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Namibia Rare Earth

Environmental Management Plan for the Lofdal Mine

SLR Project No.: 734.14013.00005

Report No.: 5

June 2016

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RARE EARTHS (PTY) LTD.

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ENVIRONMENTAL MANAGEMENT PLAN FOR THE LOFDAL MINE

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Below a list of acronyms and abbreviations used for the Lofdal Project (however, not all of these appear in this document).

Acronyms / Abbreviations	Definition
AC	Alternating current
ART	anti-retroviral treatment
amsl	Above mean sea level
ASTM	American Society for Testing and Materials
BID	Background Information Document
bgl	Below ground level
Bq/kg	Becquerel per kilogram
$CaCl_2$	Calcium Chloride
CDT	Constant Discharge Test
CZ	Central Zone
CSR	Closest sensitive receptor
dBA	Decibels
DC	Direct current
DEA	Directorate of Environmental Affairs
DPM	Diesel Particulate Matter
EAP	Environmental Assessment Practitioner
EAPAN	Environmental Assessment Professionals Association of Namibia
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPL	Exclusive Prospecting License
FOE	frequency of exceedance
GAL	Gangue acid Leach
GLC	Ground level concentrations
GROWAS	(national groundwater databse)
GWh	Gigawatt hour
GWD	Groundwater devide
ha	hectares
IBA	Important Bird Area
HREE	Heavy Rare Earth Enrichment

Acronyms / Abbreviations	Definition
HDPE	High-density polyethylene
HCL	Hydrochloric acid
HSE	Health and Safety
IAMA	Institute of Environmental Management and Assessment, UK
IAEA	International Atomic Energy Agency
IAPs	Interested and Affected Party
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ICRP	International Commission on Radiological Protection
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
km	kilometre
Km^2	Kilometre squared
KOPs	Key observation points
kWh	Kilowatt hour
kWp	Kilowatt peak
kV	kilovolt
LOM	Life of Mine
MAP	Mean Annual Precipitation
mSv/a	Millisieverts per year
m^3/h	Cubic Metres per Hour
MAP	mean annual precipitation
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MHSS	Ministry of Health and Social Services
ML	Mining License
mm	Millimetre
MME	Ministry of Mines and Energy
MM5	Fifth-Generation Penn State/NCAR Mesoscale Model
msl	Mean sea level
MVA	Megavolt amperes
MWp	Megawatt Peak
MW	Megawatt
NACOMA	Namibian Coast Conservation and Management project
NAMCOL	Namibian College of Open Learning
NBC	Namibian Broadcasting Commission

Acronyms / Abbreviations	Definition
NBR	Natural Background Radiation
NDCR	National Dust Control Regulation(s)
NGO	Non-Governmental Organisation
NGO	Non-Governmental Organizations
NHCN	National Heritage Council of Namibia
NMZ	Northern Margin Zone
NRE	Namibia Rare Earths
NSRs	Noise sensitive receptors
NWR	Namibia Wildlife Resort
NZ	Northern Zone
PAP	Project Affected People
PEA	Preliminary economic assessment
$PM_{2.5}$	Inhalable particulate matter with an aerodynamic diameter of less than 2.5μm
PM_{10}	Thoracic particulate matter with an aerodynamic diameter of less than 10μm
PPE	Personal Protective Equipment
PPP	Public Participation Process
PV	Photo Voltaic
RAP	Resettlement Action Plan
REE	Rare Earth Element
REO	rare earth oxides
RGM	Radon Gas Monitor
RMP	Radiation Management Plan
Rn	Radon (including the radioactive radon isotopes Rn^{222} and Rn^{220})
ROM	Run-of-mine
RWL	Rest water level
SCZ	Mentioned in Geology section 4.2.2, but not written out.
SEA	Strategic Environmental Assessment
SLR	SLR Environmental Consulting (Namibia) (Pty) Ltd
SME	small and medium enterprises
SOP	Standard Operating Procedure
SRTM	Shuttle Radar Topography Misiion
TGM	Thoron Gas monitor
TREO	total rare earth oxide
TSF	Tailings Storage Facility
TSP	total suspended particulates

Acronyms / Abbreviations	Definition
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
VOC	Volatile organic compound
WRD	Waste Rock Dump
WSS	Water supply scheme
XRF	x-ray fluorescence sorting technology
XRT	x-ray transmission sorting technology
%HREE	% heavy rare earth enrichment

ENVIRONMENTAL MANAGEMENT PLAN FOR THE LOFDAL MINE

1 INTRODUCTION

Namibia Rare Earths (NRE) plans to develop an open-pit mine and processing plant that will produce a concentrate consisting mainly of 'rare earths'. The principal rare earth mineral of economic interest that will be produced at Lofdal is xenotime. The proposed mine, processing plant and associated infrastructure is hereinafter referred to as the "Lofdal Project".

This Environmental Management Plan (EMP) documents a series of individual management and mitigation plans (MMPs) which are designed to meet legal requirements and avoid or minimise the impacts associated with the implementation of Namibia Rare Earth's (NRE) Lofdal Mine Project.

The Management and Mitigation Plans (MMPs) have been compiled based on a review of the findings and recommendations of the EIA Report (SLR, 2016a) and specialist studies for the proposed Lofdal Project.

Two separate EMPs were developed for the proposed powerline and water supply pipeline to the mine (SLR, 2016b and SLR, 2016c).

TABLE 1-1: SUMMARY OF ISSUES IDENTIFIED IN THE EIA AND CORRESPONDING MANAGEMENT AND MITIGATION PLANS

Environmental component (reference to Section 7 of the EIA report)	Issue (reference to Section 7 of the EIA)	Relevant MMP (reference to Section 7 of the EMP)
Topography (7.2)	Hazardous excavations and infrastructure Section 7.2.1	MMP 2 – Safety & Security
Soil and land capability (7.3)	Loss of soil resources from pollution Section 7.3.1	MMP 13 – Soil Other relevant MMP include MMP 3 and MMP 4
	Loss of soil resources through physical disturbance Section 7.3.2	MMP 13
Biodiversity (7.4)	Direct physical destruction of biodiversity and their habitats, particularly sensitive and restricted habitats.	MMP 7 – Biodiversity

Environmental component (reference to Section 7 of the EIA report)	**Issue (reference to Section 7 of the EIA)**	**Relevant MMP (reference to Section 7 of the EMP)**
	Section 7.4.2	
	Impacts on water resources as an ecological driver (2012: Section 7.4.3	MMP 3 – Surface Water MP 7 – Biodiversity
	General disturbance to biodiversity Section 7.4.4	MMP 7 – Biodiversity
Radiological (7.5)	Impacts associated with direct exposure to external gamma radiation. Section 7.5.1	MMP 2 – Safety and security
	Radiological impacts associated with the atmospheric pathway. Section 7.5.2	MMP 5 – Air Quality
	Radiological impacts associated with the aquatic pathway. Section 7.5.3	MMP 3 and 4 – Surface water and Groundwater
Surface water (7.6)	Altering drainage patterns. Section 7.6.1	MMP 3 – Surface Water
	Pollution of surface water – radiological and non-radiological Section 7.6.2	
Groundwater (7.7)	Dewatering Section 7.7.1	MMP 4 – Groundwater
	Contamination of groundwater - radiological and non-radiological Section 7.7.2	
Air (7.8)	Air pollution Section 7.8.1	MMP 5 – Air Quality
Noise (7.9)	Noise Pollution Section 7.9.1	MMP 6 – Noise & vibrations
Blasting (7.10)	Blasting Damage	MMP 6 – Noise & vibrations

Environmental component (reference to Section 7 of the EIA report)	Issue (reference to Section 7 of the EIA)	Relevant MMP (reference to Section 7 of the EMP)
	Section 7.10.1	
Archaeology (7.11)	Damage to archaeological sites and landscapes. Section 7.11.1	MMP 9 – Archeology
Visual (7.12)	Visual impact. Section 7.12.1	MMP 8 – Visual
Socio-economic (7.13)	Impacts on the national, regional and local economy. Section 7.13.2	MMP 11 – Social and Economic
	Potential economic impacts on local non-mining livelihoods. Section 7.13.3	
	Job creation and skills development. Section 7.13.4	
	In-migration impacts. Section 7.13.5	
	Impact relating traffic. Section 7.13.6	
	Mine decommissioning and closure Section 7.13.7	

1.1 KEEPING EMPS UP TO DATE

It is the intention that this EMP should be seen as a “living document” which will be amended during the operation, as the activities might change or new ones be introduced.

This is in accordance with Section 50 (g) of the Minerals (Mining and Prospecting) Act, 33 of 1992, which states that the holder of a mining license shall undertake the periodic review of the EMP(s) should circumstances change.

Should a listed activity(s) as defined in the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Government Gazette No. 4878) be triggered (as a result of future

modifications/changes at the mine), this EMP will be updated as a result of another EIA process as stipulated in the regulations.

1.2 DETAILS OF THE PERSONS WHO PREPARED THIS EMP

SLR Namibia (Pty) Ltd (SLR), the independent firm of consultants who undertook the 2016 EIA has also compiled this EMP.

Werner Petrick, with the assistance of Nadine Soutschka who are all Environmental Practitioners from SLR, prepared this EMP. Werner Petrick, the EIA project manager has over seventeen years of relevant experience in conducting/managing EIAs, compiling EMPs and implementing EMPs and Environmental Management Systems. Nadine Soutschka has over 2 years of relevant experience.

2 SCOPE OF EMP

The components of the EMP are included in table 2-1 below.

TABLE 2-1: CONTENT OF THE EMP

EIA Regulation requirement	Reference in the EMP
Details of the persons who prepared the EMP and the expertise of those persons to prepare an environmental management plan.	Section 1.2
Project overview	Section 4
A detailed description of the aspects of the activity that are covered by the EMP.	Sections 4 & 5
An identification of the persons to be responsible for the implementation of the mitigation measures.	Sections 5 & 8
Overall objectives	Section 6
Information on any proposed management or mitigation measures to address the environmental impacts that have been identified in a report contemplated by these regulations, including environmental impacts or objectives in respect of – i. Planning and design ii. Construction activities iii. Operation or undertaking of the activity iv. Rehabilitation of the environment v. Closure, where relevant	Section 7
Where appropriate, time frames within which the measures contemplated in the EMP must be implemented.	Section 8
Proposed mechanisms for monitoring compliance with the EMP and reporting on it.	Sections 7 & 9

3 ENVIRONMENTAL LEGISLATION

3.1 INTRODUCTION

Section 2 of the EIA Report for the proposed Lofdal Mining Project (and Appendix R to the EIA Report) provide a detailed description of all Namibian legislation that is relevant to the Lofdal project.

A summary of the relevant permits required by NRE is provided below.

3.2 PERMITS

Table table 3-1 list all the applicable permits/authorisations required by NRE.

TABLE 3-1: LIST OF PERMITS/APPROVALS REQUIRED BY NRE

Aspect	Permits/Certificates/Authorizations	Regulator
Exploration License	Exploration license	MME
	Environmental Clearance for EPL3400	MET
Mining License	Mining License	MME
	Environmental clearance for the Lofdal Mining Project	MET
	Environmental clearance for Linear Infrastructure (water pipeline and powerline)	MET
	Accessory Works Plan	MME
Fuel & Energy	Consumer installation certificate - Diesel storage	MME
	License for Electricity Generation	ECB
	Namwater - Omdel abstraction (Water use) Permit	MAWF-DWA
	Drilling of Boreholes	MAWF - DWA
Waste	Wastewater and effluent disposal exemption permit	MAWF - DWA
	Disposal of drilling waste	MET (MHSS)
Vegetation	Forest permit-Tree harvesting - Protected trees	MAWF - DF
Radioactive materials	Transport of radioactive materials	MHSS - NRPA
	Authorisation for the possession and use of devices generating ionizing radiation	MHSS - NRPA
Archaeological	Heritage permit/ to disturb and transport archaeological materials	NHC

4 PROJECT OVERVIEW

4.1 INTRODUCTION

NRE envisions developing an open-pit mine and processing plant at Lofdal that will produce a concentrate consisting mainly of rare earths. NRE plans to develop, amongst others, the following facilities: open pit; processing plant; waste rock dump(s) (WRD(s)); tailings storage facility (TSF); haul roads; associated mine infrastructure; and linear infrastructure for power (NamPower) and water supply (NamWater) to the mine, etc. Two separate EMPs were developed for the proposed powerline and water supply pipeline to the mine (SLR, 2016b and SLR, 2016c).

A conceptual diagram of the proposed Lofdal mining process (i.e. the main facilities) is provided in Figure 4-1. Table 4-1 below shows the project data summary which provides a scale of the project.

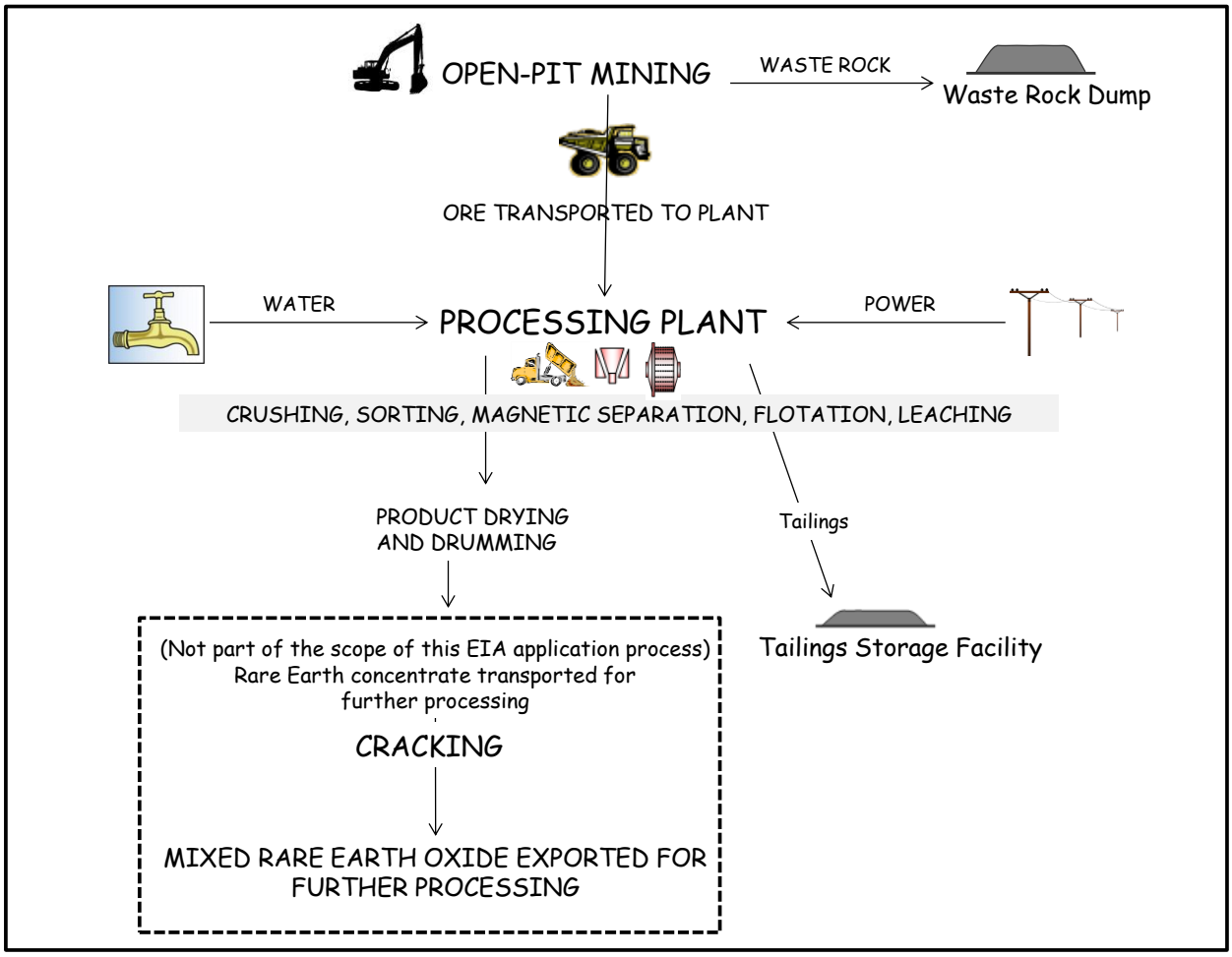


FIGURE 4-1: CONCEPTUAL DIAGRAM OF THE MINING PROCESS

TABLE 4-1: PROJECT DATA SUMMARY THAT PROVIDES PERSPECTIVE ON THE SCALE OF THE PROJECT

Group	Specific	Details
Mining	Target mineral	Rare Earths - Xenotime
	Mineable area	Main pit: ± 0.4 km^2 (40 hectares) Smaller satellite pits up to 10 km away within the ML area may be developed in the future
	Depth of the minerals below surface	Occur at surface and will be mined to a depth of 200 m
	Rate	10,440,000 tons per year (total) 840,000 tons per year to be sent to the crusher
	Life of mine	Current resource allows for approximately 7 years, however this could be extended by developing additional resources
	Extend of areas required for infrastructure	The processing plant, pit, tailings storage facility (TSF), waste rock dump (WRD) and solar plant (and other onsite infrastructure) would cover about 20 km^2 (2,000 ha).
Mine residues	Waste rock	Waste rock (i.e. mine material that does not contain rare earths to be processed) will be stockpiled on a WRD. Two options for the WRD are being considered. The total extend of the WRD (whether it is one or two dumps) will be approximately 1,000 m x 1,000 m and 50 m high.
Processing	Plant	Mill Process Plant
	Rate	70,000 tons per month ore received (the plant design capacity would be 75,000 tons per month). Produce 16,000 tons per year concentrate (after the Gangue Acid Leach (GAL) stage).
Processing residues	Tailings	About 54% of the mined ore after leaching will be waste product (i.e. tailings) to be disposed of at a TSF. Two different locations for the TSF are being considered. Depending the chosen alternative location, the size of the TSF (i.e. waste storage area) will be between 342,000 m^2 and 1,159,000 m^2 as a result of the topographical difference of the two sites.
Resource use	Water demand	Approximately 1,000,000 m^3 per year
	Power demand	± 21,178,700 kWh per annum
Employment	Staff: construction	Approximately 300 to 340
	Staff: operational	Approximately 226
	Operating times	24 hours a day, 7 days a week

At this stage in project planning, alternatives for certain aspects of the project are still under consideration. These alternatives are described in section 4 of the EIA report (SLR, 2016a). Figure 4-2 and Figure 4-3 provides the two different main site infrastructure layout options (referred to as 'option 1' and 'option 2' respectively in the EIA and EMP report) that were considered and assessed in the EIA process, also taking into consideration that the ultimate ("go-forward") site-layout might be a hybrid of the two options.

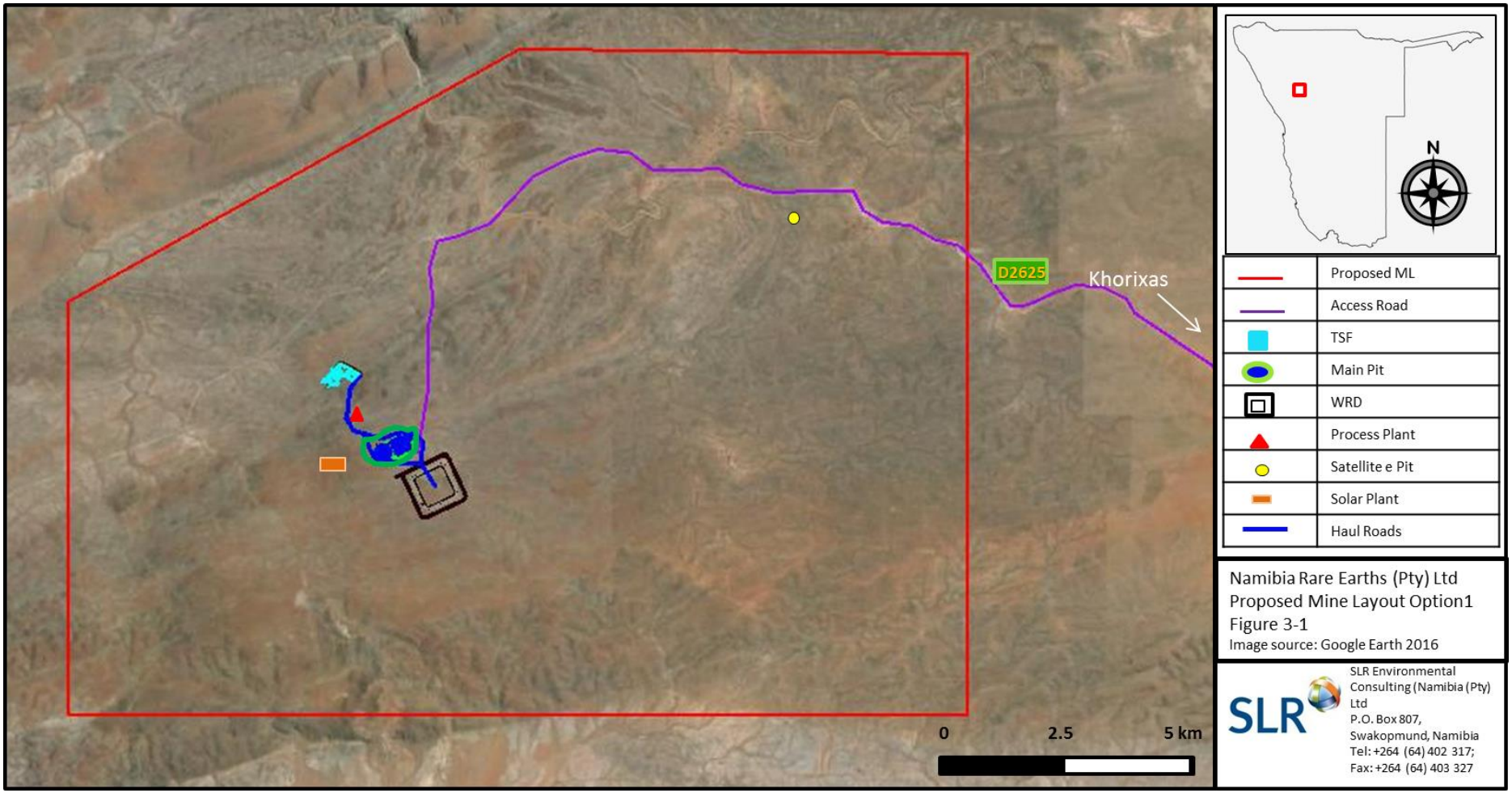


FIGURE 4-2: PROPOSED LOFDAL SITE LAYOUT OPTION 1

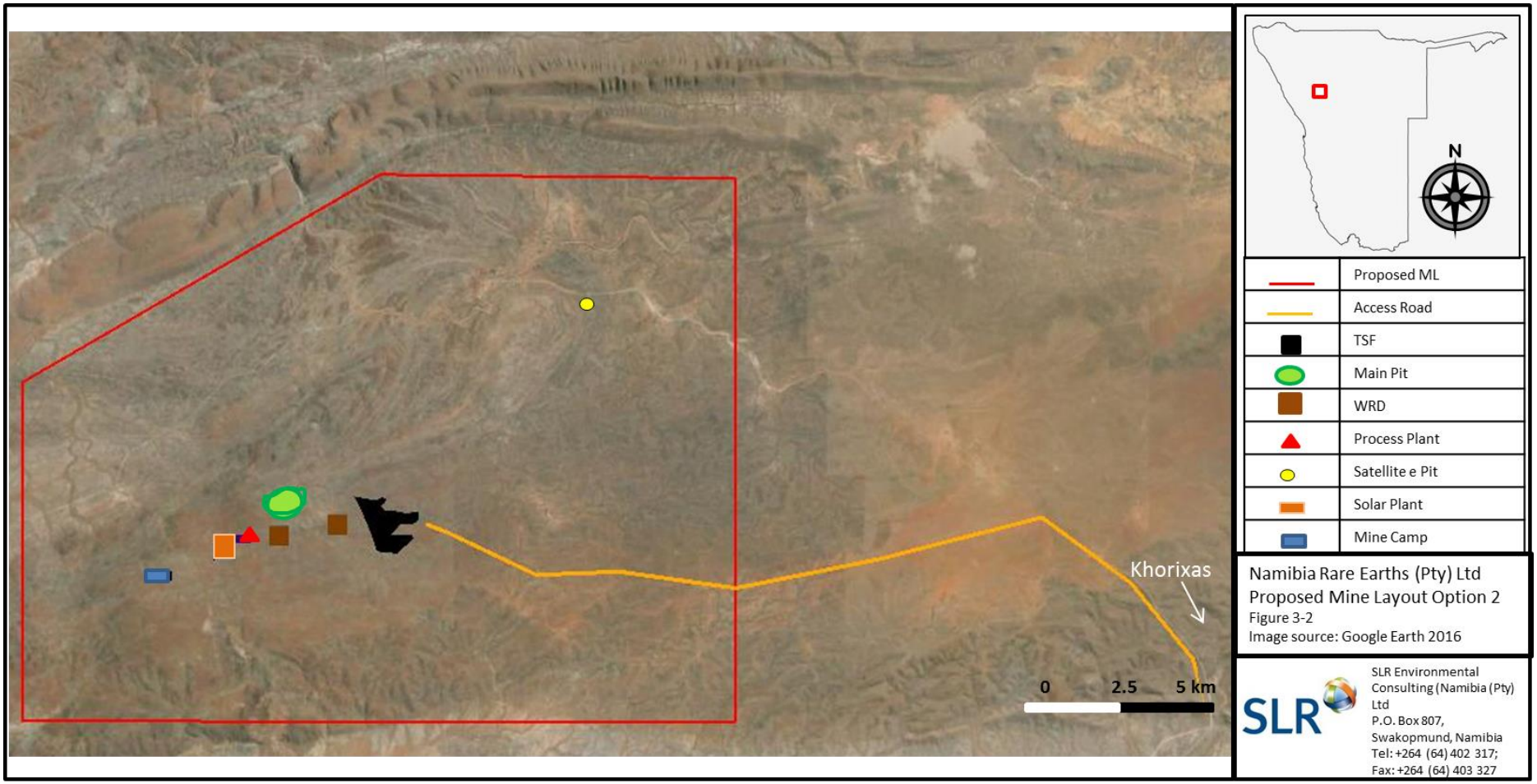


FIGURE 4-3: PROPOSED LOFDAL SITE LAYOUT OPTION 2 (PREFER LAYOUT FROM AN ENVIRONMENTAL IMPACTS PERSPECTIVE)

Considering all the assessment findings in the EIA Report, option 2, presented in Figure 4-3, is the preferred site layout option for the Lofdal Project from an environmental impacts perspective. The following needs to be highlighted in this regard:

- Specifically the Impacts on sensitive biodiversity areas as well as the visual impacts associated with the process plant and TSF are very important criteria to considerer. Even though no fatal flaws regarding either one of the two options were identified by any of the environmental specialists, implementing the option 1 TSF and process plant and associated connection roads and pipelines, these (biodiversity and visual) impacts would have high significant impacts, even with mitigation.
- Even though WRD(s) 2 option is preferred, the optimal layout still needs to be determined (during the detail design phase of the project), taking into consideration that both these WRDs are situated across drainage lines and the visual impact associated with the western WRD. Both these WRDs' locations could be moved slightly to avoid the drainage lines (refer to Appendix H and the EMP). The eastern WRD should be bigger (to ensure the height restriction on the western WRD could be applied) and should be moved further east - closer to the TSF to further reduce the catchment drainage through this drainage line.

The section below provides a summary of the various activities and facilities associated with the construction, operational and decommissioning phases of the proposed Lofdal Project. Refer to Section 3 of the EIA Report for the proposed Lofdal Mining Project (SLR, 2016a) for more details on the description of the project.

4.2 CONSTRUCTION PHASE

4.2.1 CONSTRUCTION PHASE FACILITIES

The following facilities are expected to be placed at the site (mainly in the immediate area of the processing plant site between the pit and TSF, and to the west of the WRD for large lay down areas) during construction:

- Contractors lay down areas
- Workshops, maintenance areas, stores, wash bays, lay-down areas, batch plant, fuel handling and storage area, offices, change houses
- Ablution facilities such as chemical toilets or septic tanks
- Handling and storage area for construction materials (paints, solvents, oils, grease) and waste
- Generators for temporary power supply
- Stockpiles
- Waste collection and storage areas
- Explosive magazine
- Temporary power and water supply infrastructure

These facilities would either be removed at the end of the construction phase or incorporated into the layout of the operational mine.

4.2.2 CONSTRUCTION PHASE ACTIVITIES

Construction activities take place during the establishment and preparation of the site for mining and mineral processing. Early mining activities, such as soil stripping and overburden/waste removal will coincide with the construction phase. Much of these materials will be used for construction purposes, i.e. road building, site preparation and TSF construction.

The following significant activities are expected to take place during construction:

- Appoint contractors, labours, etc.
- Drilling and blasting
- Clearing and grubbing and other earth moving activities
- Stockpiling topsoil and sub-soil
- Foundation excavations
- Backfill of material (specific grade) from borrow pits
- Opening and management of borrow pits
- Setting up contractors laydown areas
- Establishing access roads
- Digging of foundations and trenches
- Delivery of materials – storage and handling of material such as sand, rock, cement, chemical additives, etc.
- General building/construction activities including, amongst others: mixing of concrete; operation of construction vehicles and machinery; refuelling of machinery; civil, mechanical and electrical works; painting; grinding; welding; etc.
- Handling and storage of hazardous material
  - Blasting media
  - Lubricants
  - Paints
  - Gas (welding)
  - Cement
  - Chemical additives for cement
  - Diesel and petrol
- Handling, storage and disposal of hazardous waste:
  - Blasting media packaging material
  - Empty paint containers
  - Cements bags
  - Chemical additives (for cement) containers

  - Contaminated PPE and other (with oil, uranium, etc.).
  - Redundant concrete
- Handling, storage and disposal of non-hazardous waste
  - Steel off-cuts
  - Domestic waste
  - Wood off-cuts
  - Grinding wheels
  - Other construction waste
  - Packaging, e.g. plastic wrapping, Styrofoam

4.3 OPERATIONAL PHASE

4.3.1 SITE LAYOUT / SURFACE INFRASTRUCTURE

The proposed Lofdal Project will include the following facilities:

- Open pit and smaller satellite pits
- On site roads and access road
- Ore stockpiles (Run-of-Mine (ROM) stockpile and grade control stockpiles).
- Processing plant;
- Waste rock dump(s) (WRD(s))
- Tailings storage facility (TSF)
- Explosives magazine
- On site power infrastructure (Photo Voltaic (PV) solar plant)
- Clean and dirty water holding facilities
- Sewage treatment facility(s)
- Conveyors (in the plant)
- Soil stockpiles
- Workshops and stores (plant and mine complexes)
- Communication, light and security infrastructure
- Light infrastructure
- Administration offices, changes houses
- Laboratory
- Medical facilities
- Parking areas
- Refueling areas
- Linear infrastructure for power and water supply to the mine

4.3.2 MINING ACTIVITIES

- Open pit
    - drilling and blasting
    - Explosive use and storage
    - Load and haul
    - Laboratory
- Dewatering
- Waste Rock Dump
- Ore Storage
- Processing (crushing, sorting, milling, magnetic separation, flotation, gangue leaching)
- Equipment fleet and transportation
    - Refuelling areas
    - Weighbridge
    - Workshops and stores
- Exploration
- Staff and third parties
    - Medical facility
    - Security and access control
    - Parking
    - Lighting
    - Office, visitors centre and admin building
    - Housing
- Water supply
- Power Supply

4.4 DECOMMISSIONING AND CLOSURE

NRE must ensure that adequate rehabilitation and closure of the mine takes place following the conclusion of the proposed mine. At a conceptual level, decommissioning can be considered a reverse of the construction phase with the demolition and removal of the majority of infrastructure and activities very similar to those described with respect to the construction phase. The closure phase occurs as soon as possible on the waste stockpile and the TSF and then after the cessation of all decommissioning activities. Relevant closure activities are those related to the after care and maintenance of remaining structures.

5 ENVIRONMENTAL MANAGEMENT SYSTEM (ASPECTS AND IMPACTS)

NRE will introduce the development and implementation of an environmental management system (EMS) for all their proposed activities and facilities at the Lofdal Rare Earth Mine. The Lofdal Project EMS will adopt the principles spelled out in ISO14001 (International Organisation for Standardisation, 2015) or a similar standard. The use of this system will ensure that the environmental management requirements on NRE's activities at the Lofdal Mine are not only properly planned for, but a robust mechanism for implementation is also ensured and, most importantly that the environmental management function is always reviewed in a spirit of continual improvement.

This EMP will form the basis of the EMS and all the associated procedures, work instructions, etc. will be developed taking cognizance of the relevant commitments in this EMP.

As part of the EMS development, NRE will roll out the Management and Mitigation Plans (MMPs) in this EMP to the various Lofdal Mine Departments and develop detailed work instruction to ensure the objectives provided in this EMP are achieved and commitments are implemented. Responsibilities and target dates for implementing relevant commitments will therefore be included in the work Instructions and other relevant documents.

5.1 ENVIRONMENTAL ASPECTS & IMPACTS

Understanding the biophysical and human environment in which a mine operates is the first step to understanding environmental impacts. The next and possibly more important step is to identify the environmental aspects that give rise to the impacts. For example, the activity of blasting has more than one environmental aspect associated with it; namely, noise, vibration, dust generation and fallout debris. All of these aspects have the potential to cause impacts on the environment (or third parties) in a different way. Successful management will be gauged by how well NRE avoids, minimises or mitigates all the impacts associated with each environmental aspect at their Mine.

As part of the EIA processes for the Lofdal Mine, environmental aspects and potential environmental impacts associated with the activities and facilities were identified. The full suite of NRE's facilities and activities, associated with the construction, operation, decommissioning, and closure phases are described in the 2016 EIA Report and the operational phase facilities/activities are summarized in section 4 of this EMP. Table 5-1 provides a description of the environmental aspects that are associated with Lofdal mining operations and how they impact the biophysical and human environments, respectively.

TABLE 5-1: DESCRIPTION OF ENVIRONMENTAL ASPECTS AND POTENTIAL IMPACTS ASSOCIATED WITH LOFDAL MINING OPERATIONS

Environmental component	Potential Environmental Impact	MMP
Topography	Hazardous excavations and infrastructure that third parties and animals can fall into and be harmed	Safety and Security MMP
Soil and Land Capability	Loss of soil resources from pollution	Surface Water MMP/ Waste MMP
	Loss of soil resources through physical disturbance	Topsoil MMP
Biodiversity	Direct physical destruction of biodiversity and their habitats, particularly sensitive and restricted habitats	Biodiversity MMP
	Impact on water resources as an ecological driver	Surface water/storm water MMP
	General disturbance of biodiversity	Biodiversity MMP
Radiological	Impacts associated with direct exposure to external gamma radiation	Safety and Security MMP
	Radiological impacts associated with the atmospheric pathway	Air Quality MMP
	Radiological impacts associated with the aquatic pathway	Groundwater and Surface water MMP
Surface Water	Altering drainage patterns and therefore the loss of surface water flow volume as an important ecological driver.	Surface water MMP
	Pollution of surface water – radiological and non-radiological	Surface water/storm water MMP
Groundwater	Dewatering of the pit thereby lowering of groundwater levels and decline in 3rd party borehole yields.	Groundwater MMP
	Contamination of groundwater - radiological and non-radiological	Groundwater MMP/Surface Water MMP
Air	Air pollution causing nuisance and health issues of 3rd	Air Quality MMP

Environmental component	Potential Environmental Impact	MMP
	parties.	
Noise	Noise pollution causing nuisance of 3rd parties	Noise & Vibrations MMP
Blasting & Vibrations	Impact on safety of third parties from blasting damage	Safety and security MMP & Noise and vibrations MMP
Archaeology	Damage to archaeological sites and landscapes	Archaeology MMP
Visual	Visual impact causing a loss of scenic quality and landscape character	Visual MMP
Socio-economic	Impacts on the national, regional and local economy	Socio-economic MMP
	Potential economic impacts on local non-mining livelihoods	
	Job creation and skills development	
	In-migration impacts	
	Impact relating to traffic	
	Mine decommissioning and closure	

6 OVERALL ENVIRONMENTAL OBJECTIVES FOR THE EMP

The following overall environmental objectives have been set for the Lofdal Mine Project:

- To comply with national legislation and standards for the protection of the environment.
- To limit potential impacts on biodiversity through the minimisation of the footprint (as far as practically possible) and the conservation of residual habitat within the mine area.
- To investigate and exploit measures to reduce resource and energy consumption.
- To keep surrounding communities informed of mining activities through the implementation of forums for communication and constructive dialogue.
- To limit contaminated effluent discharge into the environment through the containment, recycling or removal of contaminated water.
- To conserve soil resources by stripping, stockpiling and managing topsoil.
- To protect soils and groundwater resources through the implementation of measures for spill prevention and clean-up.
- To ensure the legal and appropriate management and disposal of general and hazardous waste, through the implementation of a strategy for the minimisation, recycling, management, temporary storage and removal of waste.
- To minimise the potential for dust emissions through the implementation of dust control measures.
- To minimise the potential for noise and vibration disturbance in surrounding areas.
- To protect cultural heritage by thorough documentation and the obtaining of necessary legal approvals where relevant.
- To undertake rehabilitation wherever possible during the life of the mine.
- To incorporate final closure objectives in construction and mine planning.
- To develop, implement and manage monitoring systems to ensure good environmental performance in respect of the following: ground and surface water, air quality, noise and vibration, biodiversity and rehabilitation.
- To ensure the health and safety of surrounding communities through access control.
- To support and encourage environmental awareness and responsibility amongst all employees and service providers.
- To provide appropriate environmental education and training for all employees and service providers.
- Prevent and minimise pollution.
- To incorporate the relevant requirements stipulated in this EMP into the design and planning.
- To ensure the all the contractors adhere to the construction related management commitments.
- Ensure compliance to the EMP.

7 MANAGEMENT AND MITIGATION PLANS

The Management and Mitigation Plans (MMPs), listed in the table below, are applicable to all the relevant activities and facilities of the Lofdal Mine. (The MMPs follow in the subsequent sections).

TABLE 7-1: VARIOUS MMPS AND NUMBERS

Number	Management and Mitigation Plan (MMP)
7.1	Stakeholder Consultation/Communication MMP
7.2	Safety and Security MMP
7.3	Surface water/storm water MMP
7.4	Groundwater MMP
7.5	Air Quality MMP
7.6	Noise & Vibrations MMP
7.7	Biodiversity MMP
7.8	Visual MMP
7.9	Archaeology MMP
7.10	Socio-Economic MMP
7.11	Resource MMP
7.12	Soil MMP
7.13	Waste Management MMP

The following abbreviations are used in the MMPs for the various project phases:

Ds = Design phase
C = Construction phase
O = Operations phase
D = Decommission

All = Relevant to all of the above mentioned project phases (i.e. Ds, C, O & D).

Cl = Closure

7.1

Stakeholder MMP

7.1 STAKEHOLDER MANAGEMENT AND MITIGATION PLAN

It is important that channels of communication are maintained over the life of the project for surrounding landowners, the //Huab and Doro !Nawas Conservancy members, as well as the Town Council of Khorixas (and Fransfontein).Table 7-1 shows the stakeholders communication Management and Mitigation Plan.

7.1.1 COMPONENTS

This plan is made up of the following components:

- General Stakeholder communication.

7.1.2 MANAGEMENT

7.1.2.1 General stakeholder communication

Objectives

To ensure that ongoing feedback is provided on the relevant mining activities, together with feedback on the environmental management performance of the mine and that opportunity is provided for interested and affected parties to raise comments and concerns (complaints) on the same. Also, to ensure communication/ engagement strategies meet the needs of stakeholders.

Actions

TABLE 7-1: ACTIONS RELATING TO STAKEHOLDER COMMUNICATION

Issue	Management commitment	Phase
Understanding who the stakeholders are	Maintain and update the Lofdal stakeholder register, including stakeholders' needs and expectations. Ensure that all relevant stakeholder groups are included.	**All**
	A representative database would include government, employees, service providers, contractors, indigenous populations, local communities, conservancies, NGOs, shareholders, customers, the investment sector, community-based organizations, suppliers and the media.	**All**
	Ensure that marginalised and vulnerable groups are also considered in the stakeholder communication process.	**All**
	Record partnerships as well as their roles, responsibilities, capacity and contribution to development.	**All**
Liaising with interested and affected parties at all phases in the mine life	Devise and implement a stakeholder communication and engagement strategy.	**All**

Issue	Management commitment	Phase
Cooperative working relationship with Lofdal Mine stakeholders	As far as is feasible, fully inform identified stakeholders about the mine's activities.	**All**
	Use appropriate communication channels to consult with and disseminate information to the public, and for this purpose should develop a communication procedure.	**All**
	Communication channels could include: open days, with particular attention being paid to the accessibility of venues, newsletters for both employees and the public, national and local newspapers, television, radio, email, telecommunication (via sms) and the internet, an annual sustainable development report.	**All**
Managing perceptions and issues/complaints	Develop and implement a concerns/complaints (grievance) process for the public and publicise the channels through which complaints and comments can be submitted to the company. Respond immediately to all complaints and comments on receipt, introduce a "Third Party" if the grievance / complaint cannot be resolved between NRE and the affected party and keep complete records of complaints, responses and actions taken. Document all complaints in the external communications register. Investigate and respond to the complainant.	**All**
Safety of 3rd parties	Through appropriate communication and inductions, provide information to educate third parties about the dangers associated with hazardous excavations and infrastructure. Specifically the people staying on the farms in close proximity to the Lofdal Project area.	**All**
Monitoring	Monitor changes in the communities of interest	**All**
	Develop audit criteria for monitoring the performance of its stakeholder engagement and communication strategies as well as relations between the company and its stakeholders.	**All**

7.2

Safety & Security MMP

7.2 SAFETY AND SECURITY MANAGEMENT AND MITIGATION PLAN

It is essential that safety and security measures are defined and implemented to adequately protect the mine site from being accessed by unauthorized people. An emergency response plan for incidents is also essential.

Note that a separate Health and Safety Plan and Radiation Management Plan shall be developed for the mining activities and does not form part of this EMP.

7.2.1 COMPONENTS

This plan is made up of the following components:

- General (third party) safety and security.
- Occupational Health & Safety.

7.2.2 MANAGEMENT

7.2.2.1 General (third party) safety and security

Objectives

The objective of the management measures is to prevent physical harm to third parties and animals from potentially hazardous excavations and infrastructure.

Actions

TABLE 7-2: ACTIONS RELATING TO GENERAL (THIRD PARTY) SAFETY AND SECURITY

Issue	Management commitment	Phase
Access of unauthorised people to the ML.	The working area of the ML will be fenced	**All**
	Warning signs will be erected and maintained at the site boundary	**All**
	Security control points will be in place, to prevent uncontrolled vehicle access to existing and future mining, stockpile and waste facility areas.	**All**
	Any person entering the ML area (pit & plant) will only be allowed after formal induction.	**C/O/D**
Safety Risks	The permanent aboveground mineralised waste facilities (i.e. WRD(s) and TSF) and other stockpiles will be designed, constructed and operated in a manner that stability is a priority, that flood protection is provided and that the risk of failure is limited to acceptable levels;	**Ds/O/D**
	Any mining voids that remain open will be made safe to ensure that there is no risk to the safety of people and animals.	**D/C**

Issue	Management commitment	Phase
	All staff will be trained to attend to third parties and animals so as to avoid situations where people and animals can enter safety risk areas.	**C/O/D**
	At closure, permanent warning signs will be in place at appropriate intervals, in appropriate languages with danger pictures to warn people of the long term safety risks of entering the open pits.	**Cl**
Emergency	Develop and implement an emergency response plan for third parties falling into or off hazardous excavations and causing injury.	**C/O/D**

7.2.3 EXPOSURE TO EXTERNAL GAMMA RADIATION

Objectives

The objective of the mitigation measures is to prevent direct radiation related health impacts.

Actions

TABLE 7-3: ACTIONS RELATING TO GAMMA RADIATION IMPACTS

Issue	Management commitment	Phase
Safety Risks to 3rd parties	Relocate the households at Oas Post 3 and provide new source of water supply (from a possible new borehole). (refer to MMP 11 for more detail).	**Dc/C**
	Access to the site in general, and to the radiation sources in particular, will be restricted in all mine phases to prevent third parties from being in close proximity to radiation sources that could cause health impacts.	**O**
	It will be important that radiation protection measures commence as soon as construction activities start. These are to lead to the establishment and strengthening of existing radiation related baseline data, and the development of radiation safety procedures for the operational phase, especially the development of a Radiation Management Plan (RMP) for the operational phase.	**Ds/C**
	Once the operational phase commences, all relevant radiation protection measures as described in the RMP must be implemented. Such activities have to focus on protecting staff, members of the public and the environment against the potentially harmful effects of being exposed to ionising radiation from operations. The RMP is to guide all relevant radiation protection activities that are to be undertaken, including a description of how environmental activities are best to be interfaced with occupational radiation protection requirements and activities.	**O**

Issue	Management commitment	Phase
	Once the proposed Lofdal Project reaches its end-of-life phase, mine closure commences. This phase necessitates the implementation of radiation protection and control measures designed to ensure long-term environmental integrity and the minimisation of potential exposures of members of the public and the remaining on-site staff. Here it will be important to focus on activities that minimise ongoing radionuclide flows into the environment. To this end, the ongoing monitoring of dust emissions from the remaining mining infrastructure, ambient atmospheric radon concentrations and radionuclide concentrations in monitoring boreholes in and around the mining license area will form part of the most important radiological impact management tools in this final phase of the proposed project.	**Cl**
Emergency	Any spillage of substances that can expose third parties to unacceptable radiation levels will be handled in accordance with the Lofdal Mine emergency response procedure.	**O**

7.2.4 OCCUPATIONAL HEALTH & SAFETY

Occupational health and safety aspects of the proposed Lofdal Project do not form part of this EMP. NRE will implement a formal health and safety management system as well as a Radiation Management Plan.

The main objectives of this plan are to ensure.

- A healthy and safe work environment.
- Safe systems of work.
- Safe plant and equipment.
- Avoidance of exposure to unacceptable doses of radiation.
- The availability of such information, instruction, and training as required for worker health and safety.

Health and safety induction will be a requirement for all employees and contractors. All visitors will be required to attend a site induction prior to accessing the mine site. Specific training sessions will be developed and provided to employees requiring specific health and safety skill sets.

Health and safety audits will be routinely scheduled. Ad hoc audits will be done more frequently to follow up on concerns and/or non-compliances. Incident reporting and management augments the audits.

All hazardous chemicals used on site will have readily available material safety datasheets (MSDSs). Chemical hazards training will be an integral part of safety training and induction. Procedures will be developed for the use and handling of all dangerous chemicals. Correct personal protective equipment will be supplied.

7.3

Surface water MMP

7.3 SURFACE WATER MANAGEMENT AND MITIGATION PLAN

Water is a scares resource in Namibia, NRE will undertake its operations to maximise the recycling and reuse of water.

Industrial effluent (from the plant, laboratory, wash bay and storm water drains) will be recycled into the plant if it is suitable for use in the process. The aim is to have a facility that does not discharge effluent into the environment. Treated effluent from the sewage plant and decant water from the TSF will also be re-used in the plant.

Domestic effluent includes grey water from the laundries, shower blocks and kitchens and sewage from the ablution facilities. During construction the sewerage from the portable toilets will be disposed of at the nearest sewage works. During operations this effluent will flow into a sewage treatment facility. If the treated water is acceptable for discharge it will either be discharged to the environment or piped to the tailings facility. Under no circumstance will water that is not suitable for discharge be released to the environment.

Tailings Slurry is another industrial effluent and will be pumped to the TSF via slurry pipelines. TSF management is dealt with in the Groundwater section.

Hydrocarbons

Used hydrocarbons are hazardous liquid wastes and will be disposed of in compliance with Namibian legislation.

There are a number of sources in all project phases that have the potential to pollute surface water, particularly in the unmanaged scenario. In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. Although these sources may be temporary, the potential pollution may be long term. The operational phase will present more long term potential sources and the closure phase will present final land forms that may have the potential to contaminate surface water through long term seepage and/or run-off.

The commitments derived from the EIA Reports (SLR 2016) with regards to surface water, forms the basis of this MMP:

7.3.1 COMPONENTS

This plan is made up of the following components:

- Altering drainage patterns.
- Pollution of surface water – general.
- Industrial effluent.
- Domestic effluent.
- Spills.

7.3.2 MANAGEMENT

7.3.2.1 Altering drainage patterns

Objectives

The objective of the mitigation measures is to prevent significant reduction in water flows and related loss of biodiversity and ecosystem functionality. Efficient design of storm water measures to separate contact and non-contact storm water, allowing non-contact water to continue as downstream runoff, while containing contact water on site, for storage and possible recycling.

Actions

TABLE 7-4: ACTIONS RELATING TO THE ALTERING OF DRAINAGE PATTERNS

Issue	Management commitment	Phase
Blocking or deviation of water flow	Minimise infrastructure footprint and construction footprint	**Ds/C**
	Avoid the larger Sensitive Drainage Line by choosing Option 2 for the WRD placement. In this regard, design the alignment of the northern edge of the western WRD to not encroach into this smaller channel below the WRD, or consider another optional location for the WRD. It should be investigated whether the waste material from the eastern WRD (Option 2) could be used to further stabilise the TSF's dam wall.	**Ds**
	Avoid placing any infrastructure or waste material across drainage lines. Where unavoidable ensure uninterrupted drainage by constructing bypass channels. Make these channels as natural as possible, do not line with concrete.	**Ds/C**
Loss of surface water, and change of drainage patterns	Actively protect catchments and point water sources within the ML and EPLs	**All**
	Do not place service infrastructure (especially roads) in ecologically sensitive areas, or in areas identified as corridors of animal movement, or close to springs.	**Ds**
Natural flow of storm water (clean and dirty) flowing from surrounding areas into and around the operations.	Design all storm water interventions in such a way that storm water can bypass the major structures such as the open pit, TSF, and the WRD and stockpiles. Ensure that these facilitates are designed, constructed and operated that flood protection is provided. Refer to the surface water specialist study for the conceptual Stormwater design.	**All**
Flow of dirty storm water (rain water that falls onto and flows	Construct engineered structures to direct contaminated water from the processing areas, landfill facility, roads and offices	**C/O**

Issue	Management commitment	Phase
across the site)	areas to the return water dam circuit for storage and re-use.	

7.3.2.2 Pollution of surface water – radiological and non-radiological

Objectives

The objective of the management measures is to prevent pollution of surface water run-off and to prevent pollution of soils.

Actions

TABLE 7-5: ACTIONS RELATING TO THE MANAGEMENT OF SURFACE WATER – GENERAL

Issue	Management commitment	Phase
Clean & dirty water separation	Where possible, surface water management facilities will be designed, constructed and operated so that dirty water is kept separate from clean water run-off through a system of berms, channels, trenches, flood protection measures, erosion protection or dams. The need for long term controls around the WRD will be determined as part of closure planning.	**Ds/C/O**
	The berms will direct any clean water run-off to the streams and dirty water drained from the "dirty" areas will be directed with trenches through a silt trap to a pollution control dam. The dam will have the capacity to be pumped out to trucks for dust control or to the process water dams.	
	Effective site management / supervision to ensure no blocking of storm water infrastructure and efficient storage of contact water.	
	Surface water sampling of non-contact water to enable compilation of database of water quality. Sampling of water in contact water storage ponds to identify whether suitable for re-use within the mine, (especially for arsenic). If not suitable, evaporated until ponds dry and any sludge / silt removed to TSF.	
Mine infrastructure	Ensure that where mine infrastructure becomes damaged or causes surface water contamination they are adequately repaired and maintained.	C/O/D
Emergency	Major spillage incidents that contaminate flood waters will be handled in accordance with the NRE emergency response procedure and reported to the authorities as stipulated in the Namibian legislation. Also see actions relating to spill management (section	

Issue	Management commitment	Phase
	7.3.2.5).	
Training and awareness	Induct all employees and contractors in NRE's spillage management procedure.	
	Train selected staff in the remediation of soils or water contaminated by hydrocarbon spills.	
Safe disposal and rehabilitation of hydrocarbon contaminated soils and water	Develop and implement a hydrocarbon remediation procedure that explains how to deal with the treatment of contaminated environments (soil and water).	
Monitoring of hydrocarbon spills	Ensure that checking for hydrocarbon spills is included in the daily inspections.	
	Report spillages as per the incident management procedure and Namibian legislation.	

7.3.2.3 Industrial effluent

Objectives

The objective of the management measures is to prevent pollution of surface water, etc. due to industrial effluent (i.e. effluent from the process plant).

Actions

TABLE 7-6: ACTIONS RELATING TO INDUSTRIAL EFFLUENT

Issue	Management commitment	Phase
Legal compliance	Apply to DWA for exemption of certain conditions of the water discharge permit to allow the continued reuse of treated sewage effluent in the process water circuit.	D
Spillage of industrial effluent	Prevent spillages of industrial effluent. Where spillage does occur, ensure it is properly contained.	O
	Design relevant tanks (containing hazardous substances) in the process plant to contain 110% of the volume of one or the largest (in a multi tank setup) tank and that pumps and pipes are maintained in good working order.	
	Ensure that checking for industrial effluent spills is included in the daily inspection checklist.	

Issue	Management commitment	Phase
	Report spillages as per the incident management procedure and clean up spills within 24 hours of the incident occurring.	
Pollution of soil and / or water when spillage or discharge occurs.	In the event of industrial effluent discharge into the environment, stop the incident as soon as possible and then find the root cause.	O
	In the event of soil or water pollution, spills will be cleaned up/remediated immediately (within 24 hours) in line with spillage management procedure.	C/O/D
Prevent industrial effluent from polluting the environment	Ensure that the various effluent streams (tailings decant, treated effluent dirty storm water, process effluent) are managed to prevent overflow of the return water dam.	O
	Ensure that a freeboard is maintained to accommodate run-off during a 1:50 year storm event.	
	Monitor the effectiveness of the mitigation measures (e.g. liner) for damage to ensure that seepage does not occur.	
	Ensure that storage/containment facilities have sufficient capacity to cater for the various sources of water including rainfall.	
	Install oil separators at all wash bays to separate hydrocarbons from the water. Send the water to the return water dam.	Ds/C/O
	Skim separator regularly and dispose of hydrocarbons as per the waste management procedure.	Ds/C/O
	Maintain pipes, drains, pumps, valves, etc. to minimise the likelihood of leaks.	O
	Recycle all process water from the process dam back into the plant as per the design specifications.	
Discharge of industrial effluent to the return water dam and TSF	Ensure that all the industrial effluent is discharged into the return water dam and the TSF (slurry).	Ds/O
Storage and disposal of liquid waste (hydrocarbons)	All liquid hydrocarbon waste will be collected, safely stored in sealed drums on impermeable surfaces within bunded areas. These areas will be designed to contain 110% of the volume of one or the largest (in a multi drum setup) drum and will be equipped with traps and oil separators to contain spilled hydrocarbons. The used hydrocarbon liquid waste will be provided to third parties for recycling. Related records will be kept.	C/O/D

7.3.2.4 Domestic effluent

Objectives

The objective of the management measures is to prevent pollution of surface water, etc. due to domestic effluent.

Actions

TABLE 7-7: ACTIONS RELATING TO DOMESTIC EFFLUENT

Issue	Management commitment	
Discharge of raw sewerage and grey water	Conduct regular monitoring to ensure that effluent is not being discharged into the environment.	**C/O/D**
Awareness and Training	Train operators to understand the legal requirements and how to achieve compliance.	
	Induct Employees and Contractors in the use of the spill management procedure.	
Discharge of raw sewerage and grey water into appropriate sewage treatment facilities	Ensure that French drains / portable facilities constructed during the construction and decommission phases are managed until such time as they are no longer used and can be decommissioned.	**C**
Ablution facilities	Ensure that portable toilets are working properly and are cleaned at least weekly, so they do not pollute the surrounding environment or create hygiene problems.	**C**
	Ensure that sewerage from the portable toilets is disposed of at the nearest sewage works.	
Treatment of sewerage	Regularly service and maintain sewage treatment plant (STP) to keep it in proper working condition.	**O/D**
	If the treated water is acceptable for discharge it will either be discharged to the environment or piped to the tailings facility. Under no circumstance will water that is not suitable for discharge be released to the environment	
	Sewerage sludge from the STP shall be removed by the sewerage services contractor for disposal at the nearest waste drying beds.	
Legal compliance	Apply to DWA for the STP and a possible Waste Water Discharge permit. Conduct regular inspections and audits relating to the STP activities and ensure compliance to conditions of such possible permits issued by DWA (i.e. monitoring, etc.), where required.	**Ds**
Treatment of sewerage	Operate the STP according to the operations manual to ensure	**O**

Issue	Management commitment	
	optimum performance.	
Discharge of raw sewerage and grey water into appropriate sewage treatment facilities	Operate biological sewage treatment plant to treat sewage and grey water generated on site.	

7.3.2.5 Spills

Objectives

The objective of the management measures is to prevent pollution of surface water, etc. due to spillages.

Actions

TABLE 7-8: ACTIONS RELATING TO SPILLAGES

Issue	Management commitment	
General pollution/ spills	All hazardous chemicals (new and used), dirty water, mineralised wastes, concrete batching activities and non-mineralised wastes are handled in a controlled manner so that they do not contaminate surface water run-off and soil or where this is not possible, demonstrate (through monitoring) that the potential contamination is within acceptable limits from a human health and related risk perspective.	**C/O/D**
	Prevent pollution through infrastructure design and through education and training of workers (permanent and temporary).	
	Only use adequate fuel containment facilities	
	All materials, fuels and chemicals must be stored in a specific and secured area to prevent pollution from spillages and leakages.	
	The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include in situ treatment or disposal of contaminated soils as hazardous waste. The former is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are replaced.	
	Ensure that on-site contractors have all the necessary hazardous protection equipment for people and the environment in the advent of	

Issue	Management commitment	
	a spill.	
	All vehicles and machines must be maintained properly to ensure that oil spillages are kept at a minimum.	
	Verify fuel transport company's spill containment (emergency clean up) plan and spill clean-up agreement is in place. Ensure that fuel transporting companies adhere to the Petroleum Products and Energy Act (13 of 1990) and Regulations	
	Establish and maintain concrete bunded areas around all diesel generators, where required.	
	Maintain and implement spill management procedure, including the clean-up of hydro-carbon spills.	
	Ad hoc spills will be cleaned up/remediated immediately in line with spillage management procedure.	
	Place spill kits in all areas where hazardous substances are dispensed and stored and train staff to use it.	
	Specifications for post rehabilitation audit criteria to ascertain whether the remediation has been successful.	
Ablution facilities	Chemical sanitary facilities must be provided for construction workers. Construction workers should only be allowed to use temporary chemical / permanent toilets on the site. Chemical toilets shall not be within close proximity of any drainage system. Frequent maintenance should include removal without spillages. Chemical storage areas should be sufficiently contained, and the use of chemicals should be controlled.	**C**
Emergency situations – very large spills	Maintain and implement the emergency response procedure to address large scale hydrocarbon or reagent spills on and off site.	**C/O/D**
Hydrocarbon spills	Ensure that the company is in possession of the relevant licences can provide reports that both surface and underground storage tanks are in good condition (as per legal requirements).	**All**
	Ensure that hydrocarbon (used and new fuel and oil) tanks and drums are stored inside bunded areas on impermeable floors with traps and separators for containing spillages. These areas are designed to contain 110% of the volume of one or the largest (in a multi tank setup) tank and that pumps and pipes are maintained in good working order.	
	All wash bays will be equipped with oil traps and separators. All	

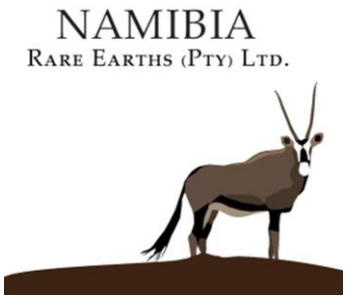
Issue	Management commitment	
	collected oil will be stored as above.	
	Ensure that all fuel and oil storage facilities (farms) and transport tankers have spill kits.	**C/O/D**
	Ensure that the fuel transport company has a system in place to deal with hydrocarbon spills and subsequent clean-up thereof.	
	Contain the spill and commence with remediation within 24 hours and report as per the incident management procedure. In this regard the remediation options include in situ treatment or disposal of contaminated soils as hazardous waste. The former is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are replaced.	
	If contamination of water occurs separate hydrocarbons from water and treat water before recycling and re-use.	
Domestic and Industrial effluent	Prevent effluent spills by ensuring that treatment and storage facilities are adequate and pipes in good condition.	**O**
	Ensure that capacities of the various facilities and pipes are not exceeded.	
	All vehicles and equipment will be serviced in workshops and wash bays with contained impermeable, floors, dirty water collection facilities and oil traps.	
	Contain the spill and as clean up within 24 hours and report as per the incident management procedure.	
	Slurry spilled on the ground is to be picked up and transported, in sealed containers, to the TSF or emergency stockpile for disposal.	
	Contain sewerage and industrial effluent spills. The first management priority is to treat the pollution by means of in situ bio-remediation in consultation with an expert.	
	If in situ treatment is not possible or acceptable then the pollution must be excavated, classified as waste and treated as per the waste management procedure.	
Legal Compliance – all spills	Comply with all legal requirements regarding spills and containment structures.	**C/O/D**

Issue	Management commitment	
	Hydrocarbon spills of 200l or more must be reported to MAWF and MME.	
Monitoring of spills – all spills	Ensure that the monitoring of all tanks, pipelines and bunds are included in the daily inspection programme to develop an early detection system for leaks.	**C/O/D**
	Update, maintain and implement a maintenance plan for tanks, tankers, pipelines and bunds.	
	Identify post rehabilitation audit criteria for verifying that remediation has been successful.	
	Conduct periodic audits of facilities to ensure compliance with legal and company standards.	
Awareness and training – all spills	Induct all NRE employees and contractors in the Environmental Policy, spillage management and incident management procedures.	**C/O/D**
	Train selected employees in the containment, and handling of spills and in the de-contamination and rehabilitation of affected environments.	
Emergency situations – all large or remote spills	Major spillage incidents must be handled in accordance with the emergency response procedure to be developed for Lofdal.	
	Identify and contract a service provider/specialist to assist with the handling and clean-up of emergency spills off site.	
	Periodically test the emergency response.	
Reagent spills -	Ensure that the reagent supply and/or transportation company is in possession of the relevant licences (legal requirements) and can provide reports that transport and storage tanks are in good condition.	**O**
	Ensure that reagent tanks are housed inside concrete bunds and that dispensing takes place on an impermeable surface.	
	Ensure that bunds are designed to contain 110% of the volume of one or the largest (in a multi tank setup) tank and that pumps and pipes are maintained in good working order.	
	Ensure that the reagent supply and/or transportation company has a system in place to deal with the variety of spills that might occur and the subsequent clean-up thereof.	
	Contain the spill using appropriate spill kits, as far as possible clean up within 24 hours as per the MSDS specification and report as per	

Issue	Management commitment	
	the incident management procedure.	
	All solid reagents to be picked up and placed in the relevant reagent tank for use in the plant. If the reagent is polluted it must be disposed of in a safe disposal site.	
	Commence with remediation within 24 hours and report as per the incident management procedure. In this regard the remediation options include in situ treatment or disposal of contaminated soils as hazardous waste.	
	If contamination of water occurs, contain the water and treat it, or direct it into the process dam for use into the process plant.	
	Identify and utilise a service provider to assist with the clean-up of very large reagent spills (emergency situations) as required.	
Process solution spills (Unplanned events – release of large volumes of process solutions	Ensure that bunds have been designed to capture any release of solution to the extent of 110 % of the largest tank constructed inside the bunded area.	**Ds/O**
	As far as possible keep bunds clean and empty.	**O**
	Ensure that pumps and pipelines are in place to pump solutions from the bunds back into the process.	**Ds/O**
	Maintain and implement an emergency procedure for the containment and clean-up of process solutions if bunds are breached and treatment of contaminated areas.	**O**

7.4

Groundwater MMP



7.4 GROUNDWATER MANAGEMENT AND MITIGATION PLAN

Potential groundwater quality and quantity impacts are an issue during all mining phases relating to various mining activities and infrastructure unless measures are undertaken to prevent and mitigate such impacts. The purpose of this groundwater management and mitigation plan is to provide for methods to be followed to achieve such mitigation.

The commitments are derived from the EIA Reports (SLR 2016) with regards to Groundwater management forms the basis of this MMP.

7.4.1 COMPONENTS

This plan is made up of the following components:

- Dewatering of Mine Pit
- Contamination of Groundwater

7.4.2 MANAGEMENT

7.4.2.1 Dewatering of Mine Pit *Objectives*

Objective

The objective of the mitigation measures is to prevent impacts from dewatering on users of 3rd party boreholes and their water supply.

Actions

TABLE 7-9: ACTIONS RELATING TO WATER SUPPLY AND DEWATERING OF THE MINE PIT

Issue	Management commitment	Phase
Mine dewatering	NRE will establish additional monitoring boreholes, with the input of a groundwater specialist, to monitor the influence of dewatering and to investigate the radius of influence (ROI). If the dewatering has influence on 3rd party boreholes the mine will ensure that the water supply will be warranted, e.g. with deeper borehole drilling.	**O**
	Communities should be consulted in advance about the potential lowering of water levels in their boreholes.	**Ds**
	Water saving measures in mining, operational and tailings deposition processes should be implemented to further reduce the use of groundwater resources for make-up water.	**O**

Issue	Management commitment	Phase
	Additional monitoring boreholes be drilled and a monitoring schedule developed including a local and regional component, thereby covering the entire EPL area. Groundwater monitoring should include the regular measurement of water levels. The groundwater model will be revised with updated geological information on a routine basis (every 2 years) during the operation phase. This will allow more precise management and planning around this issue.	**O**
	If greater impacts (than predicted) are observed, appropriate measures will be formulated and implemented by the Lofdal mine in consultation with a groundwater specialist and the Department of Water Affairs.	**O**
Further geochemical work	• Additional waste rock samples should be taken to further geochemically characterise the material likely to be exposed during mining. In particular, further sampling of those lithologies in which results of the ABA test work were inconclusive should be undertaken. • ABA results for the composite tailings samples should be reported once received from the laboratory, and the report updated accordingly. • Sequential leaching tests on tailings samples should be conducted so that the mass flux (source term) of selected contaminants from the TSF can be estimated. This would be required to improve and update the estimated potential groundwater quality impacts using a numerical contaminant transport model. • Analyse the tailings liquor after the floating process for potential contaminants and use as source term for the initial (during mine operation) seepage from the tailings dam.	**Ds**
Legal aspects	Ensure that permits for abstraction and pit dewatering are renewed as required.	**O**
	Conduct regular audits to ensure that the conditions of the permits are being met.	**C/O**

Refer to the Biodiversity MP for management requirements relating to the reduction of water resources as an ecological driver.

7.4.2.2 Impacts on Groundwater Quality

Objectives

The objective of the mitigation measures is to prevent regional groundwater pollution and negative impacts on 3rd party groundwater users.

Actions

TABLE 7-10: ACTIONS RELATING TO GROUNDWATER CONTAMINATION

Issue	Management commitment	Phase
Groundwater contamination from the plant, pit, TSF & WRDs	Mine waste facilities including WRDs and the TSF be constructed in accordance with the environmental protection design measures. Key aspects of this design are water pollution control measures including an engineered synthetic liner and seepage collection system for the TSF.	**Ds**
	Runoff from the WRD side wall must be captured by trenches and directed towards the contact water pond. The possibility for the enhancement of vegetation growth on the WRDs should be investigated, thereby reducing erosion, surface water runoff and percolation of water into the WRDs due to evapotranspiration.	**Ds/C**
	The numerical groundwater flow and transport model be updated every two (2) years in order to improve the knowledge base and predictions regarding the impacts of mining on groundwater quantity and quality.	**O**
	Any leakage through the liner or side walls must be captured by trenches and/or recovery wells to be drilled into the weathered zone. Supernatant on the TSF should be recovered and recycled. Freeboard must always be sufficient to capture extraordinary rainfall events.	**Ds**
	Monitoring boreholes will be placed around the perimeter of the TSF and downstream for early time leakage control and recovery of contaminants.	**O/D/C**
	The groundwater model will be routinely updated to take account of updated geological information and to improve the understanding and management of water related issues. This updating should be done every two years and mitigation and management measures adjusted according to updated modelled results.	**O**
	Given that the dewatering effect of the pits is key to the long term regional groundwater pollution control, additional measures to enhance this effect may be considered if future mine planning results in a reduced pit depth or other factors result in a change to the model and a reduced dewatering effect.	**O**
	As part of closure planning, the closure designs of any permanent and potentially polluting structures (mineralised waste facilities) will consider the requirements for long term regional aquifer pollution prevention and confirmatory monitoring. This will require full capping of the TSF and may also require active monitoring and management interventions that	**O/D/C**

Issue	Management commitment	Phase
	have to be implemented as long as contamination concerns exist.	
	Additional geochemical test work should be done for the hydrochloric acid process tailings, including ABA and leach tests. A source term should be determined for the final predicted tailings streams at the proportions that they will be produced. The source term will be used as key parameter in the numerical transport model, allowing the more accurate prediction of pollution plume concentrations.	**Ds**
	Potential contaminant transport is likely to occur in discrete fractures, mostly undetected at this stage and thus not simulated in the numerical model. These possible seepage conduits should be identified by means of geophysical investigation and drilling of boreholes, test pumped and monitored once a definite infrastructure layout is determined.	**Ds**
	Additional monitoring boreholes be drilled and a monitoring schedule developed including a local and regional component, thereby covering the entire ML area. Groundwater monitoring should include the regular measurement of water levels and the analysis of groundwater samples for major ions, metals, radionuclides and other rare elements.	**C**
Emergency	Major spillage incidents will be handled in accordance with the NRE emergency response procedure. DWA and surrounding farmers (potential of contaminating farm boreholes) will be informed of major spillages.	**C/O/D**

7.5

Air Quality MMP

7.5 AIR QUALITY MANAGEMENT AND MITIGATION PLAN

There are a number of sources in all phases that have the potential to pollute the air. In the construction and decommissioning phases these potential pollution sources are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long term potential sources and the closure phase will present final land forms that may have the potential to pollute the air through long term wind erosion.

The EIA showed that the most significant source of $PM_{2.5}$ PM_{10} and TSP emissions is vehicle entrainment on unpaved roads.

The commitments derived from the EIA Report (SLR, 2016) with regards to Air Quality forms the basis of this MMP.

7.5.1 COMPONENTS

This plan is made up of the following components:

- Fall-out dust, PM_{10}, $PM_{2.5}$ and gaseous emissions

7.5.2 MANAGEMENT

Objectives

The objective of the management measures is to prevent unacceptable air quality related pollution impacts.

Actions

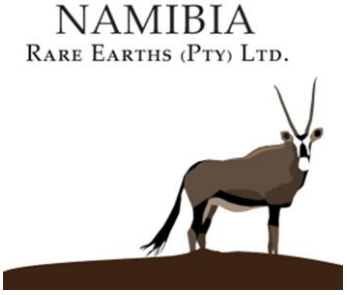
TABLE 7-11: ACTIONS RELATING TO FALL-OUT DUST, PM_{10} AND GASEOUS EMISSIONS

Issue	Management commitment	Phase
Gaseous emissions	Relocate the households at Oas Post 3 and provide new source of water supply (from a possible new borehole). (Refer to MMP 11 for more detail).	Ds/C
Dust and PM_{10} and $PM_{2.5}$		
Dust and PM_{10} and $PM_{2.5}$	All design mitigation measures to be implemented (including water sprays on all in-pit haul roads and temporary unpaved mine roads, waters sprays at screens and at materials handling points, and enclosure of crushers with fabric filters)	Ds/C/O
	In addition water sprays with chemical suppressants on permanent haul road surfaces.	
	Paving of sections of the unpaved public road in the vicinity of sensitive receptors.	

Issue	Management commitment	Phase
Dust and PM_{10} and $PM_{2.5}$ monitoring	Continuation of dustfall and ambient PM10 and PM2.5 monitoring at newly identified locations.	C/O/D
	As good practice recommend by the International Finance Corporation (IFC), the mining operations should not exceed 25%[1] of the selected ambient air quality criteria for PM_{10} and $PM_{2.5}$ concentrations outside the mining lease area. This equates to a daily $PM_{2.5}$ addition of 9 µg/m³ and PM_{10} of 19 µg/m³, with an annual addition of 4 µg/m³ for $PM_{2.5}$ and 8 µg/m³ for PM_{10}. This would require establishing background ambient concentrations for PM_{10} and $PM_{2.5}$ through the continuation of the ambient sampling. Once background concentrations have been established (at least one-year of 90% data availability), the additional allowable contributions should be added and those limits adopted as the internal performance targets for the LMP.	
NO_2 monitoring	Bi-annual one-month passive NO_2 sampling campaigns.	
Meteorological monitoring	Continuation of meteorological recordings.	

7.6

Noise & Vibrations MMP



7.6 NOISE AND VIBRATION MANAGEMENT AND MITIGATION PLAN

There is a range of construction, operation and decommissioning activities that have the potential to generate noise and cause related 3rd party nuisance. Noise pollution will have different impacts on different receptors because some are very sensitive to noise and others are not. For example, mine workers in general do not expect an environment free of mine related noise and so they will not be sensitive to environmental noise pollution at work. In contrast, local communities are likely to be more sensitive to unnatural noises and so any change to ambient noise levels because of mine related noise will have a negative impact on them. In addition the mine will introduce blasting vibration and the potential for fly rock into an area where there is currently none.

The commitments derived from the EIA Report (SLR, 2016) with regards to noise and vibrations forms the basis of this MMP.

7.6.1 COMPONENTS

This plan is made up of the following components:

- Noise pollution
- Blast impacts

7.6.2 MANAGEMENT

7.6.2.1 Noise Pollution

Objectives

The objective of the management measures is to limit excessive noise pollution

Actions

TABLE 7-12: ACTIONS RELATING TO NOISE POLLUTION

Issue	Management Commitment	Phase
Impact of noise on the environment/ sensitive receptors	Document and investigate all registered complaints and make efforts to address the area of concern where possible.	C/O/D
	No permanent residences be permitted within a zone of 1 km from any operational activity or project related infrastructure.	
	Communication channels are established to ensure prior notice to the sensitive receptor if work is to take place close to them. Information that should be provided to the potential sensitive receptor(s) include: • Proposed working times; • how long the activity is anticipated to take place; • what is being done;	

Issue	Management Commitment	Phase
	• contact details of a responsible person where any complaints can be lodged should there be an issue of concern.	
	All diesel powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.	
	To minimise noise generation, vendors should be required to guarantee optimised equipment design noise levels.	
	Vibration isolators should be considered to reduce noise and vibration from crushers and screens.	
Traffic noise	The measures described below are considered good practice in reducing traffic related noise. • Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program. • Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration. • Maintain road surface regularly to avoid corrugations, potholes etc. • Avoid unnecessary idling times. • Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm should be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level in the vicinity of the moving equipment. The promotional material for some smart alarms does state that the ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' which is the case at Lofdal	
Monitoring	A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed. The procedure described in the noise specialist report should be adopted for all subsequent noise surveys.	

7.6.2.2 Blast Impacts

Objectives

The objective of the management measures is to limit excessive blast vibration and fly rock

Actions

TABLE 7-13: ACTIONS RELATING TO BLAST IMPACTS

Issue	Management commitment	Phase
Minimise impacts of blasting	The blast design, implementation and monitoring will, as a general rule, ensure that: • Blasting at the surface will be audible over long distances and may cause a startling reaction at receptors in close proximity. This can be mitigated by adhering to blast schedules that have been communicated to the affected parties. • fly rock is contained within a maximum of 500m of the blast site and no 3rd party structures allowed within this area; • Prior to each blast the blast area will be cleared of third parties to a safe distance determined by appropriate legislation and safe working procedures. Prior to each blast an audible warning will be sounded; • ground vibration at the closest third party structures is less than 12mm/s peak particle velocity (and 6 mm/s for informal housing); • air blast at the closest third party structures is less than 115dB; and • Develop a Blast Procedure (including the requirement for a photographic record of relevant houses of nearest sensitive receptors before blasting commences). • all registered complaints will be documented, investigated and efforts made to address the area of concern where possible.	C/O/D

7.7

Biodiversity MMP

7.7 BIODIVERSITY MANAGEMENT AND MITIGATION PLAN

To understand biodiversity one must appreciate all of its components. It is not just about the species of plants and animals and the different habitats in which they live (biodiversity patterns) but the way that factors, such as wind, water, steepness of slope and presence of pollinators, affect the habitats and the species living in them (ecosystem processes).

Of the location options for infrastructure, as provided, there is in each case a clearly better and a worse one. Avoidance through careful location is thus a valid approach to mitigate this impact.
The commitments derived from the EIA Report (SLR 2016) with regards to Biodiversity forms the basis of this MMP.

7.7.1 COMPONENTS

This plan is made up of the following components:

- Managing the physical destruction of biodiversity and their habitats.
- Managing general disturbance of biodiversity and habitats.

7.7.2 MANAGEMENT

7.7.2.1 Physical destruction of biodiversity

Objectives

The objective of the mitigation measures is to prevent, as far as is possible, the unacceptable loss of biodiversity and related functionality through physical destruction.

Actions

TABLE 7-14: ACTIONS RELATING TO THE PHYSICAL DESTRUCTION OF BIODIVERSITY AND HABITATS

Issue	Management commitment	Phase
Physical destruction biodiversity by staff	Zero tolerance to killing and collecting of biodiversity. No poaching allowed. Poaching offenders will be prosecuted. No collection of dead or living plants, or parts of plants (including fuelwood) and possession thereof allowed.	All
Physical destruction biodiversity by roads	Avoid placing roads on very sensitive habitats such as rocky outcrops. In this regard, the Option two layout, specifically relating to the process plant and the TSF, is the preferred option from an environmental point of view (see Figure 4-3). Option 1 TSF and process plant and associated connection roads and pipelines would have high significant impacts, even with mitigation.	Ds
	Avoid damage to *Sesamothamnus guerichii* as a result of clearing for	Ds

Issue	Management commitment	Phase
	roads by planning the road's route in fine detail.	
	Design road footprint to be as small as possible and keep roads in good condition so that diversions off roads will not be necessary.	Ds/C/O
	Site aggregate borrow pits for road construction on the proposed mining site to reduce overburden stockpiling and unnecessary environmental disturbance.	Ds/C/O
	Control and restrict vehicle movement to established roads and service tracks as far as possible. Driving on the plains is not permitted.	C/O/D
	Develop and enforce road use policy, including speed limits.	
Physical destruction of biodiversity by all mine infrastructure	Design footprints of all facilities as small as possible and generally limit mine infrastructure, activities and related disturbance to those specifically identified and described in the EIA report.	Ds
	Use areas that are already disturbed or will definitely be disturbed in the near future for any temporary construction camps or lay-down areas.	Ds
	Avoid all sensitive and very sensitive habitats by selecting locations on the least sensitive habitat for the mining plant, the WRD, the TSF and the ancillary structures such as the solar plant and personnel camp (see Figure 4-3).	Ds
	Where possible avoid cutting or relocating protected trees and develop plans to care for them during the life of mine until their surroundings have been restored Where disturbance of protected trees is unavoidable apply for the necessary permits in a timely manner.	Ds/C/O/D
	Prior to construction and in consolation with a specialist scan proposed construction sites for any more sensitive flora and fauna and implement the recommendations of the specialist – these could include but not be limited to: a search and rescue of dens, crèches, and burrows, relocating/demarcating nests, demarcating flora (protected trees) to either be conserved within the construction site or relocated. Particularly the nesting sites of large raptors are important to protect and avoid.	Ds
	Individually evaluated all springs (including those that may still be found in the future) in detail before operations start. Do not locate infrastructure closer than 1 km from any natural springs.	Ds/C/O

Issue	Management commitment	Phase
	Clearly mark construction and maintenance footprint prior to construction activities beginning, together with designated turning points and construction laydown areas. Designated turning points for heavy vehicles. Constrain the area as far as possible and rehabilitated once construction is complete.	All
	Clearly demarcate boundaries of the waste rock dump and TSF	Ds
	Earthen-bund the perimeter of the mining pit to reduce the chances of animals being killed or injured by blasting, or incurring damage by mining equipment	C/O
	Do not place water tanks or power pylons on rocky outcrops, in the very sensitive zones or on the quartz hills in the east.	Ds
	Equip internal power lines with bird deterrent measures to prevent bird kills.	
	Allow the National Botanic Garden the opportunity to collect cuttings of plants, such as Commiphora spp., in areas where such will be destroyed.	Ds
	Upon completing construction, initiate restoration of all infrastructure including roads areas that were only impacted during construction and will not be required for mining operation	C/O
	Conduct a survey to ascertain that the new *Hermannia sp*. does occur well beyond the study site.	All
	Recommended to conduct multi-seasonal invertebrate survey within at least the two main habitats (arid savanna and rocky outcrops) of the ML, before or shortly after development proceeds.	C/O
	Monitor the requirements for the establishment of long term biodiversity functionality	D
	Where relevant, commence rehabilitation immediately after impact has ceased.	O/D
Physical destruction of biodiversity outside of mine footprint	Avoid disturbance of areas outside the designated footprint of the TSF and WRD by constructing a fence and limiting all construction activities to the area inside the fence.	C
	Mark out all construction footprints and clearly convey the rule of staying inside these boundaries to all relevant contractors	C/O

7.7.2.2 Reduction of water resources as an ecological driver

Objectives

The objective of the management measures is to prevent the unacceptable loss of biodiversity and related functionality through a reduction in the key ecological drivers of groundwater and temporary surface water flow.

Actions

See Surface Water MMP 3.

7.7.2.3 Managing general disturbance

Objectives

The objective of the management measures is to prevent unacceptable disturbance of biodiversity.

Actions

TABLE 7-15: ACTIONS RELATING TO THE GENERAL DISTURBANCE TO BIODIVERSITY

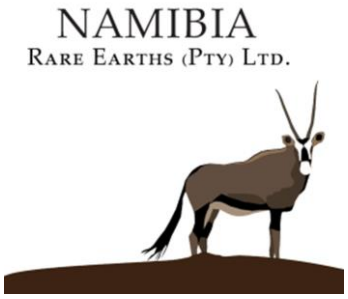
Issue	Management commitment	
Physical disturbance of biodiversity by staff	Educated, informed and train all construction and operations staff of their environmental obligations and appreciation the natural non-consumptive values of biodiversity, as well as legislation relating to protected species. Stipulate meaningful penalties for damages to biodiversity, and hold the main contractor responsible for all transgressions.	All
	Increase environmental awareness through training of key staff, including their ability to identify and handle animals. Raise awareness concerning recognising venomous snakes/invertebrates from non-dangerous ones, and ensure that sufficient personnel are trained to handle snakes/invertebrates so as to move them away from the mine without killing.	All
	The NRE Environmental Department to monitor activity of wildlife in the vicinity of the mine (e.g. using spoor counts) and compare with their activities at selected control sites in the wider area. Monitoring of animals movement (especially bigger animals (i.e. elephants) should be used to assess the scale of this effect and management adapted accordingly should it prove to be necessary. Monitor the presence of animals close to the pit.	C/O/D
	Develop a policy that limits independent movements by staff into the veld outside the fenced-in mining site.	C
	No fires are allowed on site.	C/O/D
	As much as operationally feasible, driving to and from the mining sites should be avoided at night and limited, if possible, only to within the mining area	

Issue	Management commitment	
	Carry out regular training to instil appropriate vehicle control and a high degree of professional road conduct.	
	Rigorously police the construction crews' and mining staff's adherence to the rules and do not hesitate to invoke penalty clause/s	
	Place the food scraps in a closed container to avoid animals being attracted and scavenging from these food scraps.	
General disturbance of biodiversity	Erect a game-proof fence around the pit and mining operations.	
	Use yellow outdoor lights (sodium vapour floodlights with orange covers, or yellow bulbs/tubes for incandescent and fluorescent lights) wherever possible as this is less glaring to invertebrates while serving human requirements. Keep vertebrates away from the lighted areas with appropriate fencing where feasible.	
	In general, where feasible, 'mosquito' screens should be installed on door and window openings to exclude flying insects from indoor working areas. This is particularly important if an on-site kitchen and canteen area is planned	
	Reduce the attraction to invertebrates to indoor lights by installing self-closing doors and non-opening windows in night-time operations buildings	
	If automated, UV-attractant pest management devices have to be deployed, such systems should be either kept indoors (e.g. in maintenance sheds, inside administrative blocks, or inside production plants) or should be covered with wire mesh to ensure that only target organisms of the right size are electrocuted	
	Ensure that animals have no access to contaminated water sources	
	Fence in TSF and other areas that are regularly artificially wetted and use other proven means to deter birds from reaching them; wetted areas should be kept to a minimum.	
	Locate linear infrastructure in a way that minimises new fragmentation, e.g. using infrastructure corridors	Ds
	Rehabilitate areas around linear infrastructure after installing it such that they minimise habitat fragmentation, allowing populations to be connected across them	D/C
	Implementing strict controls over the movement of materials onto and off the site to minimise the spread of invasive species; if this becomes a problem monitor the occurrence and spread of invasive species so as to instigate steps for their control, following expert advice	C/O/D

Issue	Management commitment	
Off-sets	Support the initiatives of conservation NGOs to develop conservancy management plans	C/O
Emergency	Certain instances of injury to animals may be considered emergency situations. These will be managed in accordance with the NRE Lofdal emergency response procedure.	C/O/D
Closure planning	As part of closure planning, the designs of any permanent and potentially polluting structures will take consideration of the requirements for long term pollution prevention and confirmatory monitoring.	D/C

7.8

Visual MMP



7.8 VISUAL MANAGEMENT AND MITIGATION PLAN

Visual impacts cause a loss of scenic quality and landscape character. Visual impacts of the open pits, processing plant and TSF will generally be limited by a strategy of concurrent rehabilitation over the LoM.

The commitments derived from the EIA Report (2016) with regards to visual impacts form the basis of this MMP:

7.8.1 COMPONENTS

This plan is made up of the following components:

- Visual impact

7.8.2 MANAGEMENT

7.8.2.1 Visual disturbance

Objectives

The objective of the measures is to limit visual impacts.

Actions

TABLE 7-16: ACTIONS RELATING TO VISUAL IMPACT

Issue	Management commitment	Phase
Infrastructure Layout	The Option two layout, specifically relating to the process plant, TSF, and solar plant should be implemented (see Figure 4-3). The following needs to be highlighted in this regard: • The WRD should not exceed 1020 mamsl. The WRDs needs to be designed in such a way as to create an organic shape that ties into the local landscape topography. • The toe footprint should curve to tie into the local landscape, with the crests stepped back to reduce large fill faces to the north and east. • The optimal layout for the 2 smaller WRDs still needs to be determined (during the detail design phase of the project). The eastern WRD should be bigger (to ensure the height restriction on the western WRD could be applied) and should be moved further east - closer to the TSF. • The process plant site needs to be levelled in such a way that the platform is cut into the ground allowing sufficient soil to construct a low berm to the east of the cut platform. The berm needs to be	Ds

Issue	Management commitment	Phase
	shaped to appear natural and rehabilitated with indigenous grasses.	
Blasting	Design the blast so that the blast plume is contained as much as possible.	O
Lighting	All lighting is to be kept to a minimum within the requirements of safety and efficiency. Refer to the Visual specialist report for generic guidelines regarding lighting.	C/O/D
Closure / rehabilitation requirements	• All structures to be broken down and dumped into the pit or sold as recycled material. • The impacted landscapes need to be shaped into a natural form following natural hydrological patterns. • Rehabilitation of the access road such that natural vegetation cover takes place.	D/C
Materials	All painted surfaces should blend into the natural surroundings (grey or grey-brown).	

7.9

Archaeology MMP

7.9 ARCHAEOLOGY MANAGEMENT AND MITIGATION PLAN

There is a number of activities/infrastructure in all phases that have the potential to damage archaeological resources.

The commitments are derived from the EIA Report (SLR 2012: Section 7.9) with regards to archaeology, form the basis of this MP

7.9.1 COMPONENTS

This plan is made up of the following components:

- Chance heritage finds.

7.9.2 MANAGEMENT

7.9.2.1 Archaeological sites

Objectives

The objective of the management measures is to prevent the unacceptable loss of archaeological sites and related historical information.

Actions

7.9.2.2 Chance archaeological finds

Objectives

To ensure that the correct actions are taken to preserve or document chance archaeological finds.

Actions

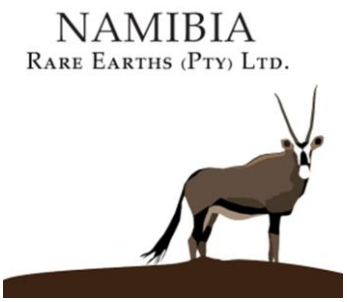
TABLE 7-17: ACTIONS RELATING CHANCE ARCHAEOLOGICAL FINDS

Issue	Management commitment	Phase
Chance Finds Procedure	Areas of proposed mining and related activity are subject to heritage survey and assessment at the planning stage. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance will be found in the course of development work. The personnel and contractor heritage induction process is intended to sensitize people so that they may recognize heritage “chance finds” in the course of their work. The procedure set out here covers the reporting and management of such finds. The “chance finds” procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment by a trained archaeologist or other appropriately qualified person. • Operator - To exercise due caution if archaeological remains are found	C/O

Issue	Management commitment	Phase
	• Foreman - To secure site and advise management timeously • Superintendent -To determine safe working boundary and request inspection • Archaeologist -To inspect, identify, advise management, and recover remains <u>Action by person identifying archaeological or heritage material:</u> • If operating machinery or equipment stop work • Identify the site with flag tape • Determine GPS position if possible • Report findings to foreman <u>Action by foreman:</u> • Report findings, site location and actions taken to superintendent • Cease any works in immediate vicinity <u>Action by superintendent:</u> • Visit site and determine whether work can proceed without damage to findings • Determine and mark exclusion boundary • Site location and details to be added to project GIS for field confirmation by archaeologist <u>Action by archaeologist:</u> • Inspect site and confirm addition to project GIS • Advise NHC and request written permission to remove findings from work area. • Recovery, packaging and labelling of findings for transfer to National Museum <u>In the event of discovering human remains:</u> • Actions as above; and • Field inspection by archaeologist to confirm that remains are human • Advise and liaise with NHC and Police • Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed.	
Legal requirements	The "chance finds procedure is intended to ensure compliance with the relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): *" a person who discovers any archaeological object must as soon as practicable report the discovery to the Council".* The procedure of reporting set out below must be observed so that heritage remains reported to the NHC are correctly identified in the field.	C/O

7.10

Socio-Economic MMP



7.10 SOCIAL AND ECONOMIC MANAGEMENT AND MITIGATION PLAN

The activities associated with the Lofdal mine have socio-economic impacts in all mine phases – some positive and some negative. These impacts related to amongst others employment/job creation, inward migration, local- and regional economies, land use and surrounding landowners and community safety and security.

This MMP aims to provide measures to enhance the positive impacts and limits the negatives impacts.

The commitments derived from the EIA Report (SLR 2016) with regards to socio-economic issues form the basis of this MMP:

7.10.1 COMPONENTS

This plan is made up of the following components:

- National, Regional and local economic Impact
- Economic impacts on local non-mining livelihoods
- Job creation and skills development
- Inward migration and community health/safety and security
- Traffic impacts
- Mine decommission and closure

7.10.2 MANAGEMENT

7.10.2.1 National, Regional and local economic Impact

Objectives

To support the country's national objective of sustained economic growth by promoting the use of labour, products and services from within the Kunene Region and Namibia as a whole.

Actions

TABLE 7-18: ACTIONS RELATING TO NATIONAL, REGIONAL AND LOCAL ECONOMIC IMPACT

Issue	Management commitment	Phase
Actions to enhance positive impacts	Consider to implement salary and wage packages that enable employees to build or purchase their homes over the life of mine and procurement policies that assist the development of small and medium enterprises (SMEs) and other local suppliers to deliver goods and services at a fair price. NRE will: • Avoid constructing mine housing on site to boost the local economies in nearby settlements. • Pay attractive salaries and wages; • Lobby government to enhance the enabling environment to promote local	C/O/D

Issue	Management commitment	Phase
	manufacturing of specialised inputs e.g. through trade incentives. • Ensure the mine's procurement policy favours Namibian products & services; • Facilitate local agricultural producers (of beef, game and horticulture) to increase production, by providing technical support and accessing inputs, in order to sell goods to the mine and residents. • Use small-scale contractors and labour intensive work, where possible. • Partner with government to upgrade roads and communication links.	
Emergency	Should at any point it seem likely that the mine may have to cease operations early and / or go into care and maintenance, employees, suppliers and all other key stakeholders should be informed promptly and given enough time to make financial adjustments.	O

7.10.2.2 Economic impacts on local non-mining livelihoods

The objective of mitigation measures are best stated by the IFC's Performance Standard 5: Land Acquisition and Involuntary Resettlement:

- "To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites" (IFC, 2012).

Actions

TABLE 7-19: ACTIONS RELATING TO ECONOMIC IMPACTS ON LOCAL NON-MINING LIVELIHOODS

Issue	Management commitment	Phase
Impacts on livelihood and resettlement	NRE is strongly advised to follow international best practice regarding project affected people and the benchmark is the International Finance Corporation's Performance Standard 5: Land Acquisition and Involuntary Resettlement (IFC, 2012). It aims to ensure that people who are physically or economically displaced as a result of a project end up no worse off - and preferably, better	C/O/D

Issue	Management commitment	Phase
	off - than they were before the project was undertaken. It refers to both physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition and/or restrictions on land use.	
	Engage with the affected communities through a process of informed consultation and participation to reach consensus on the definition of who are Project Affected People. This is critical for resettlement support and for recruitment strategies, especially when tangible benefits become visible, as many people in the wider area may claim grazing rights on that land and expect compensation. There will be a need to distinguish between residents and migrants coming into the area. The best approach is to develop a Public Consultation and Disclosure Plan (PCDP) early on in the process which should detail how the client will receive and address specific concerns including compensation and relocation, grievance mechanisms and dispute resolution.	
	Safeguard the rights of women affected by resettlement by ensuring that land titles and compensation entitlements are issued in the name of both spouses.	
	Inform project affected people of their rights concerning resettlement and provide them with technically and economically feasible options for resettlement based on consultations and an assessment of resettlement alternatives. Keeping affected people fully informed of their rights and responsibilities is crucial to the success of resettlement planning so information must be made accessible and understandable, as agreed in the PCDP.	
	In consultation with all interested and affected parties including women and other vulnerable groups, prepare and publicly disclose a Resettlement Action Plan (RAP) (IFC, 2002). The aim of the plan will be to protect both NRE and those affected, and it should include: • identification of project impacts and affected populations; (census, assets inventories, natural resource assessments, and socioeconomic surveys which are more detailed than those carried out so far) • a legal framework for land acquisition and compensation; • a compensation framework; • a description of resettlement assistance and restoration of livelihood activities;	

Issue	Management commitment	Phase
	• a detailed budget; • an implementation schedule; • a description of organisational responsibilities; • a framework for public consultation, participation, and development planning; (Project consultation with people affected by resettlement is mandatory). • a description of provisions for redress of grievances; and • a framework for monitoring, evaluation, and reporting; (IFC requires project sponsors to monitor and report on the effectiveness of RAP implementation).	
	Provide affected people with prompt and effective compensation at full replacement value for loss of assets due to project activities.	
	Provide assistance with relocation expenses (moving allowances, transportation, special assistance and health care for vulnerable groups) where physical relocation is necessary.	
	Provide temporary housing, permanent housing sites, and resources (in cash or in kind) for the construction of permanent housing—inclusive of all fees, taxes and utility connection charges—or, as required, agricultural sites for which a combination of productive potential, locational advantages, and other factors are at least equivalent to the advantages of the old site.	
	Provide affected people with transitional financial support (such as short-term employment, subsistence support, or salary maintenance).	
	Design and publicly disclose a Livelihood Restoration Plan which restores or improves living standards and livelihoods of the project affected people. This will be based on the assessed and quantified lost and affected assets and all household income sources to calculate the income loss from project land acquisition as a proportion of total income for each affected household. Options for livelihood restoration for discussion could include land-for-land compensation, full replacement costs, land resettlement preparation costs, agricultural technical assistance, cash compensation, SME technical support and small credit facilities to support physically and economically displaced households.	
Emergency	Aggrieved neighbours are best handled through a transparent Public Consultation and Disclosure Plan which establishes credible and trusted operational procedures to address neighbours and employees' concerns and grievances.	

7.10.2.3 Job creation and skills development

Objectives

The enhancement objective is to maximise employment and skills development opportunities, giving preference to people from the local area first, then from the Kunene Region and nationally.

Actions

TABLE 7-20: ACTIONS RELATING TO JOB CREATION AND SKILLS DEVELOPMENT

Issue	Management commitment	Phase
Actions to enhance positive impacts	• Develop criteria for defining Project Affected People (PAP), such as residents of the two conservancies and the Kunene Region, as part of its hiring policy and then give preference to Project Affected People through recruitment and training; • Have not higher than Grade 10 as the minimum employment requirement; • Support the Ministry of Education and NAMCOL, now, to improve education programmes in Khorixas to enable bright potential employees to gain Grade 10 and Grade 12 before recruitment for construction and operations starts; • During exploration and throughout the life of mine, promote vocational training among school learners with career talks and linking to bursaries; • During construction, establish intensive training programmes for machine operators and other required skills to enable Project Affected People to take up jobs in the operations phase; • Develop a human resources policy which prioritises the selection of women for training and recruitment and which supports women to perform well in the workplace while balancing their other duties in the family and community; • Adhere to the Namibian Chamber of Mines Mining Charter, which states that mining companies must invest at least 2% of their annual gross payrolls every year in developing the skills of historically disadvantaged Namibians. • Adhere to the International Finance Corporation's Performance Standard Two on labour and working conditions and "recognise that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers"; • Ensure that employees, and those of its mining and plant contractors, are paid market related wages, with housing allowances that can promote home ownership and contributions to pension contributions and	C/O/D

Issue	Management commitment	Phase
	medical aid; • Implement a mine procurement policy which promotes the use of small and medium enterprises (SMEs), giving preference to those provided by the neighbouring community, then other Namibian companies. • Channel corporate social investment during exploration and mining to support the GRN's efforts to focus on the most deprived constituencies to address poverty, inequality and exclusion; • Through its Corporate Social Responsibility programme, proactively work with the Kunene Regional Council and other regional stakeholders to raise education standards in early childhood development, primary and secondary levels to enable people to reach their full potential.	
Emergency	An unexpected mine closure could lead to a sudden loss of jobs. To mitigate this situation, the mining company will: • Promote employees to diversify and upgrade skills so they benefit from being able to offer labour flexibility and productivity, throughout the LoM and on mine closure. • Offer training on personal financial management to all employees throughout the LoM; • ensure skills upgrading during employment at the mine is documented and accredited where possible so skills are recognised with future employers; • ensure that the mine closure plan is understood by the workforce and guarantees final salary pay-outs and pension transfers.	

7.10.2.4 In-migration

Objectives

To minimise in-migration and manage the impacts thereof; To manage the need for land and housing; To manage the need and demand for improved health care and education services; and to promote safety and security in the local communities.

Actions

TABLE 7-21: ACTIONS RELATING TO IN-MIGRATION

Issue	Management commitment	Phase
Influx of job seekers and workers	• Build up local skills before construction and operations begin. • Give employment preference to local and Kunene residents, particularly to women, to reduce the demand for migrants. • Conduct job interviews in Opuwo and other regional centres (when the	C/O/D

Issue	Management commitment	Phase
	local supply has been exhausted) to reduce in-migration; • Inform the public about the employment policies and procedures and when vacancies have been filled to reduce potential migrants; • Establish regular meetings with the Khorixas Town Council and the Kunene Regional Council, which administers Fransfontein, and plan to minimise and manage the potential impacts; • Not build a construction camp at site but will enable construction workers to live locally in Khorixas and Fransfontein to boost the local economy. • If any housing is required near the mining area, consider locating it at the current exploration camp where it could be an asset to the local community after mine closure. • If any prefabricated buildings or housing are built on site or promoted for use by contractors or workers, use reusable materials (unless the buildings are sited where they could be used after mine closure). • As pro-actively as possible, work with the local authorities to have affordable land tenures schemes, to facilitate the development of serviced erven and land for the Shack Dwellers Federation. • Build the capacity of the Shack Dwellers Federation in the area to manage and develop land in the most cost-effective way of any housing scheme in the country. • Facilitate the integration of mineworkers into existing residential areas to avoid building “mine suburbs”. • Promote and facilitate home ownership by employees, either within the existing community or to be built in their home areas, given the relatively short life of mine. • Negotiate with the Ministry of Health and Social Services (MOHSS) to extend elements of NRE’s health care services to the neighbouring community. • Conduct a needs analysis with the MOHSS to and support them to improve the Khorixas Constituency’s standing as the most health-deprived in the country. • Establish a comprehensive HIV, AIDS and TB workplace policy and community wellness programme which will detail HIV prevention measures in the workplace and the community and enable easy access to AIDS treatment, care and support. • Stipulate that tender requirements for all contractors must adhere to NRE’s HIV and AIDS policy and programme and should be part of their reporting requirements.	

Issue	Management commitment	Phase
	• Design a shift work programme which provides sufficient time to enable workers to take trips home on a frequent and regular basis. • Support the Ministry of Education in meeting the demand for school places and to raise education standards in the wider area. • Establish a local stakeholder committee to assist with the monitoring of social impacts and the effectiveness of the mitigation measures put in place. • Have zero tolerance to alcohol in the workplace and breathalyse all personnel arriving for work. • Support partnerships that encourage a sense of community and that combat social ills, e.g. multi-purpose community & skills development centres; sports tournaments, social clubs, youth clubs, activities that promote women's empowerment and gender equality and community policing.	

7.10.2.5 Traffic impacts

Objectives

The objective of the mitigation measures is to reduce the potential for traffic impacts on the C39 and D2625.

Actions

TABLE 7-22: ACTIONS RELATING TO TRAFFIC IMPACTS

Issue	Management commitment	Phase
Traffic issues on the public roads	NRE must liaise with the Namibian Roads Authority to: • Ensure the risk/dangerous sections along the D road are identified and upgraded to reduced safety risks along this road prior to the construction phase of the mine. • Ensure ongoing maintenance on the D road. • Ensure the new intersection off the D-Road to the mine is properly designed and constructed and all the relevant road signs installed to ensure safety to third party road users. • Ensure all road safety measures are applied. (The above commitments are therefore not directly the responsibility of NRE but rather that of the Namibian Roads Authority, in collaboration with NRE).	C/O/D
	Promote basic road safety behaviour for all Lofdal employees and contractors through training and awareness. Typical issues include:	

Issue	Management commitment	Phase
	• keeping to safe speed limits, but as a minimum all specified road speeds will be adhered to; • ensuring that drivers all have valid licenses; • making sure that all vehicles are roadworthy; • zero tolerance for drinking and driving; and • using lights appropriately for night driving.	
Emergency	Road accidents are considered emergencies and will be handled in accordance with the Lofdal emergency response procedure.	

7.10.2.6 Mine decommissioning and closure

Objectives

The mitigation objective is to prepare the communities for mine closure from the construction phase onwards.

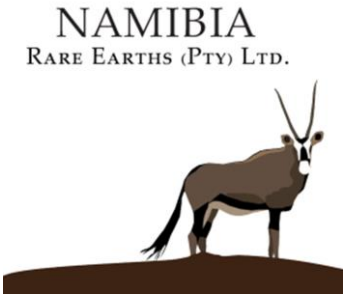
Actions

TABLE 7-23: ACTIONS RELATING TO DECOMMISSIONING AND CLOSURE

Issue	Management commitment	Phase
Decommissioning and closure	• Some mine buildings could be designed to be of use by the community on closure. • One focus of the Corporate Social Responsibility strategy during operations could be to focus on assisting other stakeholders to diversify the local and regional economy. • Ensure a detailed Mine Closure Plan is developed when operations begin. This is essential, given the medium lifespan of the mine and the volatility of the global market and economy. • Maintenance and aftercare activities will provide some economic return.	D/Cl
Emergency	Should at any point it seem likely that the mine may have to cease operations early and / or go into care and maintenance, employees, suppliers and all other key stakeholders should be informed promptly and given enough time to make financial adjustments.	O

7.11

Resource MMP



7.11 RESOURCE MANAGEMENT AND MITIGATION PLAN

This MMP provides management actions regarding scares sources like water and provides means of reducing consumption of resources.

7.11.1 COMPONENTS

This plan is made up of the following components:

- Consumption of energy.
- Consumption of water.
- Use of manufactured materials.
- Consumption of fuel.

7.11.2 MANAGEMENT

7.11.2.1 Consumption of Energy (electricity and diesel)

Objectives

The objective of the management measures is to monitor the energy (electricity and diesel) consumption and to find ways to minimise consumption.

Actions

TABLE 7-24: ACTIONS RELATING TO ENERGY CONSUMPTION

Issue	Management commitment	Phase
Understanding NRE's electricity consumption and demand	Develop an electricity consumption monitoring system.	All
	Total consumption to be monitored and recorded and compared with NamPower readings.	
	Develop a energy management plan that optimises electricity consumption whilst meeting efficiencies as far as practically possible.	
Monitoring of energy management plan	Review energy consumption in relation to the energy management plan.	
Awareness and training	Implement an awareness programme pertaining to energy usage.	
Maintenance of electrical equipment	Develop a maintenance schedule for all electrical equipment used on site.	

7.11.2.2 Consumption of water

Objectives

The objective of the management measures is to monitor the water consumption and to find ways to optimise water usage.

Actions

TABLE 7-25: ACTIONS RELATING TO WATER CONSUMPTION

Issue	Management commitment	Phase
Water usage and control	Install and calibrate water flow meters on pipes at selected locations (including tailings lines).	All
Maintenance of equipment	Develop, maintain and implement a comprehensive maintenance programme for tanks, tankers, pumps and pipes.	
Monitoring of water leaks	Ensure that checking for water spills is included in the daily inspections.	
	Report spillages as per Lofdal incident management procedure.	
Training and awareness	Maintain and implement water awareness programme for NRE employees and contractors.	
Reporting to Society	Reporting to stakeholders on water management.	
Water usage and control	Ensure that storm water falling inside the processing area is captured and directed via drains and pipes to the return water dam and re-used.	O/D
Water usage and control	Ensure that the design of the relevant clean and dirty water systems are sufficient to cater for the water volumes associated with the infrequent flood events and that unacceptable discharges of polluted water are prevented.	O
	Optimise the recycling of process water in the process plant to reduce the demand for fresh water.	
	Recycle tailings decant water back to the return water pond in closed pipes for reuse in the process plant.	
	Groundwater encountered in the pit is dewatered and used (e.g. in the process plant).	

7.11.2.3 Use of manufactured materials

Objectives

The objective of the management measures is to monitor the use of manufactured materials and to ensure efficient usage.

Actions

TABLE 7-26: ACTIONS RELATING TO THE USE OF MANUFACTURED MATERIALS

Issue	Management commitment	Phase
Transport of hazardous materials	Conduct routine inspections of the supply companies transporting hazardous materials to and from site.	C/O/D
	Ensure companies compliance to legal and NRE requirements and that the contractor has all the necessary hazardous protection equipment for people and environment in the advent of a spill.	
Consumption of reagents and chemicals	Monitor reagent consumption monthly.	
	Review and implement best practices for use by cleaning contractors. Monitor compliance.	
	Identify consumables that might qualify to be environmentally friendly products and conduct market research on such products.	
Consumption of consumables (e.g. PPE, paper)	Calculate the volumes of consumables used and determine ways of reducing consumption.	
	Investigate use of environmentally friendly consumables (where applicable).	
Consumption of reagents and chemicals	Monitor and update the process flow balance regularly to ensure optimum use of reagents.	O

7.11.2.4 Consumption of fuel

Objectives

The objective of the management measures is to monitor the fuel consumption and to find ways to optimise fuel usage.

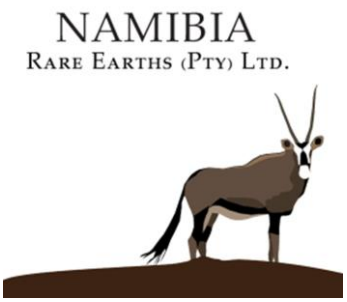
Actions

TABLE 7-27: ACTIONS RELATING TO FUEL CONSUMPTION

Issue	Management commitment	Phase
Fuel consumption	Develop and implement a preventive maintenance plan for all equipment and mine vehicles using diesel, petrol and gas on site to avoid wastage and leakages.	C/O/D
	Monitor fuel consumption in all departments.	
	Monitor use of diesel heaters.	

7.12

Soil MMP



7.12 SOIL MANAGEMENT AND MITIGATION PLAN

Management of soils is important as mining is a temporary land use where-after rehabilitation is the key to re-establishing post closure land capability that will support conservation, agricultural and tourism type land uses. Soil is a key part of rehabilitation.

The commitments derived from the EIA Report (SLR 2016) with regards to soil form the basis of this MMP:

7.12.1 COMPONENTS

This plan is made up of the following components:

- Loss of soil resources from pollution
- Topsoil stockpiling/management.

7.12.2 MANAGEMENT

7.12.2.1 Loss of soil resources from pollution

Objectives

The objective of the measures is to prevent pollution of soils.

Actions

Refer to MMP 3 (section 7.3.2.2 to 7.3.2.5) and MMP 7 (Section

7.12.2.2 Topsoil stockpiling/management

Objectives

The objective of the measures is to minimise the loss of soil resources and related functionality through physical disturbance, erosion and compaction.

Actions

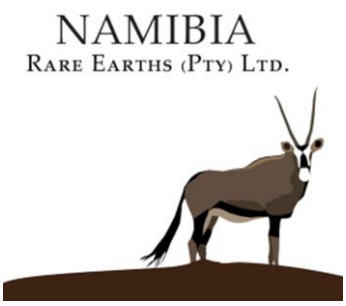
TABLE 7-28: ACTIONS RELATING TO TOPSOIL STOCKPILING/MANAGEMENT

Issue	Management commitment	Phase
Stripping and handling of soils	Limit the disturbance of soils to what is absolutely necessary both in terms of site clearing and in terms of ongoing project development and use of vehicles.	C/O/D
	Where soils have to be disturbed the soil will be stripped, stored, maintained and replaced in accordance with the specifications of the soil management plan (conservation procedure).	
	Even though the footprint of the open pit and mineralised waste facilities will never be rehabilitated, some topsoil should be stripped and stored from these areas because this valuable resource can be used elsewhere on the site for rehabilitation. In this regard, experience has shown that very few mines ever	

Issue	Management commitment	Phase
	have enough topsoil for rehabilitation.	
	Where relevant, commence rehabilitation immediately after impact has ceased, thus ensuring that storage of topsoil is kept as short as possible.	
	Dumping of topsoil in large heaps will probably result in loss of all its biologically active properties. A potential mitigating activity may be to spread it out and 'farm' it by planting a commercial nitrogen-fixing crop in it, even if it has to be irrigated (at low levels). In this way the biological processes will be kept alive. Having said that, knowledge about arid topsoil in general is sketchy. It is therefore best to systematically trial different options, including trials to determine changes in topsoil quality over time. The trade-off between losing area to stockpiles and gaining healthy topsoil can only be resolved on a case by case basis.	
Monitoring	Monitor health of topsoil through standardised method such as growing radishes in a greenhouse and measuring their weight Indicators should be determined in dedicated trials.	
Closure planning	As part of closure planning, the designs of any permanent structures (mineralised waste facilities and berms) will take into consideration the requirements for long term erosion prevention and confirmatory monitoring.	Cl

7.12

Waste MMP



7.13 WASTE MANAGEMENT AND MITIGATION PLAN

Waste is generated during all phases of the mine. This MMP deals with solid waste management.

7.13.1 COMPONENTS

This plan is made up of the following components:

- Non-hazardous solid waste (non-mineralised).
- Hazardous solid waste (non-mineralised).
- Radioactive contaminated waste.
- Medical waste.

7.13.2 MANAGEMENT

7.13.2.1 Non-hazardous solid waste (non-mineralised)

Objectives

The objective of the management measures is to ensure proper storage, recycling, re-using, removal, transportation and disposal of non-hazardous solid waste.

Actions

TABLE 7-29: ACTIONS RELATING TO NON-HAZARDOUS SOLID WASTE (NON-MINERALISED)

Issue	Management commitment	Phase
General	The waste management procedure for the Lofdal Project will cover the storage, handling, and transportation of waste. Ensure that the contractor's responsible are made aware of these procedures.	C/O/D
Collection of waste	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity.	
Waste storage – domestic waste	Collect general domestic and recyclable waste from all offices, tearooms, ablutions, security office, laboratory, workshop and stores and place into wheely or luggar bins and skips or cages.	
	Segregate the discarded domestic general and recyclable waste before placed into the correct wheely or luggar bins and skips or cages.	
	Provide paper storing boxes for the temporary storage of office paper for recycling.	
	Use plastic rubbish bags to contain general domestic waste	
	Store recyclable waste in polyweave bags before placed into skips.	
	Place domestic and general waste generated at the Explosives magazine into rubbish and polyweave bags before transferred to the appropriate skips.	

Issue	Management commitment	Phase
	Ensure that waste storage areas and/or containers meet the risk needs for that specific waste (e.g. impervious floor, bunded areas with drainage/containment systems, lids to prevent light material from blowing away or sealed containers for hazardous material).	
Waste classification (domestic and industrial)	The waste inventory will be kept up to date.	
Waste transport (domestic and industrial)	An approved waste management subcontractor will undertake the waste transport.	
Disposal (domestic and industrial)	Dispose of waste at appropriate permitted waste disposal facilities as follows: o Recyclable to identified recycling company. o Dispose of (only) non-recyclable, non-hazardous waste at the nearest municipal landfills.	
	Building rubble and waste concrete (clear of other waste) will be disposed of to a designated area in the WRD.	
Disposal records (domestic and industrial)	Written evidence of safe disposal of waste will be kept.	
Waste storage – industrial waste	Place industrial waste generated at the workshop and stores into clearly labelled skips located at the workshop.	O/D
	Separate scrap metal, cables, rubber and cardboard/wood waste respectively.	

7.13.2.2 Hazardous solid waste (non-mineralised)

Objectives

The objective of the management measures is to ensure proper storage, removal, transportation and disposal of hazardous solid waste

Actions

TABLE 7-30: ACTIONS RELATING TO HAZARDOUS SOLID WASTE (NON-MINERALISED)

Issue	Management commitment	Phase
General	The waste management procedure for the Lofdal Project will cover the	C/O/D

Issue	Management commitment	Phase
	storage, handling, and transportation of waste. Ensure that the contractor's responsible are made aware of these procedures.	
Collection of waste	Designated waste collection points will be established on site. Care will be taken to ensure that there will be sufficient collection points with adequate capacity.	
Waste storage	Hazardous waste will not be stored in skips but in designated suitable containers.	
	Store empty print cartridges in a designated box at a dedicated location on site until removal from site.	
	Store fluorescent tubes in a special labelled steel drum at a dedicated workshop(s).	
	Collect and accumulate other hazardous waste i.e. car batteries, miscellaneous batteries, oil filters, etc. at a dedicated workshop(s)until such time that the amounts can be removed from site.	
	Explosives packaging shall be safely burnt at the magazine site according to permit conditions and procedures.	
	Place oil and greasy cloths and rags into a steel drum and when full transported off site to the hazardous waste site.	
	Keep empty reagent bags (for a short period of time) at the reagents store until removed by the reagent contractor for refills. This needs to be agreed with the supplier.	
	Ensure that waste storage areas and/or containers meet the risk needs for that specific waste (e.g. impervious floor, bunded areas with drainage/containment systems, lids to prevent light material from blowing away or sealed containers for hazardous material).	
Waste classification	An inventory of wastes will be compiled and will include estimated quantities of waste. The inventory will be kept up to date.	
Waste transport	An approved waste management subcontractor will undertake the waste transport.	
Disposal	Disposed of waste at appropriate permitted waste disposal facilities as follows: o Hazardous waste shall be removed from site and may be recycled or disposed of at the nearest hazardous site (i.e. Walvis Bay/Windhoek) o Damaged reagent bags shall also be removed by the reagent contractor for repairs or disposal.	

Issue	Management commitment	Phase
Disposal records	Written evidence of safe disposal of waste will be kept.	

7.13.2.3 Radioactive contaminated solid waste (non-mineralised)

Objectives

The objective of the management measures is to ensure proper storage, removal, transportation and disposal of radioactive contaminated solid waste

Actions

TABLE 7-31: ACTIONS RELATING TO MEDICAL WASTE

Issue	Management commitment	Phase
General	The waste management procedure for the Lofdal Project will cover the storage, handling, and disposal of radioactive contaminated waste.	C/O/D
	Employees and Contractors will be made aware of the risks associated with radiation contamination and the handling and disposal of such waste.	
	Areas with potential radiation contamination transfer will be identified and control measures implemented as per procedure.	
Collection	Designated waste collection points will be established on site. Care will be taken to ensure there will be sufficient collection points with adequate capacity.	
Storage	Care will be taken to prevent cross contamination of “contaminated ” and “uncontaminated” wastes by providing storage containers nearest to risk areas and training to Lofdal employees and contractors.	
	A specific colour, well labelled containers will be used to store radiation contaminated waste generated from the “Risk Areas”.	
	Waste storage areas at Recovery and laboratory will have concrete floors or bunded areas. Containers will have lids and will be sealed for better control of this hazardous waste.	
	Smaller containers (same specific colour as above) may be located at specific areas for smaller radioactive contaminated waste.	
Disposal	NRE will be responsible for the handling and disposal of its radioactive contaminated waste.	
	All radioactive contaminated waste will be disposed of at a dedicated controlled waste disposal are on the identified waste rock dump(s).	
Records	Records of waste types, sources, quantities (estimated and/or weighed), ad hoc radiation levels and site locations will be continuously maintained.	

7.13.2.4 Medical waste

Objectives

The objective of the management measures is to ensure proper storage, removal, transportation and disposal of medical waste

Actions

TABLE 7-32: ACTIONS RELATING TO MEDICAL WASTE

Issue	Management commitment	Phase
General	The medical waste handling procedure for the Lofdal Project will cover the storage, handling, and transportation of all medical waste. Ensure that the contractor's responsible are made aware of these procedures.	C/O/D
Disposal	Incinerate the medical waste offsite at an approved medical facility.	

8 PARTIES RESPONSIBLE FOR THE IMPLEMENTATION OF THE EMP

This section describes the roles and responsibilities for implementing the various management plans.

8.1 GENERAL MANAGER

The Lofdal Mine General Manager has overall responsibility for environmental management on the mine and for ensuring this EMP is implemented. To assist the General Manager, the Lofdal Porject will have an Environmental Department that will be dedicated to managing and monitoring the environmental issues associated with the mine's activities.

8.2 ENVIRONMENTAL DEPARTMENT

The Lofdal Environmental Department will be responsible for assisting the General Manager and various other managers in all environmental and community issues, and specifically to ensure that the commitments as set out in this EMP are implemented during the design, operations, decommissioning and closure phases.

In addition to the above, the Environmental Department is responsible for ensuring that all persons involved with Lofdal Mine comply with this EMP.

As outlined in section 8.3, each contractor will be required to develop their own individual EMPs and/or relevant Method Statements (MS) based on this EMP any other relevant Lofdal Mine requirements and specifications, and any permits or authorisations issued to Lofdal Mine. These contractor EMPs/MS will focus on the specific aspects of the contractors work requirements and work areas.

The Environmental Department will be responsible for the following aspects related to compliance of this EMP:

- Implement the Lofdal Mine Environmental Management System (EMS) – ensuring this EMP form the basis of the EMS.
- Regular inspections and auditing compliance to this EMP and any other relevant legal requirements e.g. permits and authorisations.
- Conduct environmental awareness training during induction training and on an ad hoc basis thereafter.
- Conduct scheduled monitoring as outlined in section 9 as well as any additional monitoring required by permit and authorisations issued to Lofdal by relevant authorities.

- Ensure compliance to this EMP and permits and authorisations issued to Lofdal by relevant authorities. Ensure responsibilities and target dates are developed for each one of the commitments in this EMP. This will be through one of the following mechanisms:
    - Design requirements; or
    - Construction tender documents and contracts; or
    - EMS (work instructions and procedures)
- Submit required information to relevant authorities such as reporting related to monitoring and with regard to compliance with the EMP, permit and relevant authorisations.
- Liaise with Lofdal Project Management and various external stakeholders such as authorities and interested and affected parties on environmental management (where required).

8.3 CONTRACTORS

The Contractor Managers will be contractually required to comply with the various commitments in this EMP. As indicated above, the contractors will also be required to develop their own EMPs and or MSs related to their specific work requirements and work areas based on the EMP's, any other relevant Lofdal Project minimum requirements, specifications, authorisations, procedures and/or permits.

The EMPs/MSs contained in the returned tender documents will be adjudicated by the EPCM contractor and/or the project Owner's Team. This adjudication will be against aspects such as the equipment to be used, waste to be generated, provision of MSDSs etc. An adjudication checklist will be developed for this purpose.

The Environmental Department, as well as the EPCM Environmental Manager, will conduct daily informal inspections at contractor areas. Non-compliances will be recorded in the EMS to be developed, and action plans developed in conjunction with the contractor that contravened the clause of the EMP.
Contractors will be formally audited on a quarterly basis in order to determine compliance with the relevant EMPs/MSs. In the event of non-conformances, the contractor will be required to take corrective action according to the requirements of the Environmental Department. Clean up may be done on their behalf, and if so, the contractor will be back-charged accordingly. Final payment certificates can be withheld by the Environmental Department until the manager is satisfied with the rehabilitation of the contractor's sites.

Two of these formal audits will form the basis of the information to be provided in the Bi-Annual reports to the relevant authorities.

8.4 EXTERNAL SPECIALISTS

NRE may appoint external environmental specialists, as and when required, to assist with the implementation of certain commitments made in the various management plans.

An independent auditor will also assess compliance against the EMP on a bi-annual basis.

9 MONITORING AND AUDITING

9.1 MONITORING

The Management and Mitigation Plans in Section 7 have covered various aspects of the proposed monitoring. This section both augments those requirements and sets further detail where relevant. NRE will develop detailed monitoring procedures as part of their EMS, including the relevant monitoring commitments spelled out in this EMP.

As a general approach, the monitoring procedures will comprise the following:

- A formal procedure.
- Appropriately calibrated equipment – regular inspections and calibration of equipment will be undertaken in line with the equipment calibration/validation procedure.
- Where samples require analysis they will be preserved according to laboratory specifications.
- Where practical, an accredited, commercial laboratory will undertake sample analyses
- Parameters to be monitored can be identified in consultation with a specialist in the field and/or the relevant authority.
- If necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority.
- Monitoring data will be stored in a structured database.
- Data will be interpreted and reports on trends in the data will be compiled on a quarterly basis.
- Both the data and the reports will be kept on record for the life of mine.

As a general comment, if monitoring points become damaged or redundant then they can be replaced with new points.

9.1.1 WATER MONITORING

The detailed water monitoring programme shall to be developed by NRE, including the relevant surface-(during rain events) and groundwater monitoring points, frequency and parameters for monitoring. The monitoring parameters may be modified on the basis of input from an appropriate specialist and/or relevant authority.

The following needs to be taken into consideration when developing the monitoring programme:

- Additional monitoring boreholes be drilled and a monitoring schedule developed including a local and regional component, thereby covering the entire EPL area. Groundwater monitoring should include the regular measurement of water levels and the analysis of groundwater samples for major ions, metals, radionuclides and other rare elements.
- Although the results indicate that a regional deterioration of groundwater water quality would not occur prominent contaminant transport in discrete fractures unknown at the moment is

probable and should be identified, investigated and monitored once a definite infrastructure layout is determined.

- It is recommended to establish a comprehensive monitoring network and routine, whereby additional hydraulic, hydrochemical and climate data should be gathered in order to obtain more detailed information on the prevailing hydrogeological conditions. Ideally, additional information gathered in the focus area should be used to develop a local groundwater flow model (with respect to model discretisation, computational times and the current model sensitivity to hydrogeological units outside the focus area) which should be calibrated in transient state as water level time series become available.

In addition to the above, the mine will record rainfall and evaporation data on a daily basis.

Reporting will be undertaken at regular intervals (at least bi-annually) during operations or as required by relevant permits and authorisations issued to the Lofdal Project by relevant authorities.

9.1.2 AIR QUALITY MONITORING

- Dustfall collection provides a useful and cost effective tool to track the success of mitigation measures and overall dust generation from the proposed Lofdal Project. It is recommended that the proposed mine continues with monthly dustfall monitoring but that these are moved to the proposed locations indicated in Figure 9-1 prior to the mining operations commencing.
- $PM_{2.5}$ and PM_{10} monitoring provides measured ambient inhalable and respirable concentrations at selected sensitive receptors. Recommended monitoring locations for the construction, operational and closure phases are shown in Figure 9-1.
- It is recommended that NO_2 sampling be conducted over two one-month sampling campaigns – one in summer and one in winter – prior to operations to determine the baseline and then for during construction and the operational phase to ensure the proposed Lofdal operations are not resulting in significant NO_2 concentrations. The recommended location for the NO_2 sampling is shown in Figure 9-1.
- It is recommended that the on-site meteorological monitoring remain where it is located (Figure 9-1) or at the admin building at the mine (during operations) and be kept in good working order. The meteorological station must be calibrated at least once a year with regular span checks and data validation carried out to ensure the data reported are correct.

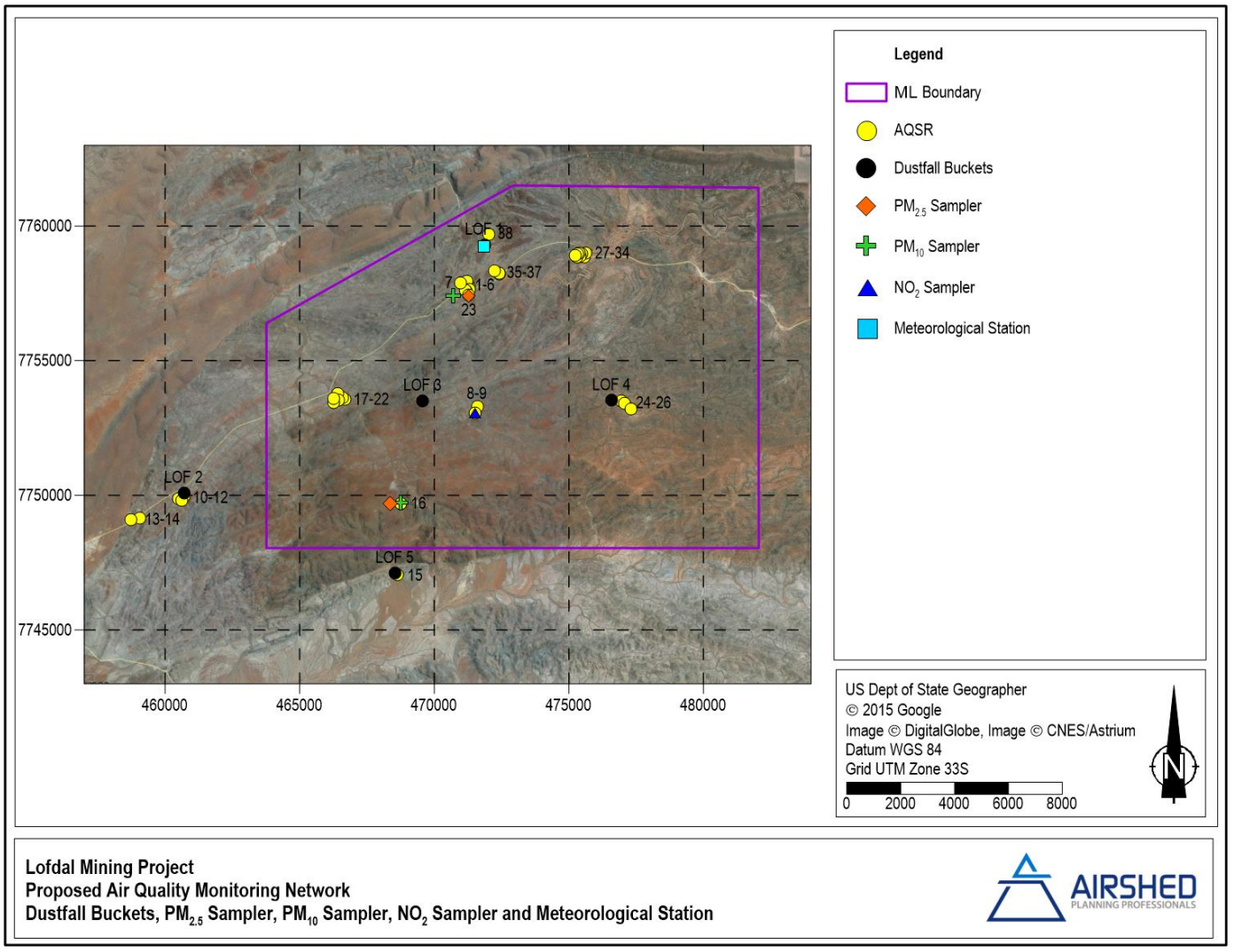


FIGURE 9-1: PROPOSED MONITORING NETWORK FOR THE PROPOSED OPERATIONS AT THE LMP

9.1.3 BIODIVERSITY MONITORING

The biodiversity monitoring will include the following:

- Monitor use of drainage lines by animals.
- Monitor health of plant populations inside and adjacent to drainage lines.
- Monitor activity of wildlife in the vicinity of the mine (e.g. using spoor counts) and compare with their activities at selected control sites in the wider area.
- Monitor use of overpasses by mammals by counting spoor once a month.
- Monitor the presence of animals close to the pit.
- Monitor mortality of invertebrates at lights.
- Monitor use of firewood by staff and other people.

9.1.4 SOIL MANAGEMENT MONITORING

- Regular inspections of soil stockpiles and rehabilitated areas will be undertaken to ensure that the soil conservation procedure is being implemented.
- Monitor health of topsoil through standardised method such as growing radishes in a greenhouse and measuring their weight
- Indicators should be determined in dedicated trials.

9.2 AUDITING COMPLIANCE OF THE EMP

The commitments contained in this EMP will, once an environmental clearance has been obtained, be NRE's contractual agreement with the Namibian authorities for sound environmental management. All employees, contractors and sub-contractors and any visitors to site will be expected to comply with the commitments contained herein.

9.2.1 AUDITS AND INSPECTIONS

The Lofdal Project Environmental Department will conduct internal management audits against the commitments in the EMP. During the construction phase, these audits will be conducted every month. In the operational phase, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement.

In addition, an independent professional will conduct an EMP performance assessment at least once a year for the Bi-Annual Report. The mine's compliance with the provisions of the EMP and the adequacy of the EMP relative to the on-site activities will be assessed in this report.

The Environmental Department will furthermore conduct daily inspections during construction and weekly inspections during mining operations.

9.2.2 SUBMISSION OF INFORMATION

As a minimum, the following documents will be submitted to the relevant authorities on an ongoing basis:

- The bi-annual report required by the MET will be submitted every six months.
- Other monitoring reports will be provided to the relevant authorities as per the permit and other agreements.

Werner Petrick **Nadine Soutschka**
(Project Manager) **(Project Assistant)**

Appendix A

Mine Closure Framework

RECORD OF REPORT DISTRIBUTION

SLR Reference:	734.14013.00005
Title:	Lofdal Mine EMP
Report Number:	5
Proponent:	NRE

Name	Entity	Copy No.	Date issued	Issuer
	MET	1	June 2016	WP