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REPORT:

NAVACHAB GOLD MINE – OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

PROJECT NUMBER: ECC-107-408-REP-02-D

REPORT VERSION: FINAL FOR GRN SUBMISSION

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Ministry Reference:	NA
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Environmental Compliance Consultancy (ECC) (Reg. No. CC 2013/11401) has prepared this OEMP on behalf of the Proponent. This report has been authored by employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent from the proponent and has no vested or financial interest in the project, except for fair remuneration for professional fees rendered based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report or the assessment, or a record of decision issued by Government. No member or employee of ECC is, or is intending to be, a director, officer, or any other direct employee of QKR Navachab Gold Mine (Navachab). No member or employee of ECC has, or has had, any shareholding in QKR Navachab Gold Mine (Navachab). Any personal views or opinions expressed by the writer may not necessarily reflect the views or opinions of Environmental Compliance Consultancy or its client.

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DEFINITIONS AND ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
%	percentage
AN	anomaly 16 pit
ASTM D1739-98	American Society for Testing and Materials Standard (D1739-98)
AQG	air quality guidelines
BH	borehole
BOD	biological oxygen demand
C5	channel 5
CIP	carbon in pulp
CN	cyanide
COD	chemical oxygen demand
COx	carbon oxides
CSI	corporate social investment
dB	decibel
DO	dissolved oxygen
DWA	Department of Water Affairs
EC	European Community
ECC	Environmental Compliance Consultancy
e.g.	example
EMA	Environmental Management Act
EMP	environmental management plan
ESIA	environmental and social impact assessment
FOG	fats, oils and greases
g	gram
GHG	greenhouse gas emissions
GIS	geographic information system
h	hour
HDPE	high density poly ethylene
HF	hydrogen fluoride
HME	heavy mobile equipment
HSE	health, safety and environment
I&APs	interested and affected parties
ISO	International Organisation for Standardization
IT-3	interim target 3 (WHO target)
KPI	key performance indicators
km	kilometer
km^2	kilometer squared

ABBREVIATIONS	DESCRIPTION
KMCC	Karibib Mining and Construction Company
MEFT	Ministry of Environment, Forestry and Tourism
mg/l	milligram per litre
mg/m²/day	milligram per meter squared per day
ML	mining licence
m³/day	meter cubed per day
m	meter
m³	meter cubed
mm	millimetre
m/s	meter per second
mm/s	millimetre per second
MME	Ministry of Mines and Energy
MHoSS	Ministry of Health and Social Services
ms/m	millisiemens per meter
MSDS	material data safety sheet
Navachab	QKR Navachab Gold Mine
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NTU	turbidimetric turbidity unit
OEM	original equipment manufacturer
OEMP	operational environmental management plan
PCD	pollution control dam
PCP	pre-concentrator plant
pH	potential hydrogen
ppm	parts per million
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of less than 10 µm
$PM_{2.5}$	particulate matter with an aerodynamic diameter of less than 2.5 µm
PPE	personal protective equipment
PV	photovoltaic
QRS	identification used for archaeological sites
ROM	run of mine
SA	South African
SANS	South African National Standard
SHE	safety, health and environment
SSEE	safety, security, environment and emergency
SOP	standard operating procedure
SO_2	sulphur dioxide

ABBREVIATIONS	DESCRIPTION
SOx	sulphur oxides
ToR	terms of reference
TSF	tailings storage facility
TSP	total suspended particle, generally accepted as aerosols <30 micron diameter
VOCs	volatile organic compounds
WAD CN	weak acid dissociable cyanide
WHO	World Health Organization
WRD	waste rock dump
WW	DWA issued registered borehole number abbreviation
µg/l	microgram per litre
µg/m³	microgram per meter cubed

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Environmental Compliance Consultancy (ECC) has been contracted by QKR Navachab Gold Mine (Navachab) to compile a consolidated operational environmental management plan for activities on ML 31, ML 180 and the accessory works area in ML 31.

Navachab is located near the town of Karibib in Namibia. Karibib is situated approximately 170 km northwest of Windhoek, the capital of Namibia (Figure 1). Navachab, mainly an open cast operation, started production in 1989. The mine was wholly owned by AngloGold Ashanti Namibia up to 30 June 2014 when shareholding was transferred to QKR and Epangelo Mining. Underground mining activities commenced in the main pit in 2021.

From inception, mining was done by a contractor, Karibib Mining and Construction Company (KMCC) (Pty) Ltd, and went to owner-mining in January 2004. A mining contractor, Lewcor, did the bulk of the mining operations between 2011 and 2017. As from 2018 Anomaly 16 (AN16) was being mined by a contractor, EVS Mining Contractors (Pty) Ltd, while the main pit and Gecko satellite operations are owner mined.

ECC has compiled this operational environmental management plan (OEMP) in terms of the Environmental Management Act (EMA), No.7 of 2007 and its regulations of 2012. The purpose of this OEMP is to support the consolidation of environmental clearance certificates for ML 31 and accessory works area in ML 31.

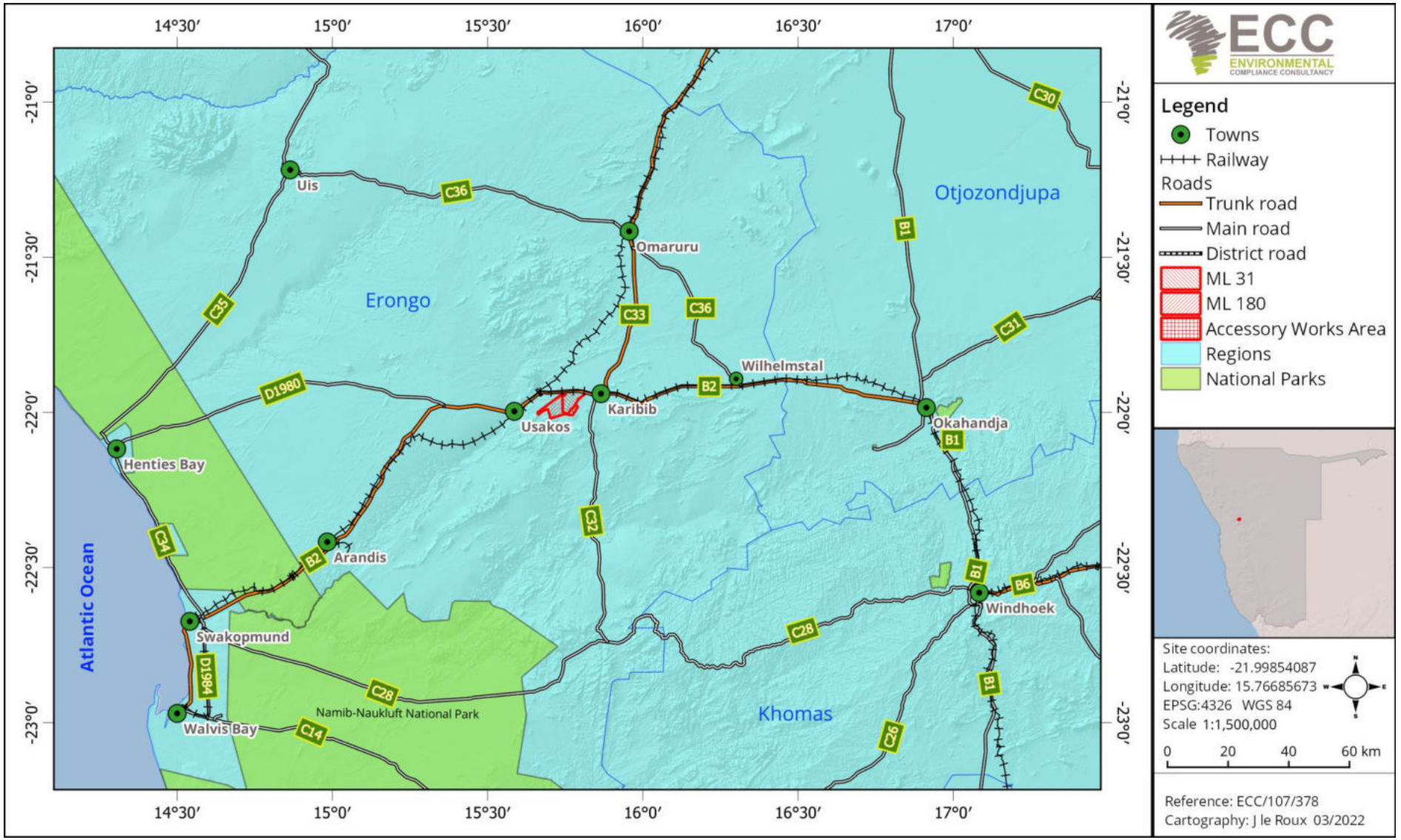

Figure 1: Locality map showing the location of Navachab Gold Mine

1.2 ENVIRONMENTAL REGULATORY REQUIREMENTS

The Project is considered as a listed activity as stipulated in the Environmental Management Act, No. 7 of 2007 and its regulations, promulgated in 2012. A valid environmental management plan (EMP) is required in order to management environmental aspects and impacts during operational activities.

This report presents the OEMP and has been undertaken in terms of the requirements of the Environmental Management Act, No.7 of 2007 and its regulations.

1.3 PURPOSE AND SCOPE OF THIS REPORT

The operational environmental management plan (hereafter referred to as the OEMP) provides a logical framework, mitigation measures and management strategies for the mining activities associated with the Project. This ensures that the potential environmental and social impacts are curbed and minimised as far as practically possible and that statutory and other legal obligations are adhered to and fulfilled. Outlined and defined in the OEMP are the protocols, procedures and roles and responsibilities to ensure that management requirements are effectively and appropriately implemented.

This OEMP is a live document and shall be reviewed at predetermined intervals and/or updated during the ESIA process when or if the scope of work alters, or when further data or information is added. All personnel working on the Project will be legally required to comply with the requirements set out in the final EMP that is approved by the competent authorities and Ministry of Environment, Forestry and Tourism (MEFT).

The scope of this OEMP includes all activities associated with mining related activities on Navachab Gold Mine. The purpose of this OEMP is to support the consolidation of environmental clearance certificates for ML 31 and accessory works area in ML 31. Figure 2 provides a current overview of issued and valid environmental clearance certificates per ML 31, ML 180 and accessory works area.

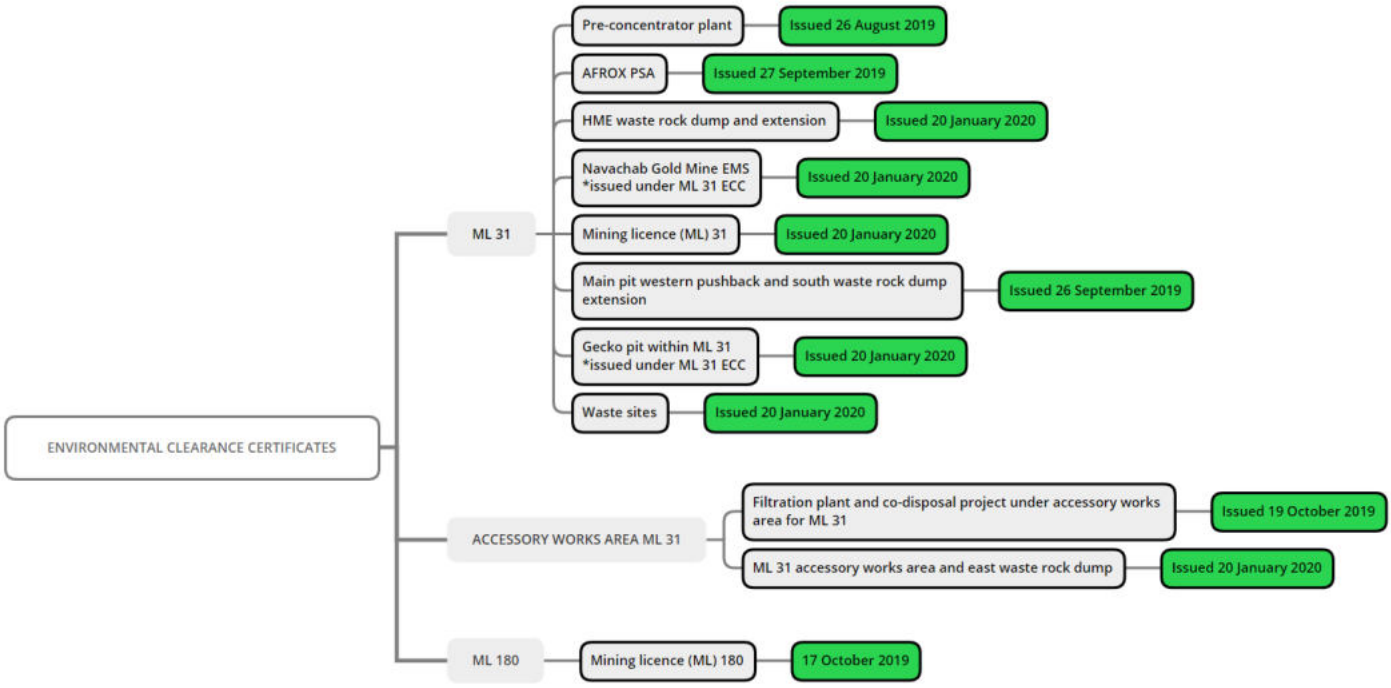

Figure 2: Navachab Gold Mine environmental clearance certificates per ML 31, ML 180 and accessory works area

1.4 MANAGEMENT OF THIS OEMP

The Proponent, Navachab, holds the valid environmental clearance certificates for the activities on ML 31, ML 180 and accessory works area in ML 31 and is responsible for the implementation and management of this EMP. The implementation and management of this EMP and thus the monitoring of compliance, will be undertaken through daily duties and activities, as well as defined monthly, quarterly and annual or other periodic inspections and/or monitoring surveys.

1.5 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS RELATED TO THIS OEMP

This OEMP does not include measures for compliance with statutory occupational health and safety requirements. This is managed by the Proponent's Occupational Health and Safety Plan, which is compliant with ISO 45001 standards and therefore not in the scope of this OEMP.

Where there is any conflict between the provisions of this OEMP and any contractor's obligations under their respective contracts, including statutory requirements (such as licences, project approval conditions, permits, standards, guidelines and relevant laws), the contract should be amended, and statutory requirements are to take precedence.

The information contained in this OEMP has been based on the current valid environmental clearance certificates and associated management plans for ML 31, ML 180 and associated accessory works area in ML 31. If and where mining requirements are changed, this EMP may require updating and/or potential further assessment to be undertaken.

1.6 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Environmental Compliance Consultancy (ECC) (Reg. No. CC 2013/11401) has prepared this OEMP on behalf of the Proponent.

This report has been authored by employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent from the proponent and has no vested or financial interest in the project, except for fair remuneration for professional fees rendered based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report or the assessment, or a record of decision issued by Government. No member or employee of ECC is, or is intending to be, a director, officer, or any other direct employee of QKR Navachab Gold Mine (Navachab). No member or employee of ECC has, or has had, any shareholding in QKR Navachab Gold Mine (Navahcab).

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2 ENVIRONMENTAL MANAGEMENT FRAMEWORK

This OEMP provides measures, guidelines and procedures for managing and mitigating potential environmental impacts. The OEMP also indicates monitoring and reporting guidelines and sets responsibilities for those carrying out management and mitigation measures. The specific management plans for the OEMP have been divided into domains, which are listed as below:

- Domain 1: Linear infrastructure (surface roads, access roads, power lines)
- Domain 2: General and administration services (administration offices, security and emergency services, general parking and sewerage systems)
- Domain 3: Open pits (main pit, gecko satellite pit, anomaly 16 satellite pit)
- Domain 4: Underground mining
- Domain 5: Tailings storage facilities (TSF 1 & 2)
- Domain 6: Stockpiles (waste rock, ore)
- Domain 7: Processing plant
- Domain 8: Workshops and laydown areas (HME, engineering, processing, contractors)
- Domain 9: Non mineralized waste facility and bioremediation site
- Domain 10: Fuel depot and wash bays
- Domain 11: Navachab farm and nursery
- Domain 12: Topsoil stockpiles

Through defining these domains, clear operating areas are established. Within each domain, a domain manager is assigned and is responsible and accountable for the management of the environment within the domain and who shall ensure that the domain schedule is reviewed to ensure no additional environmental impacts occur. The SSEE manager shall ensure that all measures are implemented to mitigate and manage environmental impacts; e.g. ensuring pollution control measures, and that monitoring and reporting associated with the domain are in place.

2.1 OBJECTIVES AND TARGETS

Environmental objectives and targets have been developed so that mining activities can minimise potential impacts on the environment, as far as reasonably practicable.

Environmental objectives for the mine are as follows:

- Zero pollution incidents;
- Minimal vegetation clearing and earthworks;
- Minimal impact on regional groundwater users;
- Protect local flora and fauna; and
- Use natural resources effectively and efficiently.

2.2 ORGANISATIONAL STRUCTURE, ROLES AND RESPONSIBILITIES

Navachab will provide a competent team to oversee and undertake mining and operational activities, which is composed of Navachab's personnel and contractors. The QKR Navachab Gold Mine's Health, Safety, Security and Environmental Manager will ensure the management and

implementation of this OEMP is carried out throughout the life of mine. The Proponent shall be responsible for:

- Ensuring all members of the operational team, including contractors, comply with the procedures set out in this OEMP.
- Ensuring that all persons are provided with sufficient training, supervision and instruction to fulfil this requirement.
- Ensuring that any persons allocated specific environmental responsibilities are notified of their appointment and confirm that their responsibilities are clearly understood.
- Contractors shall be responsible for ensuring and demonstrating that all personnel employed by them are compliant with this OEMP and meet the responsibilities listed above.

Table 1 lists the roles and responsibilities allocated to different management levels in the company and specific personnel.

Table 1 – Roles and responsibilities

ROLE	RESPONSIBILITIES AND DUTIES
Navachab Gold Mine	– Responsible for the overall management and implementation of the OEMP. – Ensure environmental policies are drafted/updated and communicated to all personnel throughout the company and contractors. – Responsible for providing the resources required to effectively run the mine and comply with the OEMP. – Appoint all managers needed to ensure effective running of the mine operations. – Ensure systems for proper induction and training of personnel and contractors are in place.
QKR Namibia management	– Manage all activities on the mine. – Monitor daily operations and ensure systems are in place for implementation of the OEMP. – Maintain the community issues and concerns register and keep records of complaints. – Ensure corrective action are taken and communicated to complainants. – Maintain up to date records of employees who have completed training and induction.
Mining director	– Ensure that all contract workers, sub-contractors and visitors to the site are aware of the requirements of this OEMP, relevant to their roles and always adhere to this OEMP. – Report any non-compliance or accidents. – Receive, recording and responding to complaints. – Ensure adequate resources are available for the implementation of the OEMP.

ROLE	RESPONSIBILITIES AND DUTIES
	– Ensure safe and environmentally sound operations. – Responsible for the management, maintenance and revisions of this OEMP.
Safety, security, environment and emergency manager	– Maintain the mine's EMS. – Draft and update mine specific environmental procedures. – Ensure on-mine induction training is relevant and address issues from this OEMP. – Do all environmental audits and inspections and report findings to relevant personnel. – Check the implementation of corrective action for incidents and complaints. – Ensure all environmental monitoring and reporting is done.
Environmental officer(s)	– Conduct environmental monitoring, audits and inspections. – Compile draft environmental reports.
Employees	– Adhere to measures set out in the OEMP. – Ensure they have undertaken a site induction. – Report any operations or conditions which deviate from the OEMP, as well as any non-compliant issues or accidents to the SSEE manager

2.3 CONTRACTORS

Any contractors hired during the mining operational activities for the life of mine shall be compliant with this OEMP and shall be responsible for the following:

- Undertaking activities in accordance with this OEMP as well as relevant policies, procedures, management plans, statutory requirements and contract requirements.
- Implementing appropriate environmental and safety management measures.
- Reporting of environmental issues, including actual or potential environmental incidents and impacts, to the SSEE Manager and/or environmental department/officer(s).
- Ensuring appropriate corrective or remedial action is taken to address all environmental impacts and incidents reported by employees and subcontractors.

2.4 EMPLOYMENT

QKR Namibia Gold Mine and all contractors shall comply with the requirements of the Republic of Namibia Regulations for Labour, Health and Safety and any amendments to these regulations. The following shall be complied with:

- In liaison with local government and community authorities, the Proponent shall ensure that local people have access to information about job opportunities and are considered first for construction/maintenance contract employment positions.

- The number of job opportunities shall be made known together with the associated skills and qualifications.
- The maximum length of time the job is likely to last for shall be indicated.
- The international crew working on the vessel shall ensure that they are always in possession of valid travel documentation.
- The Proponent shall ensure that skills transfer is affected toward the local employee base for the duration of the Project.
- Every effort shall be made to recruit from the group of unemployed workers living in the surrounding area.

2.5 DOMAIN 1: LINEAR INFRASTRUCTURE

This domain includes tasks for linear infrastructure and activities, which are mapped below (where possible):

- Access roads
- Surface roads
- Powerlines and sub-station

The overall domain manager is the Operational mining manager.

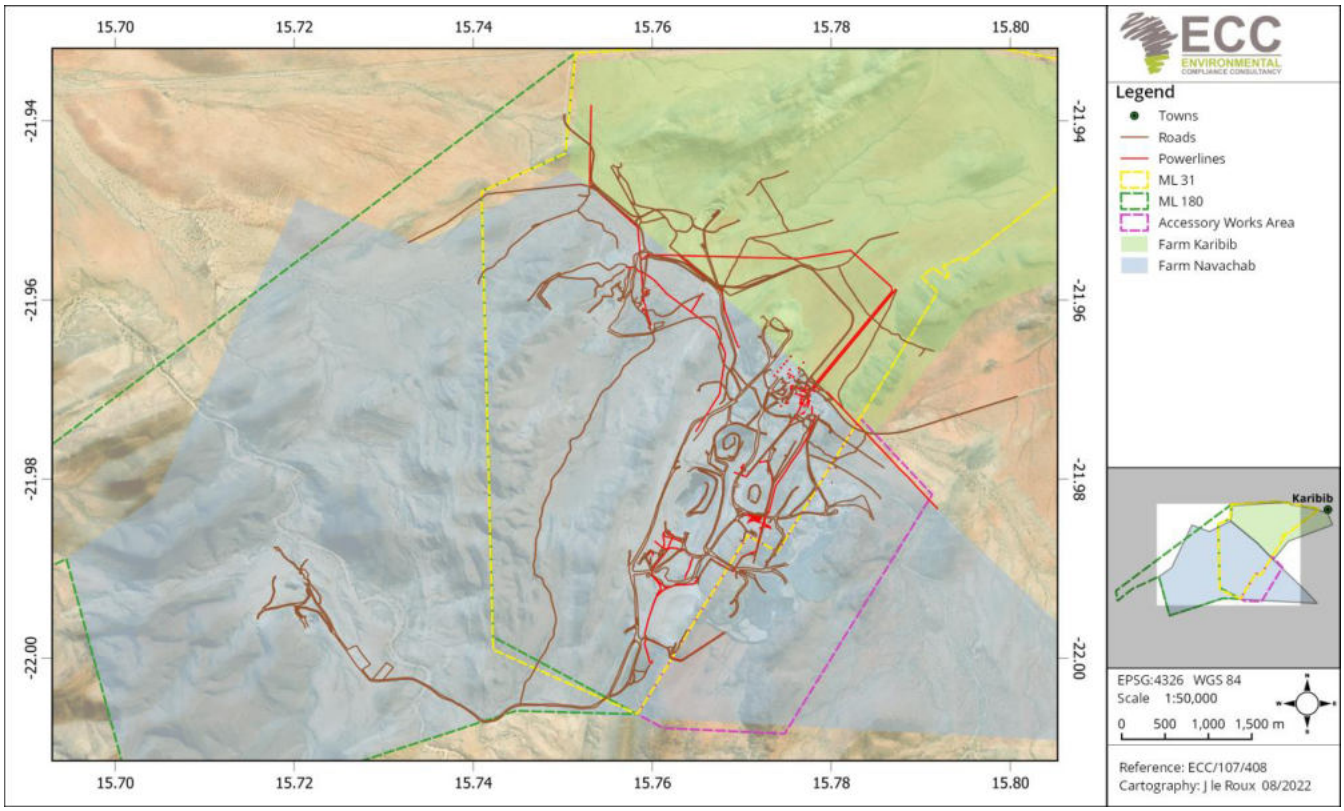

Figure 3: Domain 1 map depicting linear infrastructure

Table 2 – Environmental management plan for Domain 1; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Air quality	Dust generated from unpaved roads - potential impacts on staff, third parties and the surrounding environment	– Dust suppression measures to be implemented through the use of water sprays or chemical binding agents; – A fall out dust (TSP) monitoring network is established around the mine to monitor the effects of fall out dust from operations; – Fall out dust units to be exchanged every 28-32 days and results reported monthly to management; – Where results from the monitoring campaign warrant it, consider paving roads; – Dust masks to be issued for dusty areas on the mine; – Roads to be maintained on a regular basis, weekly where these surfaces are very active and prone to corrugation; – Trucks carrying loads should be covered, where possible; and – Complaints register to be maintained if third	– Environmental audits and inspections – Air quality monitoring programme – monthly – Complaints register – Biodiversity monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		party complaints received.		
Noise	Noise impacts on employees	– Occupational noise monitoring campaigns to be conducted on an annual basis by the SSEE department; – Employees to be issued with ear protection, where required; – Pre-start checks to be conducted daily on vehicles and equipment; and – Equipment, vehicles and HME to be serviced and maintained on a regular basis by Navachab staff, visitors and contractors.	– Environmental audits and inspections – Occupational noise monitoring programme – Workshop pre-start checklists – Workshop maintenance records	– Operational mining manager – SSEE manager
	Noise impacts on third parties	– Complaints register to be maintained if third party complaints received; – Pre-start checks to be conducted daily on vehicles and equipment; and – Equipment, vehicles and HME to be serviced and maintained on a regular basis by Navachab staff, visitors and contractors.	– Environmental audits and inspections – Workshop pre-start checklists – Workshop maintenance records – Complaints register	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Biodiversity	Injuries or mortalities to biodiversity from road users	– Drivers to have valid national and site specific drivers licenses; – Drivers to adhere to speed limits; – Drivers to drive to the conditions of the road; – Animals have right of way; – Incidents involving wildlife and staff, visitors and/or contractors to be immediately reported to the SSEE department; and – All incidents to be investigated and recorded as per the incident management procedure.	– Environmental audits and inspections – Incident records	– Operational mining manager – SSEE manager
	Injuries or mortalities to avifauna from power line infrastructure	– Regular monitoring surveys to be conducted on power lines infrastructure, where required. This is recommended to be monthly for new structures and quarterly from there on; – Suitable deterrent measures to be investigated with the assistance of a qualified high voltage electrician where	– Environmental audits and inspections – Biodiversity monitoring programme	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		there are repeat collision or electrocution events; – Stay wires to be appropriately marked; and – If high voltage power line infrastructure is property of NamPower on the mine site, annual inductions to be arranged and NamPower to be informed of planned surveys.		
Water management	Pooling/standing water from a lack of stormwater controls or inadequately designed road surface resulting in erosion of surfaces, safety concerns and attracting wildlife to work areas	– Stormwater management plan to be updated and implemented; – Road surfaces to be maintained on a regular basis; and – Diversions to be constructed in road surfaces where water is prone to pool to be released into the natural environment, expect in the case of contact water, whereby this should either be allowed to evaporate or pumped for reuse where feasible.	– Environmental audits and inspections – Maintenance schedules	Operational mining manager

2.6 DOMAIN 2: GENERAL AND ADMINISTRATION SERVICES

This domain includes tasks for general and administration services, which are mapped below (where possible):

- Administration and other offices
- Security and emergency services
- General and staff parking
- Sewerage systems
- Change houses

The overall domain manager is the SSEE manager.

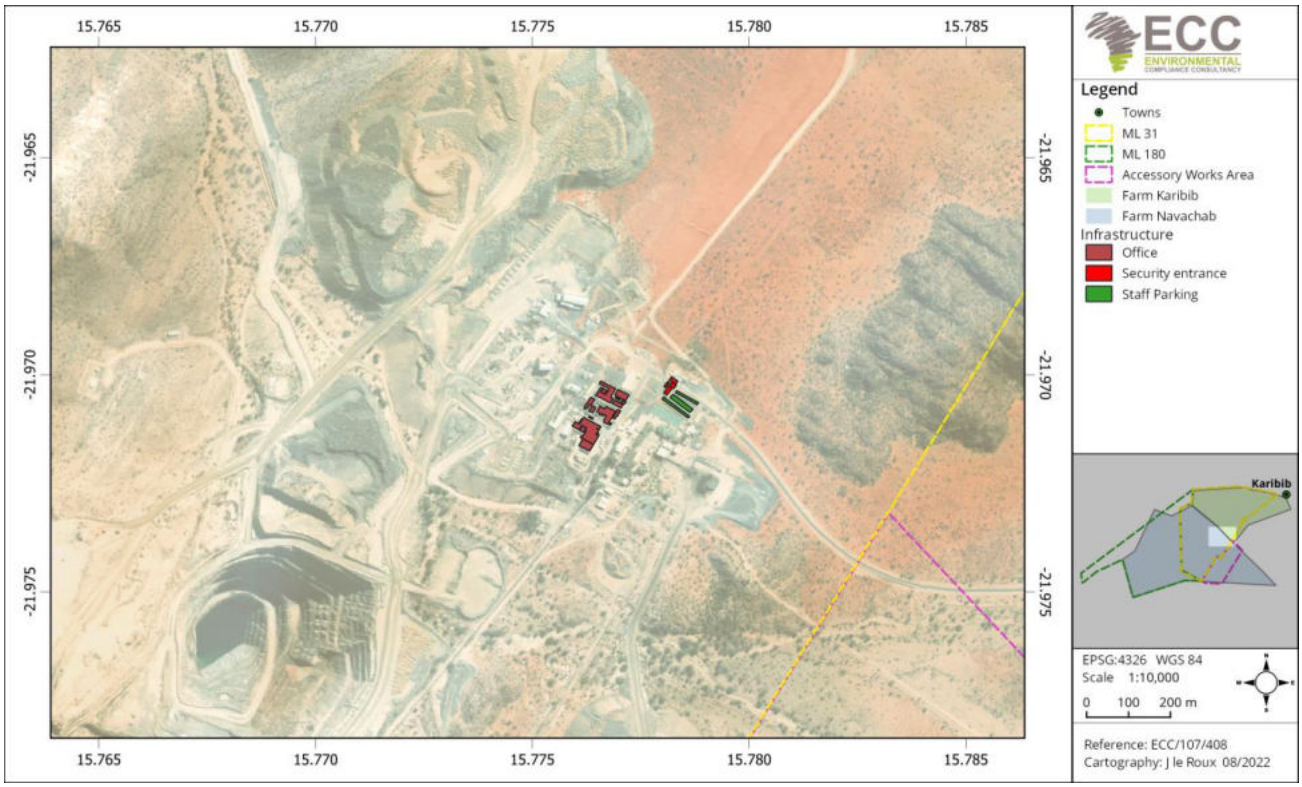

Figure 4: Domain 2 map depicting general infrastructure

Table 3 – Environmental management plan for Domain 2; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Training and awareness	Lack of environmental knowledge on EMP requirements leads to environmental incidents	– All employees, visitors and contractors are required to go through a general site induction when entering the mine site; – Environmental department to provide weekly information regarding environmental issues of concern; – Awareness will be distributed by various channels as deemed appropriate; – Notice/awareness boards to be kept up to date with the latest information shared; and – All vehicles to reverse park on the mine site.	– Environmental audits and inspections	SSEE manager
Domestic effluent water management	Lack of appropriate ablution facilities can result in soil contamination and pollution	– Only approved ablution facilities to be utilized; – No employee or contractor on Navachab site may relieve themselves in the surrounding environment and work area; – Ablution facilities to be cleaned and	– Environmental audits and inspections – Effluent monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		maintained on a regular basis; – Effluent water to be contained and spills to be cleaned up within 24 hours of the incident occurring; – Sewage facilities to be permitted with DWA; – Septic tanks to be pumped out on a regular basis to avoid overflows; – Grey water to be separated from effluent water and be reused; – Regular effluent water quality samples to be taken by the Environmental department; – Environmental friendly products to be used for the trickling filter plant; and – Sanitary bins to be provided for female employees to discard of sanitary waste correctly.		
Waste management (non mineralised)	Littering and pollution of soils/groundwater	– Waste must be disposed of in the waste receptors provided, no litter, especially in the parking areas where these receptacles might be scarce;	– Environmental audits and inspections	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Waste must be separated at source as per the waste management procedure in the correct colour coded bins and/or skips; – Waste receptacles can be supplied on request to the Environmental department; and – Bins and skips must have lids, that can seal and are scavenger/baboon proof.		
	Hazardous waste incorrectly managed and disposed of	– Smoking to occur in designated areas, clearly marked and only designated ash trays to be used; – Chemicals used in the office environment must have an accompanying MSDS and be registered with the Environmental department and the onsite clinic; – Medicine at the site clinic must be appropriately handled and stored, with accompanying MSDS, where required; – Medical waste and expired medicines must be disposed of off site at the	– Environmental audits and inspections – Waste records – Safe disposal certificates	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		incinerator at the Walvis Bay landfill site; – Sanitary waste to be collected by a registered company that can appropriately handle and dispose of this biohazard waste; – All biohazard waste associated with entry into the mine (e.g. masks, straws used for breathalyzing) must be handles correctly and disposed of as hazardous waste at a registered hazardous waste facility; – Records to be maintained of the disposal of hazardous waste; – All hydrocarbon spills from vehicles to be cleaned up by the responsible person.		
Housekeeping	Littering and soil/groundwater pollution	– Each employee or contractor is responsible for housekeeping in their work areas, which includes the offices and general areas; and – These areas be kept clean and maintained in a clean, orderly and presentable condition	– Environmental audits and inspections	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		at all times, no littering is allowed.		
Hygiene	Lack of appropriate and clean facilities for hand washing, showering and basic amenities	– Bathrooms, change houses, offices, kitchens and boardrooms to be cleaned on a daily to weekly basis; – Food scraps to be disposed of as general waste; – Where pests persists, pest control programmes to be implemented to remove the pest, after consultation with the Environmental department; – Basic amenities to be provided such as hand soap, wash clothes, toilet papers, microwaves, kettles, dishwashing liquid etc.; and – Sanitizers to be available for all staff at points of entry and exit from buildings.	– Environmental audits and inspections – Pest control programmes	SSEE manager

2.7 DOMAIN 3: OPEN PITS

This domain includes tasks for the open pit mining activities, which are mapped below:

- Main pit
- Gecko satellite pit
- Anomaly 16 satellite pit

The overall domain manager is the Operational mining manager.

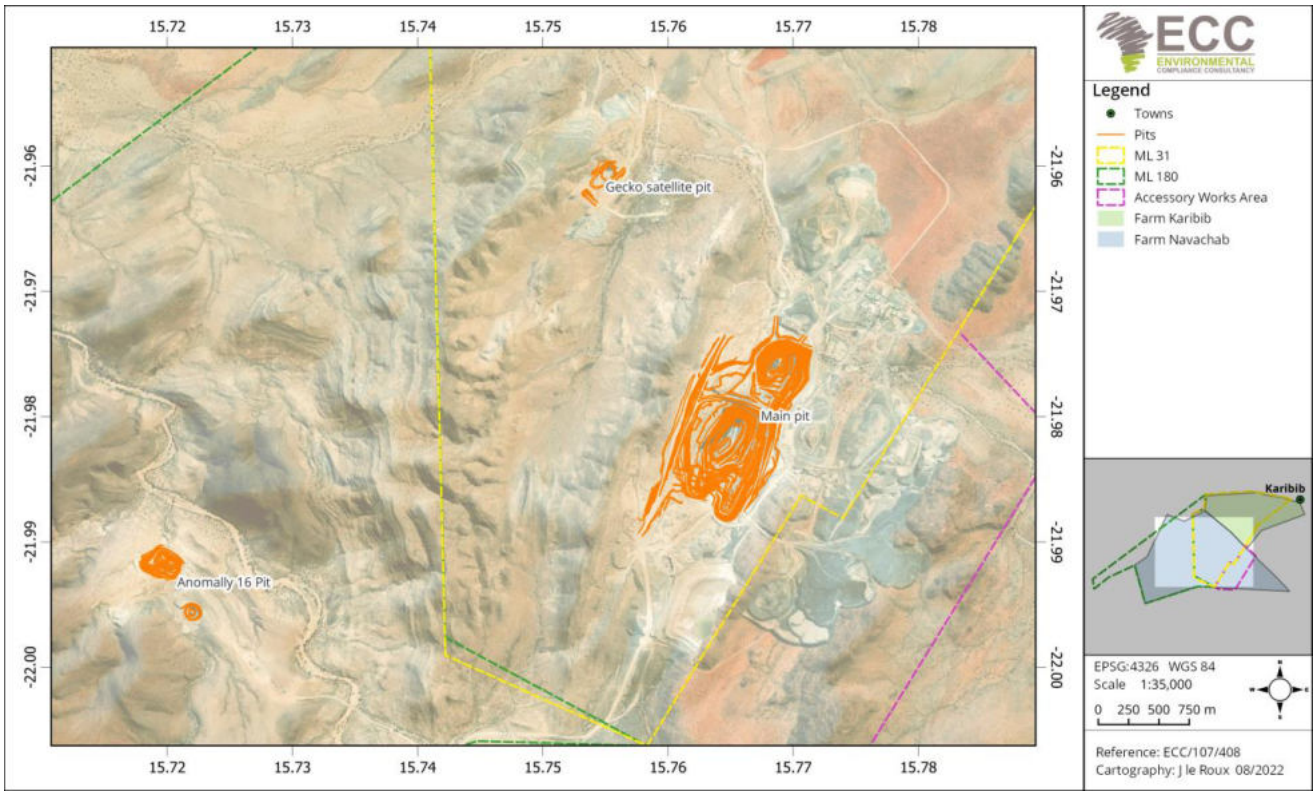

Figure 5: Domain 3 map depicting the open pits locations

Table 4 – Environmental management plan for Domain 3; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Training and awareness	Lack of environmental knowledge on EMP requirements leads to environmental incidents	– Environmental department to provide weekly information regarding environmental issues of concern; – Line management to discuss topics with teams; – SHE Representatives will be employed by contractor staff to brief staff on their company SHE topics and those of Navachab; – Awareness will be distributed by various channels as deemed appropriate; – Daily site inspections to ensure SHE requirements are adhered to; – SHE files to be maintained per shift as per Navachab requirements; and – Incident reports covering SSEE to be included, including lessons learned and corrective actions.	– Environmental audits and inspections	– Operational mining manager – SSEE manager
Potable water	No availability of potable water at	– Potable water can be sourced from AN BH and will supply the	– Environmental audits and inspections	– Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	Anomaly 16 satellite pit	contractor workshops facilities; – A pump, flow meter and storage facilities for water to be in place before use; – The Environmental department will record monthly meter readings to be reported to DWA, as per permit conditions; and – The Environmental department will conduct water quality chemical analysis of the borehole water on a monthly basis or as defined in the monitoring programme.	– Abstraction volume recordings and records	– SSEE manager
	Lack of potable water supply	– In remote working areas in the pit, with the changing work environments, potable water cannot be sourced through related infrastructure and employees should take water with them in canisters from the offices or change houses; and – Routine monthly potable water quality testing will be conducted at supplied water sources.	– Environmental audits and inspections – Potable water monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Soils management	Disturbance footprint management	– Only designated surface roads, haul roads or paved areas will be utilized; – Boundary berms to be constructed, where required; and – Topsoil to be removed, where feasible.	– Environmental audits and inspections	Operational mining manager
Domestic effluent water management	Lack of appropriate ablution facilities can result in soil contamination and pollution	– Only approved ablution facilities to be utilized; – If additional ablution facilities are required, the Environmental department to be informed; – Ablution facilities must be easily accessible for employees, onsite security and contractors to use in remote working areas; – No employee or contractor on Navachab site may relieve themselves in the surrounding environment and work area; – Ablution facilities to be cleaned and maintained on a regular basis; – Effluent water to be contained and spills to be cleaned up within	– Environmental audits and inspections – Effluent monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		24 hours of the incident occurring; – Sewage facilities to be permitted with DWA; – Septic tanks to be pumped out on a regular basis to avoid overflows; – Grey water to be separated from effluent water and be reused; and – Regular effluent water quality samples to be taken by the Environmental department.		
Waste management (non mineralised)	Littering and pollution of soils/groundwater	– Litter generated during shift must be collected in plastic bags and/or stored directly in the waste receptors provided; – Waste must be separated at source as per the waste management procedure in the correct colour coded bins and/or skips; – Waste receptacles can be supplied on request to the Environmental department; – Bins and skips must have lids, that can seal and are scavenger/baboon proof;	– Environmental audits and inspections – Waste records – Safe disposal certificates	– Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– No waste may be burnt or buried on site; – No fires will be allowed on site, unless in approved designated areas allowed by the SSEE manager; – Domestic waste is disposed of weekly at the non mineralized waste site; – Scrap metal to be collected in dedicated bunded areas and the Environmental department informed when collection is required; – Hazardous waste created including empty containers, hydraulic pipes, oil filters (etc.) should be removed from site and disposed of at a suitable registered hazardous waste facility; and – A copy of the safe disposal of these wastes to be maintained as a record on file and provided to the Environmental department on request.		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Hydrocarbon management	Incorrect hydrocarbon management can lead to soil and groundwater contamination or injury/mortality to fauna and flora	– Sufficient drip trays should be made available to capture leaks and prevent pollution from mining fleet; – Spill kits and spill absorbent treatment material to be present in the pit area for quick reaction times to handle small and large spills; – Incident reports to be compiled for each spill event as per the incident management procedure; and – Soils to be treated *in situ* and where this is not possible, soils to be removed to the bioremediation facility for further treatment.	– Environmental audits and inspections – Pre-start inspections	Operational mining manager
Air quality	Air pollution and dust emissions through vehicle emissions	– Diesel exhaust fumes/emissions from heavy machinery on site (excavators, front end loaders and haul trucks) must be controlled and minimized by regular checks and servicing of vehicles; – Any mining or construction vehicle found to be emitting excessive smoke or hydrocarbon spillage will be stopped from	– Environmental audits and inspections – Pre-start inspections and services – Air quality monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		operating until found to be mechanically sound; – Blasting should be conducted during period of atmospheric instability or as per the blasting regulations to allow for maximum dispersion of dust that has been created; – Fall out dust, $PM_{10}/_{2.5}$ and passive gases monitoring campaigns to be conducted in and around the open pits; – Adherence to speed limits on unpaved roads and surfaces; – Regular dust suppression through chemical binding agents and watering of roads, surfaces and stockpiles; – Additionally, goosenecks to be established where required; and – Alternate plans need to be in place for dust suppression as mining activities will be stopped if dust levels become too high.		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Noise management	Disturbance to third parties, fauna and flora	– Regular noise and vibration monitoring to be conducted on the neighbouring farm, Mon Repos; – To limit disturbance to the farmer, hauling of material from Anomaly 16 pit to the main mining areas/ROM, should take place during daylight hours as far as possible; and – If nighttime hauling is required, the neighbour needs to be consulted.	– Environmental audits and inspections – Noise and vibration monitoring programme – Community liaison records	– Operational mining manager – SSEE manager
Power generation	Incorrect supply and storage of power generators results in reduced mining operations and/or soil/groundwater contamination	– Power generation will be done using diesel generators, where required; – Lighting plants are expected to be used at night or during poor visibility; – All generators and diesel storage tanks must be contained within bundwalls with a sufficient capacity (110 %) contained volume; and – Records of diesel supplied to be maintained.	– Environmental audits and inspections – Fuel records	Operational mining manager
Heritage sites	Loss or damage to heritage sites	– Two significant archaeological sites are located in ML 31, guano mining site	– Environmental audits and inspections	– Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		(QRS 114/7) and possible iron wagon tyre quenching bath (QRS 114/8) and may not be disturbed; – Chance finds to be reported to the Environmental department in line with the Chance Finds Procedure; and – No authorized removal or damage to artefacts is allowed.	– Archeological monitoring programme	– SSEE manager
Biodiversity	Protection of fauna and flora to avoid damages, injuries and/or mortalities	– Protected tree species to be identified clearly and uprooting of trees to be avoided, where possible; – Seed and sample collection to be done for future rehabilitation purposes; – No firewood collection is allowed; – No large tree in the Kachab river may be uprooted for haul road construction; – Wherever large trees are encountered that are in the way, the road should be designed around them although limited trimming of branches with a chainsaw can be done;	– Environmental audits and inspections – Biodiversity monitoring programme – Mine closure plan	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Permits to be acquired from MEFT if protected trees are to be removed and/or relocated; – No hunting or poaching is allowed on Navachab farm; – No authorized removal of vegetation is allowed; – Baboons are pests and therefore require specific management, no feeding should be allowed; – Fauna and flora incidents to be reported and recorded as per the incident management procedure; – Leopard, cheetah and hyena occur in the area and can be discouraged by making loud noises, such as hooting; – Briefings on snakes and snake bite first aid treatments will be conducted; – Non-venomous snakes like mole snakes and egg eaters should be captured into a container and removed from site; – The killing of venomous snakes is		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		not encouraged (e.g. mamba, puff adder and zebra snakes); – Boa constrictors should under no circumstances be harmed or killed as they are protected by law; and – Contact the Environmental department to remove the snake should it be within the mining or construction area.		
	Conservation of fountains, springs and rivers not maintained	– No pumping from fountains/springs is allowed, especially in the Kachab river; – Avoid general disturbance to this area; – No soils to be collected from the rivers; and – The river should not be used as a general access route.	– Environmental audits and inspections – Biodiversity monitoring programme	Operational mining manager
Groundwater	Groundwater passive inflow into pits causing geotechnical instability	– The groundwater passive inflows increase during mining, reaching a peak of 308 m^3/day, towards the end of mining. It is estimated that the predicted inflows can easily be handled by sump pumping, and active	– Environmental audits and inspections – Groundwater database – Pit dewatering records	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		dewatering boreholes are not specifically required, unless geotechnical studies show critical geotechnical domains, where depressurisation may be needed; – Pit dewatering water is either used for dust suppression or released to an ephemeral water course, in line with permit conditions; – Volumes of water abstracted is recorded and reported to DWA, in line with permit conditions; and – Annual updating of groundwater model recommended.		
Housekeeping	Littering and soil/groundwater pollution	– Each employee or contractor is responsible for housekeeping in their work areas; – The pit areas and surrounds to be kept clean and maintained in a clean, orderly and presentable condition at all times; and – The various pits to be inspected on a monthly basis by the relevant supervisor,	– Environmental audits and inspections	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		line manager and/or manager.		
Stormwater management	Flood risks to the AN16 central pit and pollution control	– Various stormwater control options have been recommended and shall be implemented or alternatively a new stormwater control plan to be developed based on updated topographical and hydrological information; – Unlined containment dam and over-pumping, either around the pit to discharge to the C5 catchment downstream and from there to the Kachab River approximately 800 m downstream, or directly eastward to join the Kachab River approximately 750 m upstream of the original confluence; – Unlined containment dam and no pumping, with water lost by evaporation and /or infiltration; – Unlined attenuation dam and conveyance via a channel within one of the pit benches, if elevations allow;	– Environmental audits and inspections – Stormwater management plan – Survey database – Stormwater monitoring programme	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Diversion to another watercourse, most likely the Kachab river (with or without attenuation storage); – Collection within the pit and re-use; – If contact water from the PCP footprint enters the pit as run off, then this water is deemed dirty water and cannot be released into the natural environment; – For the AN16 central pit the peak inflow into a storage dam is calculated to be less than 25 m^3/s for the 1:50 year flood. A dam storage volume of approximately 60 000 m^3 would be recommended; and – The diversion channel should be a simple unlined trapezoidal channel.		
	Contact stormwater not contained leading to pollution	– Sumps to collect storm water that collects in the pits.	– Environmental audits and inspections – Stormwater management plan – Survey database	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
			– Stormwater monitoring programme	
Geotechnical	Pit wall stability failures due to elevated pore pressure	– The open pits will continue to be regularly inspected by geotechnical engineers; – Pore pressures will be monitored on an ongoing basis utilising a series of piezometers located around the pit; and – The need to install an active dewatering system to depressurize the pit walls will be considered as the pit deepens.	– Regular geotechnical inspections – Piezometer monitoring programme	Operational mining manager

2.8 DOMAIN 4: UNDERGROUND MINING

This domain includes tasks for the underground mining activities. The overall domain manager is the Underground mining manager.

Table 5 – Environmental management plan for Domain 4; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Employee health and safety	Underground ground control and ground support failures	– The Company's safety management plan will ensure that the SOP and golden rules include that no person is to go beyond supported ground (meaning no one can go into an area of unsupported ground). Supported ground is ground that has been controlled to an approved standard and made safe; – A ground control coordinator will be appointed; – A ground control plan will be developed; – Navachab will ensure that the application of a rigorous mine design process is in place; – Prior to mining, and refined as data becomes available, Navachab will ensure	– Ground stability monitoring – Pre-shift ground condition and support checklists.	Underground mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		a ground conditions model is developed; – Ensure that the evaluation of long-term ground control requirements is incorporated into the sites' technical plans and planning process; – Ensure that there is a multi-tiered response plan for ground support; – Ensure that all underground operators are trained in underground hazard identification; – Ensure that the site has ground control monitoring systems in place to proactively measure potential ground movement; – Ensure that the ground control requirements are incorporated into shift plans and work plans; and – Ensure that the site develops a quality assurance program for all areas of ground control/support.		
	Underground fire incident	– Develop a fire control plan through the process of risk assessment;	– HSE audits and inspections	Underground mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Develop a Maintenance System to prevent the deterioration of equipment condition and performance; – Ensure no petrol is used underground; – Design and control flammable substances use and storage; – Ensure that the control of hot work through a hot work permit system is in place specifically for underground operations; – Ensure the underground operators receive training to be able to identify and provide first response to fire emergencies; – Ensure that the site has an operational and maintenance procedures for fire control; – Ensure that the design requirements for underground mobile equipment factors in fire suppression; – Ensure that the site has specific design requirements for fixed mechanical, electrical		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		and compressor installations; – Design the ventilation system to ensure the least exposure to smoke from underground fires during evacuations; and – If associated infrastructure is required for underground operations such as workshops, lunchrooms, toilets and refuge chambers ensure these are planned and requirement designed for purpose.		
	Collision of underground mining equipment causing injury to people	– Ensure that procedures are in place to minimise the instances where pedestrians and operating mobile equipment are in the same area at the same time; – Ensure that operational Risk Assessments are part of the planning process; – Develop equipment specifications which include minimum safety requirements and the identification	– HSE audits and inspections – Pre-start checklists on all machines	Underground mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		of critical control systems for underground equipment; – Develop a maintenance system that identifies the maintenance requirements for critical safety systems; – Design requirements of all underground roads to ensure good road conditions underground are maintained; – Ensure suitable control of traffic through the development of SOPs; – Ensure all operators understand and are trained for emergency response.		
	Inrush or subsidence event within the underground mine causing injury and harm to people and project feasibility	– Ensure that due consideration of inrush and subsidence potential at each stage of a project is implemented at the planning phase; – Ensure that the use of a risk assessment process is in place to identify specific hazards; – Implement a systematic collection and analysis of data;	– Monitoring of surface and groundwater levels	SSEE Manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Evaluate of climatic conditions; – Identify risks of operating near water; – Ensure that consideration of pathways for inrushes is evaluated at each phase; – Develop, apply and monitor lead indicators; – Develop and apply a response plan for lead indicators; – Ensure the site has implemented contingency planning; – Prior to the development of working areas ensure a water control plan is developed and in place; – Apply appropriate procedures for surface and underground drilling; – Apply rigorous mine design process; – Implement effective ore and waste fill design; – Implement effective tailings and surface water storage; – Implement effective backfill design and procedures;		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Implement effective underground and surface pumping and drainage systems; and – Ensure that there is a method for open and clear communication of experiences and outcomes of inrush and subsidence events.		
Surface water	Sediment loading of surface water from decline development activities	– Installation of diversion structures to divert non-contact surface water away from and around the mining operations; – Ensure wastewater produced during the construction of the decline development is directed into the open pit; and – If the volume of water is too large and cannot be handled concurrently with open pit mining operations, ensure water is diverted to the processing plant for reuse, or if not feasible, ensure an adequately sized sedimentation pond is constructed for handling the waste water during the decline development phase, or find a	– Mine water balance	Underground mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		suitable reuse strategy for the water.		
	Sediment loading of surface water from uncontrolled surface discharge of underground mine wastewater	– Ensure wastewater produced from underground mining activities is sent to the processing plant for reuse in the processing plant; and – If the volume of water is too large and cannot be handled by the processing plant for reuse, ensure an adequately sized sedimentation pond is constructed for handling the wastewater from the underground mining operations. Reuse of the water back into the underground mine should be investigated once operations commence and the water quality is better known and understood.	– Mine water balance	Underground mining manager
	Discharges of chemicals to surface water	– Ensure correct chemical use and clean-up procedures are in place and followed; – Ensure chemical spills are cleaned up underground; and – prevent spills from entering the dewatering system	– Surface water monitoring	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		that would be transferred to surface.		
	Potential failure of containment dams that hold underground mine dewatering water	– Ensure water storage facilities are constructed and have capacity to hold the volume of water to be pumped from the underground workings.	– Mine water balance	Underground mining manager
Groundwater	Contamination of groundwater from underground mine operations including hydrocarbons and explosives.	– Ensure correct chemical use and explosive charging practices are in place and followed for underground mining operations; – Bulk fuel will not be stored underground and majority of fleet refuelling will occur on surface; and – Refueling of drills and equipment working at the face will be done in a controlled manner following standard underground refuelling procedures.	– Groundwater monitoring	– Underground mining manager – SSEE manager
	Potential for inrush into the underground mine workings during development and operations	– Ensure the dewatering plan is followed and monitoring and reporting on the dewatering plan is undertaken; – Ensure all operations are undertaken in	– Groundwater monitoring	Underground mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		accordance with the mine plan; – Ensure all water bearing features are mapped and included in survey plans; – Ensure emergency response procedures are in place in the event of an inrush; and – Ensure adequate pumping capacity with back up pumps as critical spares are kept on site.		
	Further reduction in the water table could affect deep rooted tree survival during droughts	– Monitoring groundwater levels and physiological stress levels in trees to see if a correlation exists.	– Groundwater monitoring – Vegetation monitoring	SSEE manager
Air quality	Deterioration in air quality from odour and particulate matter (i.e. total suspended particulate matter (TSP), PM10 and PM 2.5 (particulate matter of 2.5 micrometres or less in	– Ensure mechanical equipment is maintained and serviced to ensure particulate matter is reduced; and – Ensure ventilation systems are providing fresh air to working headings and the underground workings are exhausted after each blast.	– Pre-shift access checklist – Air quality monitoring – Personal exposure monitoring	Underground mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	diameter) and dust deposition) from the underground			
	Ventilation discharged from the underground workings via the portal could contribute to offensive odours	– Implement gas monitoring procedures as part of the daily operations of the underground mine; and – Ensure adequate ventilation to prevent the build-up of odours and gas within the underground mine.	– Air quality monitoring – Personal exposure monitoring	Underground mining manager
	Air quality and GHG emissions from underground mining activities	– Ensure mechanical equipment is maintained and serviced to ensure particulate matter is reduced; and – Ensure efficient waste handling such as backfilling to reduce haul distances and therefore reduce potential GHG emissions.	– GHS emission reporting	Underground mining manager
Resource use	Inefficient use of water resources	– Use water effectively and efficiently by following the reduce-recycle-reuse approach; and – Record volumes of abstraction and supply.	– Daily observations – Mine water balance	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	Inefficient electricity use increasing carbon footprint	– Rely on the use of the PV solar plant for the maximum electricity supply; and – Use energy efficient electrical equipment and lighting underground.	– Track energy use	Underground mining manager

2.9 DOMAIN 5: TAILINGS STORAGE FACILITIES

This domain includes tasks for the tailings storage facilities activities, which are mapped below:

- Tailings storage facility 1 (not active)
- Tailings storage facility 2 (active)

The overall domain manager is the Processing manager.

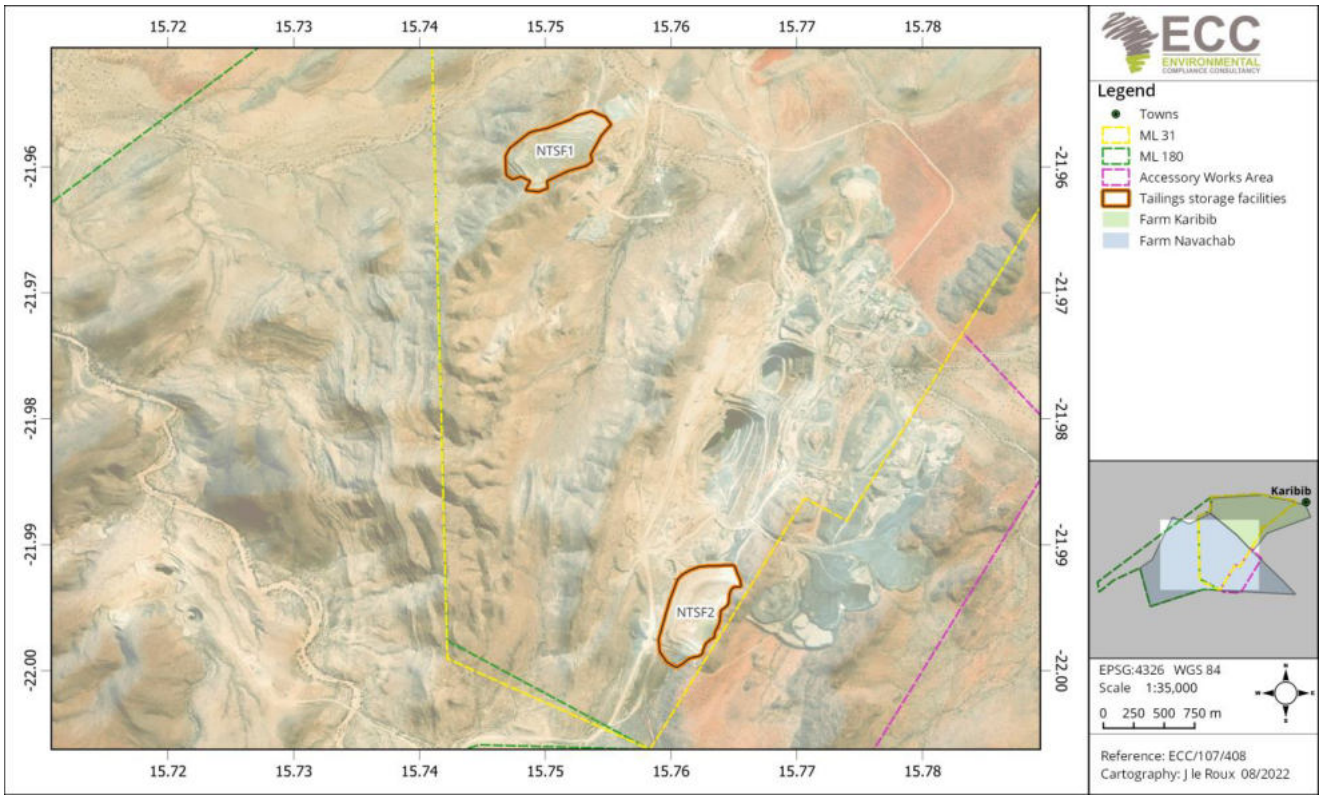

Figure 6: Domain 5 map depicting the tailings storage facility locations

Table 6 – Environmental management plan for Domain 5; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Air quality	Dust emissions (TSP & PM10) from earthmoving activities, unsealed surfaces (e.g. roads) and from the surface of the tailings facility beach	– Dust suppression to continue on access utilizing water or chemical binding agents; – Fall out dust (TSP) will continue to be monitored on a monthly basis; and – Rehabilitation will be undertaken on final landforms (e.g. starter embankment) to minimize potential for dust generation and provide conditions for revegetation.	– Environmental audits and inspections – Air quality monitoring programme – Mine closure plan	Processing manager
	SO_X, NO_X and CO_X emissions generated from operational activities (plant, diesel vehicles machinery, trucks)	– Investigate the possibility of implementing a passive gasses sampling monitoring, as described in the air quality monitoring programme.	– Environmental audits and inspections – Air quality monitoring programme	Processing manager
Hydrology, hydrogeology and water quality	Altered hydrological regimes resulting in disruption of drainage lines, reducing downstream flows, flooding and increased erosion and sediment generation	– Stormwater to be diverted around the starter walls to minimise erosion and sediment mobilization; – Erosion protection measures may be required on stream diversion channels;	– Environmental audits and inspections – Stormwater management plan	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Tailings discharge and return water pipeline will be elevated on concrete plinths to above flood level at stream crossings; – Tailings discharge will be suspended during extreme flood events to minimize risk of tailings spillage if the pipeline breaches; – Concrete drifts to be constructed at low points on ephemeral drainage courses that cross access roads to the TSF 2; – Concrete drifts will divert stormwater into pollution control paddocks constructed on the down slope side of the road, from which it will overflow via engineered spillways; and – These paddocks will be cleared out and maintained on a regular basis to maximize available storage space and ensure that they continue to function as designed.		
	Release of decant water to the environment	– Decant water to be returned to the process and may not	– Environmental audits and inspections	– Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	resulting in pollution	be released into the environment; – The TSF will be operated as per the OEM; – Volumes of water held in the TSF to be minimized; – Groundwater levels and water quality testing to be conducted regularly for the TSF boreholes, as per the groundwater monitoring programme.	– Groundwater monitoring programme – Area owner daily inspections – Operations manual	– SSEE manager
	Impact of seepage water from the TSF on groundwater flow and quality	– The TSF and related infrastructure will be managed and operated according to the OEM; – Where possible, the TSF must be lined; – The decant pool of TSF 2 will be maintained away from the eastern ridge to minimise the potential for seepage to occur along the contact between the quartzite and Kalahari sand cover; – The TSF 2 floor will be covered as soon as possible with low permeability tailings to minimize seepage potential;	– Environmental audits and inspections – Groundwater monitoring programme – Area owner daily inspections – Operations manual	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– An underdrain system to be installed to intercept seepage and return intercepted water to the decant pond from where it will be pumped back for use in the process; – The seepage interception dam will be constructed 200 m south of TSF 2 to collect shallow seepage and return it to the TSF basin for recirculation to the plant; – Groundwater quality will be monitored at boreholes downgradient of the TSF; and – Measures to maintain and upgrade the seepage interception system will be described in the OEM.		
	Impact from the seepage water of the TSF on surface water flow and quality, potentially contaminating springs	– The TSF and related infrastructure will be managed and operated according to the OEM; – Where possible, the TSF must be lined; – The decant pool of TSF 2 will be maintained away from the eastern ridge to minimise the potential for seepage to occur	– Environmental audits and inspections – Surface water monitoring programme – Area owner daily inspections – Operations manual – Six monthly inspections on	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		along the contact between the quartzite and Kalahari sand cover; – The TSF 2 floor will be covered as soon as possible with low permeability tailings to minimize seepage potential; – An underdrain system to be installed to intercept seepage and return intercepted water to the decant pond from where it will be pumped back for use in the process; – The seepage interception dam will be constructed 200 m south of TSF 2 to collect shallow seepage and return it to the TSF basin for recirculation to the plant; – This dam will be covered to prevent fauna from gaining access to the potentially contaminated water; – Measures to maintain and upgrade the seepage interception system will be described in the OEM; – Surface water will be monitored in line with	slopes down gradient	

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		the monitoring programme; and – The slopes down gradient of the TSF will be inspected on a six monthly basis to identify any new springs or seepage zones that may have developed.		
	Release of heavy metals and other contaminants to the groundwater as a result of acid mine drainage from sulphides exposed in the tailing and the starter wall waste rock material	– Static geochemical testing has shown that waste rock and tailings are non-acid forming, which neutralizing potential exceeding acid-generating potential; – The TSF and related infrastructure will be managed and operated according to the OEM; – As a precaution, the mine will determine the acid-generating potential of waste rock and tailings at six monthly intervals; and – Should horizons with acid-generating potential be encountered, the mine will identify and implement management measures necessary to minimise the potential for the	– Environmental audits and inspections – Operations manual – Six monthly testing of waste rock	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		development of acid mine drainage.		
	Increased turbidity and surface flow changes in the downstream environment, due to increased sediment generation when clearing land, starter wall construction, erosion from side walls and changes to drainage patterns/landscape	– The TSF and related infrastructure will be managed and operated according to the OEM; – Stormwater will need to be diverted around the start walls to minimise potential for erosion and sediment mobilization, particularly of disturbed areas; – Erosion protection measures may be required on stream diversion channels; – Silt traps may be required downstream of the TSF to prevent choking the downstream environment; – Silt intercepted by these structures could be used for rehabilitation purposes; – The stormwater diversion system around the TSF will be regularly inspection, maintained and upgraded where necessary; and – Rehabilitation trials will be undertaken on the TSF embankments	– Environmental audits and inspections – Operations manual – Stormwater management plan and regularly inspections – Mine closure plan	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		to minimize erosion potential.		
Resource use	Mine water consumption not optimised	– The mine will seek further opportunities to optimize water; – These measures will include maximizing the volume of water returned from the TSF for use in the plant; and – Water balance to be developed and implemented.	– Environmental audits and inspections – Monthly water balance	Processing manager
Biodiversity	Loss of natural habitats and biodiversity through land clearing required for TSF construction	– Grazing ground will be reduced due to a loss of vegetation but there is sufficient vegetation available on the surrounding farms; – Rehabilitation trials are ongoing on the walls of TSF 1 and similar trials must be conducted on the starter wall embankments of TSF 2; and – Once TSF 1 and TSF 2 are no longer required to be used for operational purposes, both will be rehabilitated to safe and stable landforms and revegetated to restore habitats, in line with the mine	– Environmental audits and inspections – Mine closure plan	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		closure plan objectives.		
	Impact of TSF operations on fauna as a result of attraction to the facilities due to an additional water source	– The decant water chemical properties will not vary between TSF's and therefore is not considered to pose a significant threat on fauna health if consumed; – Cyanide levels in the decant pond will be maintained bellow 50 ppm WAD; – Cyanide concentrations in the decant pond will be monitored on a daily basis; – The existing onsite laboratory facilities will be upgraded to analysis for WAD cyanide; – A sample of decant water will be submitted for a full suite of inorganic analysis on a monthly basis; – Any animal fatalities will be immediately reported to the Environmental department and an incident recorded, as per the incident management procedure;	– Environmental audits and inspections – Daily monitoring of decant water CN levels – Monthly sampling and monitoring of decant water CN WAD concentrations	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Should any incident be shown to have resulted from contact with process solutions on the TSF, an environmental risk assessment will be conducted and management systems will be revised accordingly; – The TSF to be fenced where possible to prevent fauna from gaining access; and – Bird deterrent measures to be investigated and implemented, as required.		
	Loss of rare or endangered species	– Currently there is no rare or endangered species identified on the mine site, however daily observations to be reported to the Environmental department.	– Biodiversity monitoring programme	SSEE manager
	Impacts to fauna and flora due to effluent releases from pipeline ruptures as reagents in process water could be potentially toxic (e.g. cyanide,	– The TSF and related infrastructure will be managed and operated according to the OEM; – TSF 2 has been designed in accordance with SABS 0286 standard to contain a 1:50 year flood event, persisting	– Environmental audits and inspections – Daily monitoring of decant water CN levels – Daily inspections of	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	caustic, hydrochloric acid)	for 24 hours, with a 1 m freeboard. This will minimize the potential for failure, overtopping or other uncontrolled releases of decant water and/or tailings to the environment; – The amount of water retained on the TSF will be minimized to increase wall stability and maximise storage volume available to impound runoff from major storm events; – Cyanide levels in the decant pond will be maintained below 50 ppm WAD; – A seepage dam will be constructed 200 m south of TSF 2 to intercept shallow seepage that might daylight as contaminated spring flow; – Intercepted seepage will be pumped back to the decant pond for return to the process; – This dam will be covered to prevent fauna access to potentially contaminated water;	pipelines and infrastructure	

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Tailings and return water pipeline will be inspected twice daily; – Pollution control paddocks will be constructed at low points along the pipeline route to contain any tailings that may be spilled during repair and maintenance work; – All tailings spillages will be immediately reported, recorded as incidents, cleaned up and returned to the TSF; – Secondary containment will be provided along the length of the tailings pipeline to restrict the spread of spilled tailings away from the source and direct spillage towards the pollution control paddocks; and – Secondary containment will be achieved by constructing access roads along one side of the pipeline and creating an earth bund on the other side of the pipeline.		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Archaeological sites	Potential disturbances or damages to heritage sites and/or artefacts	– No known sites of archaeological significance are located at the current TSF's; and – Chance find procedure to be implemented if artefacts are discovered; and – The National Heritage Council to be informed if heritage sites of significance are discovered during construction r operations of the TSF's.	– Environmental audits and inspections – Archaeological monitoring programme	SSEE manager
Visual	Visual impacts to third parties due to changes to landforms	– The waste rock used for starter wall embankments will be dumped at the angle of repose; and – Revegetation of the side walls in line with the mine closure plan objectives.	– Environmental audits and inspections – Mine closure plan	– Processing manager – SSEE manager
Noise management	Impacts on third parties and employees, contractors and visitors to Navachab	– The position of the TSF's will not increase the overall noise impact from general mining operational activities, however occupational health and safety noise limits will continue to be implemented for personnel working around vehicles and machinery;	– Occupational health and safety noise monitoring programmes – Environmental audits and inspections – Complaints register	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– The TSF and related infrastructure will be managed and operated according to the OEM; – Annual noise surveys to be conducted by occupational health; and – Third part noise complaints to be recorded.		
Soils management	Incorrect sourcing of material for the construction of starter walls	– Gravel will be sourced from existing borrow pits on the mine, where required; – Gravel can also be sourced from washed down sediment following major flood events in the ephemeral river beds spanned by the conveyor; – Calcrete will be sourced from pre-stripping of the pit area; – Borrow pits will be rehabilitated in accordance with the mien closure plan objectives; and – If additional borrow pits are to be established, an environmental impact assessment must be conducted prior to establishment.	– Environmental audits and inspections – Mine closure plan	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Housekeeping	Littering and soil/groundwater pollution	– Each employee or contractor is responsible for housekeeping in their work areas; – The pit areas and surrounds to be kept clean and maintained in a clean, orderly and presentable condition at all times; and – The various pits to be inspected on a monthly basis by the relevant supervisor, line manager and/or manager.	– Environmental audits and inspections	Processing manager
Potable water management	Lack of potable water supply	– In remote working areas, potable water cannot be sourced through related infrastructure and employees should take water with them in canisters from the offices or change houses; and – Routine monthly potable water quality testing will be conducted at supplied water sources.	– Environmental audits and inspections – Potable water monitoring programme	– Processing manager – SSEE manager
Domestic effluent water management	Lack of appropriate ablution facilities can result in soil contamination and pollution	– Only approved ablution facilities to be utilized; – If additional ablution facilities are required, the Environmental department to be informed;	– Environmental audits and inspections – Effluent monitoring programme	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Ablution facilities must be easily accessible for employees, onsite security and contractors to use in remote working areas; – No employee or contractor on Navachab site may relieve themselves in the surrounding environment and work area; – Ablution facilities to be cleaned and maintained on a regular basis; – Effluent water to be contained and spills to be cleaned up within 24 hours of the incident occurring; – Sewage facilities to be permitted with DWA; – Septic tanks to be pumped out on a regular basis to avoid overflows; – Grey water to be separated from effluent water and be reused; and – Regular effluent water quality samples to be taken by the Environmental department.		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Waste management (non mineralised)	Littering and pollution of soils/groundwater	– Litter generated during shift must be stored directly in the waste receptors provided; – Waste must be separated at source as per the waste management procedure in the correct colour coded bins and/or skips; – Waste receptacles can be supplied on request to the Environmental department; – Bins and skips must have lids, that can seal and are scavenger/baboon proof; – No waste may be burnt or buried on site; – No fires will be allowed on site, unless in approved designated areas allowed by the SSEE manager; – Domestic waste is disposed of weekly at the non mineralized waste site; – Scrap metal to be collected in dedicated bunded areas and the Environmental department informed	– Environmental audits and inspections – Waste records – Safe disposal certificates	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		when collection is required; – Hazardous waste created including empty containers, hydraulic pipes, oil filters (etc.) should be removed from site and disposed of at a suitable registered hazardous waste facility; and – A copy of the safe disposal of these wastes to be maintained as a record on file and provided to the Environmental department on request.		
Hydrocarbon management	Incorrect hydrocarbon management can lead to soil and groundwater contamination or injury/mortality to fauna and flora	– Sufficient drip trays should be made available to capture leaks and prevent pollution from equipment at the TSF; – Spill kits and spill absorbent treatment material to be present at the TSF for quick reaction times to handle small and large spills; – Incident reports to be compiled for each spill event as per the incident management procedure; and	– Environmental audits and inspections – Pre-start inspections	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Soils to be treated *in situ* and where this is not possible, soils to be removed to the bioremediation facility for further treatment.		

2.10 DOMAIN 6: STOCKPILES

This domain includes tasks for stockpile activities, which are mapped below:

- Waste rock stockpiles
- Ore stockpiles

The overall domain manager is the Operational mining manager.

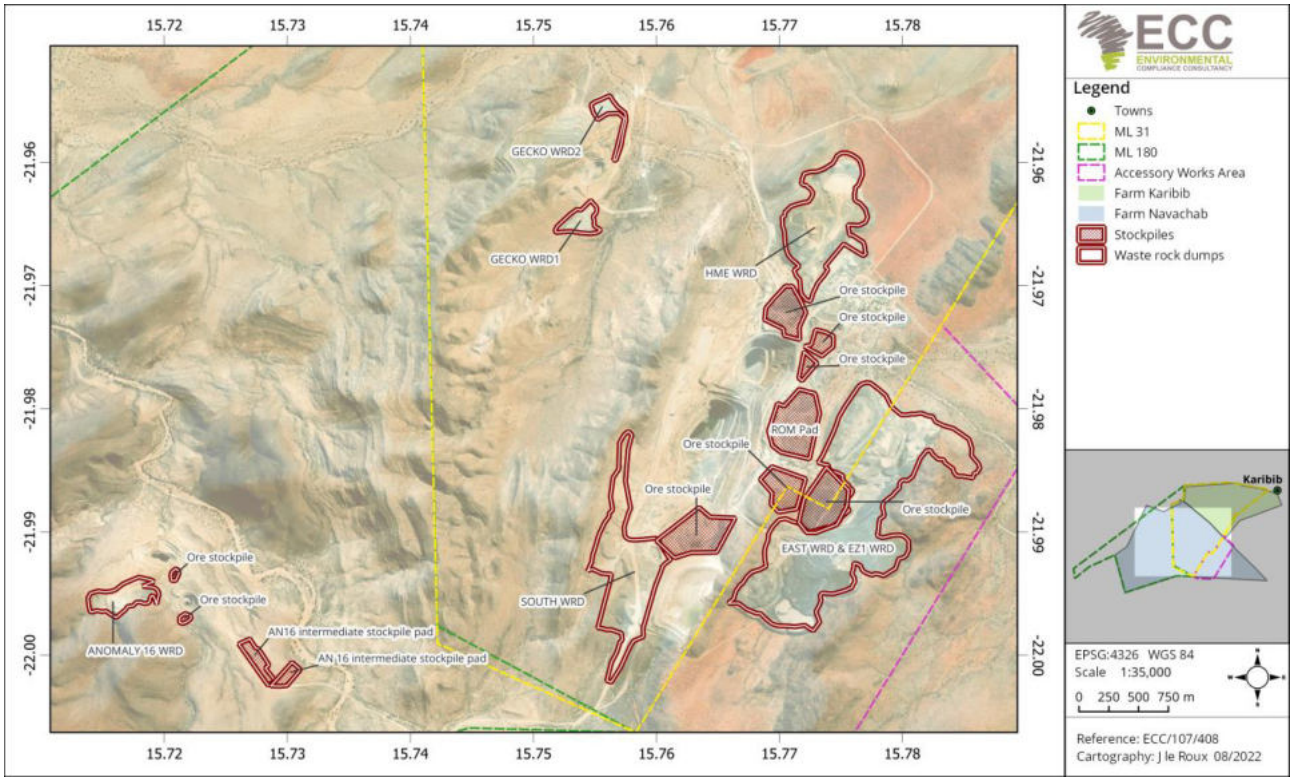

Figure 7: Domain 6 map depicting the waste rock and ore stockpile locations

Table 7 – Environmental management plan for Domain 6; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Stormwater management	Flood risks to surface infrastructure, property and personnel and water quality issues related to pollution sources within drainage lines at AN16	– The eastern toe of the AN16 WRD should not sit in the main drainage line; – A stormwater dam shall be constructed to the south of the WRD and the diversion channel would then route flood water to the east of the WRD and the central pit and turn back west to join the C5 drainage just before the confluence with the Kachab River or eastward across the watershed to discharge into the Kachab River; – A flood protection berm may need to be constructed in the C5 drainage between the outflow of the diversion channel and the Central pit, to prevent any backwater effects from flood water from the diversion channel being forced back up the C5 drainage if the	– Environmental audits and inspections – Stormwater management plan – Survey database – Stormwater monitoring programme	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		Kachab River is in flood; and – A survey of the relative elevations of the Kachab River and the C5 tributary in this area will be able to identify whether this could be an issue during peak floods; – Unlined containment dams and over-pumping, around the WRD to discharge to the C5 catchment approximately 150 m downstream of the Central pit and from there to the Kachab River; – Unlined containment dams and no pumping, water lost by evaporation and /or infiltration; – Diversion to another watercourse, most likely the un-named drainage channel to the north (with or without attenuation storage); – The WRD has an upstream catchment area consisting of two significant drainage lines, which have a combined catchment area of approximately 1.5 km^2, which will		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		produce non-contact storm water that will need to be diverted around the WRD; – There is the option to route this non-contact water (with an expected peak flow of up to 12 m^3/s) via a diversion channel (unlined trapezoidal) to the west around the WRD and into the C5 drainage line to the north of the AN central pit; – Due to the relatively small size of the upstream catchments, it may prove more cost effective to construct unlined storage dams in the two drainage lines to capture storm water and to let this storm water infiltrate and evaporate, rather than to attempt to divert these floodwaters around the WRD and back into the drainage line downstream; – Hydraulic sizing and design of the relevant storm water management infrastructure should be undertaken when the preferred		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		management option has been identified; – Collection channels to be constructed around the perimeter of the WRD for any dirty runoff generated, which will need to be connected to a lined pollution control dam (PCD) located on the downstream corner of the WRD in the C5 drainage line. It may be possible to incorporate erosion capture paddocks into the design, if the local terrain is flat enough.		
Air quality	Dust emissions from stockpiles	– Dust suppression measures to be implemented through the use of water sprays from water bowsers during stockpiling activities and high wind conditions; – Avoid handling lose material and fines when weather conditions are not favourable (e.g. strong winds); – Air quality monitoring through dust fall out stations (TSP) and $PM_{10/2.5}$ stations;	– Environmental audits and inspections – Air quality monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Trends to be analyzed on a monthly basis and reported to management for corrective action, if results show unfavourably high TSP or $PM_{10}/_{2.5}$ levels, in accordance with the relevant standard(s) exceedances.		
Groundwater and surface water	Soil pollution from contact/dirty water	– All potential contact/dirty water from WRD's and ore stockpiles should be controlled and directed away from the natural environment, especially drainage lines, towards the respective pits; – Bunds should be erected around these stockpiles, where feasible, to contain contact water run-off; – Groundwater monitoring of boreholes as per the borehole monitoring programme, this includes rest water levels and water quality; – Surface water monitoring when applicable, especially during and after rainfall events;	– Environmental audits and inspections – Groundwater monitoring programme – Surface water monitoring programme	– Operational Mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Regular reporting to management if concerns are noted from borehole monitoring or surface water monitoring results that could be related to acid rock drainage; – Where potential acid forming material is identified, this rock should be treated and/or encapsulated and recorded as such.		
Geotechnical	Erosion controls not adequately in place	– Erosion controls to be implemented on stockpiles, especially those that will remain for a long period of time; and – Regular inspections to be conducted on stockpiles.	– Environmental audits and inspections – Area owner inspections	Operational mining manager
Biodiversity	Disturbance outside of approved footprint	– Before preparation and stockpiling activities commence, the area must be assessed to determine if there are any species required to be relocated; – Thereafter topsoil should be stripped (300 mm) and placed in the designated topsoil stockpile; – Berms to be constructed around the perimeter of the	– Environmental audits and inspections – Site establishment process	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		stockpile to prevent over tipping and disturbance outside of the approved footprint; and – Wildlife of concern to be reported to the Environmental department.		
Non mineralised waste	Incorrect disposal of waste on stockpiles	– No waste may be disposed of on the WRD's or the ore stockpiles; and – Litter and any waste observed will be collected and disposed of at the correct waste cell or in a waste receptacle provided.	– Environmental audits and inspections – Area owner inspections	Operational mining manager
Mine closure	Incorrect waste rock dump construction resulting in stability issues at closure	– WRD construction will be according to Navachab Gold Mine standards; and – WRD will only be constructed once sterilization drilling has been done.	– Mine planning	Operational mining manager

2.11 DOMAIN 7: PROCESSING PLANT

This domain includes tasks for the processing plant activities, which are mapped below (where possible):

- Overall processing plant infrastructure and ponds
- Run of life of mine (ROM)

The overall domain manager is the Processing manager.

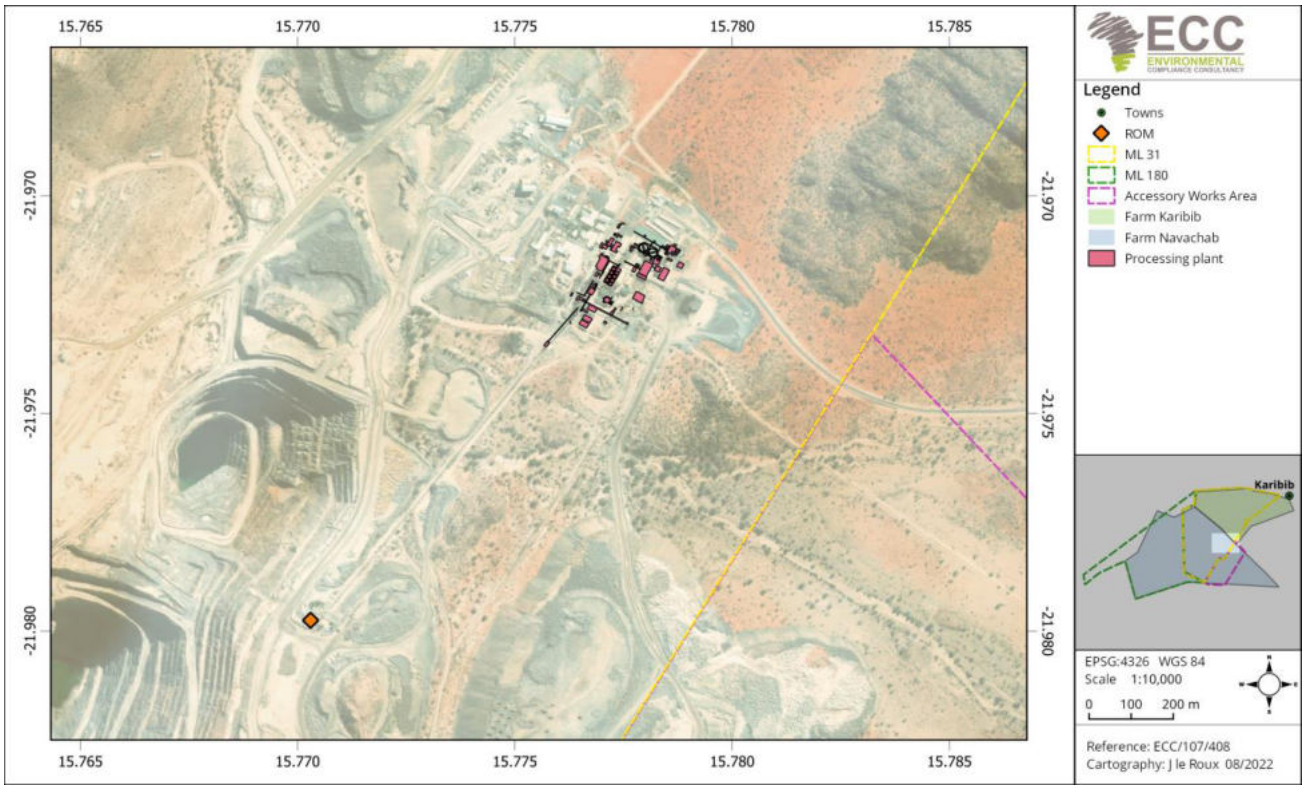

Figure 8: Domain 7 map depicting the processing plant and ROM locations

Table 8 – Environmental management plan for Domain 7; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Training and awareness	Lack of environmental knowledge on EMP requirements leads to environmental incidents	– Area specific induction required before entering and working in the plant; – Visitors to be accompanied and supervised at all times; – Environmental department to provide weekly information regarding environmental issues of concern; – Line management to discuss topics with teams; – SHE Representatives will be employed by contractor staff to brief staff on their company HSE topics and those of Navachab; – Awareness will be distributed by various channels as deemed appropriate; – Daily site inspections to ensure SHE requirements are adhered to; – SHE files to be maintained per shift	– Environmental audits and inspections – Training records	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		as per Navachab requirements; – Staff involved in the transport, handling and storage of hazardous chemicals to be competent and trained therein and know how to handle accidental releases; and – Incident reports covering SSEE to be included, including lessons learned and corrective actions.		
Stormwater management	Flood risks to surface infrastructure, property and personnel and water quality issues related to pollution sources within drainage lines from the PCP plant	– For the PCP plant, it is recommended to place the plant outside of flood lines of the river channel; – Bunds are required to be erected along the PCP plant edge closest to the drainage line for additional flood protection; – Unlined containment dam and over-pumping, either around the PCP and Central pit to discharge to the C5 catchment downstream and from there to the Kachab River approximately 1 km downstream, or directly eastward to join the Kachab River	– Environmental audits and inspections – Stormwater management plan – Survey database – Stormwater monitoring programme	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		approximately 1 km upstream of the original confluence; – Unlined containment dam and no pumping, water lost by evaporation and /or infiltration; – Unlined attenuation dam and conveyance via a channel within one of the pit benches, if elevations allow; – Diversion to another watercourse, most likely the Kachab River (with or without attenuation storage). A detailed survey should be carried out for the route to indicate the best topographical route; – For the PCP the peak inflow into a storage dam is calculated to be less than 25 m^3/s for the 1:50 year flood. A dam storage volume of approximately 60 000 m^3 would be recommended; – The diversion channel should be a simple unlined trapezoidal channel; and – Collection channels to be constructed		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		around the perimeter of the PCP for any dirty runoff generated, which will need to be connected to a lined pollution control dam (PCD) located on the downstream corner of the PCP in the C5 drainage line.		
Air quality	Air pollution or dust emissions from the crushing and PCP plant	– The PCP plant is an important contributor to atmospheric pollutants and the wetting of the ore before crushing is not sufficient, even at 50 % control efficiency; – It is recommended to enclose the PCP and primary crusher; – Enclosure control efficiencies include cyclone (65 %), scrubber (75 %) and fabric filters (83 %).	– Environmental audits and inspections – Air quality monitoring programme and results	Processing manager
	Air pollution or dust emissions from material handling points	– Dust suppression controls are required during material handling; – Main areas include the loading point at the crusher and tip point at the secondary crusher silo; and – Emissions can be reduced by water sprays (50 – 70 % control efficiency) or	– Environmental audits and inspections – Air quality monitoring programme and results	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		enclosure with bag filters (90 % control efficiency)		
	Dust emissions from conveyors and ROM	– Dust suppression controls are required during operation of conveyors and at the ROM; and – Where possible this should be with water sprays, chemical binding agentd or covered.	– Environmental audits and inspections – Air quality monitoring programme and results	Processing manager
	Air pollution from the cyanide controlled burn area	– Strict access control is required in this area; – Air quality monitoring campaign to be conducted on a monthly basis which includes dust fall out (TSP) and $PM_{10}/_{2.5}$ measurements; and – Air quality controls to be implemented to reduce dust plume – Waste to be disposed of correctly as hazardous waste at a registered offsite facility.	– Environmental audits and inspections – Air quality monitoring programme and results	Processing manager
Housekeeping	Littering, pollution of soils and/or injuries	– Work areas to be maintained in a clean, orderly and presentable condition at all times; – Stacking and storage to be in order to prevent trip, slip and fall hazards and from animals nesting;	– Environmental audits and inspections – SHE inspection checklists	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Housekeeping to be conducted throughout and at the end of each shift; – Items that can become easily windblown to be tied down/contained; and – Regular inspections by supervisor, line manager and/or manager.		
Waste management (non mineralised) hazardous and non hazardous waste	Littering and pollution of soils/groundwater	– Litter generated during shift must be collected in the waste receptors provided; – Waste must be separated at source as per the waste management procedure in the correct colour coded bins and/or skips; – Bins and skips must have lids, that can seal and are scavenger/baboon proof; – No waste may be burnt or buried on site, apart from remaining paper, plastic, boxes and food waste at the waste site; – No fires will be allowed on site, unless in approved designated areas	– Environmental audits and inspections – Waste records/register – Safe disposal certificates	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		allowed by the SSEE manager; – Domestic waste is disposed of weekly at the non mineralized waste site; and – Hazardous solid waste created including empty containers, hydraulic pipes, oil filters (etc.) should be removed from site and disposed of at a suitable registered hazardous waste facility; – A copy of the safe disposal of these wastes to be maintained as a record on file and provided to the Environmental department on request; – Cyanide waste is burnt at the cyanide burning area in the processing plant under the Ministry of Health and Social Services (MoHSS) exemption permit; – Used oil to be stored either in a bunded area or in drip trays with sufficient capacity to contain a leak (110 %) of volume; and		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Small and redundant items that have been scrapped (e.g. wood, conveyor belt etc.) to be sold on tender to employees and Karibib residents.		
Chemical and process effluent handling, storage and management	Incorrect chemical management can lead to soil and groundwater contamination or injury/mortality to fauna and flora	– A chemical file is kept by each area supervisor and/or contractor SHE representative; – All chemicals used on site, including their MSDS, is to be available in these files; – Copies of MSDS's to be provided to the Environmental department; – Environmentally friendly chemical products should be considered over hazardous chemicals; – Sufficient drip trays should be made available to capture leaks and prevent pollution; – Chemical containers either to be stored in impermeable bunds, drips trays or other secondary containment devices (110 % of largest volume); – If 1ton bags are used for reagent storage,	– Environmental audits and inspections – Chemical files – Incident reports – Groundwater monitoring	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		consider storing bags under a roof or cover to prevent sun damage and rainfall infiltration, which in turn can results in cross contamination or spills; – Spill kits and spill absorbent treatment material to be present in the various processing work areas; – Incident reports to be compiled for each spill event as per the incident management procedure; – If surface and near surface related discharges occur from the processing plant, the mine will monitor the water discharge quality; – Ensure that bunds are designed to contain 110% of the volume of the largest processing tank constructed therein and that pumps and pipes are maintained in good working order; – Major spillage incidents will be handled in accordance with the		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		emergency response procedure; – Monthly groundwater monitoring of rest water levels and water quality for early pollution detection; – Report areas of concern with the groundwater network to management timely for corrective action to be taken, if required; – Daily inspections of work areas; – Monitor effectiveness and stability of structures (e.g. concrete) and liners for leaks; and – Process effluent water to be reused in the process circuit, where feasible.		
Domestic effluent water management	Lack of appropriate ablution facilities can result in soil contamination and pollution	– Only approved ablution facilities to be utilized; – If additional ablution facilities are required, the Environmental department to be informed; – No employee or contractor on Navachab site may relieve themselves in the surrounding environment and work area;	– Environmental audits and inspections – Effluent monitoring programme	– Processing manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Ablution facilities to be cleaned and maintained on a regular basis; – Effluent water to be contained and spills to be cleaned up within 24 hours of the incident occurring; – Sewage facilities to be permitted with DWA; – Septic tanks to be pumped out on a regular basis to avoid overflows; – Grey water to be separated from effluent water and be reused; and – Regular effluent water quality samples to be taken by the Environmental department.		
Biodiversity	Incorrect management of ponds	– Ponds should be fenced to prevent larger wildlife from gaining access; – Bird deterrent measures should be investigated to keep avifauna away from ponds; – Ponds should have freeboards to prevent overflows into the natural environment (1:100 year flood event), which can attract wildlife,	– Environmental audits and inspections – Incident records	Processing manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		causing pooling water or even erosion concerns; – Animals of concern active around the pond should be reported to the Environmental department; and – All related animals injuries or mortalities should be reported immediately to the Environmental department and an incident report compiled.		
Noise	Noise impacts on employees	– Occupational noise monitoring campaigns to be conducted on an annual basis by the SSEE department; – Employees to be issued with ear protection, where required; – Pre-start checks to be conducted daily on equipment; and – Equipment to be serviced and maintained on a regular basis.	– Environmental audits and inspections – Occupational noise monitoring programme	– Processing manager – SSEE manager

2.12 DOMAIN 8: WORKSHOPS AND LAYDOWN AREAS

This domain includes tasks for workshop and laydown area activities, which are mapped below (where possible):

- HME workshops
- Engineering workshops
- Processing workshops
- Contractor workshops
- Laydown areas

The overall domain manager is the Operational mining manager.

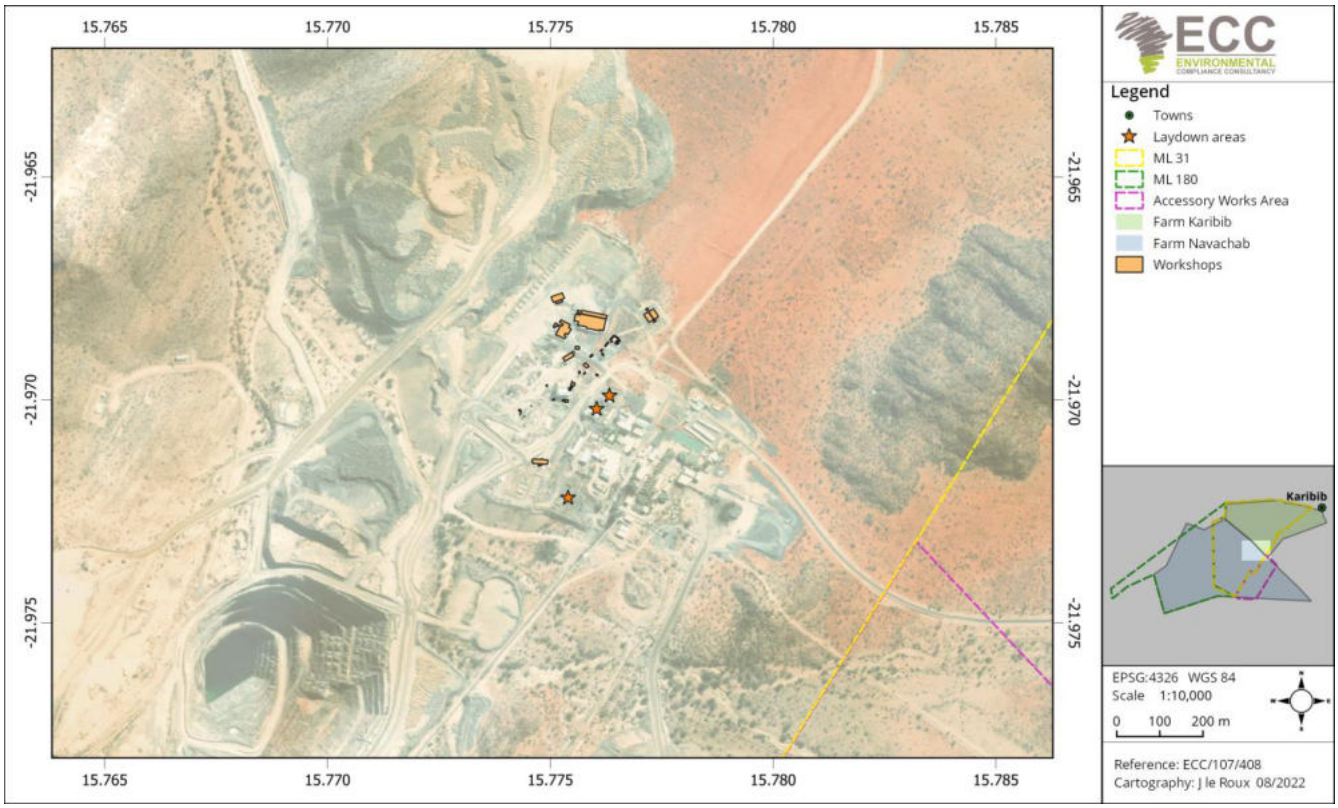

Figure 9: Domain 8 map depicting the workshops and laydown area locations

Table 9 – Environmental management plan for Domain 8; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Site establishment	Site clearing without approval	– Land clearing and disturbance may only start after a signed-off site preparation permit is issued; – If topsoil is required to be removed, vegetation must be cleared with the topsoil (300 mm) in bund walls around the construction site or to the nearest dedicated topsoil stockpile; – Construction sites must be cleared demarcated with the use of coloured pegs; – Sensitive areas (e.g. protected vegetation) to be demarcated with appropriate demarcation tape; – Disturbance to be restricted to approved areas only; and – Where areas have been unnecessarily disturbed, these will be immediately rehabilitated.	– Environmental audits and inspections – Site preparation permit	Operational mining manager
Housekeeping	Littering, pollution of soils and/or injuries	– Workshop and laydown areas to be maintained in a clean, orderly and	– Environmental audits and inspections	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		presentable condition at all times; – Stacking and storage to be in order to prevent trip, slip and fall hazards and from animals nesting; – Housekeeping to be conducted throughout and at the end of each shift; – Items that can become easily windblown to be tied down/contained; and – Regular inspections by supervisor, line manager and/or manager.	– SHE inspection checklists	
Waste management (non mineralised) hazardous and non hazardous waste	Littering and pollution of soils/groundwater	– Litter generated during shift must be collected in plastic bags and/or stored directly in the waste receptors provided; – Waste must be separated at source as per the waste management procedure in the correct colour coded bins and/or skips; – Bins and skips must have lids, that can seal and are scavenger/baboon proof; – No waste may be burnt or buried on site, apart from	– Environmental audits and inspections – Waste records/register – Safe disposal certificates	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		remaining paper, plastic, boxes and food waste at the waste site; – No fires will be allowed on site, unless in approved designated areas allowed by the SSEE manager; – Domestic waste is disposed of weekly at the non mineralized waste site; and – Hazardous solid waste created including empty containers, hydraulic pipes, oil filters (etc.) should be removed from site and disposed of at a suitable registered hazardous waste facility; – A copy of the safe disposal of these wastes to be maintained as a record on file and provided to the Environmental department on request; – Medical waste is taken to Walvis Bay landfill site for incineration; and – Cyanide waste is burnt at the cyanide burning area in the		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		processing plant under the Ministry of Health and Social Services (MoHSS) exemption permit.		
	Incorrect waste streams (salvageable) to landfill	– Scrap metal to be collected in dedicated bunded areas and the Environmental department informed when collection is required; – Vehicle batteries to be collected and removed to scrap dealers; – Tyres to be collected and removed to scrap dealers; – Bulk plastic drilling bags to be collected and removed to plastic recycling companies; – Used oil to be collected in oil drums and brought to the HME used oil recycling facility when full; – Used oil to be stored either in a bunded area or in drip trays with sufficient capacity to contain a leak (110 %) of volume; – Permit to be acquired from MME for the storage and selling of used oil on site; and	– Environmental audits and inspections – Waste records/register – Safe disposal certificates	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Small and redundant items that have been scrapped (e.g. wood, furniture, conveyor belt etc.) to be sold on tender to employees and Karibib residents.		
Chemical handling, storage and management	Incorrect chemical management can lead to soil and groundwater contamination or injury/mortality to fauna and flora	– A chemical file is kept by each workshop and laydown area supervisor and/or contractor SHE representative; – All chemicals used on site, including their MSDS, is to be available in these files; – Copies of MSDS's to be provided to the Environmental department; – Environmentally friendly chemical products should be considered over hazardous chemicals; – Sufficient drip trays should be made available to capture leaks and prevent pollution; – Chemical containers either to be stored in impermeable bunds, drips trays or other secondary containment devices; – Spill kits and spill absorbent treatment material to be present	– Environmental audits and inspections – Chemical files – Incident reports	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		in the workshops and laydown areas; and – Incident reports to be compiled for each spill event as per the incident management procedure.		
Soil and groundwater management	Lack of spill hydrocarbon management, spill control and prevention	– All hydrocarbon materials and containers must be stored correctly, in drip trays or in bunded areas that are impermeable and can contain 110 % of largest volume; – All hydrocarbon containers when transported must be stored in a drip tray and secure from falling over; – Spill kits and spill absorbent treatment material to be present in the workshops and laydown areas; – Teams must be trained on how to use spill kits and how to implement correct spill management controls; – All vehicles, HME and equipment must be serviced on an impermeable surface, such as a workshop concrete floor or liner	– Environmental audits and inspections – Incident reports	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		to prevent leaks and spills; – All spills to be cleaned up within the same shift and an incident to be recorded, where required; – Waste receptacles for hydrocarbon waste to be provided, leak proof and sufficient in quantity; and – Sumps should be installed in workshops with an oil and water separator.		
Domestic effluent water management	Lack of appropriate ablution facilities can result in soil contamination and pollution	– Only approved ablution facilities to be utilized; – If additional ablution facilities are required, the Environmental department to be informed; – No employee or contractor on Navachab site may relieve themselves in the surrounding environment and work area; – Ablution facilities to be cleaned and maintained on a regular basis; – Effluent water to be contained and spills to be cleaned up within 24 hours of the incident occurring;	– Environmental audits and inspections – Effluent monitoring programme	– Operational mining manager – SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Sewage facilities to be permitted with DWA; – Septic tanks to be pumped out on a regular basis to avoid overflows; – Grey water to be separated from effluent water and be reused; and – Regular effluent water quality samples to be taken by the Environmental department.		
Explosives storage	Incorrect management, handling and storage of explosives	– The Blasting Chief Inspector from MME to conduct an initial inspection and from thereon annually, to ensure provision with the Explosives Act, Act 26 of 1956, for the correct storage, handling and management of explosives; – Explosives to be stored at a safe predetermined distance from any emulsion; – Personnel handling explosives will be competent and trained to do so and know what to do in the case of accidental spillage; and	– Inspections and engagement by Mining manager – Training records	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– No cellphones or electronic devices to be used around explosives unless authorized by a competent blaster.		

2.13 Domain 9: Non mineralised waste facility and bioremediation site

This domain includes tasks for non mineralised waste activities, which are mapped below:

- Non mineralised waste cells
- Bioremediation facility

The overall domain manager is the SSEE manager.

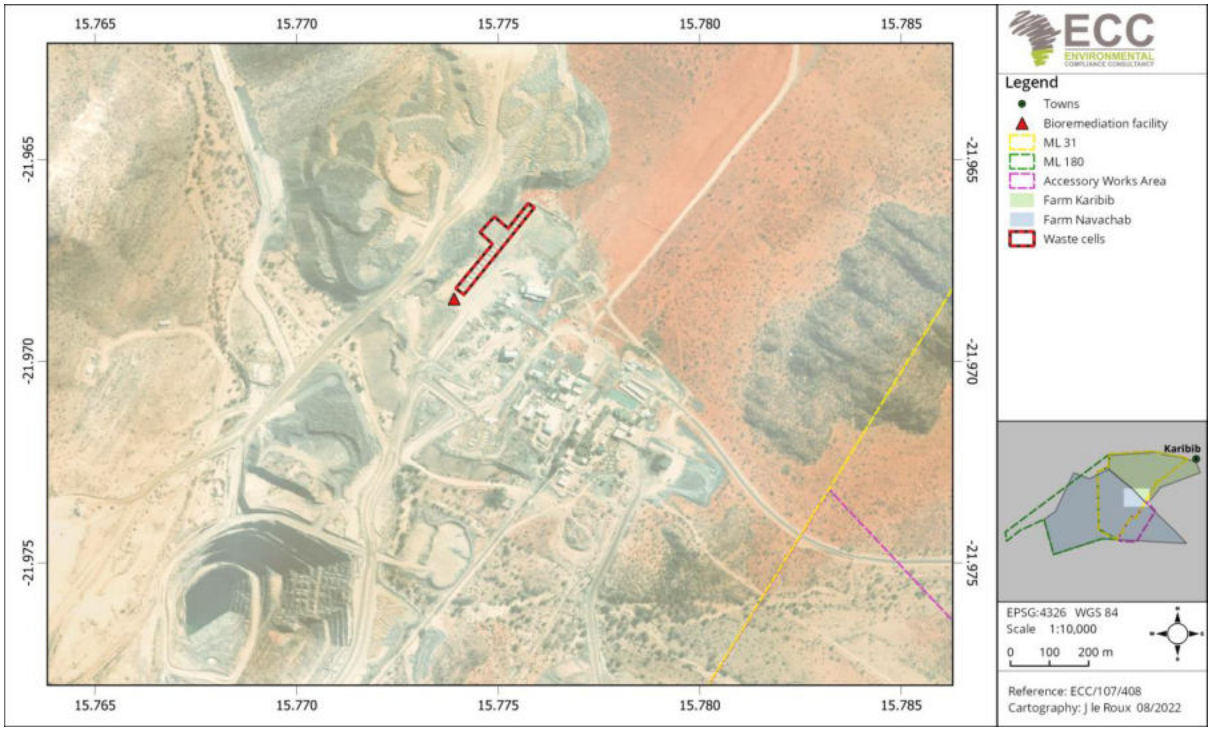

Figure 10: Domain 9 map depicting the non mineralised waste and bioremediation site area location

Table 10 – Environmental management plan for Domain 9; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Legal requirements	Compliance concerns	– A SOP has been developed for the management of the bioremediation and non mineralized waste facility in compliance with required legislation and must be adhered to accordingly; – All staffed to be trained in the requirements of the procedure, especially with regards to offloading waste; – The security to maintain a register of waste entering and exiting the site; – A functional gate in place that is to be locked after hours when security is not available at the site; – The bioremediation site should be adequately fenced; – Appropriate signage (e.g. warning of contamination/excavation, providing site contact details, etc.) should also be provided;	– Environmental audits and inspections	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Waste collectors to be escorted to the site at all times; and – The Environmental department to oversee the compliance of this site and conduct monthly inspections and regular audits.		
Site establishment	Incorrect site establishment, construction and operational conditions for the bioremediation facility	– The site must be constructed on a flat or gently sloping site; – The site is located such that, in the event of accidental discharge, contaminated material will not readily access adjacent soil, surface water or groundwater; – Suitable geological conditions (e.g. soils with low permeability); – Sufficient distance from surface water bodies (it is recommended that the treatment sites should be at least 50 m from surface water bodies); – Sufficient separation of treatment cell from groundwater (bioremediation sites should only be located where groundwater is at a depth of greater than 3 m below ground surface); – Sufficient distance from potential	– Environmental audits and inspections	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		discharge pathways such as drains, soak wells, service trenches; – Sufficient distance from odour sensitive receptors, e.g. any occupied (full or part-time) premises (It is recommended that this distance is greater than 50 m). – The base and bunding of the bioremediation facility should be constructed in accordance with SOP requirements; – The HDPE liner system requirements must be aligned to the factors and conditions of what will be treated, strength, permeability and operational life span; – The bioremediation facility will utilise a basic composting technique and staged remediation strategy; – The facility should consist of three HDPE lined cells with approximate size of 1 0m long x 5 m wide; – The depth of each cell should not exceed 2m to allow adequate sunlight penetration to		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		expedite bioremediation; – Access should be provided to either side of each cell to allow safety in placement of contaminated material; – Each cell should have an access at one end to allow for equipment to drive into the cell to place material, till soil, water and remove material upon completion of bioremediation; – Each cell will have the capacity to allow storage of approximately 100 m^3 hydrocarbon contaminated material; – Material at the bioremediation site should be watered and turned on a weekly basis; – If required additional bioremediation product to be applied; and – Maintenance of bioremediation site to be conducted monthly.		
	Incorrect site establishment, construction and	– Only domestic general waste and recyclables that cannot be removed from site to be taken to the waste cells;	– Environmental audits and inspections	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	operational conditions for the non mineralized waste cells	– Cells have been constructed and are divided into waste type; – Signage to be erected by each waste type; – Waste to be burned on a regular basis to prevent attraction of wildlife to the area; – Waste to be covered where required to prevent items from becoming windblow; and – Fencing to be erected around the perimeter of the facility.		
Groundwater, surface water and soils	Potential runoff of seepage from the solid waste landfill site as a result of additional solid waste being disposed of in the on-site landfill	– Ensure the landfill is managed in accordance with site procedures and the landfill is covered and rehabilitated as required; and – Reduce the volume of material entering the landfill by continuing to implement the reduce, reuse and recycle principle installed on site.	– Environmental audits and inspections – Waste volume monitoring – Groundwater monitoring programme	SSEE manager
	Oils, fuels and hydrocarbons resulting in soil, surface water and	– All container must be properly cleaned before disposal to ensure no excess chemicals are leached into the environment; – Provide for bunding and impervious	– Environmental audits and inspections – Groundwater monitoring programme	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	groundwater pollution	surfaces as required to protect soils, groundwater and surface water in the layout of the bioremediation site; – Impervious surfaces are to be provided in areas where hazardous chemicals (e.g. acids, hydrocarbons, concentrates) are handled; – All hazardous chemicals including hydrocarbons such as fuel, oils and greases are to be contained in bunded areas with sufficient capacity to contain the quantity stored in the bunded area; – Storm water runoff should be diverted so as not to flow onto the treatment facility. – Leachate and stormwater runoff containing contaminant levels likely to cause environmental harm must not be discharged from the bioremediation facility. – All leachate runoff should be directed to, and contained within, an impermeable	– Surface water monitoring programme – Soil testing lab results	

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		leachate collection system with adequate capacity. – Leachate may be treated, recycled into the bioremediation area or disposed of at an appropriate off-site location; – Groundwater and surface water monitoring programme to be implemented as required; – Soils can only be returned to the natural environment for reuse after test work is done and the soils meet the required standard, in line with the SOP; – Any incidental water resulting from rainfall will remain within the bioremediation facility to assist with microbial growth and is expected to evaporate over short periods of time; and – In the event that rainfall exceeds evaporation and the facility is approaching capacity, any water from within the facility will be pumped from the facility and put through the sites oily		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		water separator (if available) or removed from site by a licensed contractor.		
Domestic effluent water management	Lack of appropriate ablution facilities can result in soil contamination and pollution	– Only approved ablution facilities to be utilized; – If additional ablution facilities are required, the Environmental department to be informed; – Ablution facilities must be easily accessible for employees, onsite security and contractors to use in remote working areas; – No employee or contractor on Navachab site may relieve themselves in the surrounding environment and work area; – Ablution facilities to be cleaned and maintained on a regular basis; and – Effluent water to be contained and spills to be cleaned up within 24 hours of the incident occurring.	– Environmental audits and inspections	SSEE manager
Potable water	Lack of potable water supply	– In remote working areas, potable water cannot be sourced through related infrastructure and employees should take	– Environmental audits and inspections	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		water with them in canisters from the offices or change houses; and – Routine monthly potable water quality testing will be conducted at supplied water sources.	– Potable water monitoring programme	
Air quality	Emissions to air from bioremediation activities and landfill operations	– In the event that excessive dust is generated the area will be wet down to ensure no visible dust emissions are released from the bioremediation facility; – Navachab will continue to operate in accordance with the ambient dust monitoring programme to ensure the facilities do not generate excess dust and in turn, emissions to air; – If it is determined that emissions of volatile organic compounds (VOCs) from the facility are likely to pose a risk to human health and/or the environment, the company will conduct investigative monitoring downwind of the facility using gastec tubes; and	– Environmental audits and inspections – Air qaulity monitoring programme	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– If it is determined that VOCs emissions are significant, the company will develop and implement an air quality monitoring program that will be designed to include regular measurement and testing of odours at the location of the facility and to outline any mitigation measures to be taken to reduce emissions from the facility.		
Biodiversity	Injury and or mortalities to wildlife entering and savaging at the facilities	– Area to be fenced off; – Daily observations by security; – Wildlife of concern to be reported immediately to the Environmental department; and – Incidents to be reported immediately to the environmental department and records maintained.	– Environmental audits and inspections – Incident management procedure	SSEE manager
Decommissioning	Incorrect removal of site infrastructure and closure of site leading to soil, surface water and groundwate	– Upon completion of bioremediation and removal of the remediated soil, the natural ground surface beneath the bioremediation area will need to be validated by sampling and analysis to ensure that no leaching of	– Environmental audits and inspections – Groundwater monitoring programme	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	r contaminati on	hydrocarbons into *in-situ* soil has occurred; and – Groundwater monitoring will be required for those sites where impacted material has leached to underlying soils and the potential exists for groundwater to be impacted.		

2.14 DOMAIN 10: FUEL DEPOT AND WASH BAYS

This domain includes tasks for the fuel depot and wash bay(s) activities, which are mapped below (where possible):

- Fuel depot
- Wash bay(s)

The overall domain manager is the HME manager.

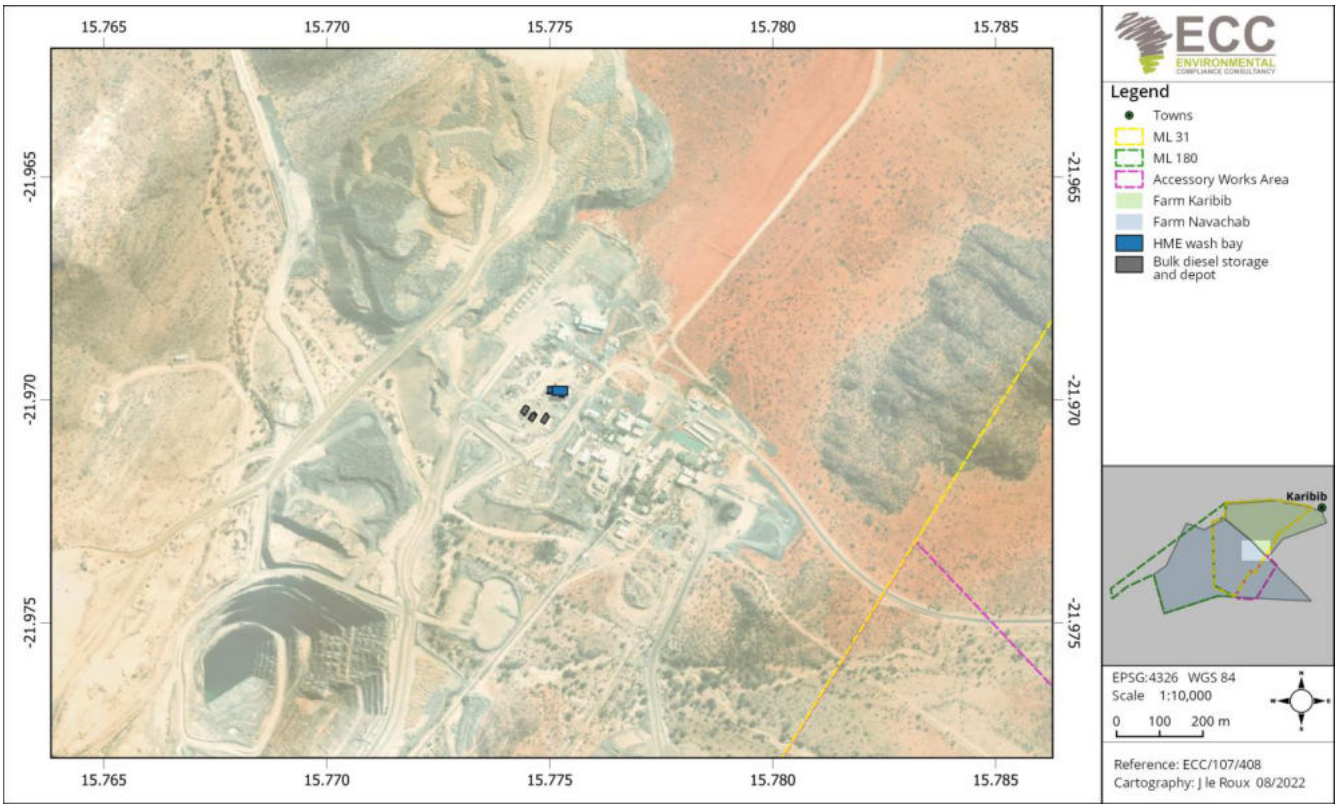

Figure 11: Domain 10 map depicting the HME wash bay and fuel depot location

Table 11 – Environmental management plan for Domain 10; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Permitting	Compliance related concerns	– The bulk fuel user must be issued with a wholesale license permit from MME to be able to supply and trade with their fuel; – If contractors store fuel on site, a consumer installation permit must be applied for from MME; and – Permits to be displayed on all fuel structures.	– Environmental audits and inspections	HME manager
Soil and groundwater	Inappropriate infrastructure design of wash bay	– Wash bays must be constructed on a high lying area and not in a drainage line; – Wash bays must be able to accommodate all equipment, vehicles and plant required to access the area, taking weight and track plant into consideration; – Wash bays should have a silt and oil trap to collect these during the wash down process; – Trenches should be constructed to capture any run-off	– Environmental audits and inspections	HME manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		and fines and divert this to the silt and oil traps.		
	Incorrect hydrocarbon management leading to soil and groundwater contamination from the wash bay	– Silt and silt trap to be maintained, removed and cleaned on a regular basis, to prevent a build up and blockage of the system; – If silt has traces of hydrocarbons in it, then to be removed for treatment at the bioremediation facility before being reused on site; – Traces and spills of hydrocarbons to be removed immediately to prevent build ups and overflows into the surrounding environment; – Oil traps to be managed and maintained as per the OEM specification; – Oil traps should be cleaned on a regular basis by removing excess hydrocarbons observed floating on the surface; – If a three cell oil trap is used, the last cell must not have an outlet but a valve installed for emergency situations;	– Environmental audits and inspections – Oil trap effluent testing records – Cleaning and maintenance schedule – Waste records of treated bioremediated soils – Incident management system	HME manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Before water can be re-used in the processing circuit or for dust suppression from the oil trap, it should be tested to ensure the water is of a suitable and safe standard to be released back into the environment; – The hydrocarbon waste is to be collected and removed as used oil; – Oil traps should be bunded; – The silt trap must be constructed up gradient of the oil trap; and – All spill incidents to be immediately reported, cleaned and incident recorded.		
	Incorrect controls and management of fuel depot leading to soil and groundwater contamination	– The appointed bulk fuel supplier will manage the fuel depot on site; – Only trained staff to handle the bulk fuel and refueling activities; – Fencing off fuel depot to avoid unauthorised entrance; – Bulk fuel when offloaded on site should take place	– Environmental audits and inspections – Daily site inspections – Incident management system	HME manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		during the daylight hours; – Fuel tankers will be double bunded and stored on imperial concrete surfaces with an additional bund, that can contain 110 % of the volume of the largest tanker; – Small bunded containments need to be sheltered from the rain; – Pipelines must be regularly inspected and maintained in good order; – Pipelines must have release and air valves to contain the pressure, especially during extreme environmental heat conditions; – The MSDS to be displayed on the outside of the tanker; – Warning signs to be displayed on the outside of the tanker; – Spill kits and absorbent material to be readily available at all times during offloading, refueling and storage; – Daily inspections of facilities;		

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– Staff to switch off vehicle, equipment, plant and HME when refueling; – Do not leave area unattended when refueling; – All spills to be immediately contained, reported and an incident recorded; and – Large spills of >200 L to be reported to MME within 48 hours.		
Air quality	Fires resulting in emissions and/or explosions	– Storage areas require adequate ventilation; – Storage area to be kept clean and tidy and free of combustibles; – No fires or smoking in these areas allowed; and – Ensure fire extinguishers are kept in close proximity and attended to regularly	– Environmental audits and inspections – Daily site inspections	HME manager

2.15 DOMAIN 11: NAVACHAB FARM AND NURSERY

This domain includes tasks for the wildlife reserve management on farm Navachab and on-site nursery activities. The overall domain manager is the SSEE manager.

Table 12 – Environmental management plan for Domain 11; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Fauna	Lack of conservative initiatives could result in injury and/or mortality to wildlife	– No game may be killed for recreation or consumption; – Poaching incidents are dealt with by contacting onsite security, who will in turn contact the police and MEFT, as well as Navachab personnel responsible for wildlife and reserve management; – The fence around farm Navachab is patrolled on an ad-hoc basis and maintained; – Salt licks are put out at the watering points on and ad-hoc basis; and – Watering points are checked on an ad-hoc basis and maintained.	– Environmental audits and inspections – Incident management records	SSEE manager
Flora	Lack of conservative initiatives could result in a loss of indigenous species	– Alien invasive species, especially Wild Tobacco, are to be controlled on the farm property.	– Environmental audits and inspections – Alien and alien invasive monitoring programme	SSEE manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
	Unauthorised activities on the farm	– Firewood may not be removed from the farm.	– Environmental audits and inspections	SSEE manager
	No on-site nursery resulting in a lack of trails and flora for rehabilitation and restoration activities	– Functional nursery to supply indigenous plants for the purposes of rehabilitation; – Valid and authorized on-site nursery certificate/permit from MEFT; and – Timely renewal of permits as only valid for 1 year.	– Environmental audits and inspections – Nursery checklist – Nursery certificate from MEFT	SSEE manager
	Lack of controls to operate nursery correctly	– Procedure to be developed with appropriate checklists for use by staff involved with the nursery operations; – Only protected plant species to be cultivated; – Seeds to be collected for cultivation; – Register to be kept of seeds collected and plants grown; – Plants to be used for revegetation, restoration and rehabilitation purposes; and – No plant may be sold or traded.	– Environmental audits and inspections – Nursery checklist – Nursery seed/growth register	SSEE manager

2.16 DOMAIN 12: TOPSOIL STOCKPILES

This domain includes tasks for the topsoil stockpile activities. The overall domain manager is the Operational mining manager.

Table 13 – Environmental management plan for Domain 12; listing environmental aspects, impacts, associated mitigation measures, monitoring requirements and responsible person(s).

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
Stockpile management	Incorrect topsoil removal and storage	– Limit disturbance to soils to what is absolutely necessary; – Suitable topsoil will be identified by the production geologist and retained in burgundy stockpiles for future rehabilitation activities; – Topsoil stockpile areas will be identified as far as practically possible to the source of the soil; – Stockpiles to be demarcated; – Soil erosion measures to be investigated and applied as soon as practically possible; – Soil stockpile heights to be restricted where possible to 20 m; – Storage periods not to exceed three years, where this is not possible erosion controls to be implemented;	– Environmental audits and inspections – Annual records of topsoil volumes for mine closure	Operational mining manager

Aspect	Impact	Management/mitigation measure	Monitoring requirements	Responsibility
		– No waste or other material to be mixed with topsoil; and – Movement of equipment on stockpiles to be restricted.		
Soils management	Incorrect stripping and handling of soils	– Soils to be stripped to a depth of 300 mm where feasible; – Handle soils in dry weather conditions as far as possible to reduce compaction; and – Reoccurring rehabilitation to be encouraged to ensure fresh topsoil is used to restore/rehabilitee areas and reduce stockpile sizes.	– Environmental audits and inspections	Operational mining manager
	Contaminated soil	– If soil becomes contaminated/polluted, the soil must firstly be treated *in situ* by applying bioremediation products; – If not possible then the soils must be removed to the bioremediation site for further treatment.	– Environmental audits and inspections	Operational mining manager

3 ENVIRONMENTAL MANAGEMENT PRINCIPLES

3.1 CONTINUAL IMPROVEMENT

The Navachab environmental department is responsible for reviewing and updating this OEMP, which will be supported by the monthly reports on compliance for each domain. As part of this review process, the monthly reports will be reviewed, identifying any trends or significant areas of concern, as well as measures implemented to manage / resolve environmental or social issues. Compliance and legislative changes will be reviewed, and lessons learnt will be captured. The OEMP will be amended as required and follow up training, awareness or updates will be provided.

Ongoing aspect and impact identification through the review of the OEMP and supporting management plans and SOPs will ensure environmental impacts are avoided or minimised to as low as reasonably practicable as part of the continuous improvement of the EMS.

3.2 BEST PRACTICE

The best practice management measures that will be complied with across site are listed in summary in Table 14.

Table 14 – A list of environmental best practice measures to be implemented

ENVIRONMENTAL ASPECT	BEST PRACTICE REQUIREMENT
Pollution prevention control	– Plant and equipment to be maintained and serviced regularly; – Refuelling at designated or approved locations; – Spill kits available wherever the risk of loss of containment is identified; – Bunds to be at least 110% of the container; and – Good housekeeping.
Solid waste management	– Good housekeeping (no littering); – Designated waste collection areas around site and one central location; – Bins labelled; – Waste to be separated and kept clean and tidy; and – Waste bins emptied on regular basis.
Ground contamination	– Refuelling will be undertaken in designated areas with spill kits available; – Chemical management enforced on site; – Efficient stormwater controls to divide and contain dirty and clean water; and – Good housekeeping.

ENVIRONMENTAL ASPECT	BEST PRACTICE REQUIREMENT
Storage of fuels, oils, chemicals and other hazardous liquids	– Storage tanks will be suitable and labelled for the liquid being stored; – Bunds to be at least 110% of the container; and – Daily inspections of tanks.
Energy efficiency	– Plant and equipment to be maintained and serviced regularly; and – Turn off plant and equipment when not in use.
Air quality	– Maintenance of roads; – Turn off plant and equipment when not in use; and – Plant and equipment to be maintained and serviced regularly.
Noise and vibration	– Blasting activities to take place during daylight hours, preferably in the afternoon; – Limit blasting activities on public holidays and Sunday; – Clearance at a radius of 500 m from the blasting site and 1 km from third parties; and – Monitor structures for damage and third party complaints.

3.3 ENVIRONMENTAL MONITORING

A monitoring and evaluation program will be used in line with HSE and ISO 14001 standards to evaluate environmental performance and promote continual improvement. Monitoring also supports environmental management on site to evaluate how effective the environmental management has been, over an extended period of time. An environmental monitoring schedule is in place for the Navachab operations.

The monitoring program will comprise inter alia:

- Air quality monitoring;
- Noise and vibration monitoring;
- Water monitoring (e.g. surface water, groundwater, effluent water, potable water);
- Biodiversity monitoring (e.g. fauna, vegetation); and
- Meteorological monitoring (e.g. rainfall and evaporation).

The Environmental officer will be tasked with conducting the monitoring with the support of the operational and underground mining manager(s).

3.4 ENVIRONMENTAL OBJECTIVES AND TARGETS

The following Navachab site environmental objectives and targets have been developed in order for activities on the Navachab site to minimise potential impacts on the environment as far as reasonably practicable.

- Zero pollution incidents;
- Sustainable resource use;
- Application of the waste management hierarchy;
- Sustainable use of water;
- Responsible disposal of waste;
- Minimise aerial discharges and dust being generated;
- Minimise noise and vibration levels; and
- Protect and enhance biodiversity.

Procedures for monitoring site activities against these environmental objectives are in place at Navachab. In addition, each year, annual targets or Key Performance Indicators (KPIs) will be set in accordance with the company wide objectives. These KPIs will be captured in the Annual Environmental Report and the site's Sustainability Report. All employees will work towards these objectives and targets.

3.5 DOCUMENT CONTROL

Internal HSE performance standards are in place at Navachab and sets out requirements to ensure that necessary documentation, records, data and information exist to support the functionality and effectiveness of QKR Namibia.

All environmental records are maintained on the site's SharePoint and is made accessible across the organisation. All environmental monitoring data is stored on DataSight. This data is made available to all HODs. All records, reports and documents are maintained in accordance with the site's document control procedure.

4 COMMUNICATION AND TRAINING

To order to ensure potential aspects and impacts are minimised it is vital that personnel are appropriately informed and trained on how to properly implement the OEMP. It is also important that regular communication is maintained with stakeholders, employees and different levels of mine management to make all aware of potential impacts and how to manage it. This section sets out the framework for communication and training in relation to the OEMP.

4.1 COMMUNICATIONS

During operations, the respective domain managers or SSEE Manager shall communicate site-wide environmental issues to employees and contractors through the following means (as and when required):

- Ensure all personal are afforded the opportunity to attend an environmental site induction that sets out their requirements in relation to this OEMP;
- Ensuring audits and inspections are undertaken regularly on a risk-based schedule;
- Toolbox talks, including instruction on incident response procedures;
- Deliver specific environmental briefings where required;
- Ensure all personnel have access to the OEMP; and
- Ensure operators of key activities and environmentally sensitive operations are briefed and understand their requirements.

This OEMP will be distributed to the operations team, including any contractors and other personnel working on the mine, to ensure that all personnel are aware of the environmental responsibilities of Navachab. Key activities and environmentally sensitive operations will be clearly communicated to workers and contractors.

During the mining activities, communications among the management team members will include discussions of any complaints received and actions needed to resolve them; any non-conformances reported during inspections and/or audits; and any achievements related to objectives or targets.

4.2 ENVIRONMENTAL EMERGENCY AND RESPONSE

An emergency is any abnormal event, which demands immediate attention. It is any unplanned event, which results in the temporary loss of management control at site but where functional resources can manage the response. An Emergency Response plan document is in place at Navachab and manages the response in relation to emergencies including environmental emergencies.

Table 15 lists the emergency response numbers to be called at Navachab.

Table 15 – A list of emergency contact details for Navachab

TOWN	AMBULANCE	POLICE	FIRE BRIGADE
Karibib	+264 (64) 55-0073	Inspector Aino Imukusi Tel: +264 (64) 550008 Cell: +264 812983226	Fire Officer Mr Gift Sililo Tel: +264 (64) 55-0020 Cell: +264 814221805
Site emergency response	055 2111 or 2111		

For large-scale spills and other significant environmental incidents, the fire services should be contacted as required and the Offices of the Ministry of Environment, Forestry and Tourism (MEFT) informed of the incident (telephone +264 61 284 2111). If hydrocarbon and petroleum spills of >200 L occur, the Ministry of Mines and Energy must be informed and form PP/01 must be completed and submitted. If significant environmental spills (hydrocarbon or processing) occur close or in a water source, the Department of Water Affairs to be notified. All correspondence with the relevant ministries should be by the Mining director and the notification should occur no later than 48 hours after the incident has occurred.

For the clean-up of smaller spills, the relevant material safety data sheet (MSDS) should be consulted to determine the appropriate clean-up procedure. Basic spill response training will be provided as part of the site environmental induction, spill response equipment, including relevant MSDS copies, will be provided in areas where potentially environmentally hazardous chemicals may be used.

4.3 COMPLAINTS HANDLING AND RECORDING

Internal performance standards of Navachab dictates that all incidents, near misses, complaints or concerns from members of the local community or other stakeholders will be reported in a timely and factual manner; accurately classified; effectively investigated; corrected and prevented from recurring through implementation of additional or more effective controls.

Any complaints received verbally by any personnel on the mine will be recorded by the receiver, including the name and contact details of the complainant, date and time of the complaint, and the nature of the complaint. The information will be given to the Mining director, who is overall responsible for the management of complaints and will provide a written response to the complainant. The respective domain manager will inform the relevant line managers of issues, concerns or complaints. The line manager must maintain a complaints register that details the name of the complainant, date and time of the complaint, the action taken to resolve the issues and date of complaint handover.

The workforce will be informed about the complaints register, its location and the person responsible, to whom to refer residents or the general public who wish to lodge a complaint. The complainant will be informed in writing of the results of the investigation and action to be taken to rectify or address the matter(s). Where no action is taken, the reasons why will be recorded in the register and communicated.

The complaints register shall be kept for the duration of the life of mine and will be available for government or public review upon request.

4.4 TRAINING AND AWARENESS

All personnel working in on the mine will be competent to perform tasks that have the potential to cause an environmental impact. Competence is defined in terms of appropriate education, training and experience.

4.5 SITE INDUCTION

All personnel involved on the mine shall be inducted to the site with a specific environmental awareness training and health and safety issues. The environmental and social awareness training shall ensure that personnel are familiar with the principles of this OEMP, and the environmental impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures. The SSEE manager shall ensure a register of completed inductions and site-specific environmental awareness training is maintained. The general site induction should include, but is not limited to the following:

- What is meant by “environment” and the OEMP;
- Why the environment needs to be protected and conserved;
- How can mining activities impact the environment;
- What can be done to mitigate against impacts;
- The inductee's role and responsibilities concerning implementing the OEMP;
- The site’s environmental rules;
- Details of how to deal with, and who to contact should any environmental problems occur;

- The potential consequences of non-compliance with this OEMP and relevant statutory requirements; and,
- The role of responsible people for the operations.

5 INCIDENT REPORTING

Navachab Gold Mine has an accident and incident reporting system that covers all applicable statutory requirements. The section below sets out the minimum requirements for incident reporting and should be used as a basis for incident reporting.

5.1 MINOR INCIDENT OR "NEAR MISS"

Any incident or "near miss" involving Navachab employees, a nominated representative, any contractor, or its subcontractors or any third party's personnel, property, plant or equipment must be:

1) Orally reported to the supervisor or the supervisor's nominated representative:
   a. Immediately and without delay (within the same shift).
   b. Regardless of whether or not injury to personnel has occurred.
   c. Property or equipment has been damaged.
2) Written up and handed to the supervisor/line manager or the supervisors/line managers nominated representative by the end of the shift. The written report should:
   a. State all known facts and conditions at the time of the incident and
   b. includes a preliminary assessment of the most likely potential consequences of the incident under the current circumstances.

5.2 SERIOUS INCIDENTS

For any serious incident involving a fatality, or permanent disability, the incident scene must be left untouched until witnessed by a representative of the Namibian police. This requirement does not preclude immediate first aid being administered and the location being made safe.

5.3 INCIDENT REPORT AND CLOSE OUT

The assigned supervisor/line manager must investigate the cause of all work accidents and significant incidents and must provide the results of the investigation and recommendations on how to prevent a recurrence of such incidents. A formal root-cause investigation process should be followed, which should involve the SSEE manager and/or his/her representative.

6 SPILL MANAGEMENT

The uncontrolled release of fuels, lubricants and other chemicals has the potential to result in the contamination of soil, groundwater and surface water, which may lead to serious environmental harm. On this basis, the storage and use of fuels or other chemicals must be managed to minimise the risk of a release, and measures must be in place to promptly address impacts should a release occur. Preventative measures to minimise the potential for a spill are listed below. Should a spill occur, this provides guidance for Navachab on the appropriate spill response measures.

The following management measures are to be implemented by Navachab:

- Spill kits are to be made available throughout the site. The kits are to include, as a minimum, the following items:
  - Absorbent materials;
  - Chemical resistant shovels;
  - Heavy-duty chemical resistant plastic bags;
  - Protective clothing (e.g. gloves, respirators, goggles, etc.);
- Drip trays and movable spillage capture equipment to be used where appropriate;
- All machines to be subjected to preventative maintenance of hydraulic hoses, oil pumps and fittings to reduce the risk of spillage during operation;
- Major servicing of equipment will be undertaken in appropriately equipped workshops;
- Provision of adequate and frequent training on spill management, spill response and refueling must be provided to all on-site staff;
- Fuels, lubricants and chemicals are to be stored within appropriately sized, impermeable bunds or trays with a capacity not less than 110% of the total volume of products stored;
- All fuel and chemical storage and handling equipment (including transfer hoses, etc.) will be well maintained;
- Storage and handling of fuels and chemicals will be in compliance with relevant legislation and regulations;
- No refueling is to take place within 50 metres of groundwater boreholes, surface water or streams; and
- MSDS are to be kept for each chemical used on site. These must be easily accessible to all personnel.

The primary concern, in the event of any spill, is the health and safety of any residents and staff in the vicinity. Of secondary, but highly significant, importance, is the protection of water sources, and then soil and vegetation.

The following points therefore apply to all areas on the site:

- Assess the situation for potential hazards;
- Do not come into contact with the spilled substance until it has been characterised and necessary PPE is provided;

- Isolate the area as required; and
- Notify the site manager or safety, health and environmental coordinator.

The following measures are to be implemented in response to a spill:

- Spills are to be stopped at source as soon as possible (e.g. close valve, plug holes or turn container upright);
- Spilt material is to be contained to the smallest area possible using a combination of absorbent material, earthen bunds or other containment methods;
- Spilt material is to be recovered as soon as possible using appropriate equipment. In most cases, it will be necessary to excavate the underlying soils until clean soils are encountered;
- All contaminated materials recovered subsequent to a spill, including soils, absorbent pads and sawdust, are to be disposed to appropriate facilities;
- The line manager or SSEE manager are to be informed as soon as possible in the event of a spill; and
- A written incident report must be submitted to the supervisor/line manager.

7 COMPLIANCE AND ENFORCEMENT

7.1 ENVIRONMENTAL INSPECTIONS AND COMPLIANCE MONITORING

Inspections and audits of the site will be managed and undertaken by the respective domain manager(s), SSEE manager and Environmental officer(s) to check that the standards and procedures set out in this OEMP are being complied with and pollution control measures are in place and working correctly. All equipment will be inspected to ensure they are operating as per specification; no damage has been caused and no leaks or spills have occurred. Any non-conformance shall be recorded, including the following details:

- A brief description of non-conformance;
- The reason for the non-conformance; the responsible party;
- The result (consequence); and
- The corrective action is taken and any necessary follow up measures required.

7.2 REPORTING

Statutory reports shall be submitted to the Mining Commissioner in terms of the Minerals (Mining and Prospecting) Act, No. 33 of 1992 and related conditions of ML 31, ML 180 and the accessory works area of ML 31.

Bi-annual environmental reports shall be submitted to the Environmental Commissioner every six months of every year during the environmental clearance certificate validity period. These reports should include records of the monitoring and other deliverables of every aspect or programme described in the OEMP. Reports should be submitted within three months of the bi-annual period lapsing.

The application documentation for renewal of the environmental clearance certificate must include a summary environmental audit report and copies of the six bi-annual reports that will be submitted every six months for the three years that the clearance certificate is valid for.

7.3 WATER PERMITS AND LICENCE

The Water Act (1956) governs the use of water resources in Namibia and is the enforceable piece of legislation for water related matters. The Water Resources Management Act (2013), passed but pending regulations (not enforced), provides an improved framework for managing water resources based on the principles of integrated water resource management. While not enforced, it is considered best practice to adhere to its stipulations while ensuring compliance with the Water Act of 1956 at the same time.

7.3.1 WASTEWATER DISCHARGE PERMIT

In the event that the operations produce wastewater, a permit must be obtained from the Department of Water Affairs. Since Navachab is an operational mine, all permits related to wastewater are in place and being maintained as relevant.

7.3.2 WATER ABSTRACTION PERMIT

The mine has abstraction permits in place in accordance to the Water Act and these are being maintained as relevant.

7.4 NON-COMPLIANCE

Where it has been identified that works are not compliant with this OEMP, the respective domain manager will employ corrective actions so that the works return to being compliant as soon as possible. In instances where the requirements of the OEMP are not upheld, a non-conformance and corrective action notice will be produced. The notice will be generated during the inspections and the supervisor/line manager shall be responsible for ensuring a corrective action plan is established and implemented to address the identified shortcomings.

A non-compliance event / situation is considered if, for example:

- There is evidence of a contravention of this OEMP and associated indicators or objectives.
- The supervisor/line manager and or contractor have failed to comply with corrective or other instructions issued by the environmental manager or qualified authority.
- The supervisor/line manager and or contractor failed to respond to complaints from the public.

Activities shall be stopped in the event of a non-compliance until corrective action(s) has been completed.

7.5 DISCIPLINARY ACTION

This OEMP is a legally binding document and any wilful non-compliance with it may result in action being taken against the perpetrator(s) within the provisions of company policy, terms of commercial contracts and/or relevant laws in Namibia. Such action may take the form of (but is not limited to):

- Fines / penalties;
- Legal action;
- Penalties imposed by the Proponent on the contractor;
- Suspension or withdrawal of authorisations;
- Suspension of work; and
- Non-renewal of environmental clearance certificate.

The appropriate action shall be determined according to the nature and extent of the transgression / non-compliance and penalties are to be weighed against the severity of the incident.

8 MONITORING PROGRAMMES

8.1 AIR QUALITY MONITORING

Air quality monitoring locations are currently established on the mine site. A fall out monitoring network is set up by following the American Society for Testing and Materials Standard (ASTM D1739-98) method for collection and analysis of fall out dust (TSP) at each of the illustrated sites in Figure 12. There are 10 current sites set up (NAQ01 – NAQ10) in and around the mine site, that are exchanged on a monthly basis, by Environmental department staff.

Due to a lack of guidelines on ambient air quality standards in Namibia, the depositional dust monitoring results will be compared to the fall out dust limits as provided by the South African National Standard (SANS) limit of 1200 mg/m²/day as an average value over a 28 – 32 day period, being the limit value for industrial areas (Table 16).

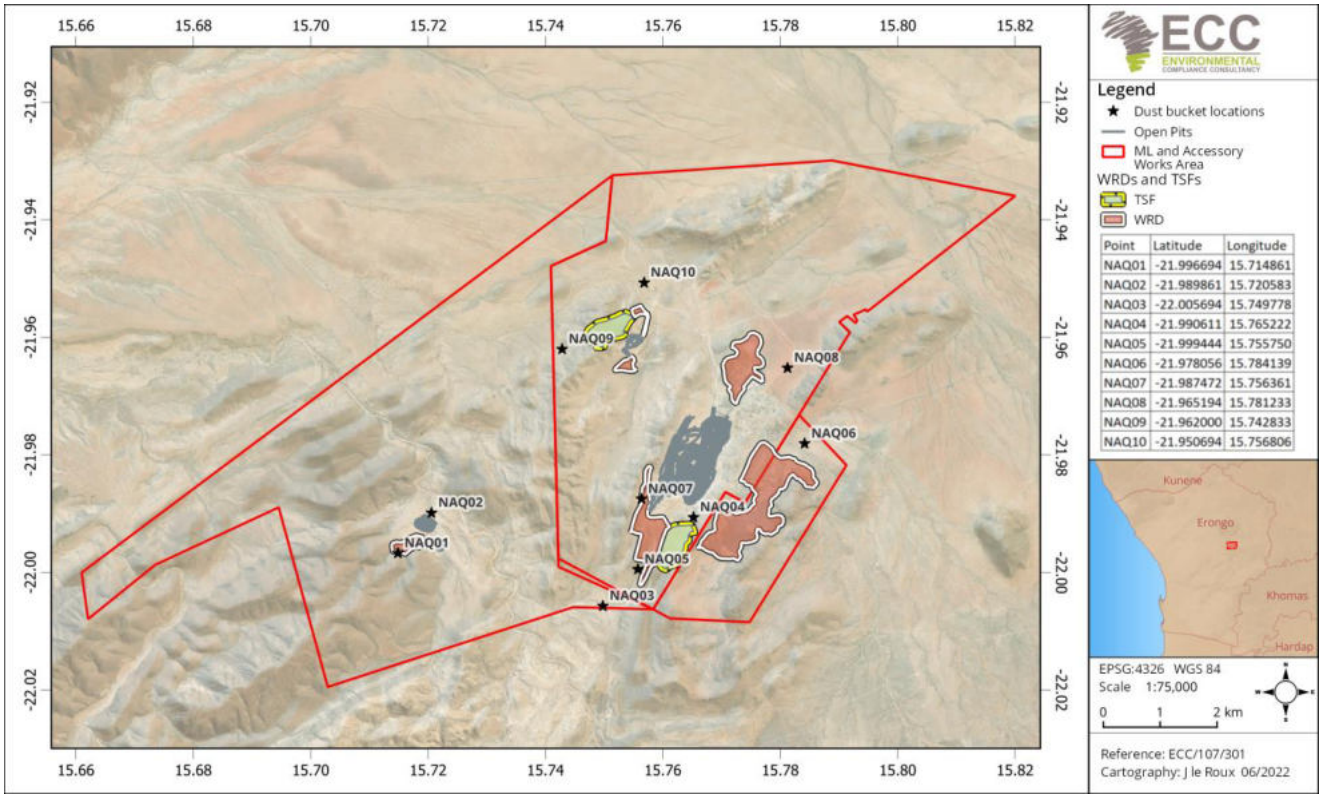

Figure 12: Fall out dust bucket locations on Navachab Gold Mine

Table 16 – SANS (1929:2011) Ambient Air Quality Evaluation Criteria for Dust Deposition

Band number	Band description	Dust rate (d) Mg/m²/day	Comment
1	Residential	D < 600	Permissible for residential and light commercial.
2	Industrial	600 < D < 1200	Permissible for heavy commercial and industrial.

3	Action	1200 < D < 2400	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
4	Alert	2400 < D	Immediate action and remediation required following the first incidence of dust fallout rate being exceeded. Incident report to be submitted to the relevant authority.

Table 17 – The Target, Action and Alert Threshold Values from the SANS 1929:2011 Ambient Air Quality Monitoring Standard

Level	Dust fall rate ($mg/m^2/day$)	Averaging period	Permitted frequency of exceeding dust fall rate
Action residential	D < 600	30 days	Three within any year, no two sequential months
Action industrial	D < 1200	30 days	Three within any year, not sequential months
Alert threshold	D < 2400	30 days	None. First incidence of dust fall rate exceeded requires remediation and compulsory report to relevant authorities

The following additions to the monitoring network is recommended for mining operations:

- Passive sampling, which includes exposing and collecting SO_2, NO_2, VOCs and hydrogen flouride. These sites will coincide with the dust bucket locations and is recommended do be conducted three times a year.
- PM10 and PM2.5 monitoring of particulate matter, a station should be set up on the northeastern boundary of the mine property, to measure pollutants moving from the mine to Karibib (e.g. mine offices, near the main gate).
- Gas monitoring procedures for the underground mining operations.
- Greenhouse gas emissions to be determined and recorded and related inventory to be developed.

Due to a lack of standards in Namibia, the best practise standards for mining operations in Namibia to be complied with are provided in Table 18 below.

Table 18 – Air quality criteria for passive gases and particulate matter

Parameter	Average	Criteria	Origin
$PM_{2.5}$	24-hour mean ($\mu g/m^3$)	37.5 (1)	WHO IT3 & SA Standard
	Annual mean ($\mu g/m^3$)	15	WHO IT3
PM_{10}	24-hour mean ($\mu g/m^3$)	75 (1)	WHO IT3 & SA Standard

Parameter	Average	Criteria	Origin
	Annual mean (µg/m³)	30	WHO IT3
SO_2	1-hour mean (µg/m³)	350 (1)	EC Limit & SA Standard (no WHO guideline)
	24-hour mean (µg/m³)	50 (2)	WHO IT2 (seen as a per 40% of the SA and EC limits)
	Annual mean (µg/m³)	50	SA Standard (no WHO guideline)
NO_2	1-hour mean (µg/m³)	200 (2)	WHO AQG & EC & SA Standard
	Annual mean (µg/m³)	40	WHO AQG & EC & SA Standard
VOC (benzene)	Annual mean (µg/m³)	5	SA Standard (no WHO guideline)
VOC (toluene)	Hourly mean (µg/m³)	640	TCEQ Short-term ELS
VOC (ethyl benzene)	Hourly mean (µg/m³)	2560	TCEQ Short-term ELS
VOC (xylene)	Hourly mean (µg/m³)	350	TCEQ Short-term ELS
HF (hydrogen fluoride)	1-hour mean (µg/m³)	18	TCEQ Short-term ELS
	Annual mean (µg/m³)	8.7	TCEQ Short-term ELS

** Notes: (1) Not to be exceeded more than 4 times per year (SA); (2) Not to be exceeded more than 3 times per year.*

Air quality monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT.

8.2 METEOROLOGICAL MONITORING

Meteorological monitoring is an important management tool that provides additional insight into understanding and evaluating air quality trends and understanding rainfall patterns for a specific site. Additionally active live monitoring can assist health and safety decision making for task risk analysis (e.g. lifting operations). Currently Navachab utilize a live weather station that acquires data for the Karibib area. Data should be downloaded on a weekly and monthly basis and added to the monitoring database.

Additionally in line with continual improvement, an onsite daily weather log can be developed and maintained, whereby abnormal conditions can be logged and recorded (e.g. blasting,

strong winds). This will provide additional insight into analyzing air quality trends when results are received and assist with management decision making.

Meteorological monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT.

8.3 NOISE AND VIBRATION MONITORING

Noise and vibration monitoring should be conducted on a monthly basis, at pre-determined third-party locations in close vicinity to mining operations. Ground vibrations measured should be less than 12 mm/s peak particle velocity. Air blasts measured should be less than 130 dB. The equipment used for this monitoring must be calibrated on an annual basis as per ISO 14001 standards. Locations and structures in and around the mine can also be monitored, however the velocity and sound measurements will differ dependent on the distance from blasting operations.

Noise and vibraton monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT.

8.4 GROUNDWATER MONITORING

8.4.1 GROUNDWATER LEVEL MONITORING

Groundwater is monitored to assess the water level of the aquifers and possible impact of abstraction on the water systems. Navachab has an existing groundwater monitoring network, whereby boreholes are located in the mining area, non-mining areas and on neighbouring farms. Currently Navachab have 39 monitoring boreholes. The rest water level depth should be recorded on a monthly to quarterly basis.

8.4.2 GROUNDWATER QUALITY MONITORING

Water quality is assessed compared to the Namibian Water Quality Standard of the Water Act, Act 54 of 1956 (Table 20). Navachab are required to comply with the following monitoring requirements stipulated in the Table 19, in order to comply with the waste water and effluent exemption permit 624 for the tailings storage facilities groundwater boreholes. Additionally, Navachab monitor the rest of their network either on a monthly or quarterly basis. Groundwater samples should be analysed by an external lab and periodically by an accredited laboratory, as per ISO 14001 standards.

Table 19 – Permit 624 TSF monitoring requirements

Clause 5.2	Requirement
Monthly Sampling	Old TSF monitoring boreholes P374, P375 and P376 will be analysed for pH, CN, sulphates, conductivity and total dissolved solids, manganese, lead, zinc and iron.
Quarterly Sampling	New TSF monitoring boreholes WW33135, WW30598 and WW30597 will be analysed for pH, total alkalinity, hardness, ammonia, WAD CN, CN, sulphates, conductivity, total dissolved solids, nitrates, cations, anions, manganese, lead, zinc and iron.

Figure 13 provides an overview of the current groundwater monitoring borehole locations on Navachab Gold Mine. Groundwater monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT. Additionally reporting requirements to the Department of Water Affairs in line with issued permit conditions.

8.4.3 PIT ABSTRACTION MONITORING

Monitoring to be conducted on a monthly basis and records of the flow meter volumes to be maintained. Reporting to the Department of Water Affairs to take place on a monthly or quarterly basis, as per permit conditions.

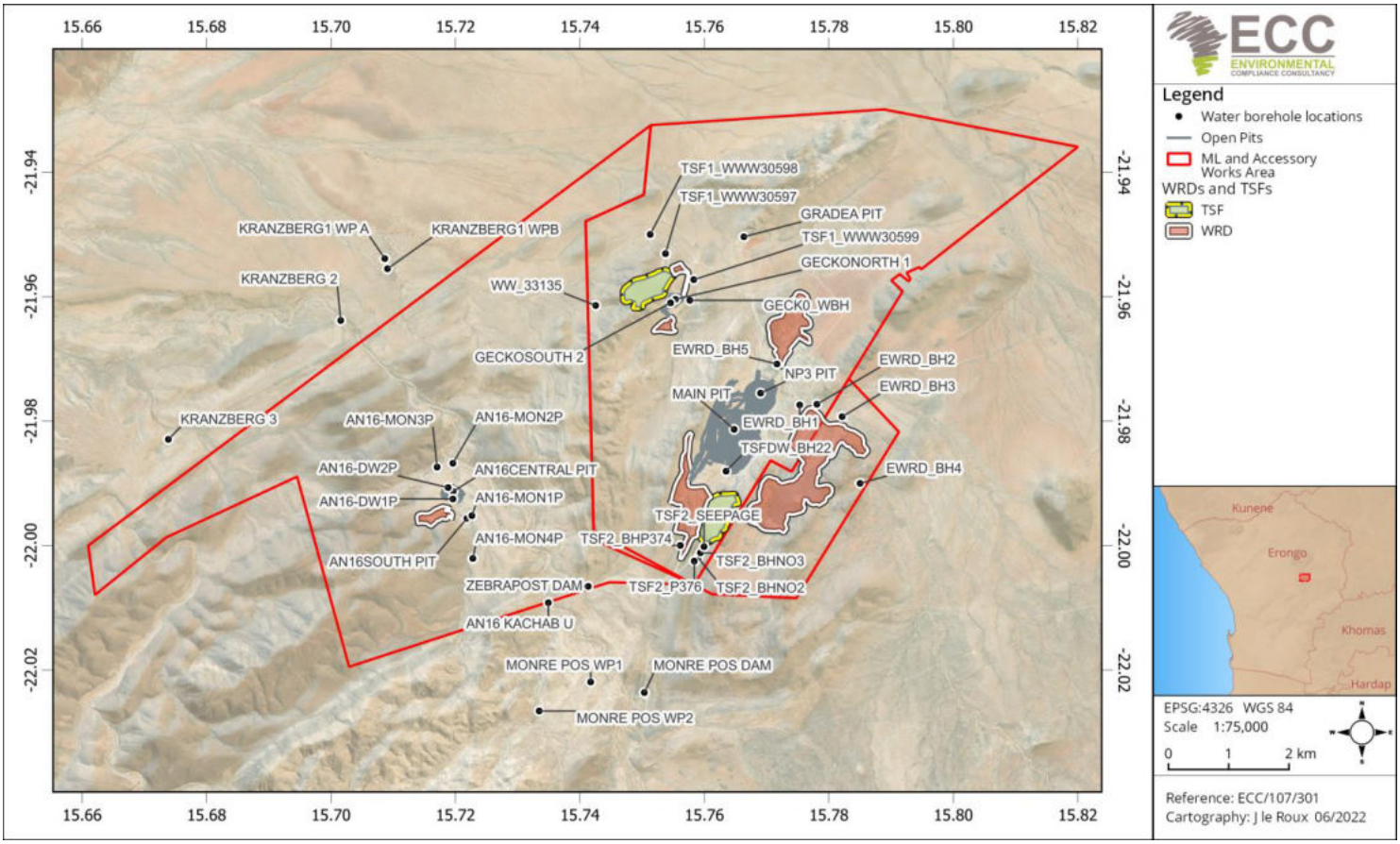

Figure 13: Groundwater monitoring network on Navachab Gold Mine

Table 20 – Water Act 54 of 1956 Water Quality standards

Parameter	Units	Group A	Group B	Group C	Group D /Livestock
pH	**pH**	6-9	5.5-9.5	4-11	4-11
Electrical Conductivity	**mS/m**	150	300	400	400
Turbidity	**NTU**	1	5	10	10
Total Dissolved Solids (calc.)	**mg/l**				6000
P-Alkalinity as $CaCO_3$	**mg/l**				
Total Alkalinity as $CaCO_3$	**mg/l**				
Total Hardness as $CaCO_3$	**mg/l**	300	650	1300	
Ca-Hardness as $CaCO_3$	**mg/l**	375	500	1000	2500
Mg-Hardness as $CaCO_3$	**mg/l**	290	420	840	2057
Chloride as Cl^-	**mg/l**	250	600	1200	1500 - 3000
Fluoride as F^-	**mg/l**	1.5	2.0	3.0	2.0 - 6.0
Sulphate as SO_4^{2-}	**mg/l**	200	600	1200	1000
Nitrate as N	**mg/l**	10	20	40	100
Nitrite as N	**mg/l**				10
Sodium as Na	**mg/l**	100	400	800	2000
Potassium as K	**mg/l**	200	400	800	
Magnesium as Mg	**mg/l**	70	100	200	500
Calcium as Ca	**mg/l**	150	200	400	1000
Manganese as Mn	**mg/l**	0.05	1.0	2.0	10
Iron as Fe	**mg/l**	0.1	1.0	2.0	10
Stability pH, at 25°C					
Langelier Index		>0= scaling, <0= corrosive, 0= stable			
Ryznar Index		<6.5= scaling, >7,5= corrosive, ≥6.5 and ≤7.5= stable			
Corrosivity ratio		Applies to water in the pH range 7-8			

8.5 SURFACE WATER MONITORING

Surface water sampling can be used as an additional tool to determine potential contamination or acid rock drainage as a result of mining related activities. Water samples are collected for further laboratory analysis and can be compared directly to the perceived source. Surface water samples preferred collection is in the form of water, however muddy samples can also be collected for analysis. Surface water samples can be collected from on-site ponds, natural streams/drainage lines with an active flow and following a rainfall event on the mine site.

Water quality is assessed compared to the Namibian Water Quality Standard of the Water Act, Act 54 of 1956 (Table 20).

Surface water monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT.

8.6 POTABLE WATER MONITORING

Navachab receives its bulk water supply from the Swakoppoort Dam via an established pipeline. An agreement exists between NamWater and Navachab for this supply. The processing plant is the main consumer of water at the mine.

Potable water samples are taken from five locations (Admin, Clinic Pre Filter, Clinic Post Filter, Geo Camp and Karibib Town Council) and are compared to the Department of Water Affairs Namibian Guidelines for drinking water. Samples should be taken on a monthly or quarterly basis and should be analysed by an external lab and periodically by an accredited laboratory, as per ISO 14001 standards.

Potable water monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT.

8.7 WASTEWATER AND EFFLUENT MONITORING

Navachab have been issued by the Department of Water Affairs with an Industrial Wastewater and Effluent Disposal Exemption Permit No. 624. This permit was issued on the 27th February 2018 and expires on the 31st March 2023. Navachab have different systems in place to manage the various effluent streams. These systems are described below:

- Trickling Filter Plant to treat sewage from the carbon in pulp (CIP) plant, engineering workshops, dense media separation system and administration buildings;
- Lewcor wetland system to act as a water recovery system for the Lewcor workshop and Navachab clinic; and
- A septic tank system with a French drain utilized for remote areas (pit view, Sasol, crusher and Gecko farmhouse).

Each system if required to be monitored on a regular basis and effluent samples analysed (monthly to quarterly) to determine if effluent is compliant with the general standards for industrial effluents as per Article 21 of the Water Act, Act 54 of 1956 (Table 21). This is especially important for effluents that are released back into the environment, either as dust suppression or directly into streams/channels. Currently 11 sample locations are available for analysis (Figure 14).

Wastewater and effluent monitoring results should be reported on a monthly basis internally, when required to DWA as per permit conditions and be included in the bi-annual environmental performance report to MEFT.

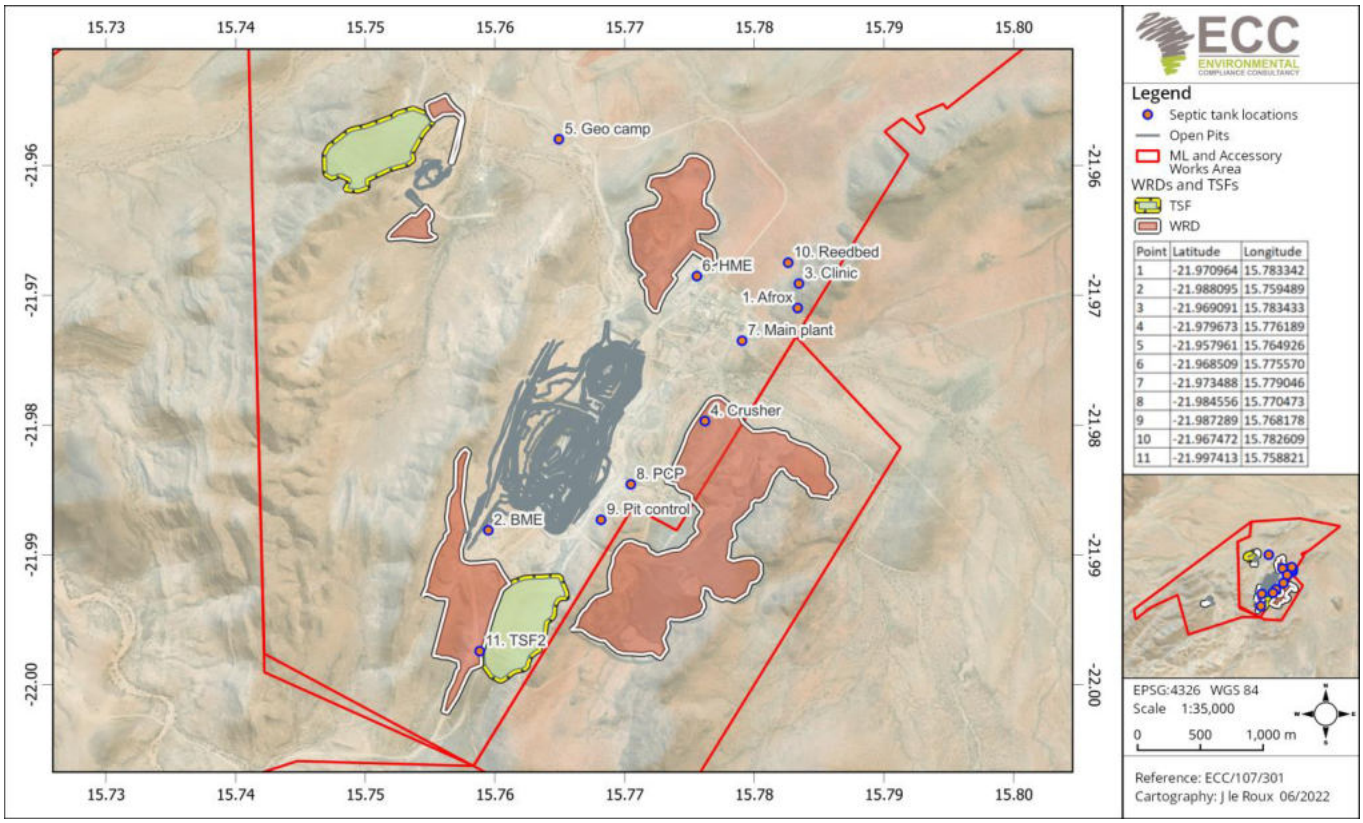

Figure 14: Sewerage sampling locations and network on Navachab Gold Mine

Table 21 – General waster standards for effluents waste water as per Article 21

Determinants	Maximum allowable levels
Arsenic	0.5 mg/l as As
Biological oxygen demand (BOD)	No value given
Boron	1.0 mg/l as B
Chemical oxygen demand (COD)	75 mg/l as O
Chlorine, residual	1.0 mg/l as Cl_2
Chromium, hexavalent	50 µg/l as Cr (VI)
Chromium, total	500 µg/l as Cr
Copper	1.0 mg/l as Cu

Cyanide	500 µg/l as CN
Oxygen, dissolved (DO)	At least 75% saturation**
Detergents, surfactants, tensides	0.5 mg/l as MBAS
Fats, oil & grease (FOG)	2.5 mg/l (gravimetric method)
Fluoride	1.0 mg/l as F
Free & saline ammonia	10 mg/l as N
Lead	1.0 mg/l as Pb
Oxygen, Absorbed (OA)	10 mg/l as O*
pH	5.5 – 9.5
Phenolic compounds	100 µg/l as phenol
Phosphate	1.0 mg/l as P
Sodium	Not more than 90 mg/l Na more than influent
Sulphide	1.0 mg/l as S
Temperature	35°C
Total dissolved solids (TDS)	Not more than 500 mg/l more than influent
Total suspended solids (TSS)	25 mg/l
Typical faecal Coli	No typical coli should be counted per 100ml
Zinc	5.0 mg/l as Zn

8.8 BIODIVERSITY MONITORING

Biodiversity monitoring requirements are related to the various ESIA outcomes and studies conducted for Navachab Gold Mine and will be amended as required when new information becomes available.

Some of the basic monitoring requirements are listed below:

- Monitor animal movement at strategic locations and points throughout the life of mine.
- Monitor the plant health of pre-selected vegetation and riparian trees.
- Implement strategies to contain animals seen as pests (e.g. rats, cockroaches, baboons).
- Monitor the use of drainage lines, tributaries and rivers by fauna.
- Record and investigated fauna injuries and mortalities.
- Implement strategies to reduce fauna and avifauna to be attracted to ponds and tailing storage facilities.
- Monitor power line structures for avifauna activity, injuries and/or mortalities.
- Implement and maintain an on-site nursery for restoration and rehabilitation trials and purposes, in line with mine closure objectives.
- Identified protected trees to be visibly demarcated/marked and monitored.
- Where trees are removed for pit development, seeds and cuttings to be collected for nursery planting.

- Monitor invasive and alien invasive species and remove when required (e.g. *Prosopis* sp, *Leucaena leucocephala* (Wonderboom)).
- Investigation offsetting, as and when required.

Biodiversity monitoring results should be reported on a monthly basis internally and be included in the bi-annual environmental performance report to MEFT.

8.9 ARCHAEOLOGICAL MONITORING

Known archaeological sites on Navachab Gold Mine that have the potential to be damaged by operational activities should be monitored on a regular basis (ML 31 sites QRS 114/7 and 114/8). Dependent on the location to operational activities, this monitoring can either be monthly or quarterly. Photographic and GPS records to be maintained of these sites. Where damages have been observed, an incident to be recorded and report to be maintained on the EMS database. Where a chance find has been found, the chance find procedure to be implemented and where necessary a specialist to be contacted to assess the site.

Archaeological monitoring results should be reported on a regular basis internally and be included in the bi-annual environmental performance report to MEFT.

9 IMPLEMENTATION OF THE OEMP

This environmental management plan:

A. Has been prepared according to the scope of work and terms of appointment issued to the EAP by the Proponent;
B. Has been prepared based on information provided to or obtained by ECC up to August 2022;
C. Is for the sole use of the Proponent, for the sole purpose of an OEMP;
D. Must not be used (1) by any person other than the Proponent or (2) for a purpose other than an OEMP;
E. Must not be copied without the prior written permission of ECC; and
F. Will be updated pending the outcomes of any future impact assessment process for an environmental clearance certificate and/or renewal thereof, as this is a live document.