
Updated Environmental Management Plan for Mining Operations for Base and Rare Metals on Mining Claims 71081, 71082, 71083, 71436, 71437, 71438, and 71439 on farm Mesopotamia No. 54, Khorixas District, Kunene Region



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Project Information

Project Title	Review and Updating of the Environmental Management Plan for Mining Operations for Base and Rare Metals on Mining Claims 71081, 71082, 71083, 71436, 71437, 71438, and 71439 on farm Mesopotamia No. 54, Khorixas District, Kunene Region
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Executive Summary

Mr. Gerhardt Kariseb of Kariseb and Sons (Pty) Ltd have constructed and operate a base and rare metals mine on mining claims 71439, 71438, 71437, 71436, 71083, 71082, 71081 within farm Mesopotamia No. 54. In 2020, the proponent commissioned an environmental impact assessment (EIA) towards development of an environmental management plan (EMP), in compliance with national legislation as a listed activity. Subsequent to the submission of an application along with the developed EMP to the office of the Environmental Commissioner (EC) in the Ministry of Environment, Tourism and Forestry (MEFT), an environmental clearance certificate (ECC) was issued for the period from 2021 and coming to expiry on the 29 January 2024.

Bearing the eventual expiry of the ECC, and need to continually remain in compliance to legislative requirements, the proponent appointed Namib Consulting to undertake the review of the EMP under the expiring ECC and further consider future plans for operations of the mine, towards renewal of the ECC.

Therefore, to fulfil the commissioned assignment, it was undertaken a review of current operational practices to determine implementation status of the 2021 approved EMP. The review results indicate that a significant portion of the recommended mitigations measures are not in alignment with operations onsite and are inapt to implement. Moreover, a further half of the measures are relevant to addressing the identified impacts, although these are ambiguously crafted to implement. However, there are a reasonable number of recommended measure that are adequate for implementation and these are being implemented onsite. This state is attributable to the uncertainty of the design and potential investment in the early stages of the proposed development. However, these have become clear providing basis for review and re-alignment. Subsequently, the plans advance beyond the initially described towards inclusion of some processing of low grade ore through the copper flotation process onsite to reach certain concentration level before readiness for export for further refinement. Subsequently, the impacts expand beyond towards consideration of production of tailings material from the processing and thus need for proper management to avert adverse impacts.

Premised on the review outcomes, it was carried forth to redefine the approach to management of the risks associated with the operations onsite, although still incorporating those risks relevant from the previous EMP. Subsequently, an updated EMP that refocuses and advances practical measures taking into consideration the nature of the landscape and the level of operations being carried out, and the immediate future plans being advanced going forward to the end of life of the resource. The review thus considers and devises mitigations measures that incorporate modern standard practice in environmental management and more so in the mining environment. These measures include addressing impacts from waste generation, lessen the wastage and depletion of natural resources, pollution prevention to natural resources such as soils and water, protection of the people from adverse operational impacts, these among the key controls incorporated in the implementation plan.

The implementation of the recommended measures can minimise, prevent and offset adverse impacts to acceptable levels and thus a pre-requisite. Cognizant of this, the Environmental Practitioner is confident of the ability of these measures to safeguard both environment and social receptors while also maintaining economic benefits derivable. It should be noted that communities in the town of Khorixas and Namibia at large have found an opportunity to support their livelihoods from the ongoing activities and such supports the broader national goals of social development.

Bearing all information consolidated in this updated EMP report, it is recommended to the Environmental Commissioner to consider the renewal and issuance of the ECC to the proponent on conditions of implementation of this updated EMP to the fullest.

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Abbreviations

EC	Environmental Commissioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism

1. Introduction

1.1 Background

Mr. Gerhart Kariseb of Kariseb and Sons Pty Ltd. as the 'Proponent', began operating a base and rare metals mine on mining claims 71439, 71438, 71437, 71436, 71083, 71082, 71081 on farm Mesopotamia No. 54, in the Khorixas district of the Kunene region. An environmental impact assessment (EIA) was undertaken in 2020 covering the project development phases of construction, operation and decommissioning. Subsequently, an environmental management plan (EMP) was developed, that addresses the potential impacts in the various project development phases and was submitted to the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT), for consideration and decision. The project obtained an ECC (Annexure 3) in compliance to the Environmental Management Act (No.7 of 2007) and EIA Regulations (GN. 30 of 2012), for the validity duration from 29 January 2021 to the 29 January 2024. Consequently, the validity of the issued ECC approaches expiry and thus a requirement for compliance with prescribed renewal process.

Premised on above background, Namib Consulting Services CC was appointed by the Proponent to carry out services related to the review and update of the EMP towards an application for renewal of the ECC and remain in compliance to legislative requirements.

1.2 Objective and Scope

The objective of the commissioned assignment is to review the environmental management plan for base and rare metals mining operations on mining claims on farm Mesopotamia No. 54.

The scope of the task involves;

- i. Review the implementation of the measure contained in the initial EMP
- ii. Review feasibility of operation measures and consolidate all mitigations measures into an updated EMP.
- iii. Submit application to the MEFT for renewal of ECC based on the updated EMP.

2. Status of EMP Implementation

2.1 Location of Mine Operations

Farm Mesopotamia No. 54 is located in the Khorixas district in the Kunene region. The farm is remotely located some approximately 100km northwest of the town of Khorixas, accessible through gravel road C39 and into D2633 in the Huab Conservancy (See Figure 2:1).

The farm is not habituated although there are small dwellings mainly for herders of livestock that may be found prior to reaching the mine site, such as at Mesopotamia village, located some 2 kilometres from the mine.

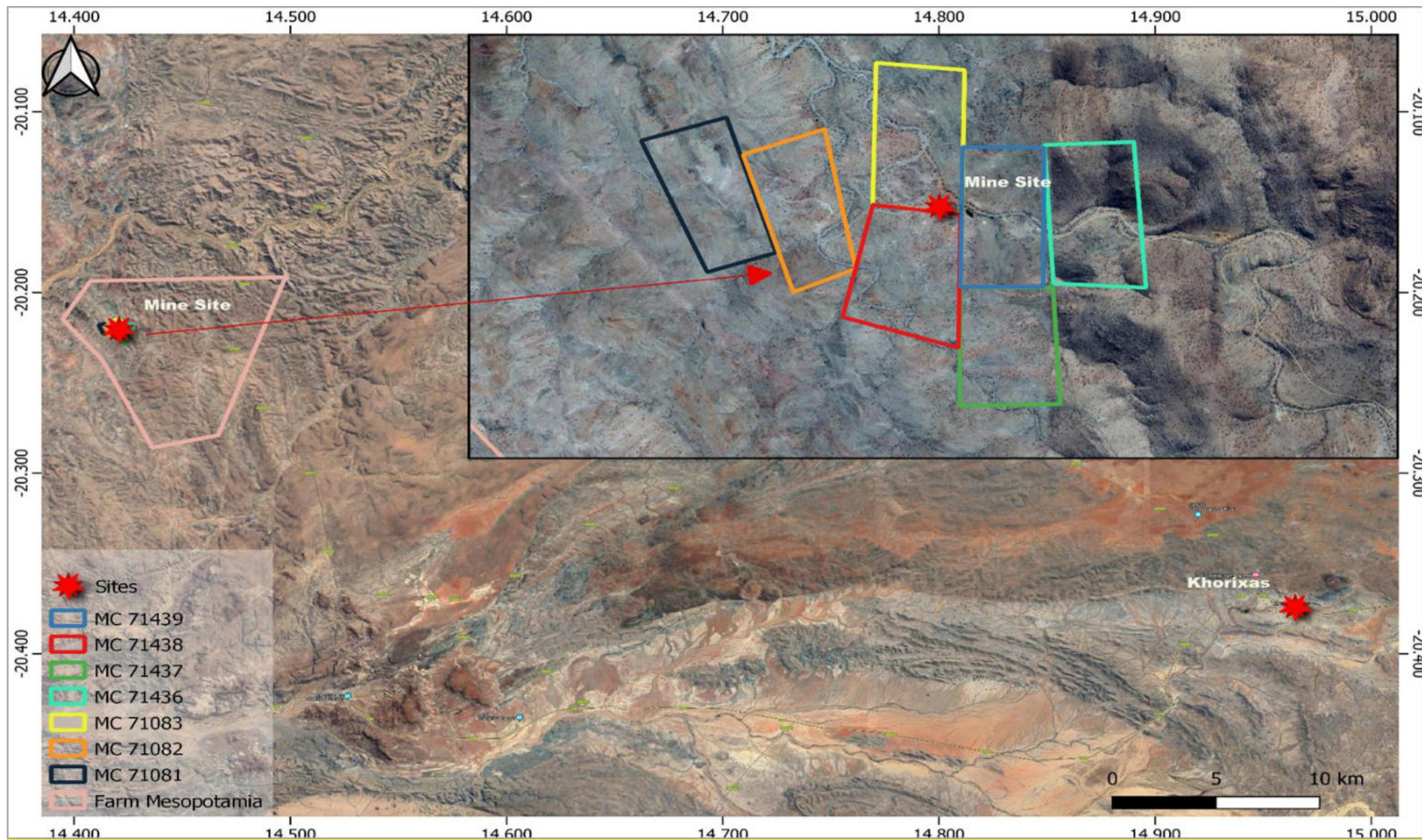


Figure 2:1 Location of mining operations

2.2 Description of Operations

Premised on the uncertainties of the project in the preconstruction phase, relating to the planning and investment in the project, the initial EIA report provides generic process description of the then envisaged copper mining process. Subsequently, these are described as follows in that report;

Mining commodity

Although the operations envisaged to extract base and rare metals, the main target commodity is the copper, however other associated minerals such as lead-zinc, cobalt-nickel remained in sight where feasible to pursue.

Mining and processing of ore

The production of pure copper cathode follows a sequence of step that involves mining and concentration of low grade ores containing copper sulphides minerals and followed by smelting and electrolytic refining. However, the application of acid leaching techniques to oxidised ores remains among existing technology in processing. The sequence to this process therefore includes the following activities;

- Open cast mining design - commonly applied through benching through drilling and boring into the hard rock and to insert and set explosives for the blasting process of the overburden rock. The pit opens outwards as such continues.
- Resultant boulders from the blasting are hauled to the processing plant for further resizing.

Ore processing

The processing of boulders delivered at the plant involves, primary crushing to reduce the size of the ore. The processing of the size reduced ore rocks was envisaged to evade the chemical leaching processing steps onsite and merely transport of size reduced ore rock for further processing to China. This was further envisaged as it considered the aid nature of eh environment and thus the limitation of water availability.

2.3 Review of EMP

Premised on the above operational approach conceived in the preconstruction phase, the following impacts were evaluated as significant in the earlier EMP in Table 2:1;

Table 2:1 Review of earlier EMP implementation Plan

Process	Aspect	Mitigations
Ore mining and limited processing	Surface and groundwater	<ul style="list-style-type: none"> ○ Ensure surface water accumulating onsite are channelled and captured through a proper storm drainage trench ○ Disposal of waste at the mining claim sites should be regulated and properly managed. ○ Regular preventative maintenance be carried out on the quarry infrastructure. Earth embankment to prevent erosion will be established where appropriate ○ Mining takes place outside the rainy season in order to limit flooding onsite and surface water pollution ○ Storm water management plans be developed for each quarry/claim site and to include management of storm water during excavation as well as installation of storm water and erosion control infrastructures and management thereof at cessation of mining ○ Storm water management systems will be installed to prevent storm water from entering or exiting the quarry. ○ Quarry slopes be profiled to ensure that they are not subjected to excessive erosion ○ Diversion channels be constructed ahead of the open cuts and stockpiles to intercept clean runoff and divert it around the mine site into natural drainage system downstream of the site ○ Existing vegetation be retained as far as possible to minimize erosion problems. ○ Rehabilitation of quarries be planned and completed on a continuous basis in such a way that runoff water will not be cause erosion ○ Visual inspection be done on regular basis on stability of water structures, erosion and siltation.
	Soil aspects	<ul style="list-style-type: none"> ○ Topsoil be removed prior to occurrence of disturbance ○ Topsoil be stored for later placement on mined out areas

	<ul style="list-style-type: none"> ○ Topsoil be stockpiled only in demarcated areas ○ Topsoil be stored in a bund wall on the high ground side of the quarry to minimise damming of waterways or washaway. stockpiles limited to 2m meters. ○ Stockpiles removed shall be managed so as to maintain regrowth potential of the topsoil ○ The overburden be removed and stored separately from topsoil ○ Transport waste to waste rock dump ○ No chemical pollution be allowed to contaminate soils. Removal of any equipment that may cause this from site and repaired. ○ In the event of petrochemical spill take suitable measure to contain the pollution and prevent it from spreading or seepage. Once contained, contaminated material be removed and disposes of at a registered hazardous disposal site.
Visual and sense of place	<ul style="list-style-type: none"> ○ Visual pollutants can be prevented through mitigations (keep trees, trinodce indigenous tall trees) ○ Quarries be levelled once mining activities cease ○ The remains of the structures erected at quarry be demolished and removed on completion of the project ○ Care must be taken to ensure that all rehabilitated areas are similar to the immediate environment ○ Overburden will be placed back into excavations as part of rehabilitation programme.
Noise	<ul style="list-style-type: none"> ○ Continuous monitoring of noise levels should be conducted to make sure the level not doesn't exceed acceptable limits ○ No activity having potential noise impacts be allowed after 18:00hrs if possible ○ In the event that activities continue outside stipulated hours, communicate such occurrence to potentially affected communities in advance
Dust and emissions	<ul style="list-style-type: none"> ○ Vehicles used onsite to only use designated roads ○ The speed of haul trucks and other must be strictly controlled to avoid dangerous conditions, excessive dust
Biodiversity	<ul style="list-style-type: none"> ○ Prevent the destruction of protected species ○ Encourage the re-generation and regrowth of tress with exposed roots in the area ○ Do not clear cut entire mining claim sites but keep few individuals or clumps of trees or shrubs as part of the landscaping and for shading ○ The trees that are to be kept should be clearly marked with danger taps to prevent accidental removal. Regular inspections of the marked trees be carried out ○ Very important tress be camped off to prevent unintended removal or damage ○ Promote planting of indigenous trees as part of landscaping ○ Transplant removed tress where possible or plant new trees in lieu of removed ○ Prevent contractor from collecting wood or veld food ○ Prevent contractor from fishing or catching aquatic species ○ No workers allowed to collect plant or snare, hunt or toe capture any wild animals ○ No domestic animals permitted on the quarry by all means of permit fence and small livestock to graze at designated areas ○ No animals shall be harmed during the course of copper ore mining. Call experts to handle dangerous wildlife.
Access to roads to site	<ul style="list-style-type: none"> ○ Roads shall be ripped or ploughed and if necessary fertilize to ensure regrowth of vegetation. Imported road construction materials that may hinder regrowth to be removed and disposed in an approved manner prior to rehabilitation. ○ If revegetation is unacceptably slow, the soil be analysed and deleterious effects be corrected and area be seeded with a mix or seed to suitable specifications
Culture and Heritage	<ul style="list-style-type: none"> ○ Management to be made aware of the provisions of the national heritage Act reading reporting of archaeological finds, unmarked human remains or other found on site. ○ In the event of finds, mining must stop and give notification to the National heritage council of Namibia
Flooding	<ul style="list-style-type: none"> ○ Mining of mining activities during the rainy season to reduce impacts of flooding
Service infrastructure onsite	<ul style="list-style-type: none"> ○ Alternative renewable energy sources be explored and introduce into employees housing development to reduce dependency on national grid ○ Solar geysers and panels should be considered to provide general lighting and heating ○ Water saving mechanisms be incorporated within the ore extraction infrastructure and plans to reduce demand ○ Reuse of treated waste water should be considered wherever possible in areas such as for dust suppression.

Transportation to the port	Traffic and equipment	<ul style="list-style-type: none"> ○ Limit and control the number of access points to the quarry ○ Ensure that roads junctions have good sightlines ○ Vehicles need to be road worthy conditions and maintained throughout the lifespan of the mine ○ Transport of materials in the least amount of trips as possible ○ Adherence to the speed limit ○ implement traffic controls
	Surface and groundwater	<ul style="list-style-type: none"> ○ No dumping of waste in proximity to surface water bodies ○ Heavy mining vehicles be kept out of any surface water bodies and movement be limited where possible to existing roads and tracks ○ Ensure oil/fuel spillages from vehicles transporting the stones and machinery are minimised as where these occurs, are appropriately dealt with ○ Drip trays must be placed underneath of leaking vehicles ○ Contaminated runoff from the mining claim sites should be prevented from entering the surface and ground water bodies ○ All materials onsite be stored properly ○ Disposal of waste from the sites should be properly managed and taken to designated spaces for each type ○ Workers should be given ablution facilities at the site located at least 30m away from any surface water and to be regularly serviced. ○ Washing of personnel or any equipment not be allowed on the mining claim site, where necessary only in designated areas.
	Health, safety and security	<ul style="list-style-type: none"> ○ Train employees on correct use of PPE ○ Miners are obligated to implement safety measures. ○ Compliance to laid out regulations and working alongside recommendation of the department of health, department of employment and labour and WHO to limit the spread of virus as much as possible. ○ Failure to comply to measure be considered a criminal offence and thus minors charged ○ Miners obligated to implement a code of practice that complies with any relevant regulations issue by government on covid 19 ○ All vehicles operators must have valid licences ○ Personnel not to overnight in the mining claim except security personnel ○ Mining personnel are properly trained depending on the nature of their work ○ Provide for first aid kit and a properly trained person to apply first aid if necessary ○ Wellness program should be initiated to raise awareness on health issues, especially on sexually transmitted diseases ○ Provide free condoms in the workplace and to local community throughout mining lifespan and promote usage ○ Facilitate access to Antiretroviral (ARV) medication ○ Encourage HIV counselling and testing ○ Encourage voluntary medical male circumcision ○ Provide awareness on prevention of mother to child HIV transmission ○ Restrict unauthorised access to the mining claim site and implement access control ○ Clearly demarcate the mining claim site boundaries along with signage of no authorised access. ○ Clearly demarcate dangerous areas and no go areas on site ○ Staff and visitors to must be fully aware of all health and safety measures and emergency procedures ○ Contractor must comply with all applicable occupational health and safety requirements. ○ PPE to be provided where necessary.
	Noise	<ul style="list-style-type: none"> ○ Install silencers on excavation machinery ○ Do not allow the use of horns as general communication except where necessary for safety measure ○ No amplified music onsite ○ Inform immediate residents of the village about dimension mining and continuous communication between residents and contractor ○ Limit mining times to acceptable daylight hours
	Municipal services	<ul style="list-style-type: none"> ○ Pumping of temporary toilets and disposal to at designated eco-friendly waste treatment site. ○ Overburden and waste rock to be disposed at designated spaces. ○ Waste bins to be placed around the quarry site for soft refuse ○ Collection of waste and disposal at designated waste spaces

	Storage and utilization of hazardous substances	Refuel at designated areas with protective surfaces covering and use of drip trays
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2.4 EMP Review Outcomes

The review of the EMP utilised, a colour coding provide basis for grouping the outcomes as provided below.

- **Blue**-feasibly implemented and implementable.
- **Black** – implemented or still applicable to the present mining phase, however need be refined for specificity or clarity.
- **Purple** - infeasible for application to the present mining phase/landscape or ambiguous to implement

Premised on the established basic codes, it is resultant that a substantial number of recommended measures are purple coded-coded and thus infeasible to the mining operation, the landscape of the mine site or ambiguous. Up to a third of the recommended mitigation measures are clear and being implemented (blue), while over a third of the measures are relevant and some implemented but are not absolute clear.

The result of the review indicates that the mining operations at farm Mesopotamia require redefining to clearly establish and anticipate feasible impacts.

3. Present Operational Design

The mining operations at farm Mesopotamia were reviewed as currently implemented and further considering advanced plan onsite and in near future. However, it is worth mentioning that the present operations include those from the initial preconstruction phase outlined in the early EIA study. However, there are advancements towards expansion from the earlier processes outlined in the development of the mine. The following are notables from the operations and plans onsite;

- i. Onsite processing of very low grade ore
- ii. Onsite housing of employees

3.1 Revised Mining Design and Process

The mining design remains open cast approach, however over time access to deeper seated resource may be considered through underground mining. On the other hand, the processing of the extracted resource will be approached twofold; current operational processes and future operational processes.

3.1.1 Current Operational Processes

Mining approach

The Mining approach aligns as described in the initial EIA study in that an open cast mining approach is being implemented. Moreover, this approach remains the feasible and safer method for the proponent at present scale as alternatives will require an advanced mining approach, with use of advanced heavy machinery that are presently unavailable. As presently, the approach evades the single large open cast pit approach that could continually keep expanding outwards, to targeting established core areas or sites for operations. The operations will be concentrated to marked areas of ore body on all the mining claims, evading areas without significant occurrence of the ore.

Ore extraction

In areas of marked ore bodies, the extraction of ore involves drilling and boring to insert explosives for purpose of blasting to expose the ore. Once blasting is completed, limited spraying of water is carried out on the exposed rocks to enable extraction of ore bearing rocks of high grade and low grade (Figure 3:1). The sites are further operated on by personnel with jack hammers to break apart rock still attached boulders apart as necessary. These broken rocks fragments while still considerably bulky are manually differentiated and stockpiled

accordingly to the grade still in these blasted areas, along with separation of waste rock (i.e. fragments without any mineral content).

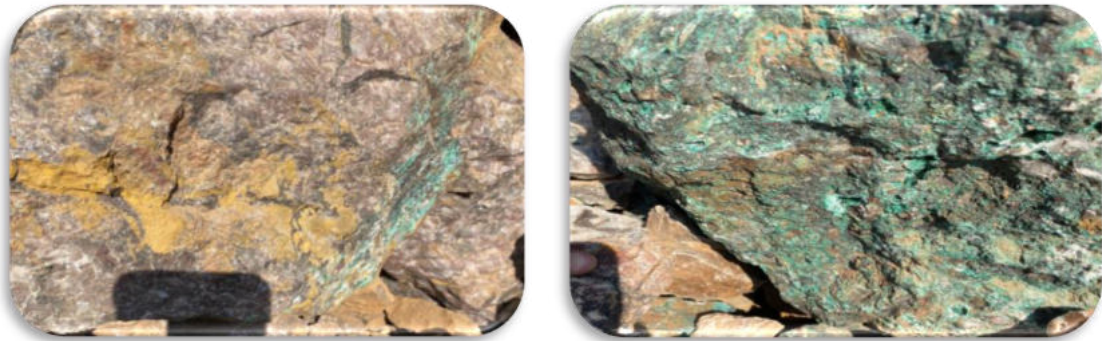


Figure 3:1 Visually differentiated ore rocks on mine site

Haulage to the plant

High grade material in the blasted areas is hauled to the general stockpile area where awaits loading onto trucks for transportation from the mine site. Haulage to the general stockpile area is by use of a front loader.

3.1.2 Expanded Operational Processes

The mine plans on processing low-grade ore onsite are envisaged in the immediate future, as preparations are advanced. The plant infrastructure for this purpose has been erected and will be commissioned once necessary testing and requirements are established. Premised on the structures setup, the following process will be implemented;

Crushing and grinding of the ore rock

Once the low-grade stockpiles in the mine sites are hauled to the plant, the material will be dumped into tipping bins (Figure 3:2). The ore containing rocks will undergo a process of crushing and grinding to achieve the minutest sizes recommended for the latter floatation steps in the process. However, once through the tipping bins, the material will be crushed and carried through a conveyor belt system (Figure 3:2) into the plant for further processing steps. These further steps include grinding to required size through a primary and then secondary milling and classification.



Figure 3:2 Constructed sections of the low-grade ore processing plant by floatation

In future, further resizing will be carried out for high grade although without any processing through the floatation process onsite.

Slurry formation

Water is added into the milling circuit to create a slurry that flows to a flotation circuit where the copper mineral is separated from ore. Reagents also referred as collectors are added to the slurry to connect with copper

minerals, becoming hydrophobic. Air is introduced into the floatation cell allowing the formation of bubbles, which rise to the surface, allowing a froth mineral-rich layer to form. The froth of copper-rich bubbles found at the top of the tank is then further processed. The gangue is systematically removed out of the system and then disposed of as mine tailings (see Annexure X 1 for the floatation process).

Thickening

The froth is transported into large tanks also referred to as thickeners (see Figure 3:3) where the bubbles break and solids from the froth solution settle to the bottom of the tank. Solids are filtered to remove excess water, and the water can be reused in the circuit. The solid copper concentrate is ready for the smelting process. No smelting process is planned onsite. The goal of site processing will be to attain concentrate level required prior readiness for export for further processing steps.



Figure 3:3 Sections of the copper floatation process structures in the plant

Transportation for export

Along with unprocessed high grade resized material, the copper moulded plates will be loaded and transported for export purposes.

3.1.3 Other Onsite Services

Housing for workers

Accommodation is constructed onsite that includes a kitchen facility with a communal dining areas for all labour force onsite (see Annexure 4). Meals are prepared for site personnel onsite. The number of workers onsite sums up to 50 workers and envisaged to increase with the full implementation of the mining plans. The workers are all majority from the town of Khorixas working a 5.5 days a week shift and a four days off in a month.

Further accommodation onsite provides for expert staff that is adjoined to office administration building.

Water supply

Annexure 2 to this report provides the revised water requirements assessment based on the revised planned operational design for processing of low grade ore onsite. Premised on this assessment, an application for drilling of five (5) boreholes was recommended to meet the water supply needs for the mine. An application to the Ministry of Agriculture, Water and Land Reform (MAWLR) was submitted in September of 2023 and decision is awaited.

Any authorization for drilling will be followed by application for an abstraction license if such boreholes are successful to comply with the requirements of the Water Resources Management Act (No. 11 of 2013).

Presently, a single borehole at the dormant Mesopotamia village supplies water for domestic purposes and minimal use in spraying of blasted mine areas.

Wastewater management

The present accommodation and administration are connected to discharge into the septic tanks. Two septic tanks of capacity 2m³ for each accommodation facility (labour and experts). These are regularly monitored for levels to prevent potential overflows. Presently, the levels indicate still at safe operating levels of the capacity, although may need continuous monitoring in future. Furthermore, there remains a need to find ways dispose wastewater pumped from these facilities when such becomes full.

Electricity

The mine is served by a 500kW diesel powered generator but also two 16kW generators mainly for the crushers.

Servicing machinery and storage of hazardous substances

All servicing of vehicles and other works with potential to contaminate soils or subsurface are carried out on built-up concrete surfaces (see Figure 3:4).

All other hazardous materials and substances such as oils and greases are stored in a lockable storehouse and only accessible on being needed in operations.



Figure 3:4 Maintenance work onsite

4. Re-identification of Impacts and Mitigation

4.1 Impact Re-identification

This section takes to identify actual and potential impacts from the redefined operational processes at the mine site and thus seek to reinforce existing and identify new measures towards mitigation or offsetting occurrence of adverse impacts. Premised on these current and envisaged operational practices, potential impacts are identified below.

Table 4:1 impacts re-identification for revised operations and plans for the mine

Activity	Impact	Impact type
Clearance of target areas for mining	Removal of protected species of trees	Environment
Blasting of target areas	Safety and health of the workers onsite	Social
Water spraying on exposed rocks	Wastage of resources leading to depletion	Social
Breaking of residual blasted rocks with jack hammers	Exposure to injuries or other unhealthy conditions	Social
	potential Impediment of surface drainage courses from placement of unwanted waste rock	Environmental
Haulage of stockpiled material from the mining sites to storage area	Accidental leakage of hazardous substances to surfaces	Environmental
	Accident from movement of the machinery on the site	Social

Loading for transportation offsite and subsequent transportation	Potential accidents leading to injuries or fatal incidences	Social and Economic
	Potential road accidents	Social and Economic
Servicing of machinery and equipment	Contamination of surfaces, water course and groundwater resources Potential hazards to onsite personnel Potential Igniting of fires	Environmental
Storage and utilization of hazardous substances		
Storage of large quantities of petroleum products onsite		
Onsite floatation processing of low-grade material	Seepage from tailings produced into surface and sub-surfaces resources	Environmental
	Depletion of local aquifers for water supply to the processing of low grade ore, impacting riparian vegetation.	Environmental
	Potential instability or failure of tailings	Social and Environmental
Site operations and lodging	Wastewater generation with potential for pollution	Social and Environmental
	Solid waste generation with potential for area aesthetics pollution	Social and Environmental
	Emission of noxious and greenhouses gasses	Social and Environmental
	Dust generation	Social
	Collecting of firewood from surroundings environment	Environmental
	Hunting of local fauna	Environmental
Site access to public	Potential straying of local livestock herders and their livestock into the mine site	Social

4.2 Mitigations and Implementation Plan

Table 4:2 below identifies measures necessary towards mitigation of the identified impacts for mining operations at farm Mesopotamia No. 54. The table further expands to outline the necessary implementation requirements for these identified measures.

Table 4:2 Updated implementation plan for the operation of mining activities at farm Mesopotamia

No.	Impact	Mitigations	Frequency/When?	Who/Responsible
1	Removal of protected species of trees.	<ul style="list-style-type: none"> ○ All target sites be inspected of protected species prior engaging mining of the area to establish potential opportunities for protection from eventual activities. 	Prior clearing of sites for blasting works.	ECO
2	Safety and health of the workers onsite to blasting and crushing of resultant rocks in target areas	<ul style="list-style-type: none"> ○ A notice board be designed and erected providing information on dates for blasting and necessary precautions. 	Once off and continually updated.	Mine Manager
		<ul style="list-style-type: none"> ○ Provide awareness about blasting a day prior as reminder of precautions. 	Continuous	ECO/Site Manager
		<ul style="list-style-type: none"> ○ Workers be provided with appropriate PPE for the areas of work. These may include gloves, hardheads, protective clothing including footwear, sun protection wear, dust and earplugs as may be necessary. 	Annually and as necessary for specific works	Mine Manager
3	Wastage of water resources leading to depletion	<ul style="list-style-type: none"> ○ Maintain minimal use of water through spraying in the blasted areas and where possible reuse of uncontaminated water from other operations. 	Continually	Mine Manager
4	potential Impediment of surface drainage courses from generation of , and disposal/storage of waste rocks.	<ul style="list-style-type: none"> ○ All waste rock retention areas be on stable areas. 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ No placement of waste rock in river or catchment shall be allowed. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Continuous monitoring of the mining site for potential illegal waste rock deposition. 	Continually	Mine Manager
5	Accident from movement of the machinery on the site	<ul style="list-style-type: none"> ○ Site workers wear easily noticeable PPE 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Identify and clearly demarcate high risk zones with cautionary signs 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ All site workers are free from using potential substances that may hinder alertness while on duty or operating machinery and equipment. 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ Provide indication for right of way where necessary for persons or vehicles. 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ Ensure operators are well rested prior undertaking activities onsite through awareness. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Allow minimal breaks in-between to allow operators to refresh and maintain alertness. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Report potential near-miss incidents for future prevention of occurrences. 	Continually	Mine Manager
6		<ul style="list-style-type: none"> ○ Setup speed reducing structure on routes with proximity to personnel movements. 	Once off and as necessary	Mine Manager
		<ul style="list-style-type: none"> ○ Ensure all vehicles operators have valid driver's license for the class operated. 	Continually	Mine Manager

	Potential road accidents from transportation of material offsite	<ul style="list-style-type: none"> ○ All vehicles operators are free from using potential substances that may hinder alertness while transporting material from site. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Ensure operators are well rested prior undertaking trips to and from site. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Mining personnel are properly trained depending on the nature of their work 	As necessary	Mine Manager
		<ul style="list-style-type: none"> ○ Provide for first aid kit and a properly trained person to apply first aid if necessary 	Continually	Mine Manager
7	Contamination of surfaces, water course and groundwater resources	<ul style="list-style-type: none"> ○ All servicing of vehicles and repairs are carried out on concrete surfaces. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Drip trays must be placed underneath of leaking vehicles. 	As necessary	Mine Manager
		<ul style="list-style-type: none"> ○ Carry out regular inspections on vehicles, machinery and equipment for signs of leaks 	Daily prior operating	Operators
		<ul style="list-style-type: none"> ○ Regular servicing of equipment and machinery. a schooled for the servicing be devised and implemented. 	As necessary	Mine Manager
		<ul style="list-style-type: none"> ○ All contaminated soils to be scraped and deposited to a demarcated bund area to allow for natural remediation by exposure to the sunlight. 	As necessary	Mine Manager
		<ul style="list-style-type: none"> ○ Potential runoff from high risk area such as tailings be diverted from direct flowing into water courses, but harvest in impoundments for exposure to evaporation. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Large volume storage of hazardous substances to be bounded by impermeable structures that can hold 150% capacity of the tank 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ Spillage or leakage of up to 200 liters of petroleum products shall be reported to the Ministry of Mines and energy 	On occurrence	ECO Mine Manager
8	Potential hazards to onsite personnel from utilization of hazardous substances	<ul style="list-style-type: none"> ○ Access and usage of hazardous substances be controlled and monitored. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ All storage areas for hazardous substances be on impermeable surfaces. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Include a material safety data sheet in storages 	Once off and updated as necessary	ECO
		<ul style="list-style-type: none"> ○ Provide appropriate signage of the hazardousness material stored constant conspicuous reminder 	Once	ECO
		<ul style="list-style-type: none"> ○ The use of PPE be enforced as may be required when accessing such areas 	As necessary	Mine Manager
9	Potential Igniting of fires	<ul style="list-style-type: none"> ○ Firefighting equipment be providing in conspicuous places. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Place signage to avoid the lighting of fires or use of risky devices in proximity. 	Once off	Mine Manager
10		<ul style="list-style-type: none"> ○ Include lining of surfaces for potential areas of tailings prior deposition. 	As necessary in design	Mine Manager

	Seepage from tailings into surface and sub- surfaces resources	<ul style="list-style-type: none"> ○ Divert runoff from the tailing into seepage gully towards containment structures (i.e. lined pond). Where possible all tailing areas be compacted with clayish material to increase storage of seeping liquid and retention within the layer. 	As necessary in design	Mine Manager
11	Depletion of local aquifers for water supply to the processing of low grade ore, impacting riparian vegetation.	<ul style="list-style-type: none"> ○ Upon issuance of licences for drilling of boreholes and success, carry out sustainability estimation to determine safe operating levels for the boreholes. 	As necessary	ECO
		<ul style="list-style-type: none"> ○ Continually monitor aquifer response to abstraction and take necessary measures to lessen adverse effects on riparian vegetation and environment. 	Monthly	ECO
		<ul style="list-style-type: none"> ○ Implement reuse of process water to curtail demand for abstraction. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ Ensure licence for abstraction of groundwater from drilled boreholes is in place. 	Continually	ECO
12	Potential instability or failure of tailings	<ul style="list-style-type: none"> ○ A tailings dam be sited on a stable area, not subject from runoff. 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ Ensure proper designs that provide stability 	Once off continual monitoring depositions	Mine Manager
		<ul style="list-style-type: none"> ○ Tailings be located far away from site worker's residents. 	Once off	Mine Manager ECO
		<ul style="list-style-type: none"> ○ Maintain a distance of minimum 30m from a water course. 	All times	Mine Manager ECO
13	Wastewater generation	<ul style="list-style-type: none"> ○ Monitoring of septic tanks to determine fill capacity 	Weekly	ECO
		<ul style="list-style-type: none"> ○ Chemical treatment of wastewater for potential use for dust suppression onsite 	Weekly	ECO
14	Solid waste generation	<ul style="list-style-type: none"> ○ Demarcate points for waste collection around the site 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ Place waste bins at all demarcated waste collection points. 	Once off	Mine Manager
		<ul style="list-style-type: none"> ○ All waste collection points are emptied regularly and waste transported to a common waste designated waste management site. 	Weekly	
		<ul style="list-style-type: none"> ○ Where possible implement segregation of common waste. 	Continually	ECO
15	Emission of noxious and greenhouses gasses	<ul style="list-style-type: none"> ○ No equipment or machinery is kept running unnecessary when not required for use. These includes all vehicles, generators, compactors, compressors, welding torches. 	Continually	Mine Manager
		<ul style="list-style-type: none"> ○ All machines observed to release excessive smoke to be switched off and necessary repairs be implemented before reused. 	As necessary	Mine Manager
		<ul style="list-style-type: none"> ○ Conduct site walkabout to monitor adherence to measures on emissions 	Weekly	ECO

		o Regular maintenance of equipment and machinery be implemented to prevent likely release of irritant emissions.	As per schedule	Mine Manager
16	Dust generation	o Setup speed reducing structure on routes.	As necessary	Mine Manager
		o Spraying of water on surface with high dust generating potential. Consider the reuse of treated wastewater for dust suppression.	As necessary	Mine Manager
		o In areas necessary, include setup in up dust retention nets.	As necessary	ECO
		o Lessen unnecessary removal of trees that may act as windbreaks.	Continually	ECO
17	Collecting of firewood from surroundings environment	o No collection of firewood be allowed for site residents.	Continually	Mine Manager
		o Provide for alternative lighting and heating for site workers onsite to prevent potential need to harvest trees.	Continually	Mine Manager
		o Erect notices to prohibit practices of tree harvesting.	Once off	ECO
		o Provide awareness to the site workers.	Monthly	ECO
18	Hunting of local fauna	o No hunting of animals to be allowed at all times.	Continually	Mine Manager
		o No stray movement of site workers be allowed.	Continually	Mine Manager
		o Provide awareness to the site workers.	Once off and as necessary	ECO
19	Potential straying of local livestock herders and animals into the mine site	o Erect signage of access restrictions or prohibition in all potential access areas.	Once off	ECO

5. Administration of the EMP

5.1 Roles and Responsibilities

5.1.1 The Ministry of Environment and Tourism

The Environmental Management Act (No. 7 of 2007) empowers the Environmental Commissioner in the MEFT as the designated authority responsible for approval of EMPs. Once approved, an EMP is a legally binding document and carries the obligation for implementation by the Proponent to the latter. The Environmental Commissioner reserves the powers to enforce legal action where non-compliance perpetuates despite carrying out inspections and issuance of compliance orders.

5.1.2 The proponent

The Proponent is custodian of the entire EMP and oversees its implementation. The role requires a supervisory designation with ability to lobby necessary resources and allocate these resources towards implementation of the EMP. Such is achieved through continuous interaction with key stakeholder and further with the technical staff to achieve the overall goal of effective and efficient delivery of solid waste management services.

5.1.3 Environmental Compliance Officer

The Environmental Compliance Officer (ECO) as an implementing level positions under the Proponent. The ascribed responsibilities are;

- i. Coordination of the implementation of the EMP. Such shall include establish protocols and standards required in the EMP.
- ii. Establishing and maintaining an information record system on implementation of EMP.
- iii. Liaise with relevant authorities and contractors regarding required compliance.
- iv. Conduct scheduled environmental and social audits of various parameters established in EMP and reporting.
- v. Providing recommendations for remedial action in the event of any non-compliances.
- vi. Ensure that contractors, subcontractors and workers and even official visitors to the site are aware of the environmental and health and safety conduct required.
- vii. Ensure that the site is utilised as per set out layout plan
- viii. Develop training and awareness programs for site workers and visitors

5.1.4 Environmental Consultant

The Environmental Assessment Practitioner is contracted to undertake the review and update the EMP, premised on review of current and planned operational design, and eventual submission of an application to the authority for renewal of the environmental clearance certificate. While the obligations of the consultant are towards renewal of environmental and social clearance. The Proponent may extend the scope of the consultant to provide technical expertise if necessary to address compliance to implementation of the EMP.

5.1.5 Contractor/Subcontractors

Contractors and subcontractors comprise those that will provide a certain service to the proponent that have environmental impacts.

5.2 Environmental Monitoring and Reporting

Table 5:1 below presents the environmental and social monitoring requirements in the implementation of the plan.

Table 5:1 Environmental and social monitoring plan

Aspect	Objective	Indicator	Frequency	Responsible
Groundwater sampling and quality testing	Detect variation in water quality and quantity of the surrounding area	Water quality results	Quarterly	ECO

Septic tank holding volumes.	Minimise potential pollution and health hazard	Inspection reports	Monthly	ECO
Regulatory reporting on implementation of the EMP	Compliance to reporting requirements	Progress reports	Bi-annual	ECO

5.3 Redress of Non-compliance

Noncompliance to the environmental and social (E& S) requirements shall comprise the following:

- i. Undertake an act that has social or environmental impacts without having obtained necessary authorization or licenses or clearances.
- ii. Not implementing necessary measures specified towards addressing an environmental or social impact emanating from an activity under the project.

Procedure for handling non-compliance to E & S requirements shall involve the following steps, administered through the ECO:

- i. Each incident observed or reported shall be in documentary form (i.e. incident report) and where possible photographic evidence be acquired.
- ii. Timely communication and instruction for the contractor/employee to halt non-compliance and thus lessening aggravation of subsequent impact.
- iii. Scrutinize the submitted incident to determine cause and extent of non-compliance
- iv. Establish and advance required corrective actions to mitigate future occurrence.
- v. Timely communication where such has immediate contractual implications. and report to the Manager.

The following levels of addressing compliance shall be implemented;

Level 1: A written notice to the contractor or employee on the incident reported or observed. The contractor/employee shall provide proof of implementing measures for corrective action towards redressing the reported incident.

Level 2: A second written warning on repeat of a similar or other E&S requirements. The contractor/employee shall further provide proof of implementing measures for corrective action towards redressing the reported incident.

Level 3: Notice shall be served of the occurrence of the third breach of E&S requirements. After investigations and determined that this remains negligence that associates to prior incidents, the manager shall be notified and a report submitted for contractual management, and potential discharge from contract or employment.

6. Conclusion and Recommendations

Conclusion

The study undertook to review the implementation of the earlier EMP and found inconsistencies and ambiguity in measures recommended for mitigation of impacts. This is due to the fact that the mining planning and design has evolved over the years and thus required a review and update as per this report. Therefore, this update EMP replaces the initial developed for the then proposed mining of base and rare earth metals on farm Mesopotamia no. 54 in area of the prescribed mining claims by the Proponent.

The review took to consider all potential impacts possible from the current scope of activities executed onsite and further those planned in immediate future. Appropriate measures were identified for mitigation of these identified impacts, consolidated into an implementation plan. These measures are based on standard practice in the field of environmental management and more so considered contemporary among acceptable practice.

The Proponent through the established structures, shall be liable for the implementation of the EMP and to achieve required level of implementation. Non-compliance shall be subject to legislative requirements and subsequent applicable processes by the Environmental Commissioner.

Recommendation

The Environmental Assessment Practitioner recommends to the Environmental Commissioner, for consideration of the updated environmental management plan as adequate for renewal of the environmental clearance towards operations of the mine.

Annexures

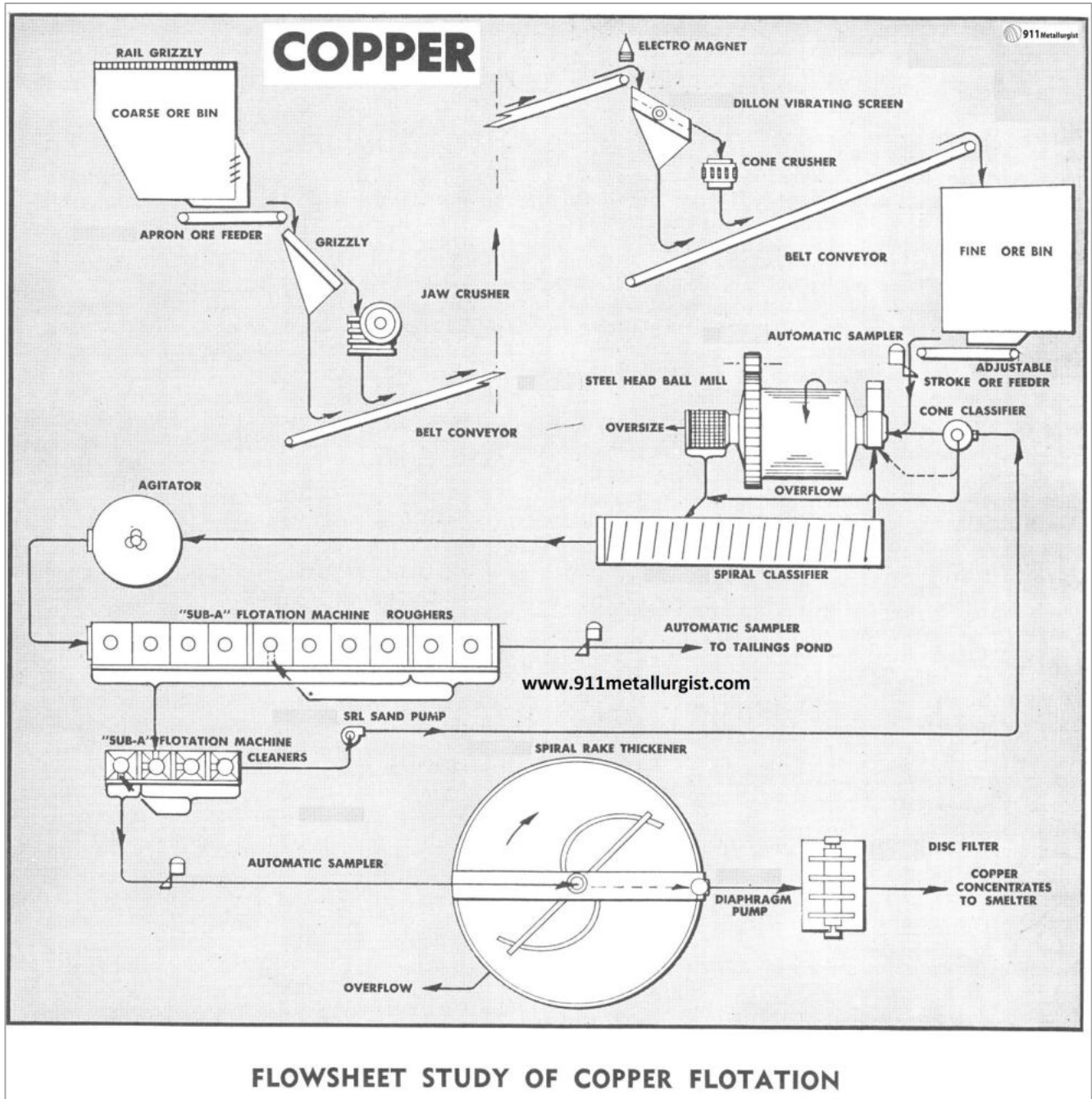
Annexure 1: The Copper Flotation Process

Annexure 2: Water Requirement Study for Operations at Mesopotamia Mine Site

Annexure 3 Copy of Expiring Environmental Clearance Certificate

Annexure 4: Site Infrastructure Layout

Annexure 1 The Copper Flotation Process



Annexure 2
Water Requirement Study for Operations at Mesopotamia Mine Site

Annexure 3
Copy of Expiring Environmental Clearance Certificate

Annexure 4
Site Infrastructure Layout