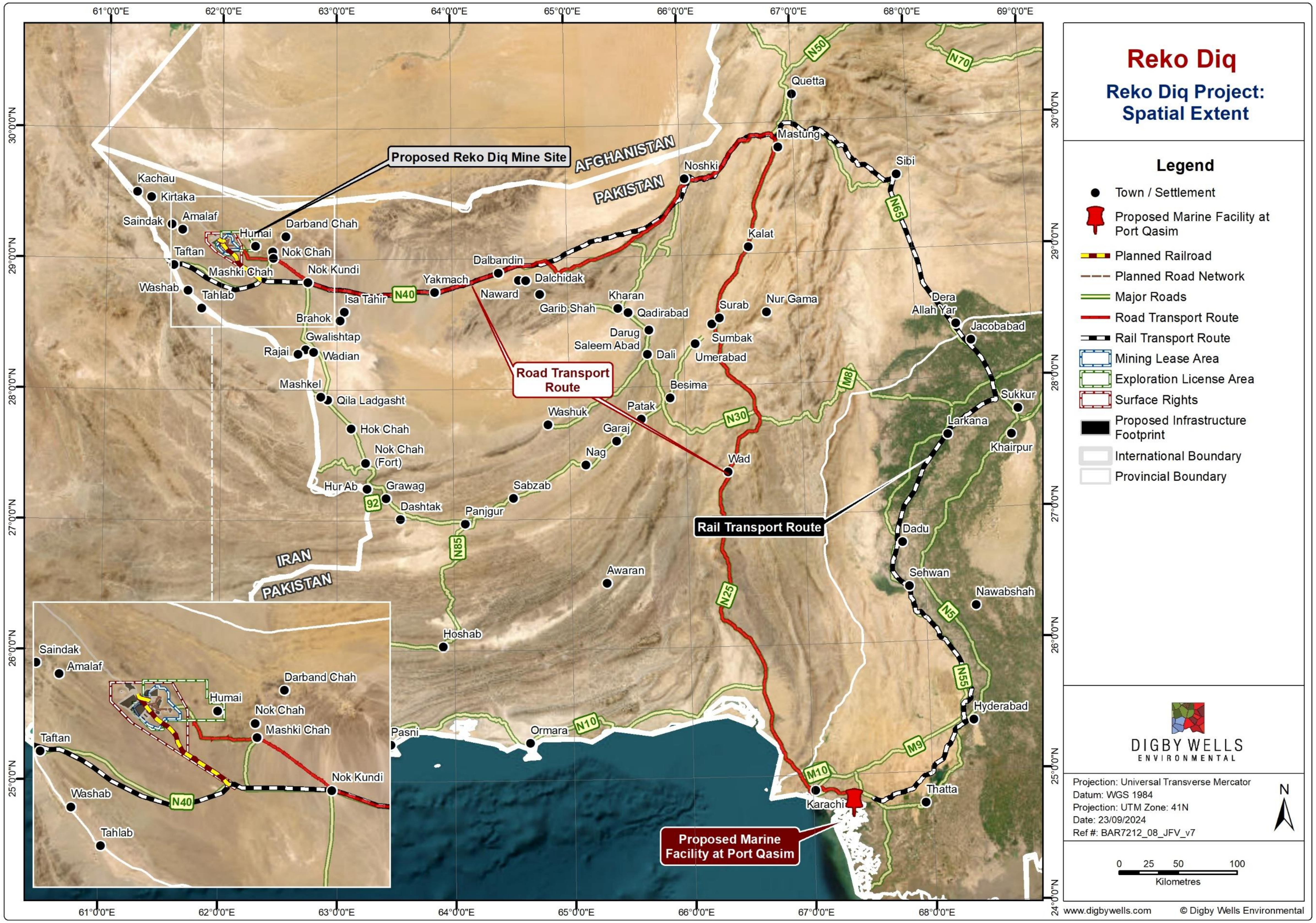



**Figure 2-1: Reko Diq Spatial Extent and Transport Routes (Rail Transport Route and Road Transport Route)**

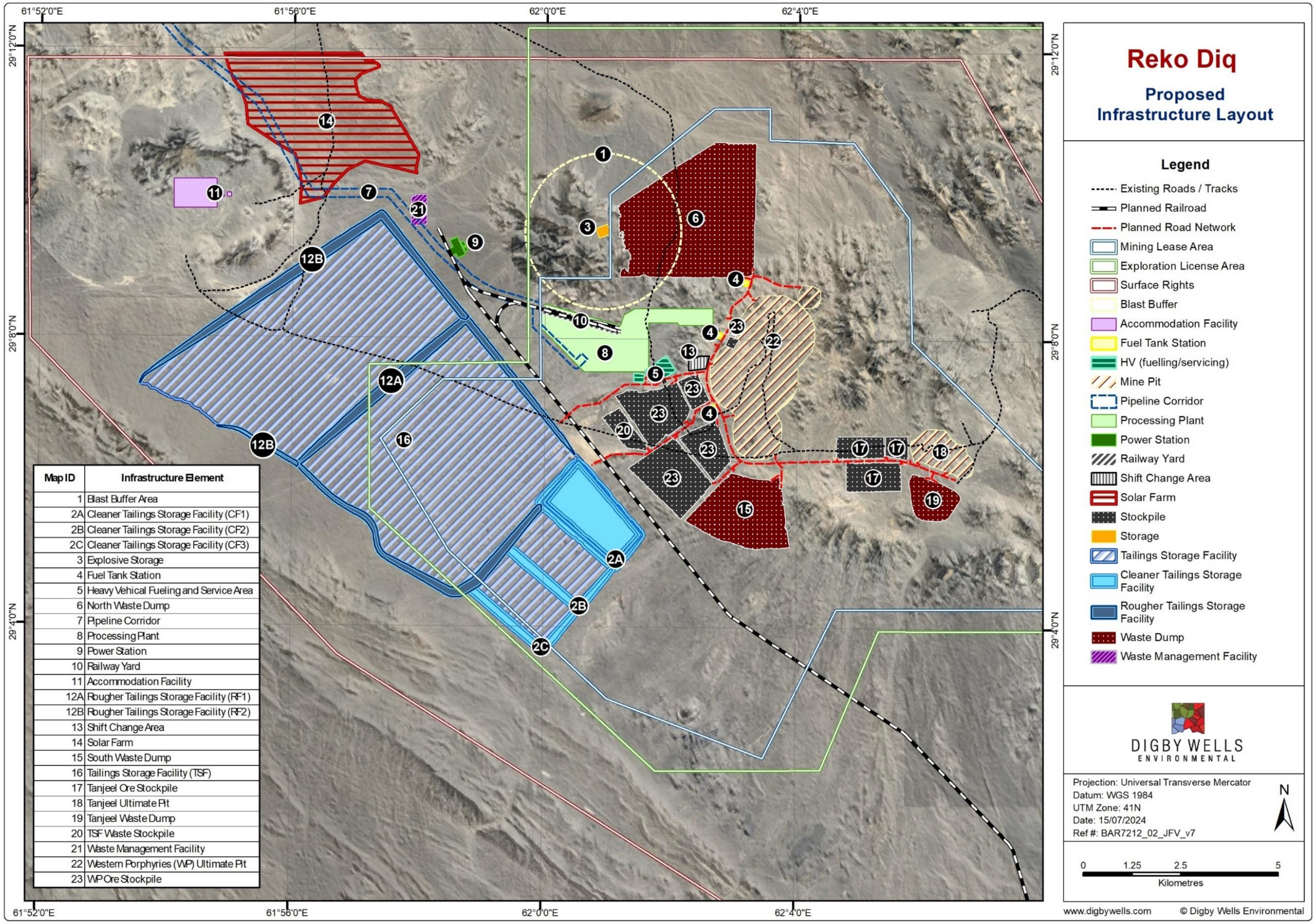



**Figure 2-2: Proposed Reko Diq Mine Site Layout**

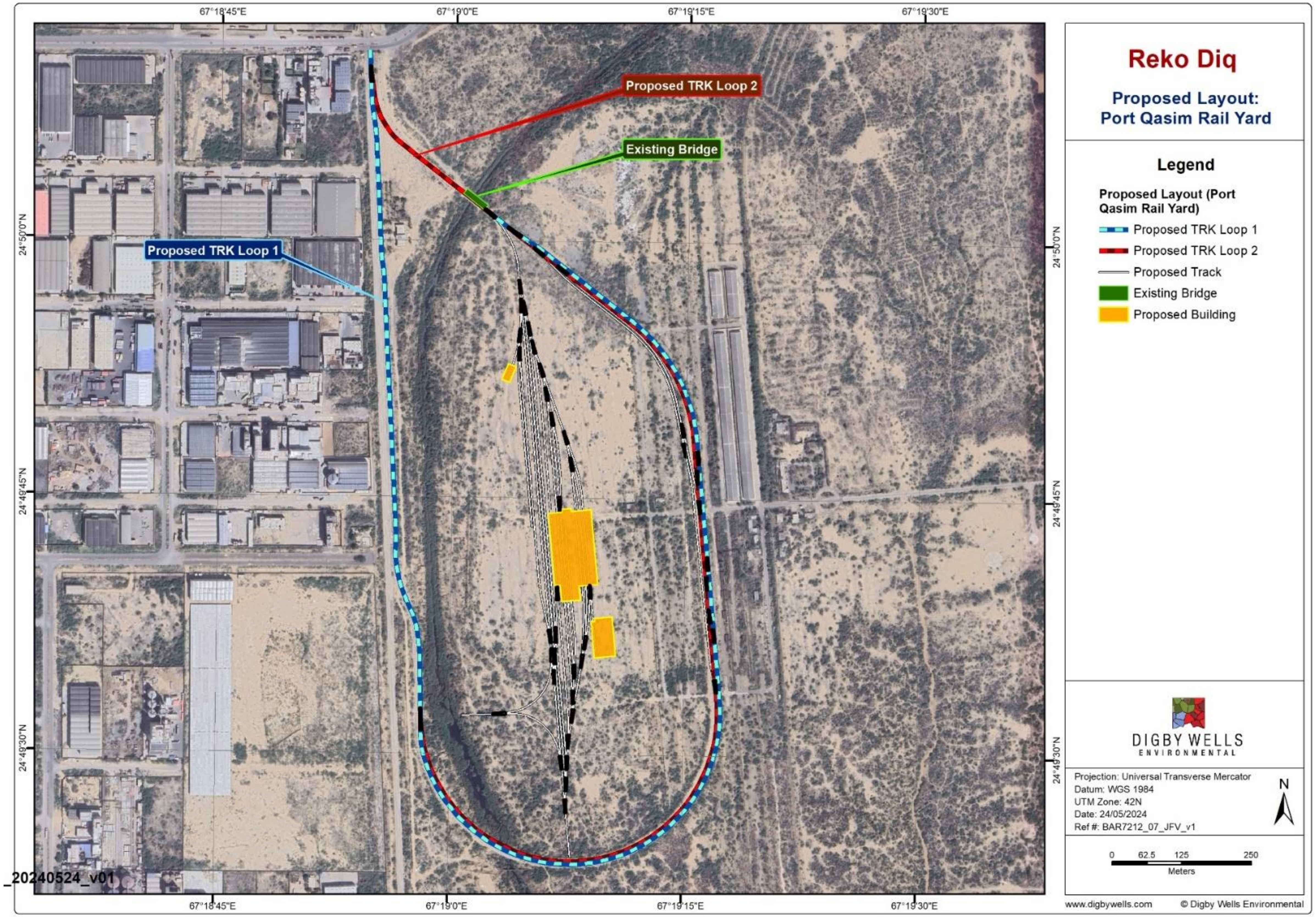



**Figure 2-3: Proposed Rail Yard Layout at Port Qasim**

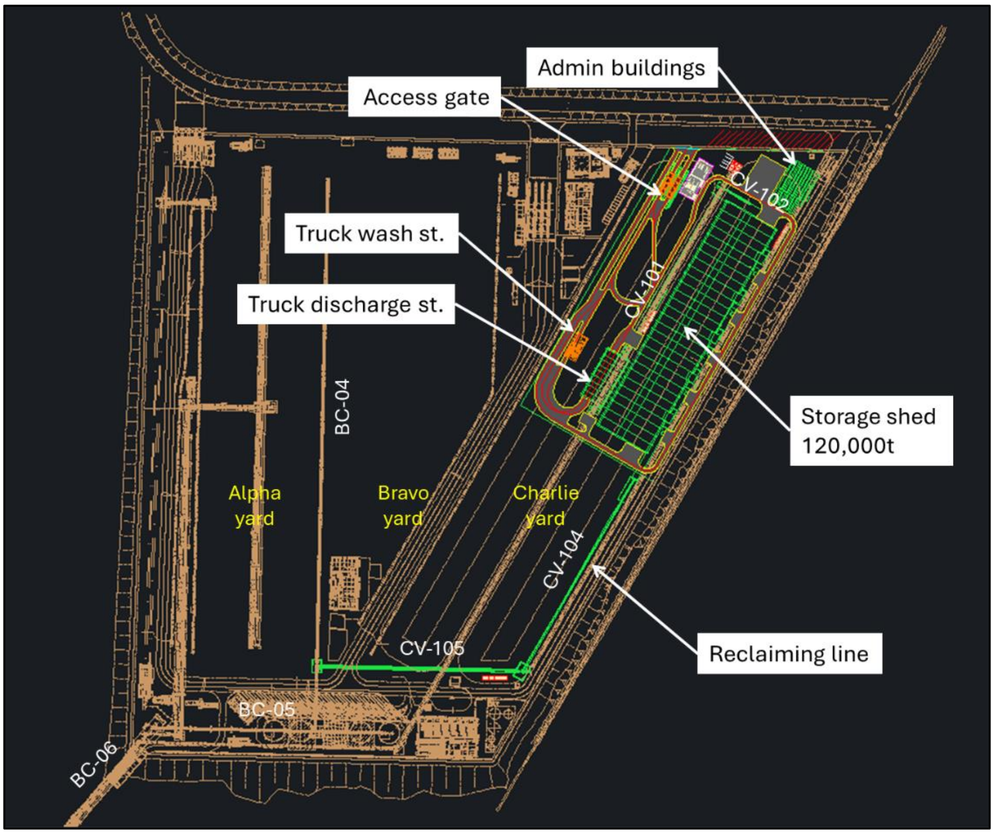



**Figure 2-4: Layout of Concentrate Facilities at PIBT at Port Qasim**

# 3. Project Approach

The approach followed in developing this CP was as follows:

- Conduct a desktop review of the specialist studies conducted as part of the original and the updated ESIA and the Barrick Mine Closure Standard;
- Define the closure battery limits, identify key closure domains, outline the closure objectives, identification of closure related risks and the development of the closure measures required for successful rehabilitation outcomes;
- Conduct specific discussions with the infrastructure design specialists (Reko Diq team) and TSF design engineers (Knight Piésold) to inform the initial CP;
- Compile a Closure Risk Assessment (CRA) based on the document review and discussions with subject matter specialists, apply appropriate risk rankings and initial closure measures aligned with specialist input;
- Propose preliminary end land uses based on available information;
- Propose initial site closure criteria based on the envisioned final land use;
- Develop a high-level post-closure monitoring plan to ensure successful rehabilitation implementation and align with the proposed closure criteria;
- Identify potential residual risks that may manifest on site after closure, that will need further investigation to quantify; and
- Identify potential gaps and a forward working plan to improve the resolution of the CP.

A high-level overview of the mine closure planning processes is presented in Figure 3-1.

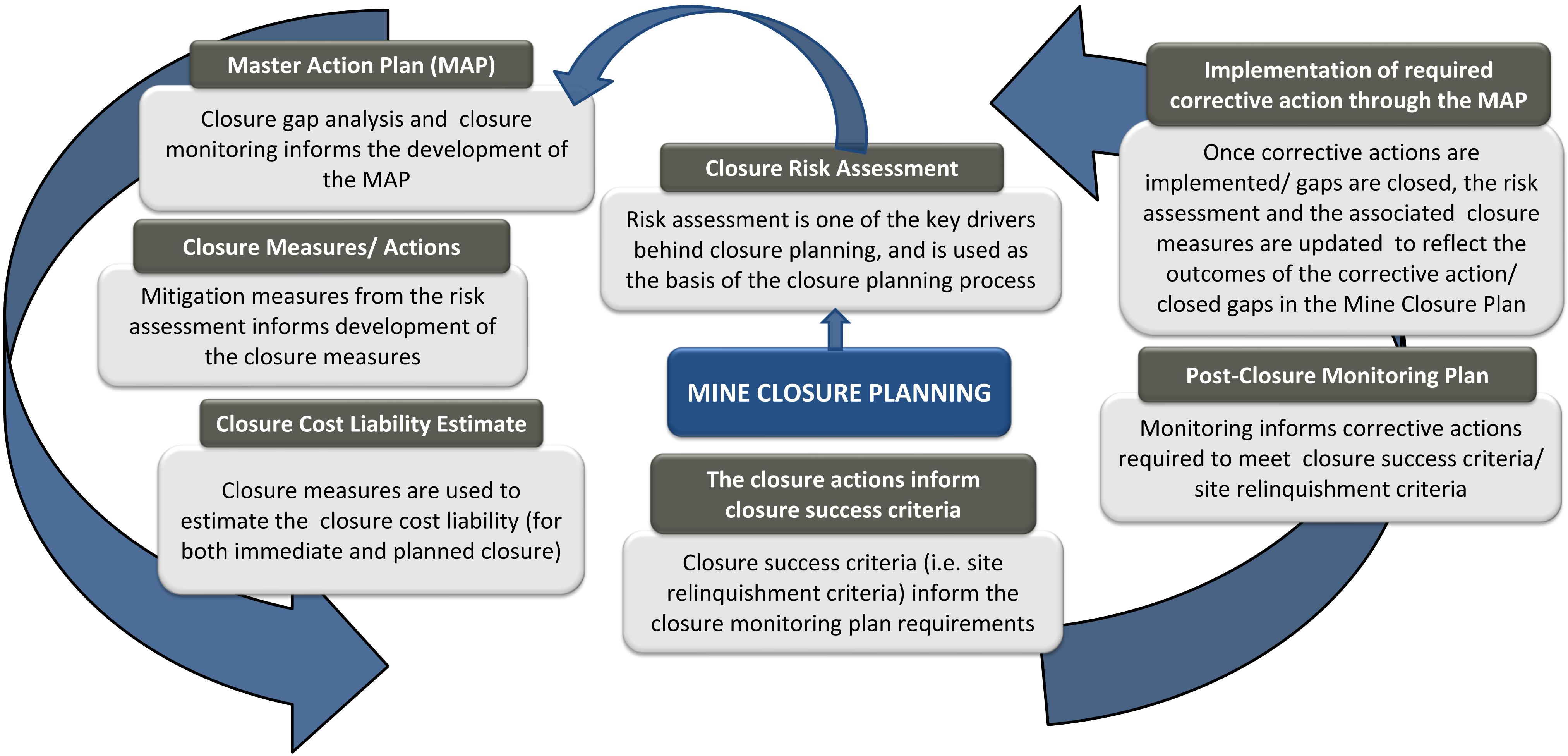



**Figure 3-1: High-Level Mine Closure Planning Process**

# 4. Supporting Information

The information made available for the compilation and development of the closure planning document is summarised in Table 4-1.

**Table 4-1: Supporting Information**

| Report/Plan Title | Author | Date |
|---|---|---|
| Air Dispersion Modelling Report | Hagler Bailey Pakistan | 2024 |
| Air Quality Assessment Specialist Report | Hagler Bailey Pakistan | 2024 |
| Biodiversity - Fauna Specialist Report | Hagler Bailey Pakistan | 2024 |
| Biodiversity – Flora Specialist Report | Hagler Bailey Pakistan | 2024 |
| Climate Change Specialist Report | Digby Wells | 2024 |
| Closure Cost Assessment | Digby Wells | 2024 |
| Environmental and Social Impact Assessment for the Reko Diq Project (ESIA) | Hagler Bailey Pakistan | 2020 |
| Environmental and Social Impact Assessment for the Reko Diq Project (ESIA) | SRK Consulting and Hagler Bailly Pakistan | 2010 |
| Early Works Environmental and Social Impact Assessment for the Reko Diq Project (ESIA) | Hagler Bailey Pakistan | 2024 |
| Feasibility Study for Tethyan Copper Company and the Reko Diq Project | SNC Lavalin and Knight Piésold | 2010 |
| Geochemistry Literature Review Memo | Digby Wells | 2022 |
| Geochemistry Specialist Report | Digby Wells | 2024 |
| Groundwater Impact Assessment for Borefield Report | Digby Wells | 2024 |
| Hydrocensus Report | Hagler Bailey Pakistan | 2023 |
| Mine Site Hydrological Impact Assessment Report | Digby Wells | 2024 |
| Surface Water Specialist Report | Digby Wells | 2024 |
| Soils and Sediments Specialist Report | Hagler Bailey Pakistan | 2024 |
| TSF Concept Closure Plan Memorandum | Knight Piésold | 2024 |
| TSF Basin Drainage Memorandum | Knight Piésold | 2024 |
| TSF Water Balance Memorandum | Knight Piésold | 2024 |

# 5. Relevant Legislation, Standards and Guidelines

There are several overarching Good International Industry Practice (GIIP) standards which provide recommendations on how rehabilitation and closure should be undertaken to achieve best practice. For the CP, the following overarching guideline documents were considered:

- Tailings Management, Good Practice Guide, International Council on Mining and Metals, (ICMM, 2021);
- Global Industry Standard on Tailings Management, (ICMM, 2021); and
- Integrated Mine Closure, good practice guideline 2nd edition. International Council of Mining and Metals, 2019 (ICMM, 2019).

The relevant in-country legislation pertinent to the Project is summarised in Table 5-1. The Project also aims to comply with the International Finance Corporation (IFC) Standards and the Equator Principles as detailed below.

## 5.1. International Finance Corporation Performance Standards (PS)

According to the IFC's Environmental, Health and Safety (EHS) Guidelines for Mining (2007), several important objectives relating to mine closure and post-closure aspects for an operation needs to be met. Thus, the mining operation should plan for the following:

- The incorporation of both physical rehabilitation and socio-economic considerations in the mine closure plan;
- The duration of post-closure monitoring should be defined on a risk basis taking site conditions into account. Monitoring is typically required for a period of five years or longer; and
- The financial feasibility of mine closure and post-closure activities, including post-closure care should be included in the business feasibility analysis during planning and design stages.

### 5.1.1. Global Industry Standard on Tailings Management

The Global Industry Standard on Tailings Management (GISTM) is the first global standard on tailings facility management and prescribes various requirements relating to social, environmental local economic, and technical considerations. In the preamble of the GISTM it is stated that the GISTM "*strives to achieve the ultimate goal of zero harm to people and the environment with zero tolerance for human fatality*".

It must be noted that compliance with the GISTM is not mandatory, however, Barrick has committed to aligning with the provisions of the GISTM. Furthermore, financial institutions such as banks may require lenders to comply with the provisions of the GISTM as part of their conditions for funding arrangements. However, notwithstanding the above, it is important to point out that it is stated in the preamble of the GISTM that "*Conformance with the Standard does not displace the requirements of any specific national, state or local governmental statutes, laws, regulations, ordinances, or other government directives. Operators are* *expected to conform with the Requirements of the Standard not in conflict with other provisions of law*".

The GISTM consists of various principles each relating to a specific aspect of tailings management. The following principles are the most relevant to the closure of the Reko Diq TSF, namely –

- Principle 1: "*Respect the rights of project-affected people and meaningfully engage them at all phases of the tailings facility lifecycle, including closure*"
- Principle 2: "*Develop and maintain an interdisciplinary knowledge base to support safe tailings management throughout the tailing's facility lifecycle, including closure*"
- Principle 3: "*Use all elements of the knowledge base – social, environmental, local economic and technical to inform decisions throughout the tailings facility lifecycle, including closure.*"
- Principle 4: "*Develop plans and design criteria for the tailing facility to minimise risk for all phases of its lifecycle, including closure and post-closure*."
- Principle 5: *"Develop a robust design that integrates the knowledge base and minimises the risk of failure to people and the environment for all phases of the trailing facility lifecycle, including closure and post-closure".*
- Principle 6: *"Plan, build and operate the tailing facility to manage risk at all phases of the tailing facility lifecycle, including closure and post-closure."*
- Principle 7: *"Design, implement and operate monitoring systems to manage risk at all phases of the facility lifecycle, including closure."*
- Principle 8: *"Establish policies, systems and accountabilities to support the safety and integrity of the tailings facility."*
- Principle 10: *"Establish and implement levels of review as part of a strong quality and risk management system for all phases of the tailing facility lifecycle, including closure."*
- Principle 15: "*Publicly disclose and provide access to information about the tailing facility to support public accountability*."

It is noted that the requirements set out in the GISTM are reflected in the Barrick Mine Closure Standard.

## 5.2. Barrick Mine Closure Standard

The Barrick Mine Closure Standard is closely aligned with International Guidelines and industry good practice (i.e., International Council for Mining and Metals - Integrated Mine Closure: Good Practice Guideline (ICMM, 2019)). The approach is aimed at leaving a positive legacy post mining and indicates that "mine closure begins before mining starts, carries on throughout each mine's life and reflects our goal of sharing benefits and maximising value for local communities" (Barrick website).

The Barrick Mine Closure Standard (2020), requires the following:

- Application of a mitigation hierarchy to manage negative environmental impacts, to avoid these wherever possible and minimise those which cannot be avoided;
- Minimise the use of water and control impacts on water quality;
- Engage with stakeholders including local communities to support sustainable management of resources for the benefit of all local users; and
- Use energy as efficiently as possible.

## 5.3. Applicable Pakistani Legislation

A summary of the relevant in-country legislation is provided in Table 5-1. The list is deemed sufficient for the development of the initial closure framework.

**Table 5-1: Applicable Legislation, Regulations, Guidelines and By Laws**

| Legislation, Regulation, Guideline or By-Law | Applicability |
|---|---|
| Balochistan Mineral Rules, 2002 | Rule 13 (2) (d) of the BMR provides that on the expiry, termination, surrender or cancellation of the title or concession the holder of the title or concession shall<br>(a) fill up all excavations; securely plug all mines and remove all equipment, installations and structures from the land to which the title or concession relates, and<br>(b) take such action as may be necessary to restore the land in so far as possible to its original condition and to prevent hazards to human or animal life or to the property of other or to the environment. Provided, however that the holder of the title or concession shall not be obliged to restore the surface of land in respect of which full compensation for any damage or disturbance has been paid pursuant to Rule 14(8).<br><br>Rule 33 Records and reporting by licensee,<br>(5) In the event of the cancellation or surrender of a mine lease under Rule 57 or Rule 58 or the expiration of<br>the term of the mining lease, the person who was the lessee immediately before such cancellation, surrender<br>or expiration shall, on a date later than 180 cancellations surrender or expiration, deliver to the licensing<br>authority, ---<br>(a) all records kept in accordance with sub-rule (1)<br>(b) all maps and plans referred to in sub-rule (3)<br>(c) all reports photographs tabulations tapes and discs prepared by on behalf such person in the courts of<br>operation and<br>(e) such other hooks, documents, records and reports as the licensing authority may require, or copies of the<br>items referred to in paragraphs (a) to (d)<br><br>113. Removal and sale of property,<br>2) The licensing authority may by notice in writing, direct the person who was the holder of the title or concession immediately after cancellation, surrender, expiration or cessation, to do any or all of the following within period of three months of the date of cancellation.<br>(a) to demolish or remove any building or structures or to remove any equipment, debris or other things specified in the notice;<br><br>Rule 113 of the BMR provides that where a mineral title or a mineral concession has been cancelled or surrendered or the term thereof has expired, or as the case may be, any area of land has ceased to be subject to the title or concession and the holder thereof has failed to comply with the requirements of the BMR or the title or concession in relation to the removal of equipment, installations or structures, the licensing authority may by notice in writing direct the holder immediately after cancellation, surrender, expiration or cessation to<br>(a) demolish or remove any building or structures or to remove any equipment debris or other things specified in the notice and<br>(b) to take necessary steps to remedy any damage to the land due to exploration or mining operations. In the event of failure of the title holder to comply with the notice, the property in respect of which notice is given is deemed to be the property of the Government and the licensing authority is entitled to carry out the directions in the notice and to dispose of the property as it deems fit, including through sale by public auction or public tender and to render the proceeds of any such disposal to the Government which will be entitled to retain them. |
| Regulation of Mines and Oil-fields and Mineral Development (Government Control) (Amendment) Act, 2022 and the relevant provisions of the Balochistan Mineral Rules, 2002 | This is an amendment by the Province of Balochistan of the Regulation of Mines and Oil-fields and Mineral Development (Government Control) Act, 1948. The 1948 act (as amended) provides for regulation of mines and oilfields and mineral development. The mineral titles have been granted to RDMC pursuant to Section 7 of the 1948 Act (as amended). The BMR, 2002, passed under the 1948 Act (as amended) only applies to the extent mentioned in the mineral titles issued to RDMC.<br>Under the Regulation of Mines and Oil-fields and Mineral Development (Government Control) Act, 1948 (“1948 Act”) the authority to make rules determining the granting and renewal of a mineral right, the charge of fees therefore and any other conditions associated to a mineral right, including the determination of the rates of royalties, production, etc. vest with the appropriate Government. as RDMC are located in Balochistan, its activities are governed by the Balochistan Mineral Rules, 2002 (BMR) issued by the Government of Balochistan (GOB). |

| Legislation, Regulation, Guideline or By-Law | Applicability |
|---|---|
| The Mines Act, 1923 as amended by the Balochistan Mines (Amendment) Act, 2011 | Regulates and inspects mining operations in Balochistan province.<br>The 1923 Act will apply to the Project as is, except as and where amended by the Balochistan Mines (Amendment) Act, 2011.<br>.Applicable during the operational phase of the Project. |
| Balochistan Factories Act, 2021 | A provincial adaptation of the federal legislation i.e., the Factories Act of 1934, which is applicable specifically in the province of Balochistan. The act enacts the labour and working conditions for labour engaged in Balochistan.<br>Applicable to workers' accommodation and rights during construction and operations. |
| Petroleum Act, 1934 and the Petroleum Rules, 1937 | Petroleum Act, 1934 and rules made thereunder which deal inter alia with grant of licenses for storage, import and transportation of petroleum.<br>The Act will likely be applicable to the construction and operations phases of the Project. As RDMC's storage / use of petroleum products exceeds the thresholds, this Act and the Rules will apply. |
| Electricity Act, 1910 and Electricity Rules, 1937 | Electricity Act, 1910 and rules made thereunder which deal with supply of energy.<br>Not applicable as the Project will rely on onsite HFO Power Plant and Solar Farm to fulfil their operations phase power requirement. However, it may become applicable if the Grid Connection option for power supply is investigated in the future. |
| Explosives Act 1908 (Amendment 2017) | Regulates handling and storage of explosive substances. |
| Balochistan Boilers and Pressure Vessels Act, 2015 | Applicability to the Project: Permits required to install and operate a boiler facility from the Chief Inspector of Boilers. |

# 6. Mine Description and Context

## 6.1. Project Description

The Project is a Copper-Gold mining operation with an onsite processing plant to produce a high-quality copper-gold concentrate (the Concentrate) that will be exported for final processing into various products. The current Life-of-Mine (LoM) is 38 years in terms of defined resources (resources that have been identified already) with significant exploration upside.

The construction phase is anticipated to take approximately 40 months, including pre-stripping. The mine will be a truck-and-shovel open pit mining operation with processing facilities that include crushing, grinding, and flotation. The final Concentrate will be railed to Port Qasim for final export by ship.

The mine will be developed in two phases, Phase 1 is expected to have a capacity of 45 Mt per annum (Mtpa) and Phase 2 is expected to have a combined processing capacity of 90 Mtpa. Phase 1 operations are anticipated to commence towards the end of 2028 and Phase 2 operations in 2030.

## 6.2. Reko Diq Mine Site and Associated Facilities

The proposed RDMS will cover an area of 33,408 ha. Figure 2-2 provides an overview of the RDMS and the major proposed infrastructure.

The core infrastructure that will be established at the RDMS includes:

- Two main pits, Western Porphyry and Tanjeel (Figure 2-2).The Western Porphyry Pit (the Pit) will mine a complex of four adjacent porphyry centres (H13, H14, H15 and H79) with the highest grades in the H14 and H15 complexes. The mining method of these pits will be a 24-hour open-pit shovel and truck operation;
- Two Low-grade stockpiles for the ore body or Run of Mine (ROM) that will be extracted, one for the Western Porphyries pit and one for the Tajeel Pit;
- Two designated Waste Rock Dumps (WRD) for the waste rock from the Western Porphyries pit. The Tajeel Pit will have a separate WRD in its proximity.
- One tailings storage facility (TSF) with four enclosed cells located to the southwest of the RDMS. The TSF embankments will be constructed with predominantly waste rock and have tailings drainage systems to control the flow of water and tailings. The enclosed cells consist of:
    - Three cells have been designed for the cleaner tailings which will be lined with 1.5 mm HDPE liner. A low permeability upstream zone will be constructed of 3 m of clay and 3 m of filter sand behind it;

    - Rougher tailings storage cells designed to contain 2,728 Mt (88%) of the total tailings produced. It will be controlled to accumulate supernatant water at a decant point, the water will be reused in the mining process.
- A processing plant with a concentrator to produce the copper or gold concentrate.

The process of producing the concentrate at the processing plant involves flotation and does not require cyanide. The daily processing rate will be 123,000 tonnes per day (t/d) in Phase 1, increasing to 246,000 t/d in Phase 2. A total of 34 million tonnes (Mt) of Concentrate will be processed with an approximate average copper grade of 26-31% and gold content of 7-15 grams per tonnes (g/t).

The predicted total material produced and transported on site is shown in Table 6-1.

**Table 6-1: Total Material Movement (Source: Mine Plan Summary 2024)**

| Destination | Tonnage for LoM (kt) |
|---|---|
| Total Ore Mined (Western Porphyries & Tanjeel pits) | 3,011,694 |
| Total Waste Mined (Western Porphyries & Tanjeel pits) | 3,200,800 |
| Waste Dump North | 2,063,287 |
| Waste Dump South | 670,298 |
| Tanjeel Waste Dump | 160,319 |
| Waste to TSF Stockpile | 306,896 |

## 6.3. Supporting Infrastructure

The proposed supporting infrastructure at the RDMS includes:

- Several sources for power supply will be utilised for the Project. The Project's estimated peak power requirements will be 183 megawatts (MW) in Phase 1 and 348 MW in Phase 2:
    - Diesel generators during the early works and construction phases until the establishment of the Heavy Fuel Oil (HFO) power station (this will be used until Year 15). The power station will have two main stacks where the flue gas ducts of the 12 generators will be combined in clusters of six per stack. An additional set of 11 HFO-based generators will be installed at the power station for Phase 2. Sixteen (16) diesel generators, each with 1.8 MW capacity will be utilised for emergency power.
    - An overhead transmission line (Overhead Line (OHL)) will supply power to the Northern Groundwater borefield via a single circuit and following the water pipeline corridor where pump stations at the borefield will be supplied by a network of 33 kV distribution lines;

    - A Solar Photovoltaic (PV) system will be developed approximately 10 km northwest of the Pits covering 300-350 hectares (ha). The installed capacity will be 183 MW in Phase 1 and then an expansion of the system to 384 MW in Phase 2;
    - It is anticipated that the Project's energy requirements will be met through a grid connection from Year 15 (operational phase). There is an existing transmission of 220 kV within the Balochistan region to Quetta which could be extended to supply power to Reko Diq. The anticipated length of the transmission line from mine site to Quetta will be 670 km (Figure 6-2);
- Diesel, HFO and other sources of fuel will be railed to the site from Port Qasim and stored in bunded contained atmospheric tanks at the mine truck shop, the processing plant and the power plant. The estimated average diesel consumption will be 26,000 kL per annum for the construction phase, increasing to 96,000 kL in Phase 1 and a predicted maximum annual consumption of 260,000 kL in 2049;
- Accommodation Facility to provide on-site accommodation for all employees and contractors working on the Reko Diq site, consisting of modular buildings located in the Northwest of the Mine Lease Area.
- Security infrastructure such as a 2 m fence with anti-berm constructed from the water rock, access cates, surveillance system and a control room at the processing plant;
- Fire protection and emergency response facilities such as fire hydrants outside buildings and three fire water systems at the processing plant, mine site and accommodation facility;
- Explosive storage near the WRD north, northwest of the Western Porphyries Pit;
- A truck workshop west of the Western Porphyries Pit. A separate building will contain the first aid station, officers, and lockers for employees and other facilities; and
- Non-mineralised waste management facilities:
    - A centralised waste storage and transfer facility (general and hazardous waste) for temporary storage of waste before recycling or final disposal;
    - A landfill (general and hazardous waste) with an estimated 260,300 t (520,600 $m^3$) being dumped before being separated for recycling or treatment. The onsite non-hazardous landfill will be approximately 8 ha and located between the processing plant area and the accommodation facility;
    - A tyre dump;
    - Bioremediation area near the landfill to treat hydrocarbon-contaminated soils. The area will be graded with a perimeter embankment;
    - A solid and liquid waste incinerator; and

- An HFO waste incinerator for the HFO sludge and processing plant. The capacity will be approximately 15,000 kilograms (kg) a day.

## 6.4. Water Supply and Management

Water for the Construction Phase, Phase 1 and Phase 2 of the Project will be sourced from a sedimentary groundwater system located approximately 70 km to the northwest of the mining area referred to as the Northern Groundwater System (Figure 6-1). The system represents a small and isolated part of a much larger basin and there are no communities or community water sources located within the proposed borefield and its area of influence.

Water in the system is saline and challenging to access, and as such is not suitable for human consumption or most agricultural or industrial uses without significant treatment and abstraction infrastructure. There are currently no planned developments or users of the target groundwater system, and the scope of the Project would not preclude future use of the broader basin by others. Independent international best practice environmental and social impact assessment and hydrogeological studies, using physical surveying and remote sensing techniques, have demonstrated that there are no surface expressions of the groundwater system and no known dependent biodiversity.

This groundwater system is considered capable of enabling development and sustaining operation of the Project, which is expected to add significantly to the socio-economic advancement within the region and country through employment, infrastructure, and services.

A 900 mm buried, cement lined steel pipe will be constructed between the site and the Northern Borefield for piping of operational water requirements.

This pipeline will be laid in parallel with a smaller diameter early works water supply pipeline at a distance of approximately 30 m apart. The total servitude for all future pipelines, service road and power supply line will be a total width of 60 m.

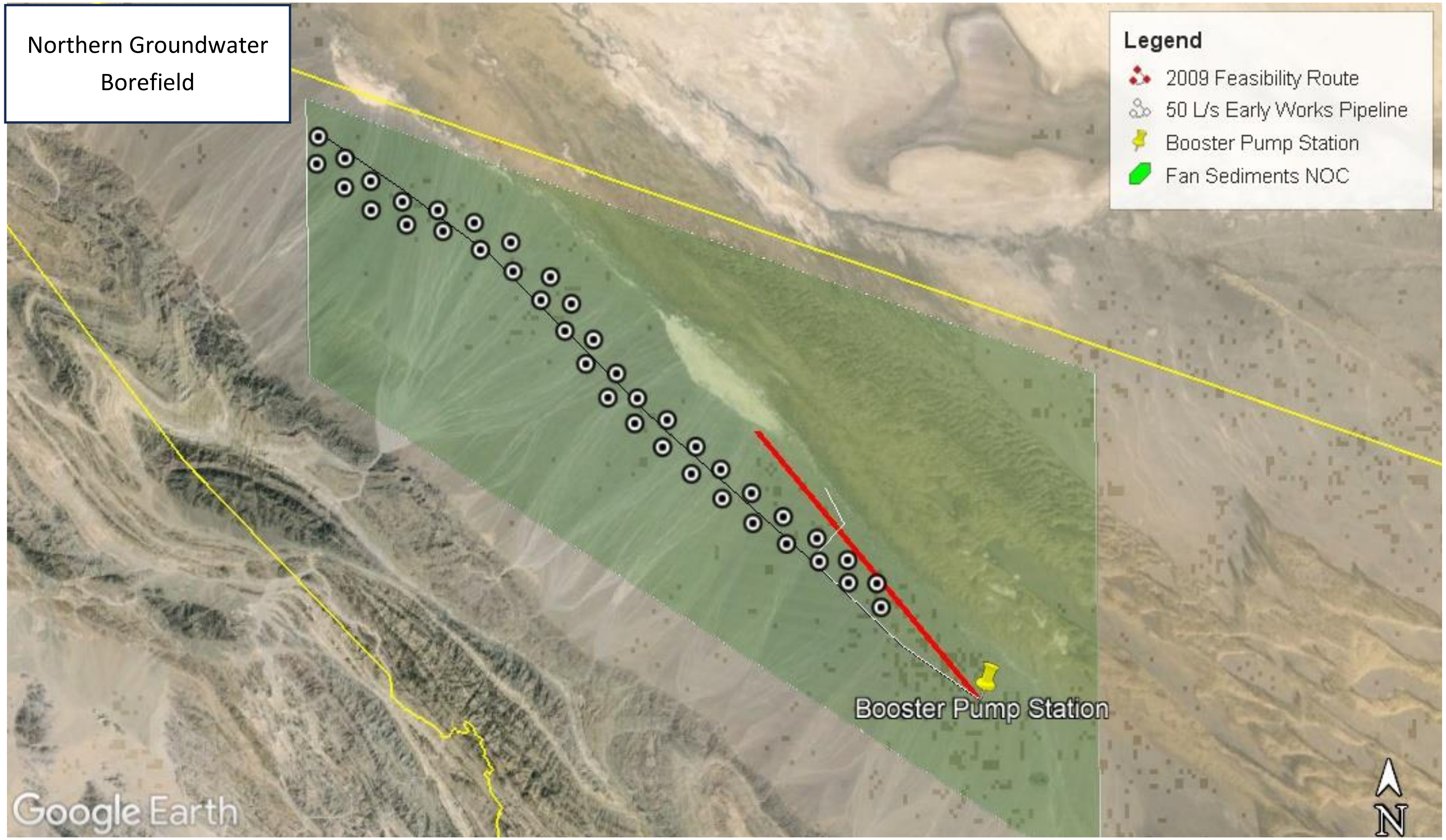



**Figure 6-1: Location and recommended layout if Northern Groundwater Borefield**

### 6.4.1. Water Management

The various aspects of water management for the Project include:

- A continuous supply of water of varying volumes such as 1.6 GL/a for the construction phase, 24 GL/a for Phase 1, 48 GL/a Phase 2 and 1.6 GL/a for the decommissioning phase.
- A Water Treatment Plant (WTP) will be installed at the mine site to provide potable water to the accommodation facility and work areas. It will be a containerised solution with two trains with a combined capacity of 145 $m^3$/hr;
- Sewage Treatment Plants (STP) will be installed at the accommodation facility and at the processing plant. The sewage treatment process will include Rotational Biological Contactor (RBC) technology. The STPs will be designed to handle four times the average daily intake and accommodate shift changes. During the construction phase, 2.9 $m^3$ of sludge will be produced daily reducing to approximately 1.5 $m^3$ during the operation phase.
- Various water storage facilities including a Raw Water Pond, Process Water Pond, Cooling Water Tank, Plant Fresh Water Tank, Village Raw Water Tank, Village Potable Water Tank and Mine Site Fresh Water Tank; and
- Various Stormwater Management around the plant area, pit area, TSF and WRDs.

## 6.5. Transport and Marine Port

The Project will use the road and rail networks to transport materials during construction and operational phases and utilise the air transportation option for personnel. The main Project transport routes (Road Transport Route and Rail Transport Route) are shown in Figure 6-2.

### 6.5.1. Access Route

Existing roads will be used to transport supplies and equipment to the mine site for the construction and operational phases.

The main routes the Project will utilise are the N-40 National Highway between Taftan (the Iranian border) and Quetta (the provincial capital), Port Qasim via the Northern Bypass (M10) and Regional Corporation for Development (RCD) Highway (also known as N-25 Highway) to Noshki and Dalbandin to Nok Kundi and finally Reko Diq Mine Site. The route from the mine site to Karachi is approximately 1,300 km, and to Nok Kundi is approximately 45 km.

A new 8 m wide, two-lane surface road will be constructed as part of the early works activities, connecting the mine site to the N-40. Within the mine site, a gravel road will be constructed which connects the main gate to the processing plant site, airstrip and the accommodation facility. This road will be used by Project-authorised vehicles only. The mine haul roads will be constructed to facilitate the transport of the ore and waste rock from the open pit to the crushers, ore stockpile processing plant and WRDs.

Charter flights will be used to transport personnel (not local to the region) routinely between Karachi and the mine site as well as for any emergency medical evacuations. A private airstrip has been constructed within Surface Rights Area (SRA). The airstrip is approximately 1.8 km in length and is located ~10 km from the RDMS.

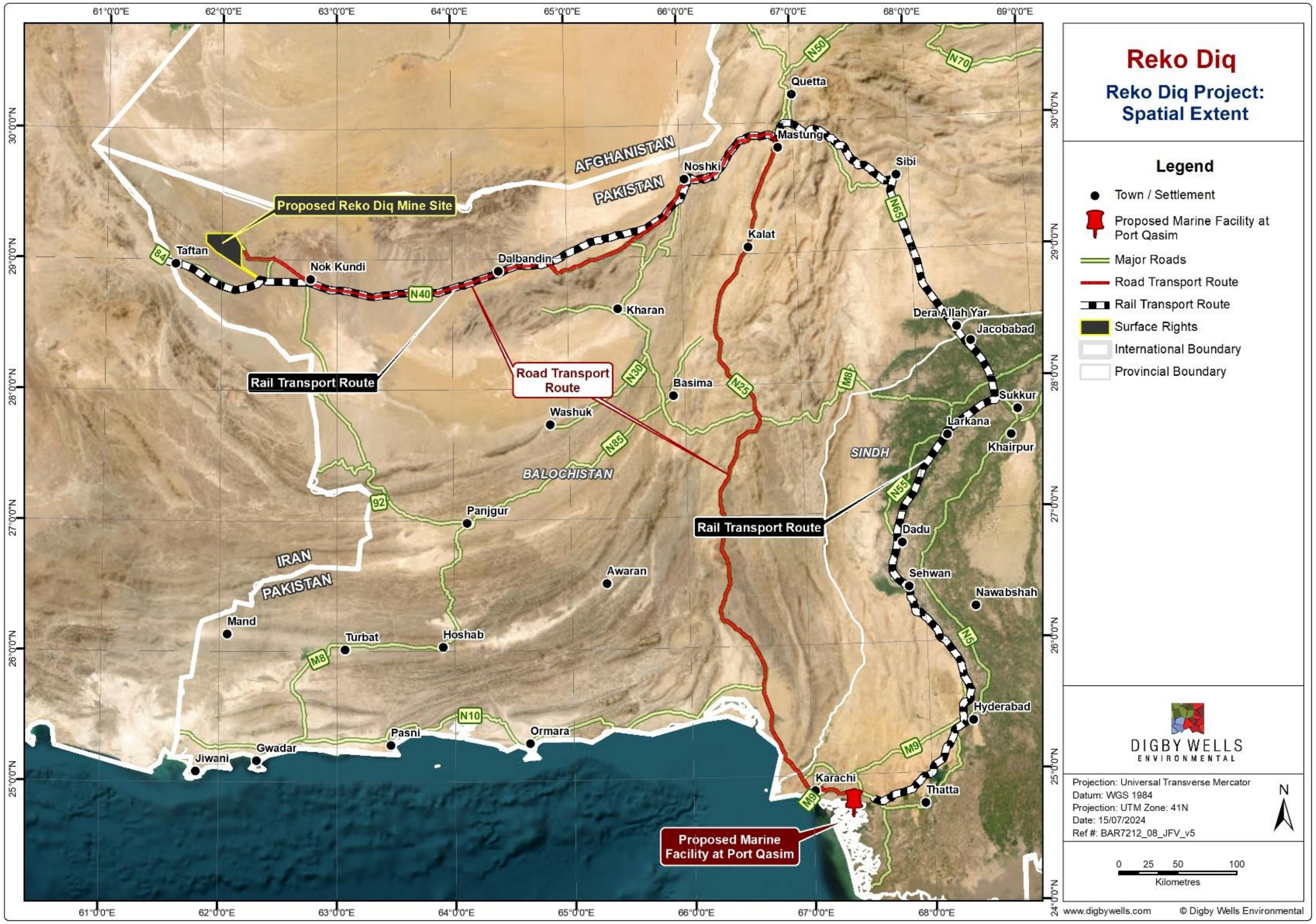



**Figure 6-2: Reko Diq Spatial Extent and Transport Routes (Rail Transport Route and Road Transport Route)**

### 6.5.2. Transport of Concentrate to Port Qasim

The Concentrate will be transported from the RDMS processing plant to Port Qasim via an existing railway line, passing through the Balochistan and Sindh provinces. The existing rail route is approximately 1,350 km in length as outlined in Figure 6-2.

A new project dedicated railway section will be constructed from the RDMS to the existing railway line at Nok Kundi. The rail transport will terminate at an existing railway loop located 13 km northeast of the Pakistan International Bulk Terminal (PIBT). The layout of the existing railway loop and proposed facilities is shown in Figure 6-3.

The fuel required during operations will be transported in bulk via rail from various import terminals at Port Qasim or Karachi Port.

Port Qasim is a marine terminal port located 50 kilometres from Karachi, on the coastline of the Arabian Sea, in the Malir District of Sindh Province of Pakistan. The Project will make use of the existing PIBT Terminal where all facilities are owned and operated by PIBT. An area will be leased to RDMC for the construction of a storage shed, for which RDMC will be responsible and all other activities will be ancillary and operated by PIBT.

The construction and operation of the Concentrate storage shed will be the responsibility of RDMC and will be included in this ESIA process.

The Terminal has a built capacity for handling up to 12 million tons of coal and 4 million tons of cement and clinker per annum, which together can be further enhanced to ramp up to 20 million tons of bulk product export per year. For this reason, there will be no need for additional port infrastructure to facilitate the requirements of the Project.

An extract of the onshore and offshore layout is shown in Figure 6-4.

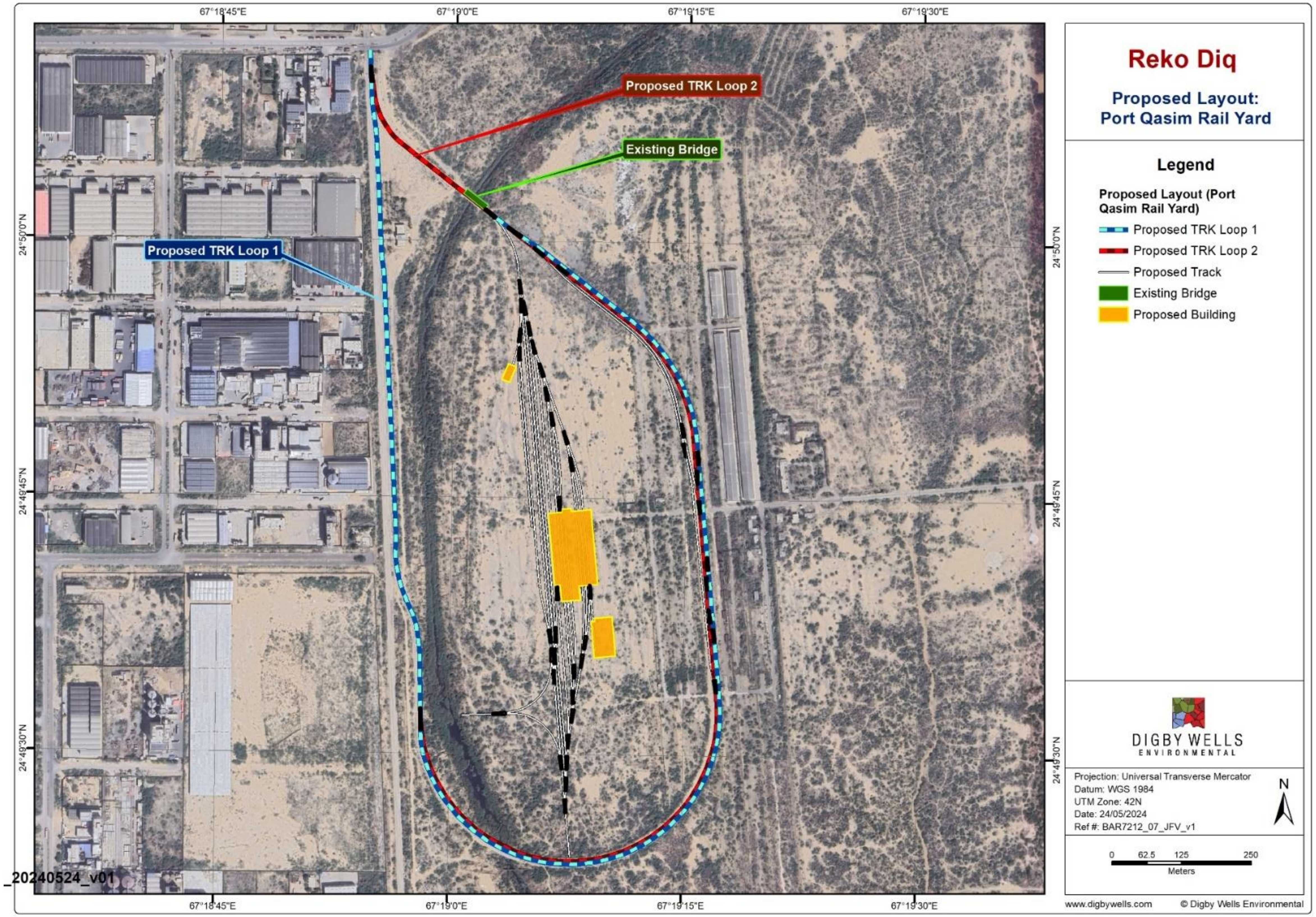



**Figure 6-3: Proposed Rail Yard Layout at Port Qasim**

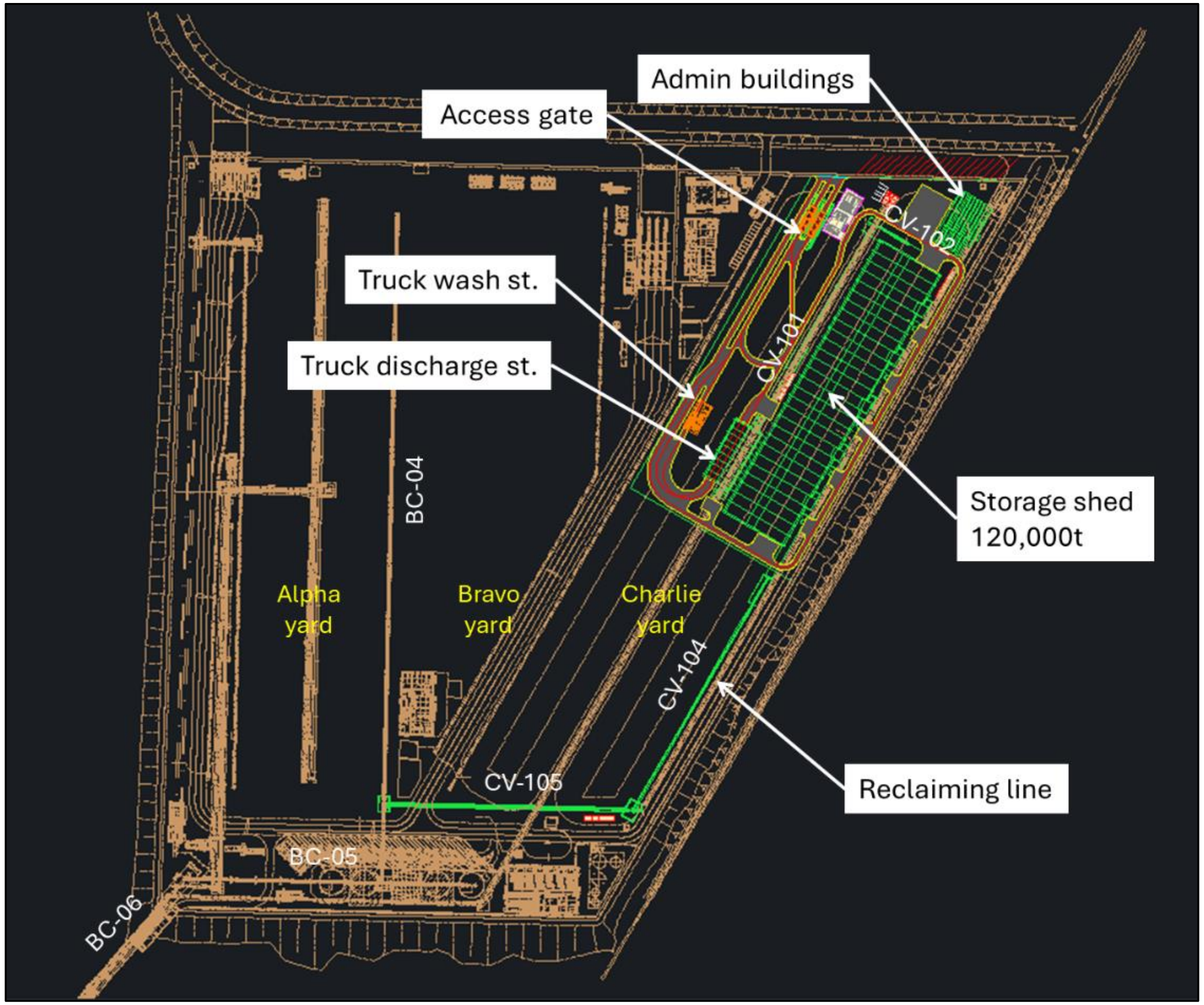



**Figure 6-4: Layout of Concentrate Facilities at PBIT at Port Qasim**

## 6.6. Employment

Preference will be given to locals for employment and appropriately qualified individuals from the surrounding communities. Table 6-2 presents the estimated average staffing during different stages of the Project.

**Table 6-2: Employment at Reko Diq Mine Site in various stages of the Project**

| **Project Phase** | **Early Works, Feasibility Study & Detailed Engineering** | **Phase 1 Construction** | **Phase 1 Operations and Phase 2 Construction** | **Phase 2 Operations** |
|---|---|---|---|---|
| | **2024** | **2025-2027** | **2028-2033** | **2034-2040** |
| **A. Contractors** | | | | |
| A.1. Contractors - Construction | 2,353 | 8,255 | 6,803 | - |
| A.2. Contractors - Operations & Services | 200 | 200 | 331 | 614 |
| Total Contractors | 2,553 | 8,455 | 7,133 | 614 |
| **B. RDMC Employees** | | | | |
| B.1. RDMC Local | 460 | 1,761 | 2,465 | 4,814 |
| B.2. RDMC Expat | 86 | 120 | 449 | 404 |
| RDMC Total Employees | 546 | 1,881 | 2,914 | 5,218 |
| **Total Engaged Workforce (A+B)** | **3,099** | **10,336** | **10,047** | **5,832** |

## 6.7. Mine Battery Limits for Closure

The CP for the Project is based on the LoM being executed in phases. Summarised rehabilitation and closure aspects are outlined for the various phases of the operation aspects for the domains listed in Table 6-3 below.

**Table 6-3: Battery Limits for Closure**

| Map Ref | Domain | Construction and Operational Phase | Aspects at Planned Closure (LoM) |
|---|---|---|---|
| 18, 22 | Tanjeel Ultimate Pit (TUP)<br>Western Porphyries Ultimate Pit (WPUP) | Design and construct access barriers and associated storm water management measures for each pit.<br>Construct the remainder of the perimeter barrier to enclose the TUP once mined out and align storm water management measures.<br>Monitor and manage access barriers and storm water systems | The WPUP assuming the access barrier and associated storm water management measures constructed during the operations will be augmented to enclose the total pit perimeter. |
| | Existing/Planned Road Network | Rehabilitate internal access roads and haul roads no longer required as mining progresses i.e., the haul roads to the TUP once mined out.<br>Monitor and maintain rehabilitated areas and refine methodologies.<br>Explore opportunities for roads/railways to remain post closure. | Demolish all linear infrastructure (existing roads, planned rail / road network and pipeline) remaining at closure and not identified for future use.<br>Conclude agreements and contracts with third parties for remaining infrastructure. |
| 6, 15, 19 | North WRD<br>South WRD<br>Tanjeel WRD | Design and construct WRDs<br>Explore methodologies to construct side slopes to their final configuration, and manage wind erosion as required.<br>Finalise the measures to mitigate wind erosion on the remaining active areas of the Tanjeel WRD and South WRD during operations.<br>Develop and manage a materials balance of suitable cladding waste rock with all requiring cladding as part of concurrent and closure rehabilitation activities.<br>Monitor and maintain rehabilitated areas and refine methodologies | Rip the remaining upper bench, access road and upper surface of the North WRD (or implement measures as determined during the operations to combat wind erosion). |

| Map Ref | Domain | Construction and Operational Phase | Aspects at Planned Closure (LoM) |
|---|---|---|---|
| 17, 20 & 23 | Tanjeel Ore, TSF Waste & WP Ore Stockpiles | Develop rehabilitation methodologies and implement concurrent rehabilitation across areas no longer required.<br>Rehabilitate the Tanjeel ore stockpile footprint during operations.<br>Run down ore stockpiles and process material through the plant leading up to closure. | Rehabilitated remaining stockpile footprints only, assuming ore will be processed and the TSF waste stockpile used as cladding material. |
| 8 | Processing Plant | Identify, demolish and remove infrastructure that may become redundant.<br>Explore opportunities for infrastructure to remain post closure for repurposed and future use.<br>Run down inventories of chemicals and reagents stored onsite leading into closure.<br>Investigate and refine decommissioning and demolition methodologies leading into closure. | Demolish and remove all infrastructure that has not been identified for future use.<br>Conclude agreements and contracts with third parties for remaining infrastructure.<br>Rehabilitated disturbed areas. |
| 4, 5 &13 | Ancillary Mine Buildings | | |
| 11, 9, 14 & 21 | Mine Accommodation, Solar farm, Power Station & Waste Management Facility | | |
| 2A-C & 12A-B | Cleaner TSF (CF1-3) & Rougher TSF (RF1-2) | Develop the closure strategy for the TSF facility.<br>Implement concurrent rehabilitation for cells where deposition is completed, including;<br>• Pump supernatant water back to the plant for reuse.<br>• Sealing underdrains once seepage stops.<br>• Profile the downstream batters and cover with gravel. | Final rehabilitation of the upper surface of the remaining active cells of the CTSF (CF3), assuming the other cells are decommissioned, clad and reprofiled towards the closure spillway (CF1-2) during operations.<br>Construct contour berms, swales and a rock lined discharge channel to allow discharge over the southern embankment for RF2. |

| Map Ref | Domain | Construction and Operational Phase | Aspects at Planned Closure (LoM) |
|---|---|---|---|
| | | • Clad upper surfaces of CF1-2, reprofiled towards the closure spillway.<br>• Construct contoured causeways and swales across RF1 and a rock lined closure spillway.<br>Reduce the supernatant pond leading into closure through pumping for reuse or treatment in exiting treatment facilities<br>Develop and manage a materials balance of volumes required for rehabilitation activities (cladding, contour causeway or swale construction) against available suitable material volumes.<br>Monitor and maintain rehabilitated areas and refine methodologies. | Decommission and close the decant systems. |

# 7. Biophysical Environmental Knowledge Base

This section describes the available environmental knowledge base used to inform closure planning. This section will be updated in subsequent iterations of this closure planning document, as more specialist studies become available to close the knowledge gaps identified. The knowledge base is developed from the specialist studies listed in Table 4-1.

## 7.1. Climate and Climate Change

The Reko Diq Project area is characterised as having an arid hot desert climate (Bwh) in the Köppen climate classification. The climate can be further characterised into four seasons which is winter (December to March), pre-monsoon (April to May), monsoon (June to September) and post-monsoon (October to November) (Hagler Bailly Pakistan and SRK Consulting , 2010). The rainfall data indicates the following:

- Rainfall is mostly received during the months of January to March (30 to 50% of the total);
- The average highest rainfall occurs in February and the average lowest in September (see Figure 7-1);
- The Mean Average Precipitation (MAP) for the Project site is 32.7 mm.; and
- The Project area is prone to flooding following extreme rainfall events that usually occur during the pre-monsoon and/or the monsoon season.

The Mean Annual Evaporation (MAE) determined for the site is 5026 mm (pan evaporation data), while the adjusted lake evaporation MAE was determined to be 2505 mm. Both values are extremely high compared to the observed MAP which confirm the very dry and extremely hot conditions for the area. As indicated in Figure 7-1 evaporation is higher during the months of April to October, a period when there is little to no rainfall.

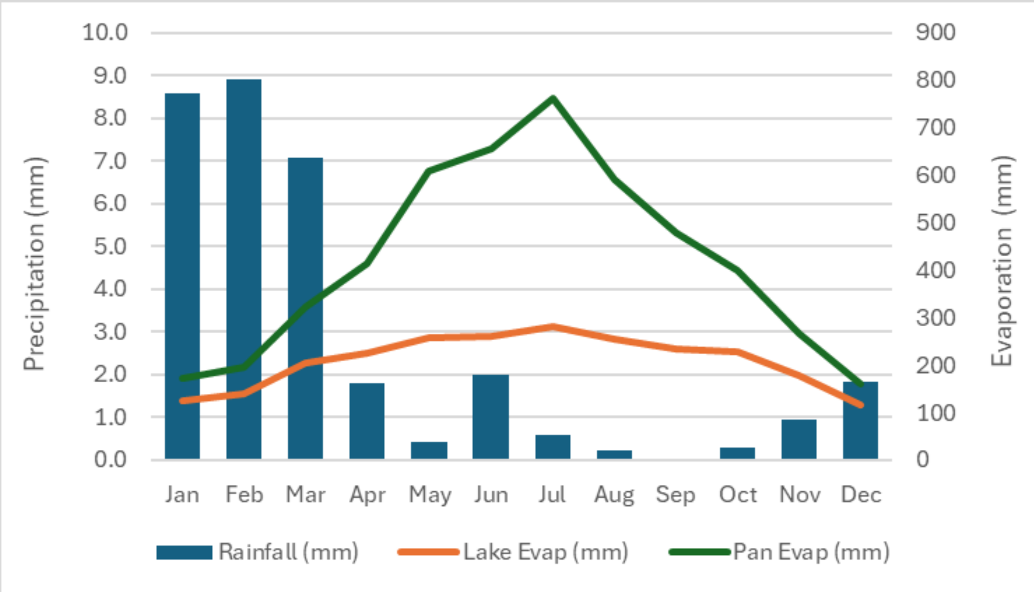



**Figure 7-1: Monthly Average Precipitation and Evaporation**

Figure 7-2 illustrates the monthly minimum and maximum temperatures that were observed at Reko Diq.

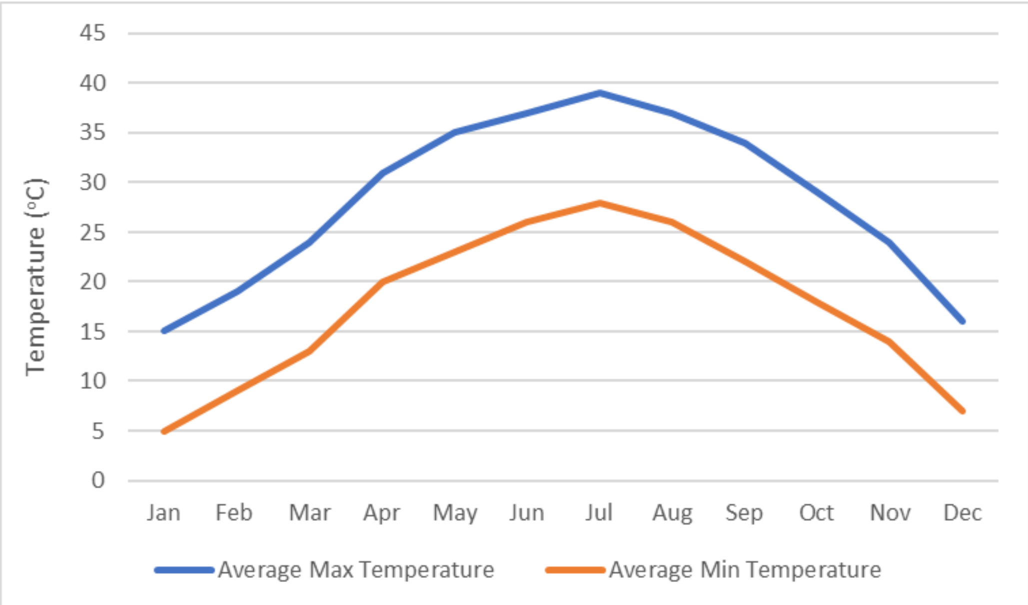



**Figure 7-2: Monthly Minimum and Maximum Temperatures**

### 7.1.1. Climate Change

Digby Wells completed a Climate Change Specialist Impact Assessment in 2024 to characterise the current conditions of the Project's Area of Influence. During this assessment, data was collected and analysed to assess the baseline climate and future climatic projections in the Project region.

The LoM is projected to be 38 years. To allow for construction years and assess risks into the decommissioning phase, hazard data is presented as a change from the historic baseline to a time horizon up to 2070. The climate change risk assessment was based on the physical risk quantification methodology.

The projected climate changes outlined for the Project site include increased flooding, extreme heat, drought, storm surge intensity and sea level rise. All reviewed climate models outlined similar physical climate risks for each aspect of the Project, with varying degrees of intensity and severity.

To reduce climate risks, the Project should consider incorporating extreme weather event and flood planning into the operation's emergency preparedness and response plans. Ensuring that built infrastructure designs consider extreme weather event scenarios will reduce risk exposure and ensuring that management plans account for climate-related risks is important.

**Closure considerations**

- Due to the arid climate and sparse natural vegetation, vegetation establishment will not be considered as part of the rehabilitation strategy;
- Increased rainfall intensity could increase erosion of unprotected areas;
- Mitigation measures to combat wind erosion should be developed and implemented concurrently for permanent structures (WRDs and TSFs) during the operational phase;
- Post-mining landform construction should be robust against storm events and based on geomorphic principles to combat soil loss to erosion;
- Additional storm water management measures should be based on dedicated hydrological modelling and consider extreme climate events (e.g., increased rainfall intensity, drought etc.);
- Regularly undertake climate risk reviews. Updated climate risk assessments will outline which mitigation options to prioritise to improve the Project's climate resilience; and
- The knowledge base should be continually improved throughout the operational phase to incorporate learnings from rehabilitation implementation and trends in monitoring data.

## 7.2. Air quality

A baseline air quality assessment was conducted by HBP in 2023/2024, to investigate the potential project related impacts on air quality, mitigation measures and monitoring requirements recommended. The study area was delineated to include areas that may impacted by the Project related activities and was defined as 15 km radius around the proposed mine site, and 1 km along the road transport route. Table 7-1 presents a summary of the air quality sampling locations and the rationale for site selection, as well as pollutants sampled.

**Table 7-1: Air Quality Sampling Locations and their Rationale for Selection**

| Location | Pollutants Sampled | Rationale for site selection and sampling |
|---|---|---|
| Reko Diq Mine Site | • $PM_{2.5}$<br>• $PM_{10}$<br>• NO<br>• $NO_x$<br>• $SO_2$<br>• $O_3$ | To assess the baseline ambient air quality at the proposed Reko Diq Mine Site.<br>At this location, PM10 and PM2.5 were sampled following the active air quality sampling approach using ECO Environmental PRAXIS/OPCUBE air quality monitor. The sampling of gaseous pollutants including $SO_2$, NO, $NO_2$, $NO_x$, and $O_3$ at this location was conducted using diffusion tubes. |
| Humai Settlement | • $NO_2$<br>• $SO_2$ | To assess the baseline ambient air quality of the nearest settlement before Project (downwind of Project facilities)<br>The sampling of $SO_2$ and $NO_2$ at this location was conducted using diffusion tubes. |

### 7.2.1. Particulate Matter (PM $_{2.5}$ and PM $_{10}$ )

Baseline concentrations are indicated in Table 7-2 in comparison with the NEQS and IFC General EHS Guidelines limits.

**Table 7-2: Baseline Concentrations of $PM_{2.5}$ and $PM_{10}$ at the project site and Comparison with NEQS and IFC General EHS Guidelines**

| | Maximum Concentration of Particulate Matter observed | NEQS limit | IFC General EHS Guidelines limit |
|---|---|---|---|
| **PM $_{2.5}$ (µg/m$^3$)** | 38 | 35 | 75 |
| **PM $_{10}$ (µg/m$^3$)** | 116 | 150 | 150 |

#### 7.2.1.1. *PM $_{2.5}$*

The reported concentration of $PM_{2.5}$ for a 24-hour averaging period exceeded the limit of 35 µg/$m^3$ prescribed in NEQS for ambient air quality for 1% (1-day) of the total days monitored. The concentrations remained within the limit of 75 µg/$m^3$ prescribed in IFC General EHS Guidelines at all times. The reported concentrations of $PM_{2.5}$ for 24-hour averaging period ranged between 4 µg/$m^3$ and 38 µg/$m^3$ with an average concentration of 12 µg/$m^{3,}$ respectively.

#### 7.2.1.2. *PM $_{10}$*

The recorded concentrations of $PM_{10}$ for 24-hour averaging period, remained within the limit of 150 µg/$m^3$ prescribed in the NEQS and IFC General EHS Guidelines. The reported concentrations of $PM_{10}$ ranged between 13 µg/$m^3$ and 116 µg/$m^3$ with average concentration of 39 µg/$m^3$. Higher concentrations exceeding the average concentration of 39 µg/$m^3$ were primarily attributed to high-speed winds between 6 m/s and 18 m/s blowing from northeast towards southwest.

### 7.2.2. Oxides of Nitrogen, Sulphur Dioxide and Ozone

The NO, $NO_2$, $NO_X$, $SO_2$ and $O_3$ concentrations remained within the limits prescribed in NEQS and IFC General ESH Guidelines for annual averaging period.[1]

### 7.2.3. Impacts

As there are no human receptors within 500 m of the decommissioning area, the interpretation of the degraded air quality in terms of visible dust by the human receptors is unlikely.

**Closure considerations**

- Progressive cladding of the CTFS and RTSF cells should be implemented during the operational period as tailings deposition progresses;
- Cladding of WRD and TSF surfaces will prevent dust generation. Methodologies should be developed during the operational phase to ensure closure measures produce known outcomes and address the potential risks; and
- Continue monitoring throughout the operational phase and revise mitigation measures aligned with results.

[1] IFC General EHS Guidelines do not prescribe limits for NO.

## 7.3. Geology

### 7.3.1. Regional Geology

The Reko Diq Porphyry complex comprises of diorite, quartz diorite and granodiorite porphyry intrusions, emplaced into volcanic and sedimentary rocks of the Humai, Juzzak and Reko Diq formations (Figure 7-5) (Razique & Tosdal, 2009).

The Humai formation comprises of calcareous and clastic sedimentary rocks, which includes a massive ~300 m thick biohermal limestone unit, within the ~2 km thick sequence. The Juzzak, Saindak and Amalaf formations overly the Humai formation, and together comprise a sequence, greater than 4 km, of shallow marine to fluviatile shale, sandstone, conglomerate and shaly limestone. Lava flows of massive amygdaloidal, porphyritic andesite and basalt are present in the Juzzak and Saindak formations, whilst the Amalaf formation includes volcanic breccia and tuff, with locally imbedded massive, porphyritic and predominantly andesitic lava flows (PorterGeo, 2024).

The Reko Diq Formation comprises of ~400 m thick sequences of fine to medium grained and porphyritic andesitic lava flows which are interbedded with autoclastic volcanic breccia and pyroclastic debris. The younger poorly consolidated clastic sediments within the region comprise of buff silt, sand and fan gravel locally interbedded with ashfall tuff (PorterGeo, 2024).

Significant structural deformation has occurred in the region. Fault systems orientation vary from ESE through to ENE for lengths greater than 100 km (Figure 7-3). The fault systems are predominantly characterised with reverse motion with enough displacement to juxtapose Cretaceous and Paleogene strata over the Neogene stratigraphy. The geometry of the primary sedimentary basins are potentially controlled by these structures. Large antiformal structure folding has also been mapped in the Chagai Hills (PorterGeo, 2024).

The Reko Diq deposits are highly fractured, with structures predominantly orientated in the NW and NE directions (Figure 7-6). Assessments of the piezometric surface between the porphyry and surrounding country rock indicates a lack of hydraulic connection (SMEC International (Pty) Ltd, 2010).

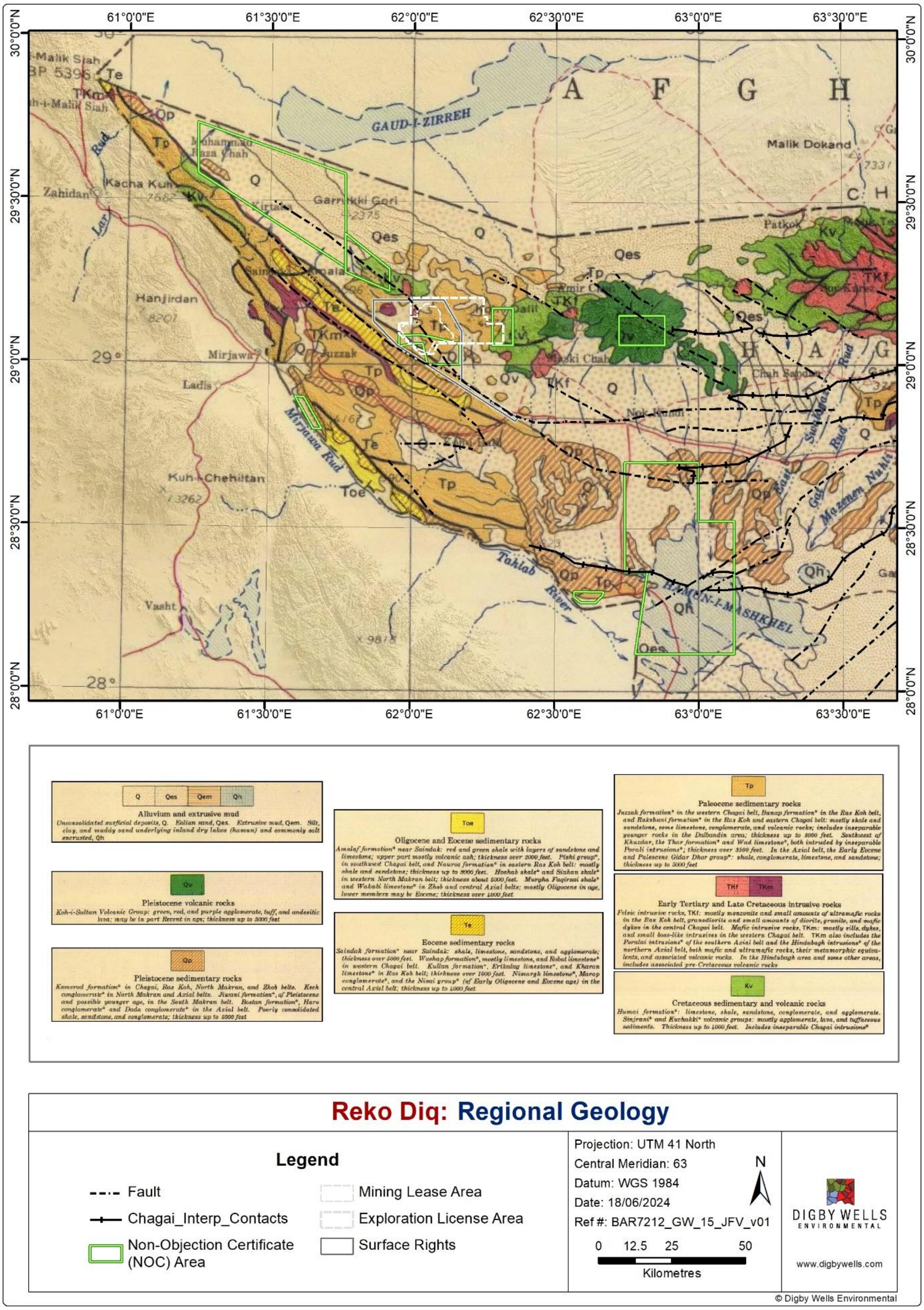



**Figure 7-3: Regional Geology**

### 7.3.2. Local Geology

The rock is composed of quartz feldspar porphyry, felsic volcanics and intermediate volcanics. Some dykes and breccias are present. NW-SE and NE-SW orientated structural lineations cross this supergene deposit (Figure 7-4). The fractures are infilled with pyrite, which in the oxidised zone leaches to produce low pH groundwater. The groundwater is currently around pH 3.5 and the deposit is still considered to be forming.

At the Western Porphyry, the intrusive rock complex consists of several multiphase porphyritic diorite and tonalite intrusions emplaced with extensive hydrothermal alteration, veining and copper sulphide mineralisation. A number of multiple generation andesitic dykes and late stage quartz veins also occur in this area. Drilling away from the intrusive cores intersect thick (250 - 280 m) volcanics (oxidised and fresh andesite, trachyte and pyroclastics) overlying a sequence of sandstone, conglomerate, siltstone and limestone. Both volcanic and sedimentary rocks comprise the Reko Diq Formation (Figure 7-5).

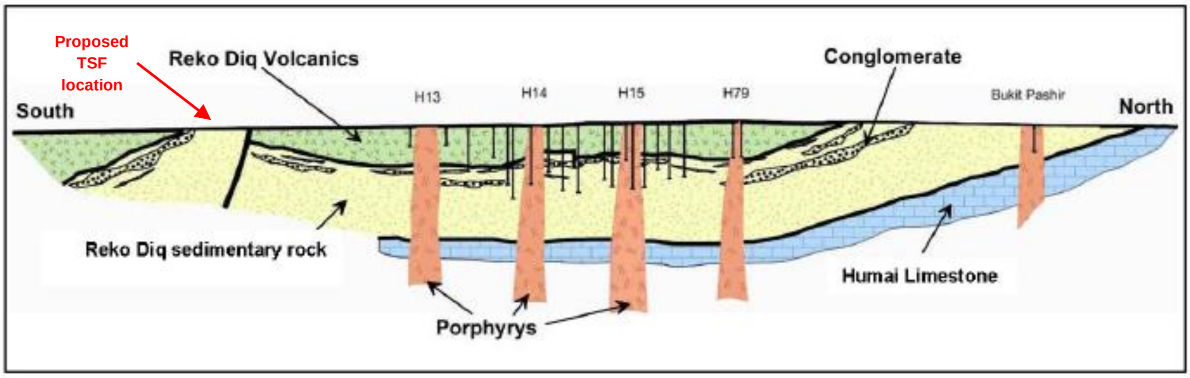
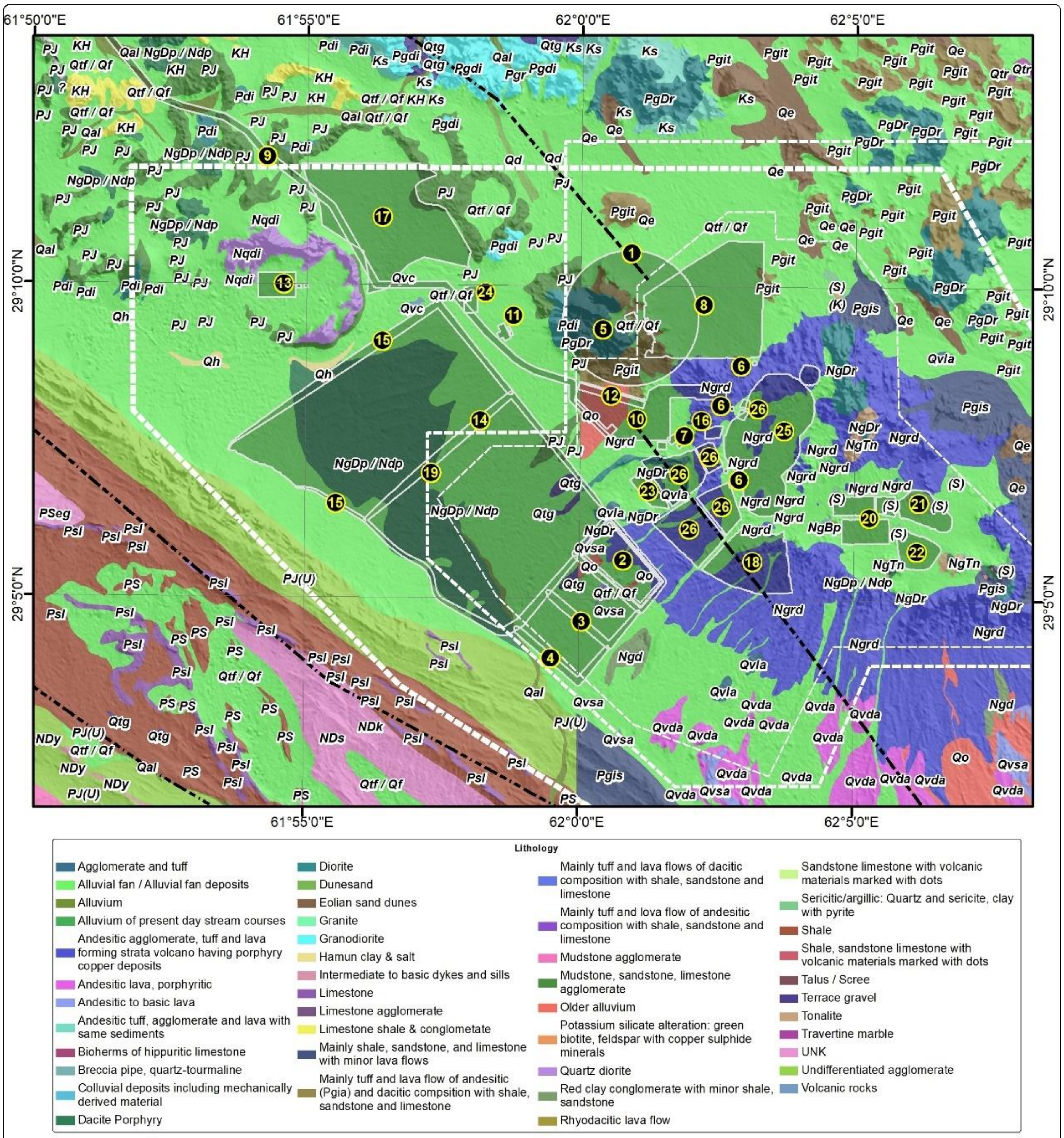



**Figure 7-4: A simplified Cross Section of the Western Porphyry. (Source: ESIA, 2010)**




| Map ID | Infrastructure Element | Map ID | Infrastructure Element | Map ID | Infrastructure Element | Map ID | Infrastructure Element | Map ID | Infrastructure Element |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Blast Buffer Area | 7 | Heavy Vehical Fueling and Service Area | 13 | Accommodation Facility | 18 | South Waste Dump | 23 | TSF Waste Stockpile |
| 2 | Cleaner Tailings Storage Facility (CF1) | 8 | North Waste Dump | 14 | Rougher Tailings Storage Facility (RF1) | 19 | Tailings Storage Facility | 24 | Waste Management Facility |
| 3 | Cleaner Tailings Storage Facility (CF2) | 9 | Pipeline Corridor | 15 | Rougher Tailings Storage Facility (RF2) | 20 | Tanjeel Ore Stockpile | 25 | Western Porphyries Ultimate Pit |
| 4 | Cleaner Tailings Storage Facility (CF3) | 10 | Plant | 16 | Shift Change Area | 21 | Tanjeel Ultimate Pit | 26 | WP Ore Stockpile |
| 5 | Explosive Storage | 11 | Powerstation | 17 | Solar Farm | 22 | Tanjeel Waste Dump | | |

**Reko Diq: Local Geology**

**Legend**
- Fault
- Mining Lease Area
- Exploration License Area
- Surface Rights
- Proposed Infrastructure Footprint

Projection: UTM 41 North
Central Meridian: 63
Datum: WGS 1984
Date: 17/06/2024
Ref #: BAR7212_GW_11_JFV_v01

N

0 1.25 2.5 5
Kilometres

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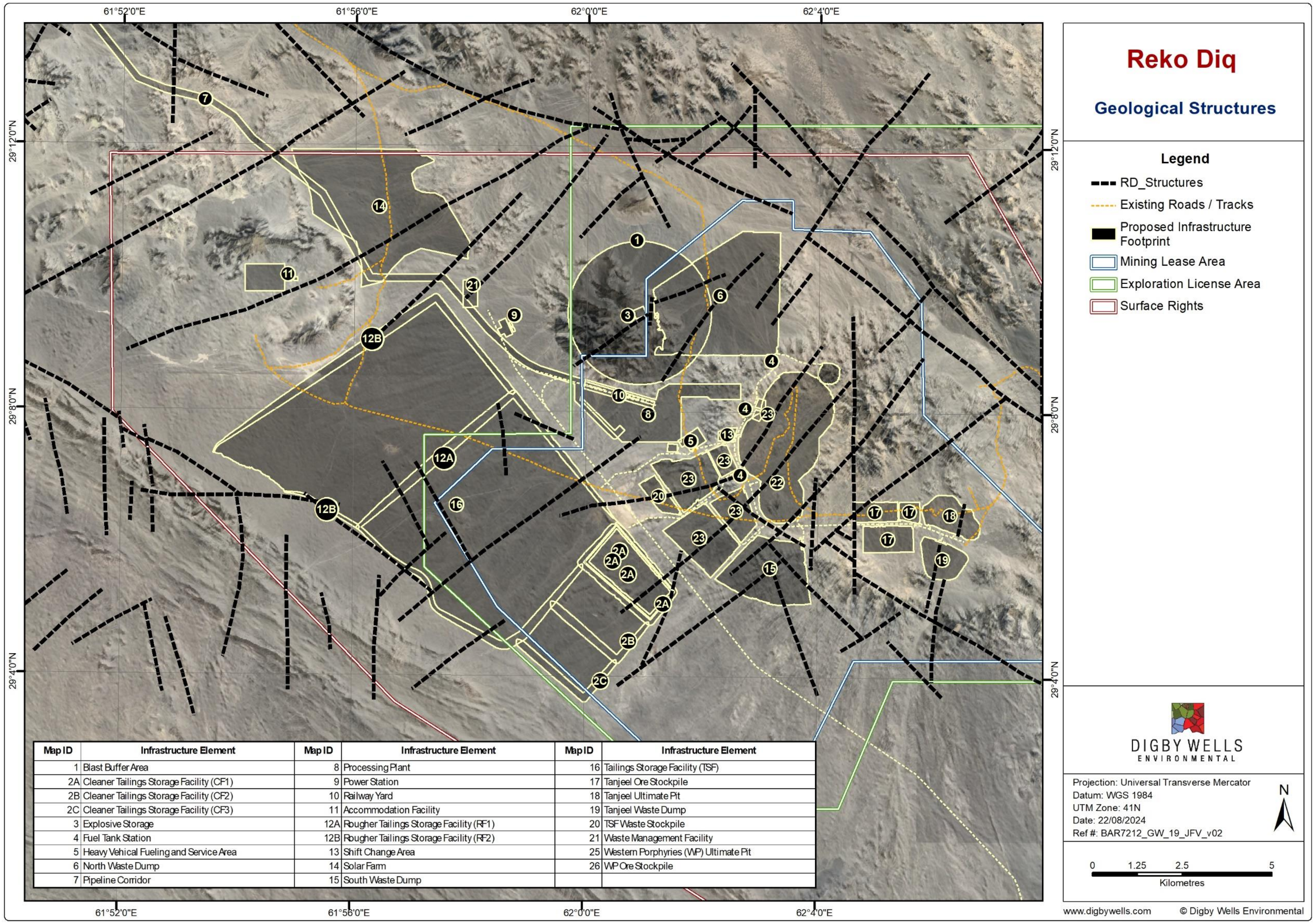
**Figure 7-5: Local Geology**




| Map ID | Infrastructure Element | Map ID | Infrastructure Element | Map ID | Infrastructure Element |
|---|---|---|---|---|---|
| 1 | Blast Buffer Area | 8 | Processing Plant | 16 | Tailings Storage Facility (TSF) |
| 2A | Cleaner Tailings Storage Facility (CF1) | 9 | Power Station | 17 | Tanjeel Ore Stockpile |
| 2B | Cleaner Tailings Storage Facility (CF2) | 10 | Railway Yard | 18 | Tanjeel Ultimate Pit |
| 2C | Cleaner Tailings Storage Facility (CF3) | 11 | Accommodation Facility | 19 | Tanjeel Waste Dump |
| 3 | Explosive Storage | 12A | Rougher Tailings Storage Facility (RF1) | 20 | TSF Waste Stockpile |
| 4 | Fuel Tank Station | 12B | Rougher Tailings Storage Facility (RF2) | 21 | Waste Management Facility |
| 5 | Heavy Vehical Fueling and Service Area | 13 | Shift Change Area | 25 | Western Porphyries (WP) Ultimate Pit |
| 6 | North Waste Dump | 14 | Solar Farm | 26 | WP Ore Stockpile |
| 7 | Pipeline Corridor | 15 | South Waste Dump | | |

**Figure 7-6: Geological Structures**

## 7.4. Groundwater

Groundwater is discussed in two distinct sections for Mine site conditions and those for the Water Supply area (SMEC, 2024) and (Darkwater,2024), with the Hydrocensus Survey as context.

### 7.4.1. Hydrocensus Outcomes

A hydrocensus survey was undertaken by HBP between April 28th to June 3rd, 2023, to provide input into the baseline hydrogeological conditions in and around Project area. The hydrocensus was conducted in 19 settlements. A total of 97 hydrocensus locations were identified (Figure 7-7) and the assessed hydrocensus locations comprise of dug wells, communal and Barrick-owned boreholes and Karezes (springs). The following is noted:

- A total of 59 groundwater samples were collected and submitted to an Analytical Laboratory in Poland for analysis;
- From the 59 water samples, about 73% of the total water resources visited were dug wells;
- A total of 71 dug wells, 15 boreholes and 11 springs were identified onsite; and
- Measured water levels range between 474 mamsl and 540 mamsl and show little change from the previous 2008 results.

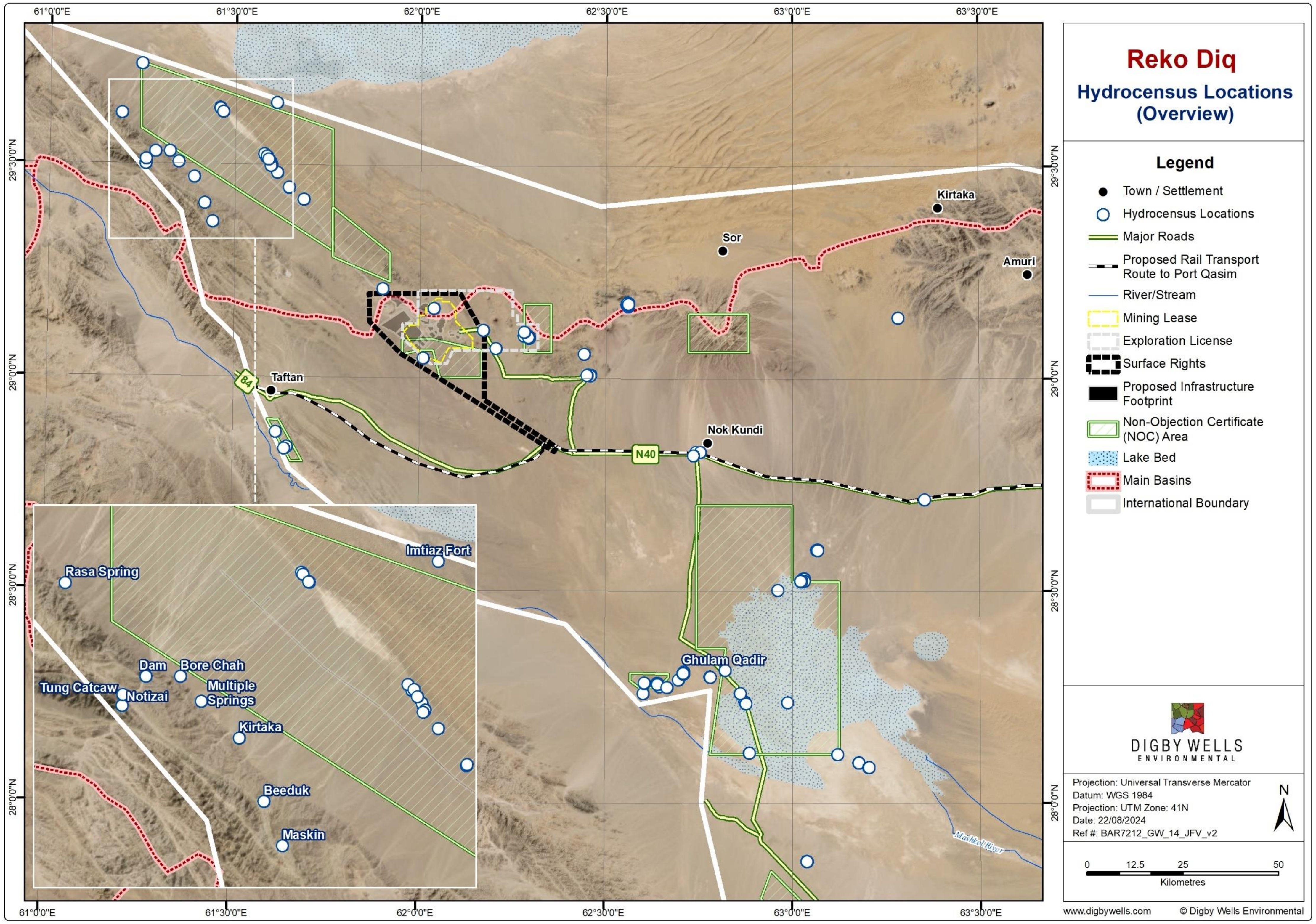



**Figure 7-7: Overview of Hydrocensus Locations**

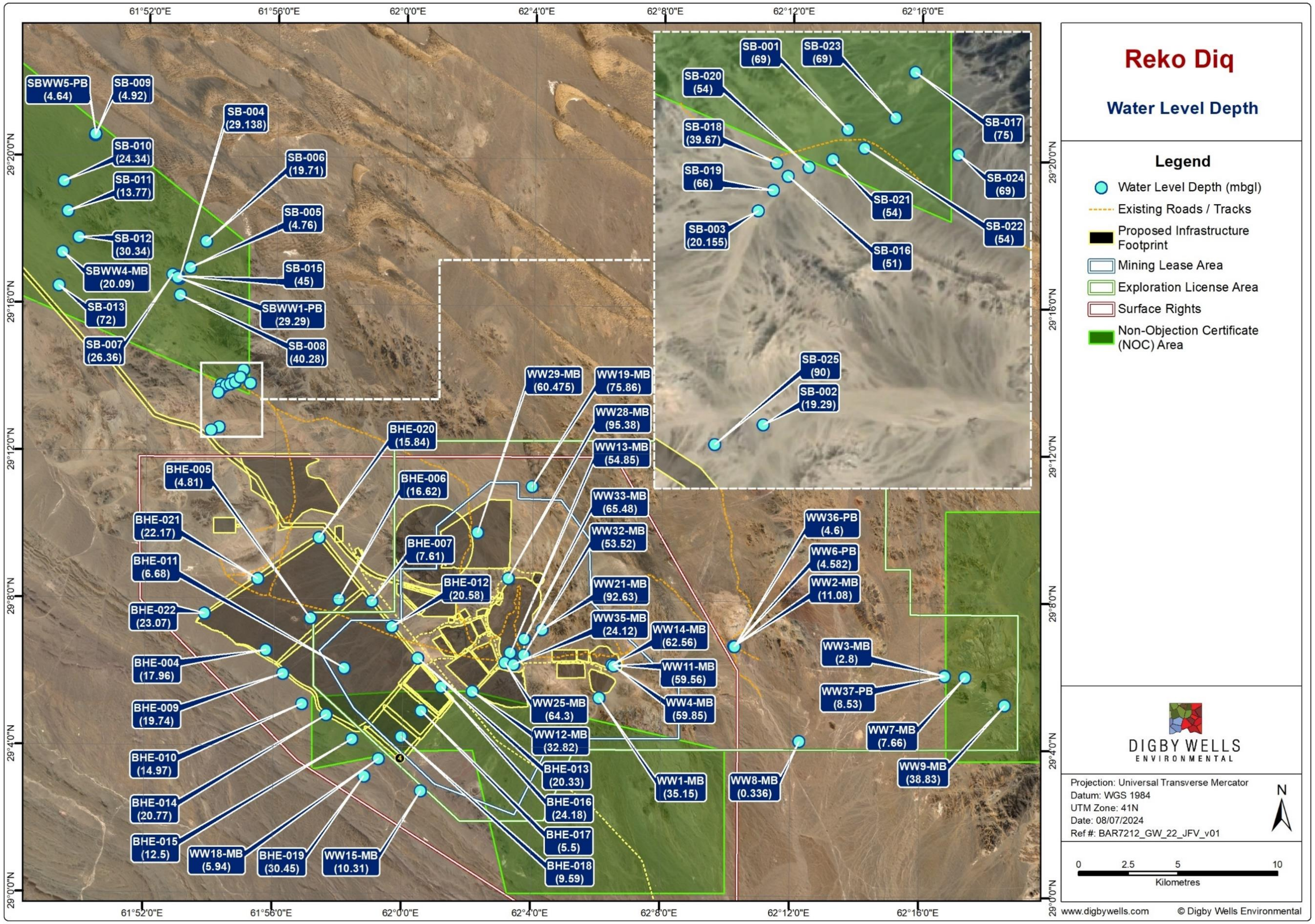



**Figure 7-8: Groundwater Monitoring Network Locations with Water Level Depths**

### 7.4.2. Mine Site Groundwater

Groundwater will likely be recharged naturally from rainfall once operational. The recharge from rainfall is expected to be insignificant due to the climate extremes of the site (MAP of 32 mm/annum and a MAE of more than 2800 mm/annum).

Groundwater occurs within small, deep and low yielding aquifers within the mining area. Significant structural deformation has occurred, and deposits are highly fractured. There is also limited hydraulic connectivity between the deposits and the country rock. Hydraulic tests testing indicates that the hydraulic conductivity ranges between 6.9x10-5 – 1.8 m/d and these conductivities decrease with depth.

No receptors have been identified within the vicinity of the Project within the nearest community to the site is Humai, which is approximately 20 km away (Digby Wells Environmental, 2024) .

#### *7.4.2.1. Groundwater Level and Flow Direction*

The groundwater levels measured within the mine lease range between 0.3 and 64.3 mbgl (839 – 949 mamsl), with an average of 22.5 mbgl (Figure 7-9). Comparison of the 2023-2024 groundwater levels with those taken during previous assessments (2004-2011) indicates little to no change in groundwater levels.

There is a good correlation of 92% between topography and hydraulic head elevation indicating that the groundwater elevation mimics topography. The watershed divide between the Sisan and Mashkhel Basins is also an approximate location of a groundwater divide, and therefore the overall groundwater flow direction is to the northwest towards Gaud-i-Zirreh and to the southeast towards Hamun-i-Mashkel.

Although the overall flow direction is towards the northwest and southeast, it could be different on a local scale, depending on the orientation and permeability of local structures.

#### *7.4.2.2. Baseline Groundwater Quality*

Sixteen new monitoring boreholes have been drilled during this feasibility assessment which have been used to expand the aerial extent and depth of the monitoring that was established from the 24 boreholes that were previously drilled in the 2008 feasibility assessment.

The pH of the groundwater is neutral except at Tanjeel where it ranges between 3.2 and 3.7. The low pH is due to the supergene depositional environment of the Tanjeel ore, where sulphide minerals are oxidised.

The natural groundwater chemistry is saline with the Total Dissolved Solids (TDS) in the Project area analysed to be typically more than 10 000 mg/L, which is significantly more than the drinking water quality limits established by the WHO and Balochistan (of 1 000 mg/L). The following localised variations in TDS are noted:

- In the TSF area, the TDS ranges between 15 600 mg/L and 180 000 mg/L..

- At the Western Porphyry and Tanjeel deposits, the concentrations range between 11 500 mg/L and 16 600 mg/L.
- In the vicinity of the northern WRD, it is 16 000 mg/L.

The main constituents of the TDS are sodium and chloride, which is a typical signature of groundwater that has had a long residence time within an aquifer and receives little to no recharge.

### 7.4.3. Geochemistry and Seepage

The geochemistry, together with potential seepage, is discussed for each area (Digby Wells, 2024):

#### *7.4.3.1. Western Porphyries Ultimate Pit and associated Waste Rock:*

The waste rock has been classified as potentially acid forming (PAF). Geochemical analysis of the Western Porphyry indicates that 88% of the samples classified as highly potentially acid generating (HPAG), with a low acid neutralisation capacity.

Acidic metal drainage is expected within the Western Porphyry pit and waste rock dump. However, due to the encapsulated nature of Sulphides and the site's low humidity and high evaporation environment, this process will take decades to manifest. The low reactivity of the material and the site's hydrogeological conditions will limit the impact of Acid Rock Drainage and Metal Leaching (ARDML). (Digby Wells Environmental, 2024).

The updated geochemical assessment (Digby Wells Environmental, 2024) indicates that the seepage from the WRD containing material from the Western Porphyry Pit is 2 078 mg/L.

#### *7.4.3.2. Tanjeel Ultimate Pit and Associated Waste Rock:*

In contrast to Western Porphyry, the material at Tanjeel exhibits a more oxidised nature, with a greater exposure of sulphides in the waste rock, pit walls, and stockpiled ore, and therefore, even though the potential for acid generation is lower when compared to that of the Western Porphyry deposit, the higher reactivity of the Tanjeel deposit increases the potential risk for acid rock drainage. 98% of waste rock samples are classified as HPAG (Digby Wells Environmental, 2024).

Despite this, the extremely low infiltration rates, depth of groundwater, and saline nature of the groundwater minimise the risk of ARDML impacting groundwater. Additionally, no groundwater receptors are at risk at either site. However, monitoring is recommended for constituents of concern, including acidity, total dissolved solids, Sulphate, aluminium, antimony, barium, cadmium, cerium, cobalt, copper, iron, manganese, lead, scandium, strontium, and zinc, in both surface and groundwater.

The updated geochemical assessment (Digby Wells Environmental, 2024) indicates that the seepage from the WRD containing material from the Tanjeel Pit is 775 mg/L.

#### *7.4.3.3. Tailing Material and Tailings Storage Facilities*

The potential for environmental impacts to groundwater from rougher tailings is low due to the extremely low infiltration rates predicted by hydrogeological modelling, the depth of groundwater across the site, and the highly mineralised, saline nature of the groundwater. Additionally, there are no groundwater receptors at risk at this site. The rougher tailings will be predominantly unlined and infiltration will report either to the underdrainage system or groundwater (KP, 2024).

Natural weathering of cleaner tailings will produce acidic drainage, with concerning constituents including low pH, high electrical conductivity, Sulphate, copper, lead, manganese, molybdenum, strontium, and uranium. These substances may be mobilised during operations and could impact groundwater quality. Therefore, installing an impermeable HDPE liner will be implemented to control and manage seepage from the cleaner cells.

The updated geochemical assessment (Digby Wells Environmental, 2024) indicates that the seepage from the cleaner TSF could have a sulphate source term of 2 340 mg/L, whilst the source term for the rougher TSF is 2 120 mg/L.

#### *7.4.3.4. Drawdown due to Pit Dewatering*

The pits will require depressurisation of pit wall when mining extends below the water table. The maximum depth of the Western Porphyry Pit is expected to be approximately 840 m while that of the Tanjeel Pit is 60 m. The water level at the Western Porphyry is approximately 55 m, while at Tanjeel is 60 m. As mining progresses below these depths, depressurisation will be required to provide safe working conditions and to ensure slope stability.

Mine depressurisation can potentially impact the groundwater environment negatively by lowering the groundwater levels and creating a cone of depression. The size of the cone of depression will be largest at the end of operation. This is displayed in Figure 7-9. The maximum radius of influence is estimated to be 1030 m towards the north and the east.

Post closure, these depressurisation activities will cease. Due to limited groundwater recharge and high evaporation, the open pits will remain as hydraulic sinks for perpetuity (simulated up to 100 years) (Digby Wells, 2024). As a result, the radius of influence will increase even after closure as shown in Figure 7-10. At the predicted cessation of operations, the cone of dewatering is expected to be a radius of 1,030 m in from the edges of the pits. But this is expected to increase to 3,100 m after 100 years after closure.

It is recommended that the groundwater network and abstraction volumes are continuously monitored as this will allow for more information to be gathered to update the numerical model and provide more accurate predictions.

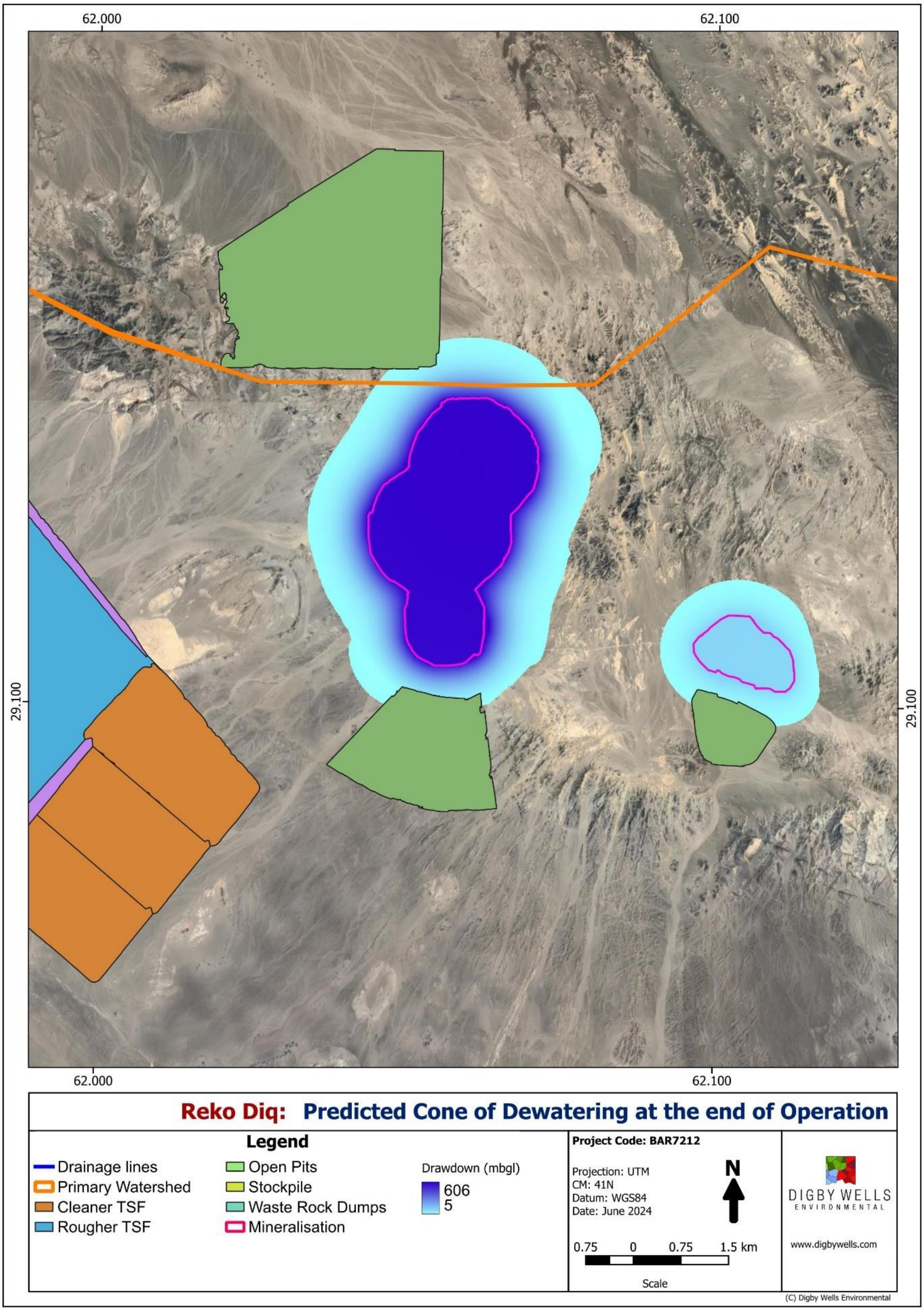



**Figure 7-9: Estimated Cone of Dewatering at the End of Operations**

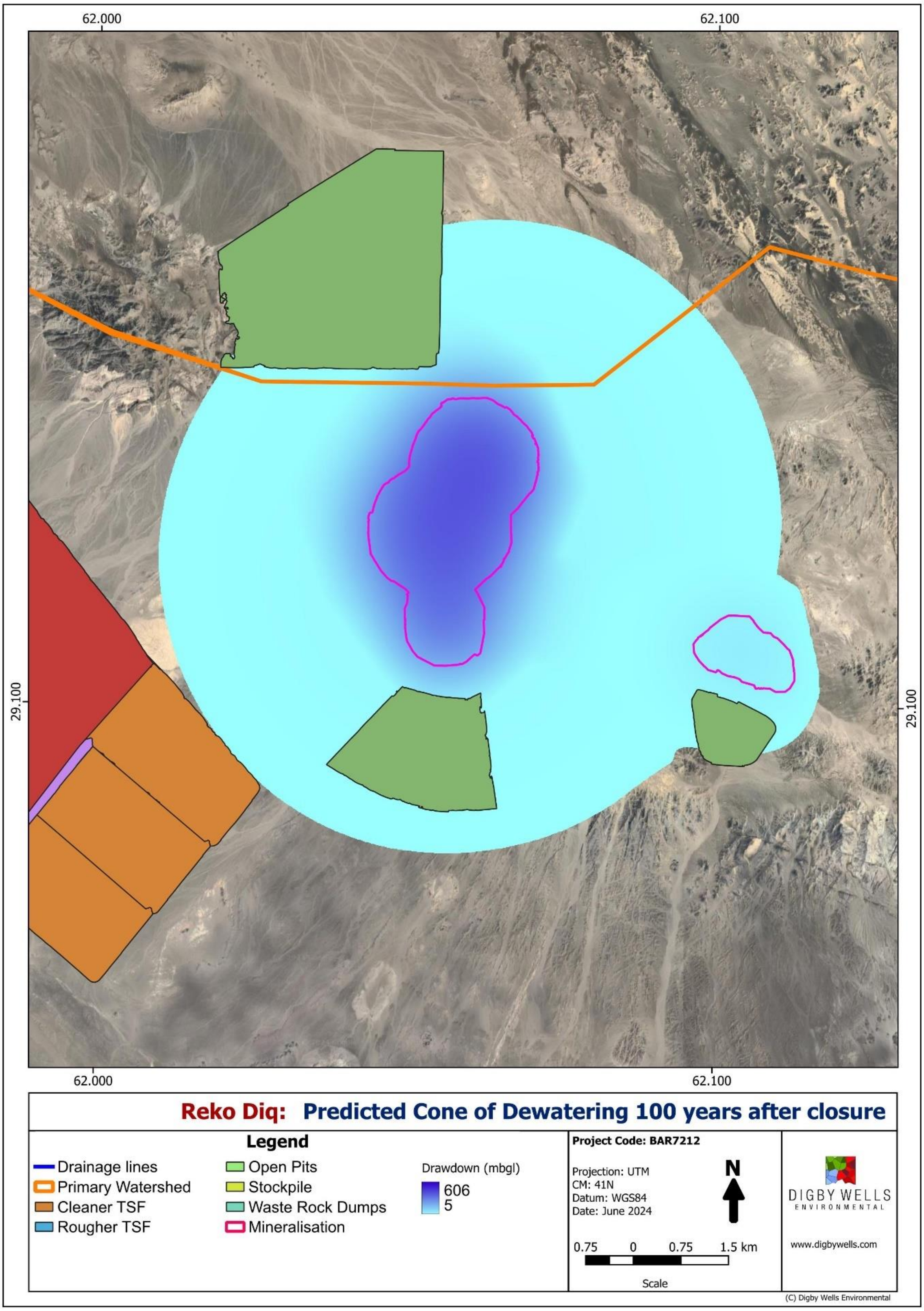



**Figure 7-10: Predicted Cone of Dewatering 100 years after Closure**

#### *7.4.3.5. Decommission Phase Impacts*

The specialist groundwater impact assessment followed the source-pathway-receptor approach (Digby Wells, 2024). As indicated, no receptors exist within the vicinity of the mine site so even though the groundwater resource will be modified, no impacts on receptors are expected. Although no groundwater impacts have been identified for the Reko Diq Project, the groundwater resource will be depleted in the vicinity of the pits, which will remain hydraulic sinks for perpetuity. The potential environmental risks associated with the Project are as follows:

- Contamination of soil and water resources due to accidental spills and releases of hydrocarbons and chemicals during decommissioning;
- Groundwater levels are not expected to recover to fully (100-year period modelled), the radius of influence becomes larger as the drawdown cone becomes shallower; and
- Operation of the WRD and TSF could potentially allow for the seepage of contaminants into the groundwater resource. Rehabilitation of the facilities post-closure is aimed at reducing the potential for contamination.

**Closure considerations**

- Develop a site wide closure storm water management plan based on dedicated hydrological calculations and informed by climate change scenarios;
- Groundwater quality and level monitoring should continue for a period agreed to with the relevant authorities. Three (3) years has been assumed for this initial CP and CCA after closure or after mining ceases, the monitoring period should be reviewed and adapted during the operation as required;
- Continuously monitor groundwater quality for possible contaminated seepage from the TSFs and WRDs during the operational phase and closure phase;
- There are limited to no receptors;
- The Cleaner TSF cells will be lined to prevent seepage;
- Ensure active management of seepage from the TSFs during the operational period, due to low rainfall and high evaporation no ponding on the TSFs is expected post closure;
- Rehabilitation measures will focus on landform stability and resistance to wind erosion; and
- Track, monitor and compile geochemical data for waste rock dumps and tailings facilities during operations, update the geohydrological and numerical model with actual monitoring results to confirm initial assumptions.

## 7.5. Water Supply

### 7.5.1. Drawdown due to Borefield Abstraction

A numerical model was developed to assess the impacts of abstraction at the Northern Borefield. Abstraction of groundwater from the Northern Groundwater System will draw down groundwater levels. The zone of influence is estimated to extend about 30 km from the Borefield.

The identified springs and karez, located at the foothills of the Mirjawa Hills are interpreted to have limited hydraulic connectivity with the Northern Groundwater System and are therefore not expected to be impacted by groundwater abstraction for the project.

#### *7.5.1.1. Results and Impacts*

Abstraction from the Borefield will lower groundwater levels surrounding the Borefield.

The numerical model was developed to simulate groundwater recovery up to 1000 years post closure, where during the simulated period, a full recovery is not expected.

It is recommended that groundwater numerical models are continuously updated as more data becomes available from monitoring, drilling, pump testing and initial operation of the Borefield.

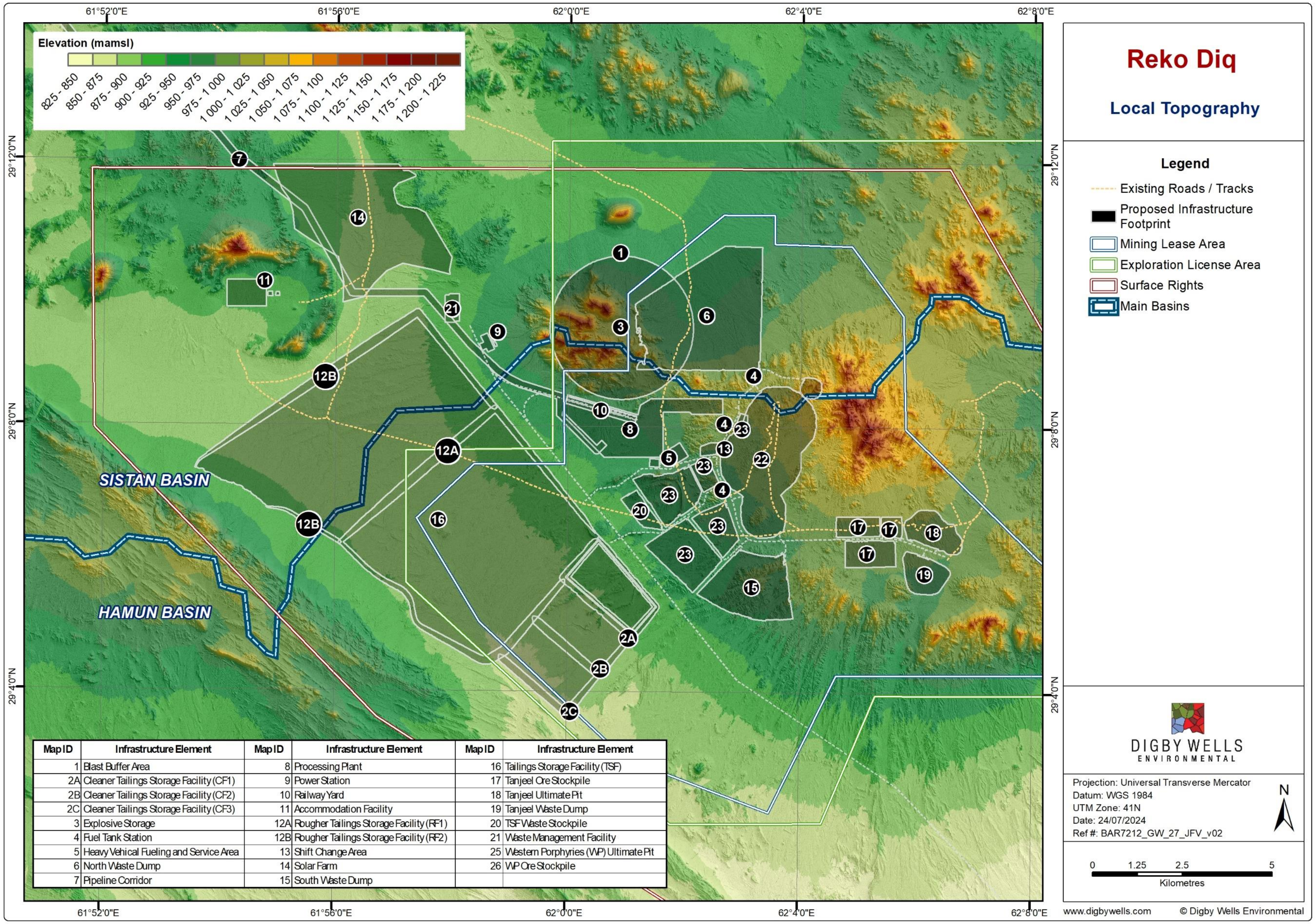
## 7.6. Topography and Drainage

The proposed Project area is located within a predominantly flat caldera surrounded by a small escarpment that forms part of the Chagai Hills. The topography altitude range in the Project area lies between 697 and 1,194 mamsl. The Sistan Basin drains to Gaud-i-Zirreh playa in

**Closure considerations**

- The open pits will remain post-mining, access barriers should be constructed to limit access and provide surface water management measures designed and constructed to protect the pit edges from erosion;
- A site wide closure storm water management plan should be developed to ensure a cohesive approach and that the surface water runoff from rehabilitated areas is aligned with the site wide drainage framework;
- The TSF and WRDs will also remain as permanent features in the landscape, methodologies to combat wind erosion should be developed and tested during the operational phase to ensure closure measures provide known outcomes; and
- Ensure that disturbance is limited to the proposed footprint and rehabilitate areas as soon as they become available.

Afghanistan, while the Mashkel Basin drains to the Hamun-i-Mashkel playa in Pakistan. The mine infrastructure is predominantly within the Mashkel Basin, except for the northern WRD and portion of the TSF.




| Map ID | Infrastructure Element | Map ID | Infrastructure Element | Map ID | Infrastructure Element |
|---|---|---|---|---|---|
| 1 | Blast Buffer Area | 8 | Processing Plant | 16 | Tailings Storage Facility (TSF) |
| 2A | Cleaner Tailings Storage Facility (CF1) | 9 | Power Station | 17 | Tanjeel Ore Stockpile |
| 2B | Cleaner Tailings Storage Facility (CF2) | 10 | Railway Yard | 18 | Tanjeel Ultimate Pit |
| 2C | Cleaner Tailings Storage Facility (CF3) | 11 | Accommodation Facility | 19 | Tanjeel Waste Dump |
| 3 | Explosive Storage | 12A | Rougher Tailings Storage Facility (RF1) | 20 | TSF Waste Stockpile |
| 4 | Fuel Tank Station | 12B | Rougher Tailings Storage Facility (RF2) | 21 | Waste Management Facility |
| 5 | Heavy Vehical Fueling and Service Area | 13 | Shift Change Area | 25 | Western Porphyries (WP) Ultimate Pit |
| 6 | North Waste Dump | 14 | Solar Farm | 26 | WP Ore Stockpile |
| 7 | Pipeline Corridor | 15 | South Waste Dump | | |

**Figure 7-11: Local Topography**

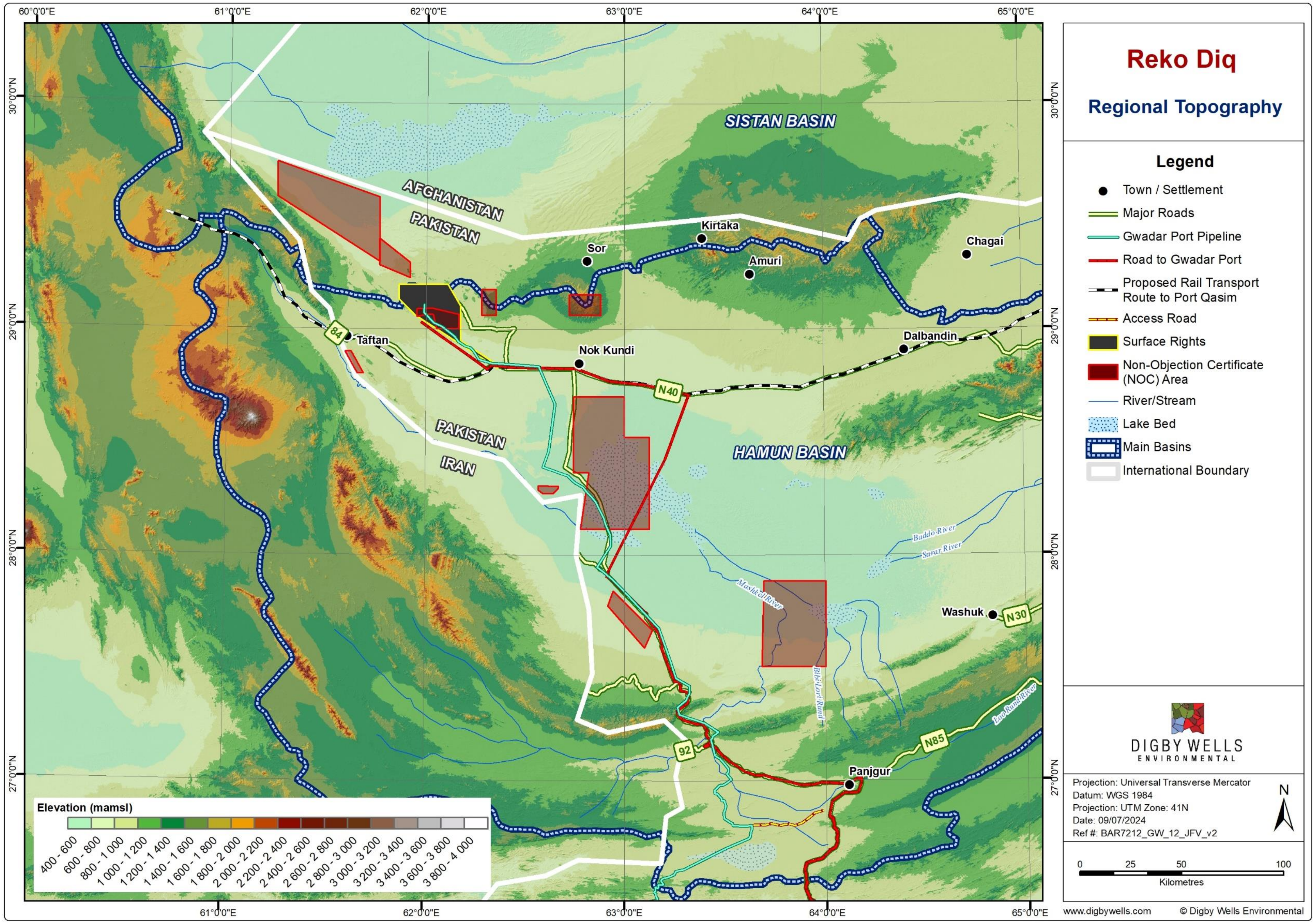



**Figure 7-12: Regional Topography**

## 7.7. Soils and Sediments

A baseline soils and sediments assessment was conducted by HBP through field surveys conducted in 2023. The study area included the mine site, the Road Transport Route, the Rail Transport Route and Port Qasim, with 15 samples collected across the study area and sent for testing at various laboratories.

As a basis for interpreting the laboratory data, Soil Screening Values (SSV) and soil fertility guidelines were assessed. Due to non–availability of any local soil screening standards, Alberta Guidelines and Dutch Standards are used to assess compliance.

### 7.7.1. Soil Types

The soils in Chagai are largely influenced by the region's arid climate, topography, and geological features, and are predominantly arid and desert-like, characterised by low organic matter and limited fertility. They are mostly sandy or rocky, with poor water retention and susceptibility to erosion. Overall, the soils are extremely limited in terms of agricultural value.

The tested soils generally have a homogenous porous structure invariably calcareous in nature. The lime content of soil varies from 5 to 30 % and is uniformly distributed in most soil textures. Where having a high lime content (> 15 %), the soil is hard when dry and friable when moist. The organic matter content is generally low, in order of 0.3 to 0.5 %.

Most of the surface of mountains and hills slopes are bare rock without soil cover (about 70 %). Small patches contain shallow, strongly calcareous, gravelly, and stony loams. Soil in the Piedmont plains is very deep, well drained, homogeneous, silty, and strongly calcareous with an 18-20 % lime content uniformly distributed (LARUS-IT, 1992).

The soils at the proposed Project area are shallow (< 1 m in most places) and consist largely of sands and gravels with fines (silt and clay material) comprising an average of 10-30% of the total weight. A large proportion of the soil fraction has undergone aeolian (wind) transport and is still variably mobile depending on the soil fraction.

### 7.7.2. Sampling Results

The baseline data collected concluded that agricultural significance of the soils is minimal, and that no prior contamination was detected. The soil analysis revealed high concentrations of metals and some minerals within the soil which exceed the Soil Screening Values (SSVs) which are geogenic in nature as the soils in the region are highly metalliferous.

### 7.7.3. Decommissioning Phase Impacts

The decommissioning activities will involve backfilling and site rehabilitation to the extent possible. As no excavation will occur during the decommissioning phase, the disturbance and displacement of existing soils will be minimal. However, during the construction and operational phases of the Project will be when most of the soil related impacts of the Project are expected to occur as most of the excavation is expected to occur during this time.

The Project will implement several mitigation measures, including planning its construction activities to minimise disturbance to the soil and natural topography. Additionally, the Project will develop a Land Disturbance and Rehabilitation Plan. The Plan will at minimum include adequate provisions for:

- Excavation areas;
- Management of backfill; and
- Measures for rehabilitation of the landscape.

**Closure considerations**

- Maintain a LoM gravel/waste rock balance of available material (*in-situ* and stockpiled) vs volume required for rehabilitation purposes;
- Develop methodologies to limit dust generation during operations and post closure;
- Limit the disturbed areas to the planned footprints and implement concurrent rehabilitation as soon as areas become available;
- The soils and climate are not suitable for cultivation practices, the end land use will be aligned with the pre-mining and surrounding land uses (limited grazing and wilderness); and
- End land use objectives should be discussed with all stakeholders to ensure alignment of expectations.

## 7.8. Surface Water

The Project area is located on a catchment divide between the Hamun-i-Mashkel Basin to the south and the Sistan Basin to the north. The Hamun-i-Mashkel Basin is the largest hydrological unit in Balochistan (catchment area of about 126,500 $km^2$) and is fed by the Baddo Rud, Tahlab, Rakhshan and Mashkel rivers (SRK, 2010). It is a closed inland system containing a playa, which acts as a groundwater discharge zone for the catchment. The Hamun-i-Mashkel playa is mostly dry although some water inundation of the playa occurs once every two to three years and can take two to five months to evaporate and/or infiltrate, depending on the extent of initial flooding (SRK, 2010).

Surface drainage lines at the Project site are typically dry due to the very low rainfall (average annual precipitation is 32.7 mm based on climate records for the period 1983-2023 at Nok Kundi and available data collected at the sites). Following higher intensity storm events surface water may flow for a short distance and time before either evaporating or infiltrating to the ground. The very low rainfall is coupled by high evaporation rates propelled by high temperatures that characterise the area.

### 7.8.1. Water Quality

A hydrocensus survey was conducted within and around the Project area which confirmed the absence of surface flows in the area. People in local settlements use water from different sources including dug wells, boreholes, and springs. No surface water quality was assessed as the drainage lines were dry during the hydrocensus surveys.

### 7.8.2. TSF Surface Water Management

The closure hydrology design by KP is currently being developed and will be incorporated as appropriate in future iterations. The concept essentially includes manging and conveying stormwater around or off the TSF to maintain stability.

No surface ponding is expected on the upper surface of the tailings complex due to the extreme aridity and evapotranspiration. At closure, the remaining cells of the RTSF (RF2) and CTSF (CF3), refer to Figure 2-2, will be covered with 500 mm of gravel or mine waste (rock). The other cells will be concurrently decommissioned and covered as they are filled, and deposition progresses during the operational phase.

### 7.8.3. Mine Pits, WRD and Ore Stockpiles Surface Water Management

Stormwater diversion drains will be installed to divert any clean water before it enters the Ore Stockpile areas.

The mine pits will all have perimeter berms around them to prevent natural runoff entering the pits. Water collecting in the pits will be pumped to a central storage pond, from where it can be used for processing or dust suppression.

### 7.8.4. Decommissioning Phase Impacts

The potential environmental risks associated with the Project are as follows:

- Contamination of soil and water resources due to accidental spills and releases of fuels, solvents, oils, and chemicals, and disposal of waste;
- Impacts to natural drainage patterns; and
- Mobilisation of contaminants related to acid mine drainage (AMD) contamination.

**Closure considerations**

- The pre-mining water quality monitoring programme should be continued through the operational period into the post-closure phases for an agreed period to ensure determinants are within agreed limits and closure criteria are met;
- Disturbances should be limited to planned footprints;
- Additional storm water management measures may be required and should be based on dedicated storm water modelling for the post closure landform;
- Manage clean and dirty water separation throughout the operational and decommissioning phases as good practice even though there are limited to no receptors;
- Implement rehabilitation as soon as possible as areas become available; and
- Measures implemented on or around permanent structures should be designed and built for closure, including TSF cladding , access barriers and associated storm water management measures around the pit perimeters.

## 7.9. Fauna and Flora

A baseline Fauna and Flora Assessment was conducted by HBP in 2022/2023.

### 7.9.1. Fauna

#### *7.9.1.1. Birds*

A total of 17 birds' species were observed at the Reko Diq Mine Site. All the species observed are Least Concern.

Of the 31 bird species observed at the Northern Groundwater System area, the conservation concern birds' species observed include one Endangered, Egyptian Vulture (*Neophron percnopterus*) and one Vulnerable, Macqueen's Bustard (*Chlamydotis macqueenii*), species. The rest of the species encountered are Least Concern according to IUCN Red List of Threatened Species.

34 bird specimens were observed belonging to eight species along the access route to the Reko Diq Mine Site. Common bird species observed include Greater Short-Toed Lark (*Calandrella brachydactyla*), Eurasian Roller (*Coracias garrulous)*, and Barn Swallow (*Hirundo rustica)*. All the species observed are Least Concern according to IUCN Red List of Threatened Species.

15 bird species were observed at Port Qasim. Only one the species classified as Near Threatened, Curlew Sandpiper (*Calidris ferruginea*), while the rest were Least Concern.

#### *7.9.1.2. Herpetofauna*

A total of 10 herpetofauna species were. Seven were observed during the Post-Monsoon 2022 season and four during the Spring 2023 survey. Only one restricted range herpetofauna species i.e., Alcock's toad-headed Agama (*Phrynocephalus euptilopus*) was observed during the Spring 2023 survey.

No conservation concern herpetofauna species were observed in any of the surveys at the Northern Groundwater System area, all 11 of the species observed, are listed as either Least Concern or Not Evaluated.

Three herpetofauna species were observed along the access route to the Reko Diq Mine Site. All were listed as Least Concern according to IUCN Red List of Threatened Species.

All four species observed within the Port Qasim study area are listed as Least Concern by the IUCN Red List of Threatened Species.

#### *7.9.1.3. Mammals*

A total of four mammalian species were observed during both Post-Monsoon 2022 and Spring 2023 surveys at the Reko Diq Mine Site. All the species observed are Least Concern according to the IUCN Red List of Threatened Species

Six mammalian species were observed at the Northern Groundwater System area. Of these, Sand Cat (*Felis margarita*) and Goitred Gazelle (*Gazella subgutturosa*) are listed as Critically

Endangered while, two species i.e., Cape Hare (*Lepus capensis*) and Ruppell's Fox (*Vulpes ruppellii*) are listed as Vulnerable and one species i.e., Red Fox (*Vulpes vulpes*) is listed as Near Threatened according to Pakistan National List of Mammals. The Long Eared Hedgehog (*Hemeichinus auritus*) was listed as Least Concern according to the National Status.

Three mammalian species were observed along the Access Route to Reko Diq Mine Site. All species were listed at Least Concern.

A total of seven species were observed within the Port Qasim study area, all listed as Least Concern according to IUCN status. However, two of the species, Asiatic Jackal (*Canis aureus*) and Indian Crested Porcupine (*Hystrix indica*) were listed as Near Threatened according to the national status.

Only one species of small mammal i.e., Great Gerbil (*Rhombomys opimus*) was captured during both Post-Monsoon 2022 and Spring 2023 surveys. This species is listed as Least Concern according to IUCN Red List of Threatened Species.

#### 7.9.1.4. Invertebrates

A total of five and seven invertebrates' species were observed during both Post-Monsoon 2022 and Spring 2023 surveys at the Reko Diq Mine Site and Northern Groundwater System areas, respectively. All the invertebrate species observed in these surveys were either Least Concern or Not Evaluated according to IUCN Red List of Threatened Species.

**Closure considerations**

- The Project should adopt a habitat quality preservation mindset, i.e., the proposed activities should not result in the deterioration/degradation of terrestrial habitat within the associated terrestrial ecosystem; and
- Limit development footprint areas, manage potential no-go areas and maintain connectivity to reduce habitat fragmentation as far as possible.

### 7.9.2. Flora

A baseline Fauna and Flora Assessment was conducted by HBP in 2022/2023. The ecological studies were conducted for four areas. Post-Monsoon 2022 and Spring 2023 surveys were conducted at the Reko Diq Mine Site, at the Northern Groundwater System area and Access Route to the Reko Diq Mine Site, only for terrestrial flora. A Post-Monsoon 2023 Survey was conducted also at the coastal area along Port Qasim for both terrestrial flora and mangroves.

- A total of 20 plant species were observed at the Reko Diq Mine Site. All the species were not evaluated in the IUCN Red List of Threatened Species, except the Salt Tree (*Haloxylon stocksil*) which was listed as Least Concern. Only one alien invasive plant (AIP) species, Bermuda Grass (*Cynodon dactylon*), was observed during the Spring 2023 survey.

- A total of 33 species were observed at the Northern Groundwater System area. Of these, three species were listed as Least Concern, Neem (*Azadirachta indica*), Saltwort (*Haloxylon stocksil*) and Salt Heliotrope (*Heliotropium crispum*). The rest of the species were not evaluated. Three AIP species, Sixweeks Threeawn (*Aristida adsecensionis*), Red-river Gum (*Eucalyptus camaldulensis*), Purple Threeawn (*Aristida purpurea*), were observed.
- A total of 12 species were observed at the access route to the mine site. Only one of the plants, Puncture Vine (*Tribulus terrestres*), were listed as Least Concern on IUCN, and the others were not evaluated. None of the species observed during these surveys exhibit characteristics of alien invasiveness within the region.
- A total of 35 plant species were observed at Port Qasim. Most of the terrestrial plant species observed at Port Qasim are listed as Least Concern or Not Evaluated and have a wide distribution range. One species of conservation concern was observed namely Lanceleaf Buttonwood (*Conocarpus lancifolius)* which is listed as Near Threatened. five Alien-Invasive Plant Species were observed namely Giant Reed (*Arundo donax),* Lanceleaf Buttonwood *(Conocarpus lancifolius),* Bermunda Grass *(Cynodon dactylon),* Mesquite *(Prosopis juliflora)* and Honey Meaquite (*Prosopis glandulosa)*.
- Two species of Mangroves were observed at Port Qasim, Grey Mangrove (*Avicennia marina)* and Red Mangrove (*Rhizophora mucronata)*. All the mangrove species are listed as Least Concern in the IUCN Red List of Threatened Species. The mangroves at Port Qasim are classified as Critical Habitat.

### 7.9.3. Decommissioning Phase Impacts

The following closure-related impacts were identified that relate to fauna and flora.

**Table 7-3: Closure-related impacts on fauna and flora**

| Interaction | Impact |
|---|---|
| Cessation of active mining, decommissioning, and removal of infrastructure. | 1. Habitat disruption and wildlife encounters. |
| | 2. Soil disturbances and habitat loss. |
| Rehabilitation activities, such as shaping and protecting of disturbed footprints, cladding of WRDs and mineralised stockpiles and construction of safety bunds around pit areas. | 1. Disruption of wildlife movement. |
| | 2. Soil, vegetation disturbances and AIP encroachment. |
| Post-closure monitoring. | No negative impacts anticipated as capturing data during rehabilitation efforts may be used to adjust rehabilitation efforts and address unforeseen impacts. |

**Closure considerations:**

- Implement concurrent rehabilitation during the operational phase as areas become available to restore habitat;
- Develop and implement management protocols to identify and remove Alien Invasive Species during the operations and as part of the post-closure monitoring and maintenance activities; and
- Use monitoring data to adjust rehabilitation efforts and address any unforeseen impacts on fauna and flora effectively.

# 8. Closure Risk Assessment

An initial closure related Risk Assessment (RA) was completed with the aim of informing the rehabilitation and closure measures required to meet the proposed closure objectives and promote sustainable mine closure.

The RA is based on the supporting information and specialist studies (see Table 4-1). The identified risks should be revisited and updated annually to incorporate new information as closure planning progresses and the knowledge gaps identified are closed.

The objectives of the RA are as follows:

- Ensure timeous risk reduction through appropriate interventions;
- Identify and quantify the potential latent or residual environmental risks related to post-closure;
- Detail the approach to managing the risks; and
- Outline monitoring, auditing, and reporting requirements.

## 8.1. Risk Assessment Methodology

Initial closure related risks were identified and ranked based on the review of the specialist studies compiled for this ESIA and information supplied by the mine.

The following approach was implemented in compiling this Risk Assessment:

- Review of available information and specialist studies;
- Identifying possible closure related risks;
- Ranking the pre-mitigation risks in terms of likelihood and consequence;
- Developing mitigation measures to reduce the likelihood of the risk occurring;
- Reranking the risk for likelihood of occurrence, with the assumption that the mitigation measure is effectively applied; and
- Summarising the high-level risks in this report to emphasise the need for their mitigation.

The risk ratings used to classify the risks are presented in Table 8-1, these ratings are based on the likelihood and consequence rating applied, as reflected in Table 8-2.

**Table 8-1: Risk Rankings**

| Risk Rating | Risk Level | Guidelines for Risk Matrix |
|---|---|---|
| 21 to 25 | High | A high risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised immediately. |
| 13 to 20 | Significant | A significant risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised as soon as possible. |
| 6 to 12 | Medium | A moderate risk exists that management's objectives may not be achieved. Appropriate mitigation strategy to be devised as part of the normal management process. |
| 1 to5 | Low | A low risk exists that management's objectives may not be achieved. Monitor risk, no further mitigation required. |

## 8.2. Identified Significant Closure-Related Risks

The medium and high risks identified during the initial CRA (i.e., risks with a pre-mitigation risk level of 13 or higher) are summarised in Table 8-3. The complete CRA, showing the initial full suite of closure risks identified is presented in Appendix A. The potential residual risks are highlighted in the following section, see the discussion in Section 8.4 and the identified knowledge gaps described in Section 15. The CRA should be revisited as part of regular updates of the CP.

It is only the permanently reduced groundwater levels remain as significant post closure. No mitigation measures are proposed as no receptors were identified within the zone of influence.

**Table 8-2: Risk Estimation Matrix**

| **Capital Projects Risk Matrix** | | **CONSEQUENCE** (Where an event has more than one 'Consequence Type', choose the 'Consequence Type' with the highest rating) | | | | |
|---|---|---|---|---|---|---|
| **Consequence Type** | | **1 - Insignificant** | **2 - Minor** | **3 - Moderate** | **4 - High** | **5 - Major** |
| Schedule | | Less than 1% impact on overall project timeline | May result in overall project timeline overrun equal to or more than 1% and less than 3% | May result in overall project timeline overrun of equal to or more than 3% and less than 10% | May result in overall project timeline overrun of equal to or more than 10% and less than 30% | May result in overall project timeline overrun of 30% or more |
| Cost | | Less than 1% impact on the overall budget of the project | May result in overall project budget overrun equal to or more than 1% and less than 3% | May result in overall project budget overrun of equal to or more than 3% and less than 10% | May result in overall project budget overrun of equal to or more than 10% and less than 30% | May result in overall project budget overrun of 30% or more |
| Safety | | First aid case | Medical treatment case | Lost time injury | Permanent disability or single fatality | Numerous permanent disabilities or multiple fatalities |
| Environment | | Lasting days or less; affecting small area (meters); receiving environment highly altered with no sensitive habitats and no biodiversity value (e.g., urban / industrial areas). | Lasting weeks; affecting limited area (hundreds of meters); receiving environment altered with little natural habitat and low biodiversity value | Lasting months; affected extended area (kilometres); receiving environment comprising largely natural habitat and moderate biodiversity value | Lasting years; affecting area on sub-basin scale; receiving environment classified as having sensitive natural habitat with high biodiversity value | Permanent impact; affecting area on a whole basin or regional scale; receiving environment classified as highly sensitive natural habitat with very high biodiversity value |
| Legal & Regulatory | | Technical non-compliance. No warning received; no regulatory reporting required | Breach of regulatory requirements; report/involvement of authority. Attracts administrative fine | Minor breach of law; report/investigation by authority. Attracts compensation/ penalties/ enforcement action | Breach of the law; may attract criminal prosecution, penalties/ enforcement action. Individual license temporarily revoked | Significant breach of the law. Individual or company lawsuits; permit to operate substantially modified or withdrawn |
| Social / Communities | | Minor disturbance of culture/ social structures | Some impacts on local population, mostly repairable. Single stakeholder complaint in reporting period | On going social issues. Isolated complaints from community members/ stakeholders | Significant social impacts. Organised community protests threatening continuity of operations | Major widespread social impacts. Community reaction affecting business continuity. "License to operate" under jeopardy |
| Reputation | | Minor impact; awareness/ concern from specific individuals | Limited impact; concern/ complaints from certain groups/ organisations (e.g., NGOs) period | Local impact; public concern/ adverse publicity localised within neighbouring communities | Suspected reputational damage; local/ regional public concern and reactions | Noticeable reputational damage; national/ international public attention and repercussions |
| **PROBABILITY** | | **RISK LEVEL** | | | | |
| **5 - Almost Certain** **>90%** | 90% and higher likelihood of occurring | **11 (Medium)** | **16 (Significant)** | **20 (Significant)** | **23 (High)** | **25 (High)** |
| **4 - Likely** **30%-90%** | Between 30% and less than 90% likelihood of occurring | **7 (Medium)** | **12 (Medium)** | **17 (Significant)** | **21 (High)** | **24 (High)** |
| **3 - Possible** **10%-30%** | Between 10% and less than 30% likelihood of occurring | **4 (Low)** | **8 (Medium)** | **13 (Significant)** | **18 (Significant)** | **22 (High)** |
| **2 - Unlikely** **3%-10%** | Between 3% and less than 10% likelihood of occurring | **2 (Low)** | **5 (Low)** | **9 (Medium)** | **14 (Significant)** | **19 (Significant)** |
| **1 - Rare** **<3%** | Less than 3% likelihood of occurring | **1 (Low)** | **3 (Low)** | **6 (Medium)** | **10 (Medium)** | **15 (Significant)** |

**Table 8-3: Significant and High Level Risk Identified**

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| **Mine Infrastructure** | | | |
| Demolition of Infrastructure | Possible human access to remnant infrastructure. | Open access to or collapse of remnant infrastructure which could lead to human injury or fatality. | • Demolish and remove all remnant infrastructure from site during the decommissioning phase.<br>• Identify infrastructure that could remain post-closure and conclude formal agreements with next user. |
| Waste management | Unplanned or haphazard disposal of building rubble from infrastructure demolition | Devalued end land use and potential safety hazard | • Investigate appropriate on-site disposal aligned with relevant legislation and agreed to with the authorities.<br>• Dispose of building rubble in the closest pit (Western Porphyries Pit).<br>• Identify materials that could be reused post closure. |
| Infrastructure handed to next land user | No formal hand-over agreements in place or capacity building and training for next users | Derelict and unsafe infrastructure | • Ensure formal agreements are in place with next land users for any infrastructure that will remain after closure.<br>• Demolish and remove all infrastructure where such agreements have not been concluded.<br>• Ensure hand-over procedures are developed and that training or capacity building is provided as required. |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| **Dams and Diversions** | | | |
| Water management impoundments remaining post closure | Possible human and animal access | Open access could lead to injury or fatality (entrapment when dry or drowning when full) | • Decommission, demolish and remove all surface and water impoundments (not handed over to a new owner).<br>• Shape side slopes and basin to create a free draining landform aligned with the site wide surface water drainage framework.<br>• If infrastructure is identified for post closure use:<br>• Ensure formal agreements are in place with next land users for any infrastructure that will remain after closure.<br>- Retain all the safety measures for each facility<br>- Ensure hand-over procedures are developed and that training or capacity building is provided as required. |
| Drainage framework | Cessation of active mining;<br>Decommissioning and removal of infrastructure;<br>Rehabilitation activities;<br>Mine closure and post-closure monitoring. | Degradation of water courses;<br>Increased erosion;<br>Potential spillage of hydrocarbons such as oils, fuels and grease, thus contamination of surface water runoff; and<br>Increased AIPs due to soil disturbance;<br>Vehicle movement leading to soil | • Continue operational management protocols into the decommissioning and closure phase as required.<br>• Manage and maintain clean and dirty water systems throughout the operational and decommissioning phases until all rehabilitation activities are complete. |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| | | compaction and increased runoff, the onset of erosion and sedimentation of water courses | • Shape and level areas aligned with the site wide closure storm water management plan and provide additional protection through rock cladding for identified areas of higher risk.<br>• Ensure operational stormwater management measures are kept in place until all infrastructure is removed. Where infrastructure will remain, stormwater and culverts should be maintained and monitored.<br>• Actively shape and level disturbed areas as soon as possible, the reprofiled landscape should allow free drainage close to the pre-mining conditions.<br>• |
| **Mining Areas** | | | |
| Opencast Workings | Possible human and animal access | Open access could lead to injury or fatality | • Design and construct permanent access control berms during the operational period around the pit perimeter and beyond the expected breakback zone.<br>• Design and construct storm water measures based on dedicated storm water modelling to reroute surface water runoff on the outside of the berm aligned with the site wide drainage framework.<br>• Construct final portions of the barrier and associated storm water management measures at |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| | | | closure for the remaining open access areas (haul road access to main ramp).<br>• The design should be fit for purpose, consider the long-term closure requirements and maximise the use of available mine waste rock. |
| Opencast Workings | Pit remains as feature in the landscape | Pit edge stability | • Design and construct permanent access control berms during the operational period around the pit perimeter and beyond the expected breakback zone (to be determined).<br>• Monitor the pit stability during operations and confirm permanent location of the berm.<br>• Design and construct storm water measures based on dedicated storm water modelling to reroute surface water runoff on the outside of the berm aligned with the site wide drainage framework.<br>• Construct final portions of the berm and associated storm water management measures at closure for the remaining open access areas (haul road access to main ramp).<br>• The design should be fit for purpose, consider the long-term closure requirements and maximise the use of available mine waste rock. |
| **Soils, Land Capability and Land Use** | | | |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
| --- | --- | --- | --- |
| Land Capability | Exposed soils and surfaces | Soil erosion and sedimentation | • Continue operational management protocols into the decommissioning and closure phase as required.<br>• Manage and maintain clean and dirty water systems throughout the operational and decommissioning phases until all rehabilitation activities are complete.<br>• Shape and level areas aligned with the site wide closure storm water management plan and provide additional protection through rock cladding for identified areas of higher risk.<br>• Ensure operational stormwater management measures are kept in place until all infrastructure is removed. Where infrastructure will remain, stormwater and culverts should be maintained and monitored;<br>• Actively shape and level disturbed areas as soon as possible, the reprofiled landscape should allow free drainage close to the pre-mining conditions;<br>• |
| | Soil contamination and deterioration | Decreased land capability | |
| Land Use | Possibility of not implementing the final Land Use Plan | End Land Use not achieved. | • Update the site wide CP regularly as the site body of knowledge is improved to ensure a coherent approach and to guide all activities aligned with the closure objectives. |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| | | | • Develop an End Land Use Plan as an integral part of the Closure Plan.<br>• Design and implement trials during the operations phase and with appropriate monitoring to ensure that closure measures provide known outcomes.<br>• Develop a site wide closure Storm Water Management Plan and design additional management measures informed by dedicated hydrological modelling.<br>• Implement concurrent rehabilitation as soon as areas become available.<br>• Engage stakeholders throughout the life of the operation to ensure alignment of expectations regarding the end land use and mine closure;<br>• Develop and implement a land management policy and appropriate standards for unmined land under the mines care. |
| **Surface and groundwater** | | | |
| Groundwater | Cessation of pit dewatering | Permanently reduced groundwater levels | • No mitigation measures required as no receptors are identified within the radius of influence.<br>• Continue monitoring. |
| **Financial and Regulatory** | | | |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| Closure Provision | Insufficient funds to implement CP | Increased financial liability to address unforeseen costs at closure | • Update the site wide CP regularly as the site body of knowledge is improved to ensure a coherent approach and to guide all activities aligned with the closure objectives.<br>• Review and update the closure costs annually and with improved accuracy until the last 5 years of mining, at which point an execution level estimate is required.<br>• Continually address the identified gaps to improve the site body of knowledge and reduce uncertainties running into closure.<br>• Implement concurrent rehabilitation where possible to incrementally address the closure objectives and reduce the financial burden over time. |
| Authorised closure | Failure to achieve authorised closure | Uncertainty regarding closure regulatory requirements and misalignment with authorities | • Update the site wide CP regularly as the site body of knowledge is improved to ensure a coherent approach and to guide all activities aligned with the closure objectives.<br>• Develop an End Land Use Plan as an integral part of the Closure Plan.<br>• Continually engage with stakeholders and authorities to align expectations. |
| **Social Risks Related to Mine Closure: Internal** | | | |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| Employees | The cessation of the operations causing the laying off of workers. | Loss of employment opportunities and income source | • Develop and implemented a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use, specifically for local mine employees.<br>• Conduct regular stakeholder consultations between Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions.<br>• Continue implementing the development projects as per the Community Development Plan.<br>• Provide local employees with confirmation of employment documents for work undertaken and certificates of completion for in-house training.<br>• Maintain Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan. |
| **Social Risks Related to Mine Closure: External** | | | |
| Interested and affected parties | Failure to address social closure | Misalignment and general unhappiness | • Develop and implement a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use. |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
|---|---|---|---|
| | | | • Conduct regular stakeholder consultations between Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions.<br>• Continue implementing the development projects as per the Community Development Plan.<br>• Provide local employees with confirmation of employment documents for work undertaken and certificates of completion for in-house training.<br>• Maintain Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan. |
| Local economy | Closure of mining operation taking away the source of income for the local economy | Loss of business opportunities. | • Develop and implement a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use.<br>• Conduct regular stakeholder consultations between Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions.<br>• Continue implementing the development projects as per the Community Development Plan. |

| Aspect | Risk driver | Consequence | Mitigation Measure(s) |
| --- | --- | --- | --- |
| | | | • Maintain Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan. |

## 8.3. Highlighted Closure Related Risks

The following aspects are highlighted based on the risk assessment outcomes:

**Mine employees and the local community (surrounding the mine and Nok Kundi)**: once mining operations cease, employees face the risk of job losses, leading to an increase in unemployment and poverty in the area. The mine will no longer support local suppliers and there will be reduced economic opportunities.

The following is proposed (along with monitoring) to enable employees and local businesses to find alternative employment and to explore opportunities for alternative industry/livelihoods.:

- Develop and implement a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use, specifically for local mine employees;
- Conduct regular stakeholder consultations with Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions;
- Continue implementing the development projects as per the Community Development Plan and track progress/success;
- Provide local employees with confirmation of employment documents for work undertaken and certificates of completion for in-house training; and
- Maintain/ Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan.

## 8.4. Potential Residual/Latent Risks

**Cumulative impacts on groundwater in the region:** The remote location of Reko Diq in a unique arid environment means no key receptors were identified by the various specialist studies. Contributing factors include (but are not limited to):

- there is little potential for environmental impacts to groundwater at Reko Diq due to the extremely low infiltration rates predicted from hydrogeological modelling, the depth of groundwater across the site and the highly mineralised, saline nature of groundwater (SRK, HBP, 2010);
- Baseline groundwater at Tanjeel contains high trace metals and is acidic due to in-situ oxidation of sulphides by contacted groundwater;
- Very low rainfall and high evapotranspiration; and
- The region is sparsely populated, and the nearest settlements are Humai approximately 19 km away (population of around 1000) and Nok Kundi approximately 75 km away (with a population of around 10 000).

The numerical model developed by Digby Wells 2024), simulated groundwater recovery up to 1000 years post closure. During the simulated period, a fully recovery is not expected. The radius of influence of the drawdown cone becomes larger whilst the drawdown becomes shallower. Since no receptors are identified within the zone of influence, minor medium- and short-term impacts can be mitigated.

### 8.4.1. Risk Monitoring

**Groundwater Quality:**

Monitoring of groundwater and surface water should be undertaken frequently throughout the operational phase to identify and update the risk register, to track water qualities against the baseline assessment and relevant water quality guideline threshold levels, and to monitor the impact of mining on the surrounding environment.

The following is proposed for the closure phase for the Mining site:

- Continue groundwater monitoring quarterly for three (3) years post closure;
- Continue water monitoring at surface water points when possible following high rainfall events (assuming bi-monthly) for three (3) years post closure.

Groundwater and geochemical models should be updated regularly to replace or confirm initial assumptions with actual monitoring results and laboratory analyses of potential waste streams. The CP must be regularly updated as the site body of knowledge is improved over the LoM.

## 9. Assumptions Applied in the Closure Plan Development

The compilation of this CP is based on the following assumptions and limitations:

- This is a conceptual CP addressing the planned mining and infrastructure at Reko Diq, the CP is compiled as a desktop assessment;
- Given the nature of mining at Reko Diq, concurrent rehabilitation of finalised areas (such as full RTSF and CTSF cells and the TSF complex embankment) will take place throughout the operational phase;
- Upon cessation of mining, all infrastructure on site will be demolished unless these assets can be legally transferred to a third party and a contract is instituted which details the conditions of transfer;
- Decommissioning and rehabilitation activities will follow directly after the cessation of mining;
- Information, mitigation measures and recommendations provided in this report are based on the specialist studies completed as part of the Impact Assessment;
- The proposed monitoring includes the following aspects, as an adaptive strategy, that can be amended based on implementation during the operations:

  - Rehabilitation monitoring and maintenance will take place annually for a minimum of three years post-closure;
  - Groundwater and surface water monitoring will continue for 3 years post-closure with a risk-based approach to updating monitoring and management plans thereafter; and
  - Air quality will also continue for 5 years post-closure with a risk-based approach to updating monitoring and management plans thereafter.
- The recommendations contained within this report currently exclude any comments or issues raised by stakeholders and/or Interested and Affected Parties (I&APs). Incorporation of comments from stakeholders or I&APs into the CP should be considered in subsequent annual updates as and when received; and
- This report must be considered as a dynamic document and should be updated as the site body of knowledge progresses and incorporate learnings from implemented measures and monitoring during the operational period.

# 10. Closure Vision

An initial closure vision is proposed for the Project in the text box below. A clear closure vision provides a framework to guide the mine's rehabilitation, closure planning and implementation. The closure vision provides the envisioned status, and land use over the final rehabilitated landscape post-mining and can be refined in subsequent updates.

***Reko Diq aims** to establish a safe, stable, and non-polluting, post-mining landscape that is sustainable over the long-term while achieving the desired end land use.*

# 11. Closure Objectives

The initial closure objectives as informed by the Barrick Mine Closure Standard, are adopted for the Project, and include:

- Ensure that all reclaimed properties support productive uses considering pre-mining conditions;
- Ensure safety & health of workers during closure activities;
- Ensure that local communities utilizing the site after closure are not exposed to unacceptable risks;
- Properly manage all reagents and chemicals. Neutralise or control-and-treat all potentially harmful residual discharges from decommissioned facilities so that water and land resources are properly protected;
- Physically stabilize remaining structures to ensure proper drainage, minimize erosion and sedimentation and to limit the quantity of water requiring management;
- Reclaim mine properties to protect and enhance pre-existing plant and animal communities;
- Utilize closure strategies that relinquish properties in a self-sustaining condition with little or no need for ongoing care and maintenance;
- Understand & address community concerns regarding closure. Safeguard the sustainability of community interest to the greatest extent practicable; and
- Comply with mine closure permitting and regulatory requirements and obtain documented confirmation of meeting all closure requirements.

The overall, long term post-closure land use objective for the site is to return it to a self-sustaining condition suitable to support pre-mining land use activities, such as Wilderness habitat, grazing or subsistence agriculture.

# 12. Final Land Use Plan

The final land use plan (FLUP) is the end land use to which the mine would return the land disturbed by mining activities. The closure objectives set as part of the mine closure planning process aims to support achievement and effective implementation of a FLUP. The final land use must be developed with the inputs of stakeholders, Project affected communities and/or I&APs. The plan for Reko Diq should be geared towards long-term safety and landform stability for remaining mining features and a land use aligned with the pre-mining and surrounding land capabilities.

No FLUP has been developed for the Project yet. To ensure that areas are not rehabilitated in isolation, it is recommended that a cohesive site wide FLUP as an integral component of future updates of the CP.

## 12.1. Current Land Use

### 12.1.1. Regional overview

The Chagai region is predominantly characterised by its mineral-rich landscapes, with significant mining activities centred around extracting copper, gold, and other valuable minerals from sites. Agriculture, although limited due to scarce water resources, plays a crucial role in supporting local communities, with date palms, wheat, and barley being the primary crops cultivated through traditional and often subsistence farming methods. The primary economy in Chagai, is cross border trade with some artisanal and larger scale mining. The sparse vegetation and extensive desert areas also reflect the district's arid climatic, impacting both agricultural potential and the livelihoods of its inhabitants.

The region is sparsely populated, and the nearest settlements are Humai approximately 20 km away and Nok Kundi approximately 75 km away.

### 12.1.2. Site specific overview

Pre-mining land use at the Project area is characterised by desert terrain and limited agricultural potential. Traditional water management systems, including the ancient karez systems, played a crucial role in sustaining agriculture and human settlements by channelling groundwater from the surrounding mountains. Human presence in the region was marked by small, scattered villages and historic trade routes, reflecting the area's significance as a crossroads for commerce and cultural exchange. Archaeological sites hinted at ancient human habitation and activities, underscoring the long-standing connection between people and the land in the Reko Diq area. There are no settlements or ground water users in the vicinity of the Project site.

It is important that all mining and rehabilitation actions are geared towards achieving the end land use incrementally over time. The following Land Use Categories were provided as a percentage of habitat, (refer to Table 12-1):

- Large sections of the area consist of gravel plains, which are composed of alluvial sand and gravel. Mountains/ hills and sand dunes are extensive across the Project site. (Early Works ESIA, 2024);
- Approximately 0.003% of the ecological study area is currently being used for agricultural areas/ date palms, which is a mix of planted and natural vegetation, while only 0.01% area is classed as built-up areas, all of which fall outside of the Project area; and
- With this as reference the most probable end land use for the Project area is wildlife habitat, with potential for limited grazing. and /or a mix of small scale agricultural and subsistence activities.

**Table 12-1: Habitat Categories and Comparison of Area and % of Habitat for proposed RDMS, and Associated Facilities**

| *No.* | *Habitat Type* | *Area (km²)* | *Percentage (%)* |
|---|---|---|---|
| 1. | Agriculture Areas/Date Palms | 0.1 | 0.003 |
| 2. | Built-up Areas | 0.4 | 0.01 |
| 3. | Clayey Plains | 148.1 | 4.5 |
| 4. | Dry Streambeds | 125.2 | 3.8 |
| 5. | Gravel Plains | 1,761.4 | 53.8 |
| 6. | Mountains/Hills | 808.5 | 24.7 |
| 7. | Sandy Plains/Sand Dunes | 430.8 | 13.2 |
| **Total** | | **3,274.5** | **100.0** |

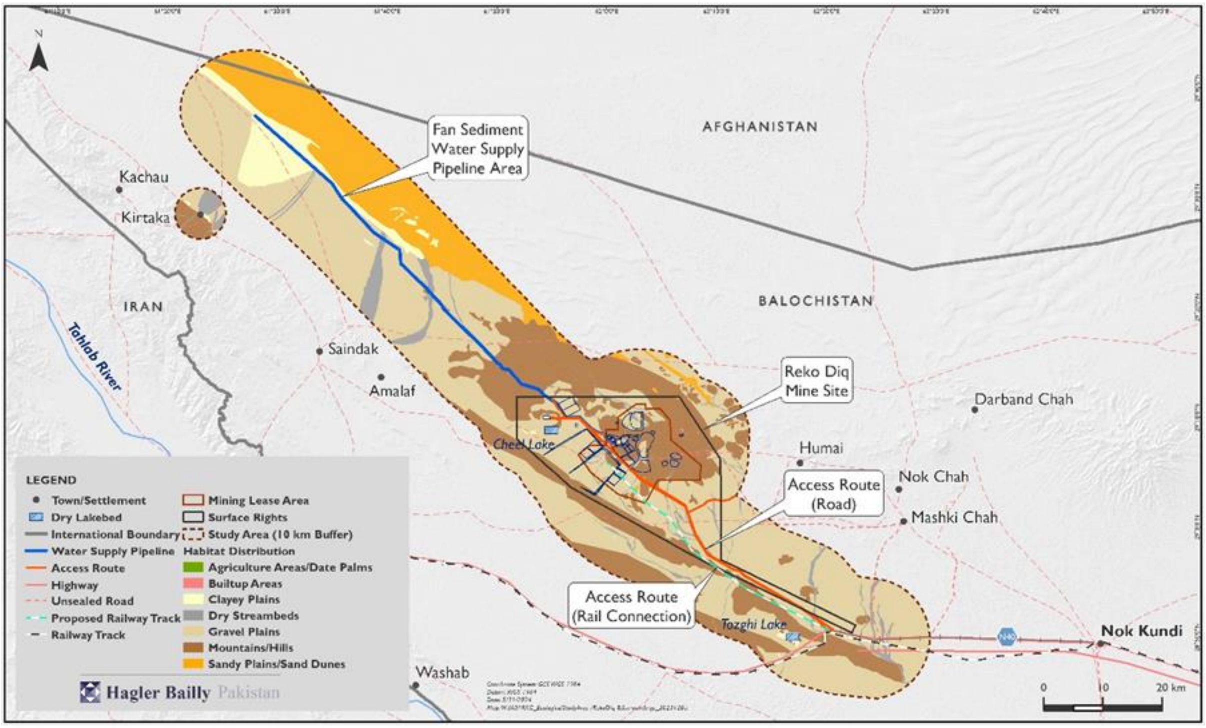



**Figure 12-1: Ecological Area and Identified habitats for the RDMS**

## 12.2. Post-Mining Land Use

A high-level land use evaluation was undertaken for the Project, assessing the potential land use options for the site. The land use options were evaluated based on the following criteria and are reflected in Table 12-2.

- **Likely end land uses:** Primary or anchoring end land uses, which are likely to be functionally self-sufficient over the long term;
- **Possible end land uses:** Secondary or supporting land uses, which are reliant on likely uses or other external factors to be sustainable; and
- **Unlikely end land uses:** Undesirable end land uses, or land uses that are unlikely to be sustainable or that would be contextually inappropriate.

**Table 12-2: High Level Evaluation of Post-Mining Land Use Options**

| Likely | Possible | Unlikely |
|---|---|---|
| • Wildlife habitat (desert). | • Small scale agricultural processing with retention of suitable mining infrastructure and services (water, solar power, workshops/warehousing etc.);<br>• Ecological conservation<br>• Limited grazing and /or a mix of small scale agricultural and subsistence activities; and<br>• Renewable energy generation given connection to the Pakistan grid is planned; | • Large-scale commercial or urban development;<br>• Medium to large scale Agricultural processing;<br>• Intensive agriculture (dependent on post mining land capability); and<br>• Irrigated cultivated land (dependent on post mining land capability and water quality/availability) |

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# 13. Closure Actions and Measures

The closure measures supporting the proposed closure scenario are presented in Table 13-1. The closure measures are developed in support of achieving the preliminary end land use and mitigating post-closure risks outlined in the CRA (Section 8)..

The closure measures should be refined overtime as part of the regular CP updates as more detailed supporting information becomes available.

**Table 13-1: Closure and Rehabilitation Actions**

| Component | Rehabilitation measures |
|---|---|
| Mining Aspects – Open Pits, Waste Rock Dumps, Ore Stockpiles, TSF waste Stockpile and Laydown areas | Open Pits still active at closure (Western Porphyries Ultimate Pit)<br>• Construct final portion of the perimeter berm to close off access with waste rock within a hauling distance of 2 km; and<br>• Construct the storm water management measures on the outer toe line of the berm to align runoff with the site wide drainage framework.<br>• Pits themselves to be left open.<br>Waste Rock Dumps remaining at closure (North WRD):<br>• Rip upper surface and access ramp; and<br>• Reinforce dump crest (if required) based on operational learnings.<br>Stockpiles and laydown areas:<br>• Grade drainage lines across the cleared footprint to reroute surface water runoff aligned with the site wide drainage framework. |
| Tailings Storage Facilities | Cleaner TSF cell CF3:<br>• Load, haul and place a final cladding layer of gravel/waste rock across the cleaner cells, reprofiled towards the closure spillway; and<br>• Construct the rock lined closure spillway to allow for surface water discharge down the final embankment slope.  rougher cells.<br>Rougher TSF cell RF2: |

| Component | Rehabilitation measures |
|---|---|
| | • Construct the contour causeways (500 m spacing) and swales across the final tailings surface; and<br>• Construct the rock lined discharge channel cut into natural ground to discharge surface runoff to the south. |
| Process Plant, conveyors and associated workshops | <u>Infrastructure demolition and clean-up:</u><br>• Demolish and remove all concrete structures to a maximum of 1 m below ground level;<br>• Dismantle/demolish and remove temporary/prefabricated structures;<br>• Dismantle streel structures and store in designated salvage yard prior to removal/sale;<br>• Decontaminate the Plant;<br>• Dispose inert building rubble in the WPUP within a 2 km hauling distance; and<br>• Remove all contractor containers from site prior to closure.<br><u>General rehabilitation measures:</u><br>• Grade drainage lines across the cleared footprint to reroute surface water runoff aligned with the site wide drainage framework.. |
| Ancillary infrastructure – Mine infrastructure, on-site supporting infrastructure, Accommodation Facility, Solar Farm, Explosives storage, Power Plant and Waste Management Facility. | <u>Infrastructure demolition and clean-up:</u><br>• Demolish and remove all concrete structures to a maximum of 1 m below ground level;<br>• Demolish all temporary/prefabricated buildings;<br>• Dismantle streel structures and store in designated salvage yard prior to removal/sale;<br>• Dismantle solar panels and store in designated salvage yard prior to removal/sale;<br>• Dispose of inert building rubble in the WPUP within a 2 km hauling distance; and<br>• Remove all contractor containers from site prior to closure.<br><u>General rehabilitation measures:</u><br>• Level and shape dam walls and basins to be free draining, aligning the surface water runoff with the site wide drainage framework;<br>• Grade drainage lines across the cleared footprint to reroute surface water runoff aligned with the site wide drainage framework.. |

| Component | Rehabilitation measures |
|---|---|
| | |
| Linear Infrastructure | Haul roads and gravel roads<br>Grade drainage lines across the cleared footprint to reroute surface water runoff aligned with the site wide drainage framework.<br>Fencing, pipelines and powerlines<br>• Remove all wire fencing;<br>• Demolish and remove all surface pipelines; and<br>• Remove all powerlines not required by a subsequent user. |
| Monitoring and maintenance | • Implement monitoring and maintenance across rehabilitated areas for three (3) years post-closure;<br>• Conduct inspections of key permanent features like the TSF complex, WRDs and pit perimeter berms as part of the rehabilitation monitoring;<br>• Continue the air quality monitoring programme for three (3) years post closure;<br>• Groundwater qualities and in borehole elevations will be monitored and reported quarterly for three (3) years post-closure; and<br>• Water chemistry will be monitored at existing surface water sampling sites quarterly for three (3) years post-closure. |

# 14. Alternative Closure Measures

There are currently no prominent alternative options for the mine closure measures on site. The closure and rehabilitation measures provided as part of this CP are aligned with the specialist study recommendations, risk based and are considered the preferred option for closure. The proposed closure actions and measures (reflected in Section 14) are designed to support the closure objectives included in Section 11.

# 15. Closure Planning Knowledge Gaps

The following knowledge gaps, presented in Table 15-1, were identified during the compilation of this CP and need to be addressed during the operational period to inform further updates of this CP and to mitigate identified environmental risks related to closure.

**Table 15-1: Knowledge Gaps**

| Identified Knowledge Gap | Schedule |
|---|---|
| Confirmation of assumptions relating to long term water management:<br>• Update and refine the proposed geohydrological model for the operational and closure period, considering the outcomes of the geochemical study of the Project's waste streams and the water and salt balance; and<br>• Use monitoring data and results to replace assumptions within the modelling. | Throughout the operational period. |
| **Site wide rehabilitation planning and methodologies:**<br>• Compile a detailed site wide rehabilitation and end land use plan;<br>• Develop and maintain LoM material balance of suitable cladding material for concurrent cladding and final closure activities;<br>• Develop methodologies to combat wind ersion for the final active areas of the WRDs (access ramps and upper surface) at closure;<br>• Develop and trial cladding and reprofiling methodologies for the CTSF cells; and<br>• Test and refine the construction of contoured causeways and swales on the upper surface of the RTSF. | During operational period. |
| **Social closure planning stakeholder engagement:**<br>• Engage with regulatory authorities to confirm the waste disposal strategy and environmental authorisations needed for waste disposal associated with demolition activities; and<br>• Develop a detailed post-mining land use plan, based on the post-mining land capabilities currently planned, and ensure this plan is shared with the relevant stakeholders through effective stakeholder engagement. These engagements should ensure input and | During the operational period. |

| Identified Knowledge Gap | Schedule |
|---|---|
| subsequent buy-in of local communities and any input supplied by stakeholders should be included in the land use plan where appropriate. | |

# 16. Threats, Opportunities and Uncertainties

The initial threats and opportunities associated with closure of the Project are provided in Table 16-1. The uncertainties are weighted towards the gaps identified (see Section 15) and should be revisited in subsequent updates to reflect additional monitoring data and analysis.

**Table 16-1: Initial Threats and Opportunities for Mine Closure**

| | |
|---|---|
| Threats | The absence of proactive management of the following identified threats could lead to project underperformance or failure. Active management is required to place the project on the front foot in terms of closure planning:<br>• Not having a coherent overarching site wide closure plan integrating the planned activities;<br>• Inefficient communication and management of stakeholders and authorities' expectations regarding post closure land capabilities and land uses;<br>• Failure to integrate closure design and concurrent rehabilitation into mine planning and execution;<br>• Not continually improving the site body of knowledge and addressing gaps and uncertainties as they are identified;<br>• Lack of regulatory consistency due to changes in legislation, political effort and regulator personnel with site-specific involvement and knowledge;<br>• Ability to achieve end land use and land capability objectives;<br>• Failing to engage in rigorous contract development and management to ensure efficient and accurate implementation by contractors onsite;<br>• Failing to manage the post mining landform construction and materials balance throughout the LoM; and<br>• Waste generation onsite, potential waste classifications and disposal that may be required at closure. |

| | |
|---|---|
| Opportunities | • On-going surface water and groundwater quality monitoring during the operational LoM to identify trends over time and to monitor changes in water quality to determine if the mine is impacting on water quality and/or quantity within the vicinity of the mine;<br>• The water sampling results must inform the groundwater model, to more accurately predict post closure impacts based on actual data obtained during the operational phase;<br>• Long timeline to develop the Social Closure Plan and identify opportunities i.e., skills training for staff;<br>• Engagement with stakeholders and authorities throughout the project life cycle to ensure alignment on closure and rehabilitation methodologies and expected outcomes;<br>• Develop and improve site specific rehabilitation methodologies to ensure known outcomes at closure;<br>• Implemented concurrent rehabilitation during the project lifespan to reduce the financial burden at closure;<br>• WRDs and pit perimeter berms can be designed and constructed as permanent structures, requiring little to no additional measures at closure;<br>• The comprehensive environmental monitoring programme results. Project provides solid baseline data to inform decision making; and<br>• Availability of appropriate closure funds. |

## 17. Preliminary Mine Closure Schedule

The mine closure schedule addresses the timing of rehabilitation and closure activities performed during the decommissioning and post-closure phases. The schedule presented is preliminary and identifies the key activities RDMC will conduct during the decommissioning and post-closure phases. The schedule should be refined as the operation nears the cessation of mining (Figure 17-1).

It is expected that the decommissioning phase will last five (5) years after which the post closure management period, which includes monitoring and maintenance, will continue for an estimated period of three (3) years. Monitoring and maintenance will need to continue until the site closure objectives are met (Table 17-1).

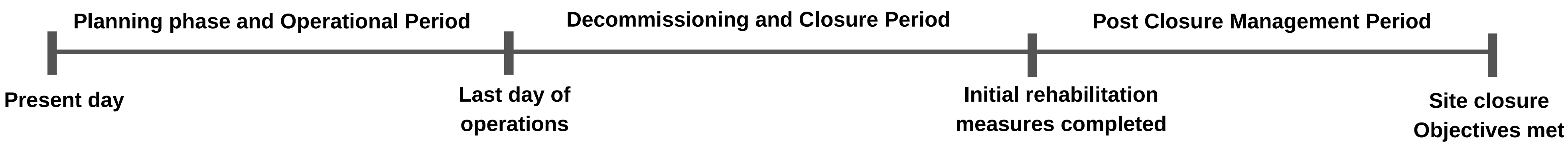


**Figure 17-1: Preliminary Mine Closure Timeline**

**Table 17-1: Preliminary Mine Closure Timeline**

| Planning Phase and Operational Period | Decommissioning and Closure Period | Pre-site -Closure Management Period |
|---|---|---|
| Update the initial CP and Closure RA annually. | Decontaminate the plant area, demolish surface infrastructure, and ensure that access to the mining areas is prevented. | Undertake rehabilitation monitoring as per the post-closure monitoring programme to confirm success of rehabilitation measures, by assessing whether closure objectives are being achieved. |
| Reduce the threats and uncertainties identified in the plan by addressing the highlighted knowledge gaps, undertaking additional studies as required, and designing for closure. | Rehabilitate the disturbed footprints once infrastructure is removed. | Undertake closure management activities (corrective action) where applicable. This will be informed by the rehabilitation monitoring. |
| Engage with the relevant stakeholders regarding the final land use plan, closure criteria, and completion schedule. | Complete all outstanding rehabilitation on site, in line with the mine's closure objectives and final land use plan. | Continue surface water, groundwater and air quality monitoring until site closure criteria are achieved. |
| Identify potential infrastructure for third-party transfer / selling and ensure the required agreements / contracts are in place. | Transfer identified and usable infrastructure as per agreements / contracts and demolish all remaining infrastructure. | Ensure contractual matters and training (if required) are finalized. |

| Planning Phase and Operational Period | Decommissioning and Closure Period | Pre-site -Closure Management Period |
|---|---|---|
| Implement monitoring over areas that have been progressively rehabilitated and ensure a feedback mechanism to refine approaches and improve outcomes. | Continue rehabilitation monitoring and maintenance (if not completed operationally). | Continue monitoring for the manifestation of residual risks and continue mitigation of long-term closure risks. |

# 18. Monitoring, Auditing and Reporting

Initial monitoring requirements relating the to the rehabilitation measures for the post-closure phase at specific areas on the mine are provided in Table 18-1.

Monitoring provides data to confirm whether the rehabilitation techniques implemented have been successful (i.e., whether site closure criteria are being met). Monitoring should further provide an early indication of problems that may arise so that corrective action can be taken in a timely manner. The pre-construction and operational monitoring programmes should continue into closure.

The duration of post-closure monitoring will be determined based on environmental performance and until it can be demonstrated that the rehabilitation work has achieved the closure criteria.

Post-closure monitoring programmes are typically informed by the receptors. It is recommended that an adaptive approach is applied for Reko Diq. The proposed monitoring programme outlined in Table 18-1 should be regularly reviewed against operational conditions, monitoring results and updated modelling for the site (air quality/dispersion and groundwater in particular).

**Table 18-1: Progressive and Post-Closure Monitoring**

| Component / Aspect | Monitoring | | Performance / success criteria | Corrective action |
|---|---|---|---|---|
| | Methodology | Frequency / duration | | |
| **Soil Management** | | | | |
| Erosion | • Conduct a visual assessment post-closure to determine areas of potential erosion;<br>• Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site; and<br>• Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs. | Bi-annually during for at least 3 years after rehabilitation or as deemed necessary. | • No evidence of significant erosion. | Regrade areas as required. |
| General site status | Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site. | Continually following implementation of rehabilitation measures. | Waste / rubble free sites. | As required:<br>• Clear remnant rubble and dispose of at a designated facility. |
| Post-mining end land use | • Assess activities completed, as well as legal and related documentation completed and signed-off for identified infrastructure; and<br>• Ensure rehabilitation measures are aligned to the end land use plan. | Continually, throughout the operational phase. | • Area has been rehabilitated to an aesthetic quality;<br>• Transfer identified infrastructure to end land users has taken place once the area has been proven to be safe for use;<br>• Stable landforms with suitable protection against wind erosion and increased runoff during storm events. | Refer to the end land use approach and refine measures to be implemented in achieving the desired final land use. |
| Topography | • Conduct a visual assessment to determine areas of potential erosion; and<br>• Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs. | During rehabilitation phase. | • No evidence of significant erosion;<br>• and<br>• The final profile achieved must be acceptable in terms of surface water drainage requirements and the end land use objectives. | As required:<br>• Regrade areas and maintain cladding as required, and ensure alignment with the site wide surface post-closure SWMP; and<br>• Refer to the end land use approach and refine measures to be implemented in achieving the desired final land use. |

| Component / Aspect | Monitoring | | Performance / success criteria | Corrective action |
|---|---|---|---|---|
| | Methodology | Frequency / duration | | |
| Invasive alien species | • Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g., eroded/ degraded areas, along drainage lines, etc.); and<br>• Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation. | Yearly for at least 3 years after rehabilitation or as deemed necessary. | • Limit and/or prevent declared invader species;<br>• Minimise extended threats to ecosystems, habitats or other species; and<br>• Increase the potential for natural systems to deliver goods and services. | • Remove invasive species aligned with operational protocols;<br>• Revisit mitigation measures; and<br>• Continue control and management. |
| **Surface Water and Groundwater Management** | | | | |
| Surface water flow | • Visually assess the functionality of the surface water drainage systems feeding surface water runoff from rehabilitated areas for blockages, erosion etc.;<br>• Determine whether the rehabilitated mine site is free draining, and that unnecessary impoundment of surface water run-off is prevented;<br>• Conduct a site inspection after the onset of the rainy period, after all closure related measures have been implemented;<br>• Inspect all notable drainage lines on the rehabilitated mine site and establish whether these lines are free draining and have a limited potential for scouring; and<br>• Inspect the catchments of the respective drainage lines for possible unnecessary impoundment of surface water run-off. | • Monthly throughout the operational phase and quarterly for 3 years after post-closure; and<br>• After major rains during major storm events. | • No evidence of significant erosion and scouring;<br>• Free-draining landforms aligned with the site wide surface drainage framework; and<br>• Re-instated pre-mining surface water flow patterns maximising the clean surface water runoff into natural drainage lines. | As required:<br>• Regrade areas as required, ;<br>• In-fill erosion gullies;<br>• and<br>• Re-instate surface drainage, as necessary. |
| Surface water quality | Monitor specific parameters in surface water, continue the operational monitoring programme into the closure phase. | Monthly throughout the operational phase and quarterly for at least a 3-year period post-closure. | To be determined during the operational period and agreed to with the relevant authorities | As required:<br>• Refer to end land use approach and refine measures to be implemented in achieving the desired final land use. |
| Groundwater quality | Monitor specific parameters in groundwater and continue the operational monitoring programme into the closure phase. | Quarterly monitoring during the operational phase and quarterly for at least a 3-year period after post-closure. | To be determined during the operational period and agreed to with the relevant authorities | As required. |

| Component / Aspect | Monitoring | | Performance / success criteria | Corrective action |
|---|---|---|---|---|
| | Methodology | Frequency / duration | | |
| Groundwater quantity | • Sample and monitor groundwater levels in the vicinity of the mine. | Quarterly during the operational phase and quarterly for at least 3 years period post-closure. | Confirmation of modelling predictions. | As required. |
| **Dust Management** | | | | |
| Dust | Continuous $PM_{10}$ and $PM_{2.5}$ monitoring by a designated air quality officer at sensitive receptor locations. | Quarterly for at least a 3-year period after rehabilitation or as deemed necessary. | • To be determined during the operational period and agreed to with the relevant authorities; and<br>• Acceptable threshold levels based on comparisons with the baseline data and appropriate guideline values. | As required:<br>• Undertake an investigation as to the source of the dust; and<br>• Devise measures to reduce dust to acceptable levels. |
| **General** | | | | |
| Audit Reports | • Auditing against the conditions outlined within the approved ESIA / ESMP or CP at time of mine closure; and<br>• To determine compliance to ESMP or CP conditions. | Conducted annually and must be audited by the Environmental Officer or an independent auditor. | Annual performance assessment. | As required:<br>• Environmental Officer / Independent Third Party and updated annually. |
| General site status | Conduct a visual assessment with respect to compliance of the afore-mentioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site. | Once-off following implementation of rehabilitation measures. | Waste / rubble free sites. | As required. |

# 19. Preliminary Site Closure Criteria

Site closure criteria need to be set, measured, and met for all parties to understand what needs to be completed.

This provides all parties involved in the process a target that needs to be achieved and sets the standards that closure, and rehabilitation are measured against. Table 19-1 provides the preliminary site closure criteria outlined for the mine. These criteria will need to be revised and updated as the site body of knowledge is improved during the operations (through ongoing monitoring and further specialist investigations).

**Table 19-1: Site Closure Criteria**

| Environmental Aspect | Closure criteria | Monitoring Requirement | Reporting Requirement |
|---|---|---|---|
| Groundwater | Groundwater qualities after mine closure need to comply with the qualities agreed to with the relevant authorities.<br>Geohydrological, geochemical and water balance modelling must be confirmed against predictions. | Quarterly groundwater monitoring for 3 years after mine closure; and<br>Updated modelling to confirm actuals against predicted closure scenarios. | Groundwater Monitoring Reports.<br>Specialist Modelling Reports. |
| Surface water | Surface water qualities after mine closure need to comply with the qualities agreed to with the relevant authorities. | Quarterly surface water monitoring for 3 years after mine closure. | Surface Water Monitoring Reports. |
| Social | Engagement with stakeholders and employees regarding closure related aspect and formulisation of a retrenchment and downscaling policy. Demonstrating training initiatives and skills development assisting in employees being up skilled, which would help individuals to seek alternative employment at the time of closure. | Engagement, training, and skills development policies during operational phase. | Records of correspondence, training matrices and records of training. |
| Air quality | Dust, $PM_{10}$ and $PM_{2.5}$ must comply with the minimum standards and limits agreed to with the relevant authorities. | Monthly air quality monitoring during the decommissioning and rehabilitation phase. | Air Quality Monitoring Reports. |

| Environmental Aspect | Closure criteria | Monitoring Requirement | Reporting Requirement |
|---|---|---|---|
| Soil, land capability and land use | Post land use mining assessment to determine status of rehabilitated areas with respect to areas rehabilitated to an agreed upon land use; and<br>Comparisons of the as-built landforms against the landform design elevations. | Land capability assessments;<br>Daily soil erosion monitoring during the rehabilitation phase; and<br>Setting out elevations during rehabilitation phase and monthly survey reports on landform construction to design elevations. | Land Capability Reports, Survey Reports and Erosion Monitoring Reports. |
| Safety | Ensure dangerous mining areas, such as open pit areas, have been appropriately bunded / protected and suitable signage erected. | Visual inspections and sign off report by a registered engineer. | Signed off report by a registered engineer. |

# 20. Organisational Capacity

The Project is currently in the advanced planning phase. The organisational structure should be set in place as soon as possible to ensure that closure is considered throughout the life cycle of the operation.

## 20.1. Organisational Structure

The following closure organisational considerations have emerged as good practice and is suggested for consideration by the Project. Once the relevant persons have been selected then the training and capacity building needed for closure can be determined.

The establishment of a closure committee, which has emerged as international best standard, is key to ensure that closure planning is conducted in terms of the relevant legal requirements and company policies. Although closure planning forms part of the environmental management function, the establishment of a multi-disciplinary committee can help ensure that closure planning is an integrated activity which is incorporated into mine planning. Figure 20-1 below shows typical key roles that may be identified for a closure committee as defined by ICMM (2019).

The role of the closure champion in a committee is critical, as the champion will be responsible for consulting with other key leaders within the organisation. The community liaison and development officer engage with the relevant stakeholders, which can be actioned through a stakeholder forum. Human resources consider the transition into closure and develops plans to minimise job losses. The technical specialists focus on addressing the knowledge gaps and guides rehabilitation implementation. The finance officer ensures that sufficient funds are available for closure.

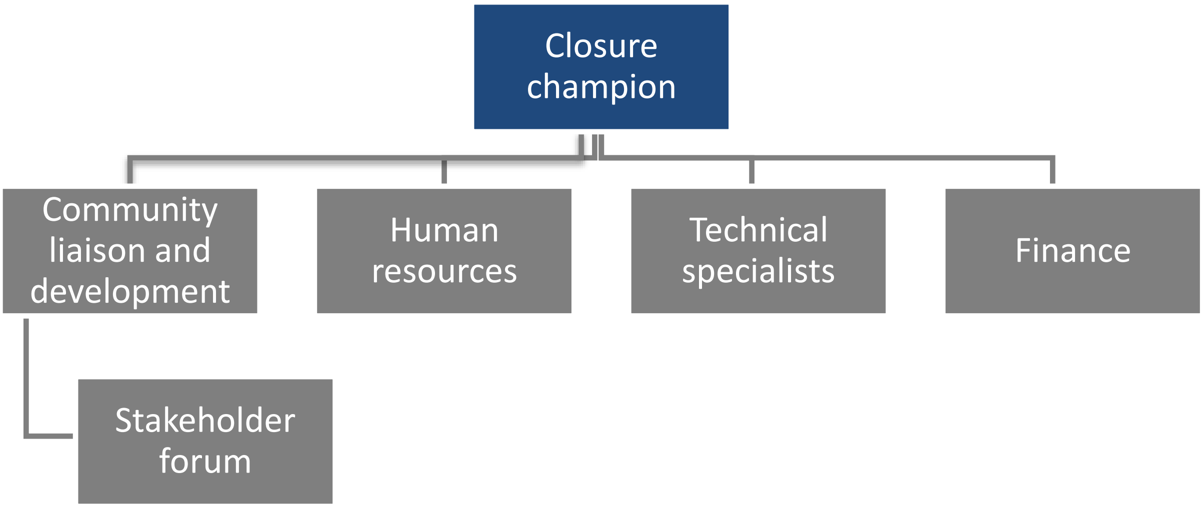


**Figure 20-1: Typical Closure Committee Roles**

# 21. Conclusion

Closure and rehabilitation are a continuous series of iterative activities that should begin with planning prior to the Project's design and construction; and end with achievement of long-term closure and rehabilitation objectives.

Not only will the implementation of this concept result in a more satisfactory environmental outcome, but it will also reduce the financial burden at closure. This CP provides an initial foundation for developing detailed rehabilitation measures to close the operation safely and aligned with the closure objectives.

Figure 21-1 illustrates that there are feedback loops between each element resulting in the iterative closure planning process as the knowledge base is expanded.

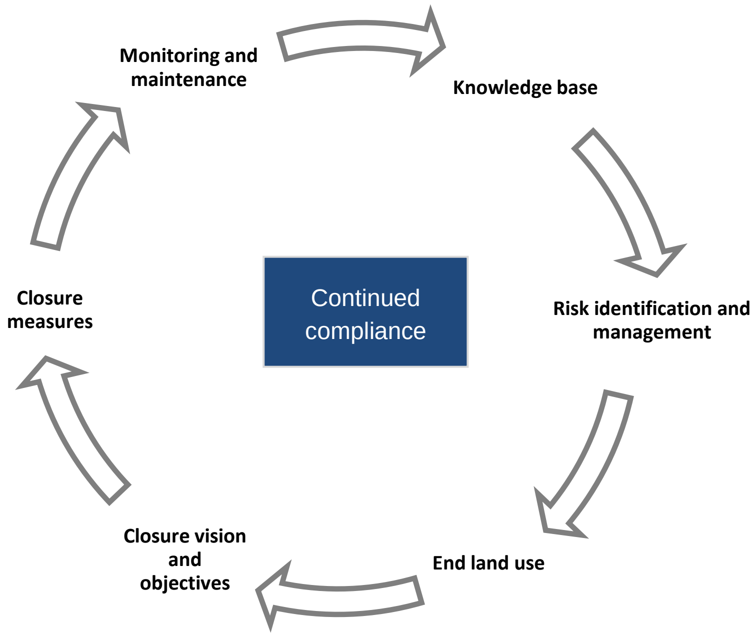


**Figure 21-1: Iterative Process of Mine Closure Planning Elements (Anchor,2023)**

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# Appendix A: Closure Risk Assessment

## Closure Risk Assessment

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| **ENVIRONMENTAL RISKS RELATED TO MINE CLOSURE** | | | | | | | | | | |
| **Mine Infrastructure** | | | | | | | | | | |
| Demolition of infrastructure | Possible human access to remnant infrastructure. | Open access to or collapse of remnant infrastructure which could lead to human injury or fatality. | Health & safety | 3 | 5 | 22 (H) | Demolish and remove all remnant infrastructure from site during the decommissioning phase.<br>Identify infrastructure that could remain post closure and conclude formal agreements with next users. | 1 | 1 | 1 (L) |
| Waste management | Unplanned or haphazard disposal of building rubble from infrastructure demolition | Devalued end land use and potential safety hazard | Environment | 3 | 4 | 18 (S) | Investigate appropriate on-site disposal aligned with relevant legislation and agreed to with the authorities.<br>Dispose of building rubble in the closet pit (Western Porphyries Ultimate Pit).<br>Identify materials that could be reused post closure. | 1 | 2 | 3 (L) |
| Infrastructure handed to next land user | No formal hand-over agreements in place or capacity building and training for next users | Derelict and unsafe infrastructure | Reputation | 3 | 4 | 18 (S) | Ensure formal agreements are in place with next land users for any infrastructure that will remain after closure.<br>Demolish and remove all infrastructure where such agreements have not been concluded.<br>Ensure hand-over procedures are developed and that training or capacity building is provided as required. | 1 | 2 | 3 (L) |
| Rehabilitation of remaining footprint areas | Material balance | Insufficient gravel / mine waste (waste rock) for rehabilitation on remaining footprint areas | Environment | 1 | 2 | 3 (L) | Low risk due to the extent of the planned pits.<br>Develop and maintain a LoM materials balance to ensure that rehabilitation planning and costing is informed by actual volumes of available material.<br>Develop and implement rehabilitation methodologies during the operational period and refine to ensure that the closure measures provide known outcomes. | 1 | 1 | 1 (L) |
| **Water Management Facilities (Dams, Drying beds, Water Treatment Plants etc.)** | | | | | | | | | | |
| Water management impoundments remaining post closure | Possible human and animal access | Open access could lead to injury or fatality (entrapment when dry or drowning when full) | Health & safety | 3 | 5 | 22 (H) | Decommission, demolish and remove all surface water impoundments (not handed over to a new owner).<br>Shape side slopes and basin to create a free draining landform aligned with the site wide surface water drainage framework.<br>If infrastructure is identified for post closure use:<br>- Ensure formal agreements are in place with next land users for any infrastructure that will remain after closure.<br>- Retain all the safety measures for each facility<br>- Ensure hand-over procedures are developed and that training or capacity building is provided as required. | 1 | 1 | 1 (L) |
| **Mining Areas Physical aspects (Open Pits, WRDs, TSFs, stockpiles etc.)** | | | | | | | | | | |
| Opencast Workings | Possible flooding and decant | Pit edge stability and increased erosion | Environment | 1 | 1 | 1 (L) | Low risk - dedicated groundwater modelling indicates that the full recovery of the groundwater draw down during operations is not expected.<br>No receptors are identified within the radius of influence.<br>Implement the following recommendations based on the. | 1 | 1 | 1 (L) |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| Opencast Workings | Possible human and animal access | Open access could lead to injury or fatality | Health & safety | 2 | 5 | 19 (S) | Design and construct permanent access control berms during the operational period around the pit perimeter and beyond the expected breakback zone.<br>Design and construct storm water measures based on dedicated storm water modelling to reroute surface water runoff on the outside of the berm aligned with the site wide drainage framework.<br>Construct final portions of the barrier and associated storm water management measures at closure for the remaining open access areas (haul road access to main ramp).<br>The design should be fit for purpose, consider the long term closure requirements and maximise the use of available mine waste rock. | 2 | 3 | 9 (M) |
| Opencast Workings | Pit remains as feature in the landscape | Pit edge stability | Health & safety | 1 | 5 | 15 (S) | Design and construct permanent access control berms during the operational period around the pit perimeter and beyond the expected breakback zone (to be determined).<br>Monitor the pit stability during operations and confirm permanent location of the berm.<br>Design and construct storm water measures based on dedicated storm water modelling to reroute surface water runoff on the outside of the berm aligned with the site wide drainage framework.<br>Construct final portions of the berm and associated storm water management measures at closure for the remaining open access areas (haul road access to main ramp).<br>The design should be fit for purpose, consider the long term closure requirements and maximise the use of available mine waste rock. | 2 | 3 | 9 (M) |
| Waste Rock Dumps | Continued above ground storage of waste rock | Landform stability | Environment | 2 | 3 | 9 (M) | Recommended mitigation measures:<br>- WRDs will be constructed in their final configuiration requiring no additional shaping/cladding at closure.<br>- Test final design configurations through iterative landform stability and erosion modelling to highlight potential areas of risk and design appropriate mitigations if required (typically upper benches and crest).<br>- Develop and implement rehabilitation methodologies during the operational period and refine to ensure that the closure measures provide known outcomes. | 2 | 2 | 5 (L) |
| CTSF and RTSF | Continued above ground storage of tailings material | Landform stability | Environment | 2 | 3 | 9 (M) | Construct the TSF cells and operate aligned with design criteria, Barrick Tailings management Standards and subscribed International Guidelines (GISTM).<br>Recommended mitigation measures (KP, 2024):<br>Cleaner TSF cell CF3:<br>- Load, haul and place a final cladding layer of gravel/waste rock across the cleaner cells, reprofiled towards the closure spillway;<br>- Grade the downstream batters to 3H:1V and cover with gravel; and<br>- Construct the rock lined closure spillway to allow for surface water discharge down the final embankment slope. rougher cells.<br>Rougher TSF cell RF2:<br>- Construct the contour causeways (500 m spacing) and swales across the final tailings surface;<br>- Grade the downstream batters to 3H:1V and cover with gravel; and<br>- Construct the rock lined discharge channel cut into natural ground to discharge surface runoff to the south. | 2 | 2 | 5 (L) |
| **Biodiversity (over rehabilitated areas and within in MRA in the post-closure period)** | | | | | | | | | | |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| Fauna and Flora | Cessation of active mining, decommissioning, and removal of infrastructure. | Habitat disruption and wildlife encounters. Surface disturbances and habitat loss. | Environment | 2 | 2 | 5 (L) | Implement concurrent rehabilitation on areas as they become available (areas where redundant infrastructure may be demolished and removed during operations) to allow fauna to adapt gradually to the changing environment.<br>Continue construction and operational phase management/monitoring protocols for the closure phase to assess the presence of any protected or rare species and consider salvaging and relocating them to suitable habitats (if any).<br>Proposed rehabilitation measures for disturbed areas:<br>- Compile a site wide closure storm water management plan.<br>- Level and shape the footprint to be free draining and aligned with the site wide surface water drainage framework.<br>- Clad areas requiring additional protection against erosion with gravel/waste rock.<br>- Implement monitoring and maintenance of rehabilitated areas to ensure the end land use objectives are achieved. | 2 | 2 | 5 (L) |
| | Rehabilitation activities, such as levelling and shaping disturbed areas and areas where infrastructure is removed, rock cladding WRDs and the TSFs and construction of safety bunds around pit areas. | Disruption of wildlife movement. | Environment | 2 | 2 | 5 (L) | Implement concurrent rehabilitation on areas as they become available (TSF embankment, TSF cells) to allow fauna to adapt gradually to the changing environment.<br>Continue construction and operational phase management/monitoring protocols for the closure phase to assess the presence of any protected or rare species and consider salvaging and relocating them to suitable habitats (if any).<br>Proposed rehabilitation measures for disturbed areas and areas where infrastructure is removed:<br>- Compile a site wide closure storm water management plan.<br>- Level and shape the footprint to be freedraining and aligned with the site wide surface water drainage framework.<br>- Clad areas requiring additional protection against erosion with gravel/waste rock.<br>- Implement monitoring and maintenance of rehabilitated areas to ensure the end land use objectives are achieved.<br>Proposed Measures for the TSFs:<br>-<br>- Design and implement trials during the operations phase and with appropriate monitoring to ensure that closure measures provide known outcomes.<br>Proposed measures for the WRDs:<br>- WRDs will be constructed in their final configuiration requiring no additional shaping/cladding at closure<br>- Test final design configurations through iterative landform stability and erosion modelling to highlight potential areas of risk and design appropriate mitigations if required (typically upper benches and crest).<br>- Develop and implement rehabilitation methodologies during the operational period and refine to ensure that the closure measures provide known outcomes.<br>Proposed measures for the Pits:<br>Design and construct permanent access control berms during the operational period around the pit perimeter and beyond the expected breakback zone (to be determined).<br>Monitor the pit stability during operations and confirm permanent location of the berm.<br>Design and construct storm water measures based on dedicated storm water modelling to reroute surface water runoff on the outside of the berm aligned with the site wide drainage framework.<br>Construct final portions of the berm and associated storm water management measures at closure for the remaining open access | 2 | 2 | 5 (L) |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | areas (haul road access to main ramp).<br>The design should be fit for purpose, consider the long term closure requirements and maximise the use of available mine waste rock. | | | |
| Air Quality | Infrastructure demolition | Dust Generation & increased particulate matter in the atmosphere | Environment | 3 | 2 | 8 (M) | Continue operational management protocols into the decommissioning and closure phase as required.<br>Implement concurrent rehabilitation on areas as they become available (TSF embankment, TSF cells etc,.).<br>Continue the operational air quality monitoring into the closure phase to enable identification of impacts, and implementation of corrective actions as required. | 2 | 1 | 2 (L) |
| Air Quality | Rehabilitation activities, such as levelling and shaping disturbed areas and areas where infrastructure is removed, rock cladding WRDs and the TSFs and construction of safety bunds around pit areas. | Dust Generation & increased particulate matter in the atmosphere | Environment | 3 | 2 | 8 (M) | | 2 | 1 | 2 (L) |
| **Existing catchments and drainage** | | | | | | | | | | |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| Drainage framework | Cessation of active mining;<br>Decommissioning and removal of infrastructure;<br>Rehabilitation activities;<br>Mine closure and post-closure monitoring. | Sedimentation and increased sediment loads into catchment;<br>Degradation of water courses;<br>Increased erosion;<br>Potential spillage of hydrocarbons such as oils, fuels and grease, thus contamination of surface water runoff; and<br>Increased AIPs due to soil disturbance;<br>Vehicle movement leading to soil compaction and increased runoff, the onset of erosion and sedimentation of water courses | Environment | 4 | 3 | 17 (S) | Continue operational management protocols into the decommissioning and closure phase as required.<br>Manage and maintain clean and dirty water systems throughout the operational and decommissioning phases until all rehabilitation activities are complete.<br>Shape and level areas aligned with the site wide closure storm water management plan and provide additional protection through rock cladding for identified areas of higher risk.<br>Ensure operational stormwater management measures are kept in place until all infrastructure is removed. Where infrastructure will remain, stormwater and culverts should be maintained and monitored;<br>Actively shape and level disturbed areas as soon as possible, the reprofiled landscape should allow free drainage close to the pre-mining conditions;<br>No material should be dumped/stockpiled within any watercourses (even if dry). | 2 | 2 | 5 (L) |
| **Land use and land capability** | | | | | | | | | | |
| Land capability | exposed soils and surfaces | soil erosion and sedimentation | Environment | 3 | 3 | 13 (S) | Continue operational management protocols into the decommissioning and closure phase as required.<br>Manage and maintain clean and dirty water systems throughout the operational and decommissioning phases until all rehabilitation activities are complete.<br>Shape and level areas aligned with the site wide closure storm water management plan and provide additional protection through rock cladding for identified areas of higher risk.<br>Ensure operational stormwater management measures are kept in place until all infrastructure is removed. Where infrastructure will remain, stormwater and culverts should be maintained and monitored;<br>Actively shape and level disturbed areas as soon as possible, the reprofiled landscape should allow free drainage close to the pre-mining conditions;<br>No material should be dumped/stockpiled within any watercourses (even if dry). | 2 | 2 | 5 (L) |
| | Soil contamination and deterioration | decreased land capability | Environment | 3 | 3 | 13 (S) | | 2 | 2 | 5 (L) |
| | soil disturbances | Increased AIPs | Environment | 2 | 3 | 9 (M) | Implement concurrent rehabilitation as soon as possible once areas become available.<br>Implement and maintain an AIPs Management Plan for the duration of the rehabilitation phase and into closure. | 2 | 2 | 5 (L) |
| Land use | Possibility of not implementing the final Land Use Plan | End Land Use not achieved. | Environment | 2 | 5 | 19 (S) | Update the site wide CP regularly as the site body of knowledge is improved to ensure a coherent approach and to guide all activities aligned with the closure objectives.<br>Develop an End Land Use Plan as an integral part of the Closure Plan.<br>Design and implement trials during the operations phase and with appropriate monitoring to ensure that closure measures provide known outcomes.<br>Develop a site wide closure Storm Water Managment Plan and design additional managment measures informed by dedicated hydrological modelling.<br>Implement concurrent rehabilitation as soon as areas become available.<br>Engage stakeholders throughout the life of the operation to ensure alignment of expectations regarding the end land use and | 1 | 2 | 3 (L) |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | mine closure;<br>Develop and implement a land management policy and appropriate standards for unmined land under the mines care. | | | |
| **Surface and Groundwater** | | | | | | | | | | |
| Surface water | Poor water management | Possible surface water contamination | Environment | 2 | 3 | 9 (M) | Continue surface water quality monitoring programmes throughout the operational period into the post closure phase to ensure determinants are within specified limits (three years).<br>Develop a closure Storm Water Management Plan.<br>Additional storm water management measures may be required and should be based on dedicated storm water modelling for the post closure landform.<br>Limit the development footprint as far as possible.<br>Manage clean and dirty water separation throughout the operational and decommissioning phases to limit impacts on surrounding surface water bodies. | 1 | 2 | 3 (L) |
| Groundwater | Poor water management | Contamination of groundwater resources | Environment | 2 | 3 | 9 (M) | Groundwater quality and level monitoring should continue for three years post closure.<br>Continuously monitor groundwater quality for possible contaminated seepage from the TSFs and WRDs during the operational phase and closure phase.<br>Update the geohydrological and numerical model with actual monitoring results, to replace initial assumptions and improve the accuracy over time. | 1 | 2 | 3 (L) |
| Groundwater | Cessation of pit dewatering | Permanently reduced groundwater levels | Environment | 5 | 2 | 16 (S) | No mitigation measures required as no receptors are identified within the radius of influence.<br>Implement the following recommendations based on the Groundwater Modelling report for the Northern Water Supply Area:<br>- Continue monitoring of the groundwater system. | 5 | 2 | 16 (S) |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater | Leachate from the TSF complex | Reduced surface and groundwater qualities | Environment | 4 | 1 | 7 (M) | Rated as a Medium to low risk due to the following site specific conditions:<br>No receptors are identified within the radius of influence.<br>there is little potential for environmental impacts to groundwater at Reko Diq due to the extremely low infiltration rates predicted from hydrogeological modelling, the depth of groundwater across the site and the highly mineralized, saline nature of groundwater (SRK, HBP, 2010).<br>Baseline groundwater at Tanjeel contains high trace metals and is acidic due to in-situ oxidation of sulphides by contacted groundwater.<br>Very low rainfall and high evapotranspiration.<br>Mitigations<br>A liner will be constructed for the Cleaner Tailings Facility due to the higher risk of acid generation and leaching of metals. | 4 | 1 | 7 (M) |
| Groundwater | Seepage from the WRDs | Reduced surface and groundwater qualities | Environment | 4 | 1 | 7 (M) | Rated as a Medium to low risk due to the following site specific conditions:<br>No receptors are identified within the radius of influence.<br>there is little potential for environmental impacts to groundwater at Reko Diq due to the extremely low infiltration rates predicted from hydrogeological modelling, the depth of groundwater across the site and the highly mineralized, saline nature of groundwater (SRK, HBP, 2010).<br>Baseline groundwater at Tanjeel contains high trace metals and is acidic due to in-situ oxidation of sulphides by contacted groundwater.<br>Very low rainfall and high evapotranspiration.<br>Mitigations<br>Implement the following recommendations based on the Groundwater Modelling report:<br>- Continue monitoring of the groundwater system. | 4 | 1 | 7 (M) |
| **Financial and Regulatory** | | | | | | | | | | |
| Closure Provision | Insufficient funds to implement CP | Increased financial liability to address unforeseen costs at closure | Cost | 3 | 3 | 13 (S) | Update the site wide CP regularly as the site body of knowledge is improved to ensure a coherent approach and to guide all activities aligned with the closure objectives.<br>Review and update the closure costs annually and with improved accuracy until the last 5 years of mining, at which point an execution level estimate is required.<br>Continually address the identified gaps to improve the site body of knowledge and reduce uncertainties running into closure.<br>Implement concurrent rehabilitation where possible to incrementally address the closure objectives and reduce the financial burden over time. | 1 | 1 | 1 (L) |
| Authorised closure | Failure to achieve authorized closure | Uncertainty regarding closure regulatory requirements and misalignment with authorities | Legal & regulatory | 3 | 4 | 18 (S) | Update the site wide CP regularly as the site body of knowledge is improved to ensure a coherent approach and to guide all activities aligned with the closure objectives.<br>Develop an End Land Use Plan as an integral part of the Closure Plan.<br>Continually engage with stakeholders and authorities to align expectations. | 2 | 2 | 5 (L) |

| Aspect | Risk Driver | Consequence (unwanted event) | Risk Type | Probability | Consequence | Risk Ranking (pre-mitigation) | Mitigation measure(s) | Probability | Consequence | Risk Ranking (post-mitigation) |
|---|---|---|---|---|---|---|---|---|---|---|
| **SOCIAL RISKS RELATED TO MINE CLOSURE** | | | | | | | | | | |
| **Internal** | | | | | | | | | | |
| Employees | The cessation of the operations causing the laying off of workers. | Loss of employment opportunities and income source | Social | 4 | 3 | 17 (S) | Develop and implemented a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use, specifically for local mine employees.<br>Conduct regular stakeholder consultations between Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions.<br>Continue implementing the development projects as per the Community Development Plan.<br>Provide local employees with confirmation of employment documents for work undertaken and certificates of completion for in-house training.<br>Maintain Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan. | 2 | 2 | 5 (L) |
| **External (social closure engagement and considerations)** | | | | | | | | | | |
| Interested and affected parties | Failure to address social closure | Misalignment and general unhappiness | Social | 4 | 3 | 17 (S) | Develop and implemented a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use.<br>Conduct regular stakeholder consultations between Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions.<br>Continue implementing the development projects as per the Community Development Plan.<br>Provide local employees with confirmation of employment documents for work undertaken and certificates of completion for in-house training.<br>Maintain Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan. | 2 | 2 | 5 (L) |
| Local economy | Closure of mining operation taking away the source of income for the local economy | Loss of business opportunities. | Social | 4 | 3 | 17 (S) | Develop and implemented a Social Closure Plan 5 years prior to closure to proactively manage the transition from active mining to the planned end land use.<br>Conduct regular stakeholder consultations between Project stakeholders, including local communities and businesses to identify potential challenges and develop associated solutions.<br>Continue implementing the development projects as per the Community Development Plan.<br>Maintain Implement a structured stakeholder engagement process and grievance mechanism, as well as direct communication channels to surrounding communities and ensure it aligns with the Social Closure Plan. | 2 | 2 | 5 (L) |
| **RESIDUAL RISKS AND LATENT RISKS RELATING TO MINE CLOSURE (These risks manifest after site relinquishment)** | | | | | | | | | | |
| **Latent Risks** | | | | | | | | | | |
| Climate | Climate change | Increased temperatures, rainfall intensity, drought, epidemic diseases | Environment | 3 | 4 | 18 (S) | Regularly update CP and CCA to ensure risks are adequately understood and addressed.<br>Continually address the identified gaps to improve the site body of knowledge and reduce uncertainties running into closure.<br>Develop a site wide closure storm water management plan. Additional storm water management measures should be based on dedicated hydrological modelling and consider sensitivities to increased rainfall intensity.<br>Periodically review the rehabilitation methodology based on climate forecasts, monitoring results and rehabilitation success. | 2 | 2 | 5 (L) |