

Maria Nandelila Veii

MCs Nos. 72264-72273

MEFT ECC APPLICATION REFERENCE No.
APP-002856

Final Environmental Management Plan (EMP) to support the Application for Environmental Clearance Certificate (ECC) for the Mining Claims (MCs) Nos. 72264-72273 for Maria Nandelila Veii, Farm Otjeherani (Sterkfontein) No. 216, Okahandja District, **Otjozondjupa Region, North Central Namibia**

July 2021

P.O. Box: 2824
Erf 250, Okaramba Street, Wanaheda
WINDHOEK, NAMIBIA

PROPONENT, LISTED ACTIVITIES AND RELATED INFORMATION SUMMARY

MEFT ECC APPLICATION REFERENCE No.
APP-002856

TYPE OF AUTHORISATIONS REQUIRING ECC
Mining Claims (MCs) Nos. 72264-72273

NAME OF THE PROPONENT
Maria Nandelila Veii

COMPETENT AUTHORITY
Ministry of Mines and Energy (MME)

ADDRESS OF THE PROPONENT AND CONTACT PERSON

P.O. Box: 2824
Erf 250, Okaramba Street, Wanaheda
WINDHOEK, NAMIBIA

CONTACT PERSON:
Maria Nandelila Veii
Mobile: 264 81642 8248/81833700
Email: veiin Tobias@iway.na

PROPOSED PROJECT

Proposed Small-Scale Mining Operations and Ongoing Exploration
Mining Claims (MCs) Nos. 72264-72273, Farm Otjeherani (Sterkfontein) No. 216,
Okahandja District,
Otjozondjupa Region, North Central Namibia

PROJECT LOCATION

Farm Otjeherani (Sterkfontein) No. 216, Okahandja District,
Otjozondjupa Region, North Central Namibia
(Latitude: -21.309167, Longitude: 17.825278)

ENVIRONMENTAL CONSULTANTS



Risk-Based Solutions (RBS) CC

(Consulting Arm of Foresight Group Namibia (FGN) (Pty) Ltd)
41 Feld Street Ausspannplatz
Cnr of Lazarett and Feld Street

P. O. Box 1839, **WINDHOEK, NAMIBIA**
Tel: +264 - 61- 306058. Fax: +264-886561821
Mobile: + 264-811413229. Email: smwiya@rbs.com.na
Global Office / URL: www.rbs.com.na

ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Dr. Sindila Mwiya
PhD, PG Cert, MPhil, BEng (Hons), Pr Eng

Summary Profile and Qualification of the Environmental Assessment Practitioner (EAP) / International Consultant Projects Director – Dr Sindila Mwiya

Dr Sindila Mwiya has more than eighteen (18) years of practical field-based technical industry experience in Environmental Assessment (SEA, EIA, EMP, EMS), Energy (Renewable and Non-renewable energy sources), onshore and offshore resources (minerals, oil, gas and water) exploration / prospecting, operation and utilisation, covering general and specialist technical exploration and recovery support, Health, Safety and Environment (HSE) permitting for Geophysical Surveys such as 2D, 3D and 4D Seismic, Gravity and Electromagnetic Surveys for mining and petroleum (oil and gas) operations support, through to engineering planning, layout, designing, logistical support, recovery, production / operations, compliance monitoring, rehabilitation, closure and aftercare projects lifecycles. The great array of highly technical specialist knowledge and field-based practical experiences of Dr Sindila Mwiya has now been extended to supporting the development of Environmentally Sustainable, automated / smart and Climate Change resilient homes, towns, and cities.

Through his companies, Risk-Based Solutions (RBS) CC and Foresight Group Namibia (FGN) (Pty) Ltd which he founded, he has undertaken more than 200 projects for Local (Namibian), Continental (Africa) and International (Global) based clients. He has worked and continue to work for Global, Continental and Namibian based reputable resources (petroleum and mining / minerals) and energy companies such as EMGS (UK/ Norway), CGG (UK/ France/Namibia), BW Offshore (Norway/Singapore /Namibia), Shell Namibia B. V. Limited (Namibia/ the Netherlands), Tullow Oil (UK/Namibia), Debmarine (DBMN) (Namibia), Reconnaissance Energy Africa Ltd (ReconAfrica) (UK/Canada/Namibia), Osino Resource Corporation (Canada/Germany/Namibia), Desert Lion Energy Corporation (Canada/ Australia/ Namibia), Petrobras Oil and Gas (Brazil) / BP (UK/ Namibia), REPSOL (Spain/ Namibia), ACREP (Namibia/Angola), Preview Energy Resources (UK), HRT Africa (Brazil / USA/ Namibia), Chariot Oil and Gas Exploration (UK/ Namibia), NABIRM (USA/ Namibia), Serica Energy (UK/ Namibia), Eco (Atlantic) Oil and Gas (Canada / USA/ Namibia), ION GeoVentures (USA), PGS UK Exploration (UK), TGS-NOPEC (UK), Maurel & Prom (France/ Namibia), GeoPartners (UK), PetroSA Equatorial Guinea (South Africa / Equatorial Guinea/ Namibia), Preview Energy Resources (Namibia / UK), Sintezneftegaz Namibia Ltd (Russia/ Namibia), INA Namibia (INA INDUSTRIJA NAFTE d.d) (Croatia/ Namibia), Namibia Underwater Technologies (NUTAM) (South Africa/Namibia), InnoSun Holdings (Pty) Ltd and all its subsidiary renewable energy companies and projects in Namibia (Namibia / France), HopSol (Namibia/Switzerland), Momentous Solar One (Pty) Ltd (Namibia / Canada), OLC Northern Sun Energy (Pty) Ltd (Namibia) and more than 100 local companies. Dr Sindila Mwiya is highly qualified with extensive practical field-based experience in petroleum, mining, renewable energy (Solar, Wind, Biomass, Geothermal and Hydropower), Non Renewable energy (Coal, Petroleum, and Natural Gas), applied environmental assessment, management and monitoring (Scoping, EIA, EMP, EMP, EMS) and overall industry specific HSE, cleaner production programmes, Geoenvironmental, geological and geotechnical engineering specialist fields.

Dr Sindila Mwiya has undertaken and continue to undertake and manage high value projects on behalf of global and local resources and energy companies. Currently, (2020-2023) Dr Sindila Mwiya is responsible for permitting planning through to operational and completion compliance monitoring, HSE and engineering technical support for multiple major upstream onshore and offshore petroleum, minerals and mining projects, Solar and Wind Energy Projects, manufacturing and environmentally sustainable, automated / smart and Climate Change resilient homes developments in different parts of the World including Namibia. Currently, Dr Sindila Mwiya is developing a 16 Ha commercial and residential Mwale Mwiya Park in the Town of Katima Mulilo, Zambezi Region, Namibia as one of first advanced Environmentally Sustainable, automated / smart and Climate Change resilient development in Namibia. He continue to worked as an International Resources Consultant, national Environmental Assessment Practitioner (EAP) / Environmentally Sustainable, automated / smart and Climate Change resilient homes developer, Engineering / Technical Consultant (RBS / FGN), Project Manager, Programme Advisor for the Department of Natural and Applied Sciences, Namibia University of Science and Technology (NUST) and has worked as a Lecturer, University of Namibia (UNAM), External Examiner/ Moderator, NUST, National (Namibia) Technical Advisor (Directorate of Environmental Affairs, Ministry of Environment and Tourism / DANIDA – Cleaner Production Component) and Chief Geologist for Engineering and Environment Division, Geological Survey of Namibia, Ministry of Mines and Energy and a Field-Based Geotechnician (Specialised in Magnetism, Seismic, Gravity and Electromagnetics Exploration and Survey Methods) under the Federal Institute for Geoscience and Natural Resources (BGR) German Mineral Exploration Promotion Project to Namibia, Geophysics Division, Geological Survey of Namibia, Ministry of Mines and Energy.

He has supervised and continue to support a number of MScs and PhDs research programmes and has been a reviewer on international, national and regional researches, plans, programmes and projects with the objective to ensure substantial local skills development, pivotal to the national socioeconomic development through the promotion of sustainable natural resources coexistence, management, development, recovery, utilisation and for development policies, plans, programmes and projects financed by governments, private investors and donor organisations. Since 2006 until 2017, he has provided extensive technical support to the Department of Environmental Affairs (DEA), Ministry of Environment and Tourism (MET) through GIZ in the preparation and amendments of the Namibian Environmental Management Act, 2007, (Act No. 7 of 2007), new Strategic Environmental Assessment (SEA) Regulations, preparation of the updated Environmental Impact Assessment (EIA) Regulations as well as the preparation of the new SEA and EIA Guidelines and Procedures all aimed at promoting effective environmental assessment and management practices in Namibia.

Among his academic achievements, Dr Sindila Mwiya is a holder of a PhD (Engineering Geology/Geotechnical / Geoenvironmental / Environmental Engineering and Artificial Intelligence) – Research Thesis: Development of a Knowledge-Based System Methodology (KBSM) for the Design of Solid Waste Disposal Sites in Arid and Semiarid Environments, MPhil/PG Cert and BEng (Hons) (Engineering Geology and Geotechnics) qualifications from the University of Portsmouth, School of Earth and Environmental Sciences, United Kingdom. During the 2004 Namibia National Science Awards, organised by the Namibian Ministry of Education, and held in Windhoek, Dr Sindila Mwiya was awarded the Geologist of the Year for 2004, in the professional category. Furthermore, as part of his professional career recognition, Dr Sindila Mwiya is a life member of the Geological Society of Namibia, Consulting member of the Hydrogeological Society of Namibia and a Professional Engineer registered with the Engineering Council of Namibia.

Windhoek, Namibia July 2021

Contents List

NON-TECHNICAL SUMMARY..... VII

1. BACKGROUND..... - 1 -

- 1.1 INTRODUCTION - 1 -
- 1.2 PROPOSED SCOPE OF WORK..... - 1 -
- 1.3 REGULATORY REQUIREMENTS - 1 -
- 1.4 LOCATION, LAND USE, INFRASTRUCTURE AND SERVICES..... - 2 -
 - 1.4.1 *Location and Land Use* - 2 -
 - 1.4.2 *Supporting Infrastructure and Services* - 2 -
- 1.5 SUMMARY OF THE RECEIVING ENVIRONMENT - 7 -
 - 1.5.1 *Topography*..... - 7 -
 - 1.5.2 *Habitats and Ecosystem* - 7 -
 - 1.5.3 *Geology*..... - 7 -
 - 1.5.4 *Water*..... - 8 -
 - 1.5.5 *Socioeconomic*..... - 8 -
 - 1.5.6 *Archaeology, Historical and Cultural Resources* - 8 -

2. OBJECTIVES OF THE EMP..... - 13 -

- 2.1 SUMMARY OBJECTIVES - 13 -
- 2.2 EMP MANAGEMENT LINKAGES..... - 13 -
- 2.3 SUMMARY OF IMPACT ASSESSMENT RESULTS..... - 13 -
 - 2.3.1 *Summary of Impacts Assessment Methodology*..... - 13 -
 - 2.3.2 *Summary of Impact Assessment Results* - 13 -
- 2.4 IMPLEMENTATION OF THE EMP - 26 -
 - 2.4.1 *Roles and Responsibilities*..... - 26 -
 - 2.4.2 *Proponent’s Representative (PR) / Project Manager (PM)*..... - 26 -
 - 2.4.3 *Project Health, Safety and Environment (Project HSE)*..... - 27 -
 - 2.4.4 *Environmental Social Governance (ESG) / EMP Coordinator/s*..... - 28 -
 - 2.4.5 *Contractors and Subcontractors* - 28 -
 - 2.4.6 *Construction Supporting Teams* - 29 -

3. EMP MITIGATION MEASURES - 30 -

- 3.1 HIERARCHY OF MITIGATION MEASURES IMPLEMENTATION - 30 -
- 3.2 MITIGATION MEASURES IMPLEMENTATION..... - 30 -

4. EMP GUIDANCE, MONITORING AND REHABILITATION - 47 -

- 4.1 EMP GUIDANCE AND AWARENESS MATERIALS..... - 47 -
- 4.2 ENVIRONMENTAL AWARENESS TRAINING GUIDANCE MATERIALS..... - 47 -
- 4.3 MANGANESE TOXICOLOGICAL AND ENVIRONMENTAL PERFORMANCE REPORTING - 50 -
 - 4.3.1 *Manganese Occurrence and Toxicological Profile* - 50 -
 - 4.3.2 *Manganese Toxicological Profile* - 51 -
- 4.4 MONITORING AND ENVIRONMENTAL PERFORMANCE - 52 -
- 4.5 ENVIRONMENTAL PERFORMANCE REPORTING..... - 52 -
- 4.6 MINE CLOSURE PLAN MONITORING AND REPORTING..... - 61 -
 - 4.6.1 *Mine Closure Plan*..... - 61 -
 - 4.6.2 *Mine Closure Environmental Monitoring*..... - 61 -
 - 4.6.3 *Annual Reviews of the Mine Closure Plan*..... - 62 -

5. CONCLUSION AND RECOMMENDATION - 64 -

- 5.1 CONCLUSIONS..... - 64 -
- 5.2 RECOMMENDATIONS..... - 64 -

List of Figures

Figure 1.1:	Regional location of the MCs Nos. 72264-72273 Area.....	- 3 -
Figure 1.2:	Regional location of the MCs Nos. 72264-72273 falling within the EPL No. 3980.	Error! Bookmark not defined.
Figure 1.3:	Detailed regional location of the MCs Nos. 72264-72273 within Otjeherani (Sterkfontein) No. 216 inside the MCs Nos. 72264-72273 with key access.....	- 6 -
Figure 1.4:	Detailed local location of the MCs No. Nos. 72264-72273 with coordinates.	- 6 -
Figure 1.5:	Detailed topographic map of the MCs Nos. 72264-72273 and surrounding areas.	- 9 -
Figure 1.6:	Vegetation map of the MCs Nos. 72264-72273 other existing minerals licenses and infrastructures in the surrounding areas.	- 10 -
Figure 1.7:	Simplified local geological map of the MCs Nos. 72264-72273.	- 11 -
Figure 1.8:	Simplified hydrogeological map of the MCs Nos. 72264-72273.	- 12 -
Figure 2.1:	RBS Schematic presentation of Namibia's Environmental Assessment Procedure.	- 14 -

List of Tables

Table 2.1:	Summary of the proposed activities, alternatives and key issues considered during the environmental assessment (EA) process for the proposed exploration and small-scale mining operations in the MCs Nos. 72264-72273.	- 15 -
Table 2.2:	Results of the sensitivity assessment of the receptors (Physical, Socioeconomic and Biological environments) with respect to the proposed exploration small-scale mining operations without mitigations.....	- 16 -
Table 2.3:	Results of the scored time (duration) over which the impact is expected to last during the exploration and small-scale mining operations without mitigations.	- 18 -
Table 2.4:	Results of the scored geographical extent of the induced change during the exploration and small-scale mining operations without mitigations.	- 20 -
Table 2.5:	Results of the qualitative scale of probability occurrence during the exploration and small-scale mining operations without mitigations.	- 22 -
Table 2.6:	Significant impact assessment matrix for the proposed exploration and small-scale manganese mining activities without mitigations.	- 24 -
Table 3.1:	Project planning and implementation.	- 32 -
Table 3.2:	Implementation of the EMP.....	- 32 -
Table 3.3:	Public and stakeholders relations.....	- 33 -
Table 3.4:	Measures to enhance positive socioeconomic impacts.	- 33 -
Table 3.5:	Environmental awareness briefing and training.	- 34 -
Table 3.6:	Erection of supporting exploration and small-scale mining infrastructure.	- 34 -
Table 3.7:	Use of existing access roads, tracks, and general vehicle movements.	- 35 -
Table 3.8:	Mitigation measures for preventing flora and ecosystem destruction and promotion of conservation.....	- 36 -
Table 3.9:	Mitigation measures for preventing faunal and ecosystem destruction and promotion of conservation.....	- 37 -
Table 3.10:	Mitigation measures to be implemented with respect to the exploration, small-scale mining, and infrastructure support areas.....	- 38 -
Table 3.11:	Mitigation measures for surface and groundwater protection as well as general water usage.	- 39 -
Table 3.12:	Mitigation measures to minimise negative socioeconomic impacts.	- 40 -
Table 3.13:	Mitigation measures to minimise health and safety impacts.	- 41 -
Table 3.14:	Mitigation measures to minimise visual impacts.	- 42 -
Table 3.15:	Mitigation measures to minimise vibration, noise and air quality.	- 43 -
Table 3.16:	Mitigation measures for waste (solid and liquid) management.	- 44 -
Table 3.17:	Rehabilitation plan.	- 45 -
Table 3.18:	Environmental data collection.	- 46 -

Table 5.1:	Monitoring of environmental performance implementation / environmental awareness training.....	- 54 -
Table 5.2:	Monitoring of environmental performance for the settlement.....	- 55 -
Table 5.3:	Environmental data collection.	- 57 -
Table 5.5:	Recruitment of labour.....	- 58 -
Table 5.6:	Management of the natural habitat and surficial materials management.	- 58 -
Table 5.7:	Tracks and off-road driving.	- 59 -
Table 5.8:	Management of surface and groundwater.....	- 60 -
Table 5.9:	Public relations.	- 60 -

NON-TECHNICAL SUMMARY

1. Background

Maria Nandelila Vei, the Proponent, have applied for Mining Claims (MCs) Nos. 72264-72273 for base and rare metals with special focus on manganese exploration and small-scale mining. The 180 Ha MCs area covering ten (10) MCs were applied on 13/11/2020. MCs falls in privately owned commercial farmland, Farm Otjeherani (Sterkfontein) No. 216 situated in the Okahandja District, Otjozondjupa Region. The MCs area is surrounded by well-established commercial cattle farming area supported by game farming, tourism, and hospitality services as well as conservancies.

The Proponent intends undertake exploration activities using exploration techniques/ methods such as geophysical surveys, geological mapping, trenching, drilling, bulk sampling, and laboratory tests followed by small scale manganese test mining and mining operations. The implementation of the site-specific field-based small scale manganese mining activities will be subject to the discovery of potential economic minerals deposits within the MCs area. The following is the summary of the project developmental stages that may be implemented: Preconstruction, construction, operation, ongoing monitoring and rehabilitation, decommissioning, closure, and aftercare stages.

The proposed exploration and small-scale mining activities are listed in the Environmental Impact Assessment (EIA) Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007) and cannot be undertaken without an Environmental Clearance Certificate (ECC). This Environmental Impact Assessment (EIA) report has been prepared by Risk-Based Solutions (RBS) CC to support the application for the ECC for the proposed exploration and small-scale mining activities in the MCs Nos. 72264-72273.

The impacts that the proposed exploration and small-scale mining activities and associated infrastructure such as access and supporting facilities will have on the receiving environment (physical, biological and socioeconomic) will depend on the extent of the proposed activities over the development area/s, management of the affected area/s and how the mitigations as detailed in the EMP Report are eventually implemented and monitored by the Proponent. The overall severity of potential negative environmental impacts of the proposed project activities on the receiving environment (physical, biological, socioeconomic environments and ecosystem functions, services, use and non-use values or passive uses) will be of high magnitude, permanent duration, localised extent, and high probability of occurrence especially around the 180Ha MCs areas targeted for possible manganese exploration and small-scale mining operations. The immediate surrounding areas bordering the targeted exploration and mining operations area will also likely to be low-to moderately negatively affected.

2. Summary of the Proposed Mitigation Measures

Avoiding sensitive habitats such as Ephemeral River channels, rock heads and mountainous terrains as well as track discipline, including not killing/poaching of fauna, unnecessarily cutting down of trees and continuous consultations with the land owner/s must be adhered to and/or always enforced. Mitigation measures shall be implemented as detailed in this EMP report and includes the following:

1. Project planning and implementation.
2. Implementation of the EMP.
3. Public and stakeholders relations.
4. Measures to enhance positive socioeconomic impacts.
5. Environmental awareness briefing and training.
6. Erection of supporting exploration and small-scale mining infrastructure.
7. Use of existing access roads, tracks and general vehicle movements.

8. Mitigation measures for preventing flora destruction.
9. Mitigation measures for preventing faunal destruction.
10. Mitigation measures to be implemented with respect to the exploration, small-scale mining, and infrastructure support areas.
11. Mitigation measures for surface and groundwater protection as well as general water usage.
12. Mitigation measures to minimise negative socioeconomic impacts.
13. Mitigation measures to minimise health and safety impacts.
14. Mitigation measures to minimise visual impacts.
15. Mitigation measures to minimise vibration, noise and air quality.
16. Mitigation measures for waste (solid and liquid) management.
17. Rehabilitation plan, and.
18. Environmental data collection.

3. Conclusions and Recommendations of the EMP

Based on the findings of the EIA and the mitigation measures provided in this EMP Report, it is hereby recommended that the proposed exploration and small-scale mining activities in the MCs Nos. 72264-72273 shall be issued with an Environmental Clearance Certificate (ECC). The following is the summary of the key conditions that shall be implemented by the Proponent for the proposed project activities:

- (i) The Proponent shall implement the conditions of the land lease agreement/s to be concluded with the owner/s of the land as may be required to support the proposed exploration and small-scale mining activities.
- (ii) The proponent shall implement and adhere to all the provisions of this EMP report.
- (iii) Mitigation measures shall be implemented and monitored as detailed in this EMP report.
- (iv) The Proponent shall prepare a mine closure plan and ongoing and final rehabilitation shall be always undertaken.
- (v) The Proponent shall adhere to all the applicable national regulations and standards as well as Good International Industry Practice (GIIP) that defines leading industry best practices as provided for in the Equator Principles and International Finance Corporation (IFC) environmental management guidelines and frameworks, and.
- (vi) The Proponent shall adopt the precautionary approach / principles in instances where baseline information, national or international guidelines or mitigation measures have not been provided or do not sufficiently address the site-specific project impact.

The following are the recommended actions (roles and responsibility) to be implemented by the Proponent as a part of the management of the impacts through implementations of this EMP Report:

- (i) Appoint an Environmental Control Officer to lead and further develop, implement and promote environmental culture through awareness raising of the workforce, contractors and sub-contractors in the field during the whole duration of the proposed project.

- (ii) Provide with other support, human and financial resources, for the implementation of the proposed mitigations, rehabilitation plans and effective environmental management during the planned mine project life cycle.
- (iii) Develop a simplified environmental induction and awareness programme for all the workforce, contractors and sub-contractors.
- (iv) Where contracted service providers are likely to cause environmental impacts, these will need to be identified and contract agreements need to be developed with costing provisions for environmental liabilities.
- (v) Implement internal and external monitoring of the actions and management strategies developed during the project duration and a final Environmental Monitoring report to be prepared by the Environmental Control Officer and to be submitted to the regulators, and.
- (vi) Develop and implement a monitoring programme that shall be integrated into the overall company's Environmental Management Systems (EMS) as well as for any future EIA related to the expansion of the current delineated resources or development of completely new mine site/s within the general area.

All the responsibilities to ensure that the recommendations and provisions of this EMP Report are executed accordingly, rest with the Proponent. The Proponent shall provide all appropriate resource requirements for the implementation of this EMP as well as an independently managed (not directly controlled by the company) funding instrument for final mine rehabilitation and associated short and long-term environmental liabilities.

It is the responsibility of the Proponent to make sure that all members of the workforce including contractors and subcontractors are aware of the provisions of this EMP and its objectives. It is hereby recommended that the Proponent take all the necessary steps to implement all the recommendations of this EMP for the successful execution of the proposed exploration programme.

1. BACKGROUND

1.1 Introduction

Maria Nandelila Veii, the Proponent, holds mineral rights under the Mining Claims (MCs) Nos. 72264-72273. The following is the summary of the MCs Nos. 72264-72273:

- ❖ **Type of License:** Mining Claims (MCs) which allows for small scale exploration and mining operations.
- ❖ **MCs Holder and Proponent:** Maria Nandelila Veii.
- ❖ **Date Applied:** 13/11/2020.
- ❖ **Commodities:** Base and rare metals with special focus on manganese, and.
- ❖ **Size of the MCs:** Approximately 180 Ha.

1.2 Proposed Scope of Work

The Proponent intends undertake exploration activities using exploration techniques/ methods such as geophysical surveys, geological mapping, trenching, drilling, bulk sampling, and laboratory tests followed by small-scale manganese test mining and mining operations. If economic manganese deposits are discovered within the MCs area, the Proponent will implement small-scale manganese mining operations. The following is the summary of the envisaged multi-phased project development process that will be implemented if the proposed and ongoing exploration is successful:

- (i) Feasibility, planning and permitting.
- (ii) Preconstruction and site clearing for the open pit mining areas and supporting infrastructure area such as onsite and offsite workers accommodation, administration block, processing plant area, storage, tailings and rock waste dumps, external and internal access/ transportation system, and all related services points for water and energy supplies.
- (iii) Construction of the proposed mine and all the supporting infrastructure.
- (iv) Mine operation, processing, stockpiling, transportation via road or new rail link to Walvis Bay through Okahandja for manganese export. The mining operations will be supported by ongoing monitoring and rehabilitation, and.
- (v) Decommissioning, final rehabilitation, closure, and aftercare.

The proposed exploration and small-scale mining activities will be implemented as soon as all the required regulatory permits such as the Environmental Clearance Certificate (ECC) have been granted by the Government as well as all key agreements have been concluded with the land owners, contractors and services providers.

1.3 Regulatory Requirements

The proposed prospecting and small-scale mining activities are listed in the Environmental Management Act, 2007, (Act No. 7 of 2007) and the EIA Regulations, 2012 and cannot be undertaken without an Environmental Clearance Certificate (ECC). The Proponent is required to have undertaken Environmental Assessment comprising this Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports for the proposed minerals prospecting activities.

In fulfilment of the environmental requirements, the Proponent appointed Risk-Based Solutions (RBS) CC as the Environmental Consultants led by Dr Sindila Mwiya as the Environmental Assessment Practitioner in the preparation of the EIA and EMP Reports to support the application for ECC (Annex 1).

1.4 Location, Land Use, Infrastructure and Services

1.4.1 Location and Land Use

The MCs Nos. 72264-72273 are located in the located in the Okahandja District in the Otjozondjupa Region, Central Namibia (Fig. 1.2 - 1.3). The MCs Nos. 72264-72273 combined area has a total area coverage of 180 Ha and falls within Farm Otjeherani (Sterkfontein) No. 216 (Fig. 1.4).

The land use of the minerals licence area is mainly dominated by commercial cattle and small stock agriculture. Bush thickening or encroachment is viewed as an economic problem in the general area with an estimated 4,000 to 12,000 plants/ha – mainly *Acacia mellifera* being the dominant problematic species (Bester 2001, Cunningham 1998, Mendelsohn *et al.*, 2002).

The area is not part of the communal conservancy system in Namibia with no protected area nearby the MCs area.

1.4.2 Supporting Infrastructure and Services

The project area is 132 km from Okahandja and accessible through 30 km tarred road from Okahandja and 100 km of gravel road along the C31, C30 and D2125 (Figs. 1.2 and 1.3). The MCs Nos. 72264-72273 area boarder the D2125 road and is internally serviced by several local farm tracks and some of the minor roads require high clearance 4 x 4 vehicles that may need to be upgraded as required.

The following supporting infrastructures and services will be required:

- (i) External and internal roads network: The Proponent will use the already existing external and internal roads. However, additional internal roads also likely to be created with the permission of the land owner.
- (ii) Water supply: The Proponent will utilise the existing boreholes with permission from the land owner/s. The exploration such as drilling operations will require limited water resources which will be supplied by a tanker. However, possible small-scale mining activities will need more water that will be sourced from groundwater resources. If new water supply boreholes will need to be drilled, the Proponent will be required to apply for freshwater abstraction permit from the Department of Water Affairs in the Ministry of Agriculture, Water and Land Reform (MAWLR).
- (iii) Energy: The proposed exploration and small-scale mining operations will use diesels and solar energy as may be required for exploration equipment and lighting, respectively. The small-scale mining operations may require reliable power supply to be supplied by NamPower. A new high voltage power line may be required, and.
- (iv) Accommodation and other supporting facilities and services: The exploration and possible small-scale mining team will utilise the exiting accommodation facilities and services in the area. In absence of such suitable facilities and services, the Proponent will provide onsite site prefabricated temporary accommodation and supporting portable infrastructures such as chemical toilets as well as other requirements as may be applicable.

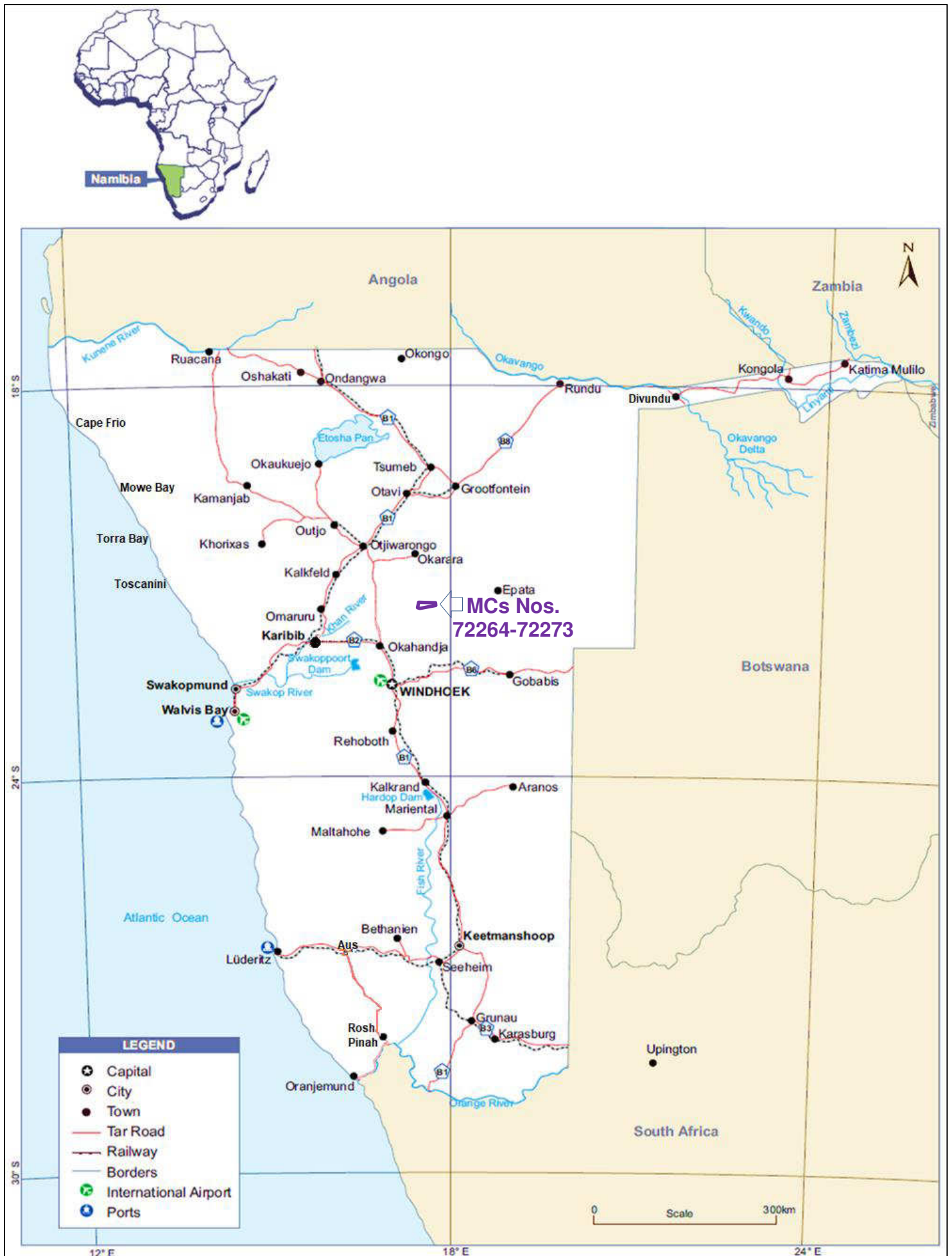


Figure 1.1: Regional location of the MCs Nos. 72264-72273 Area.

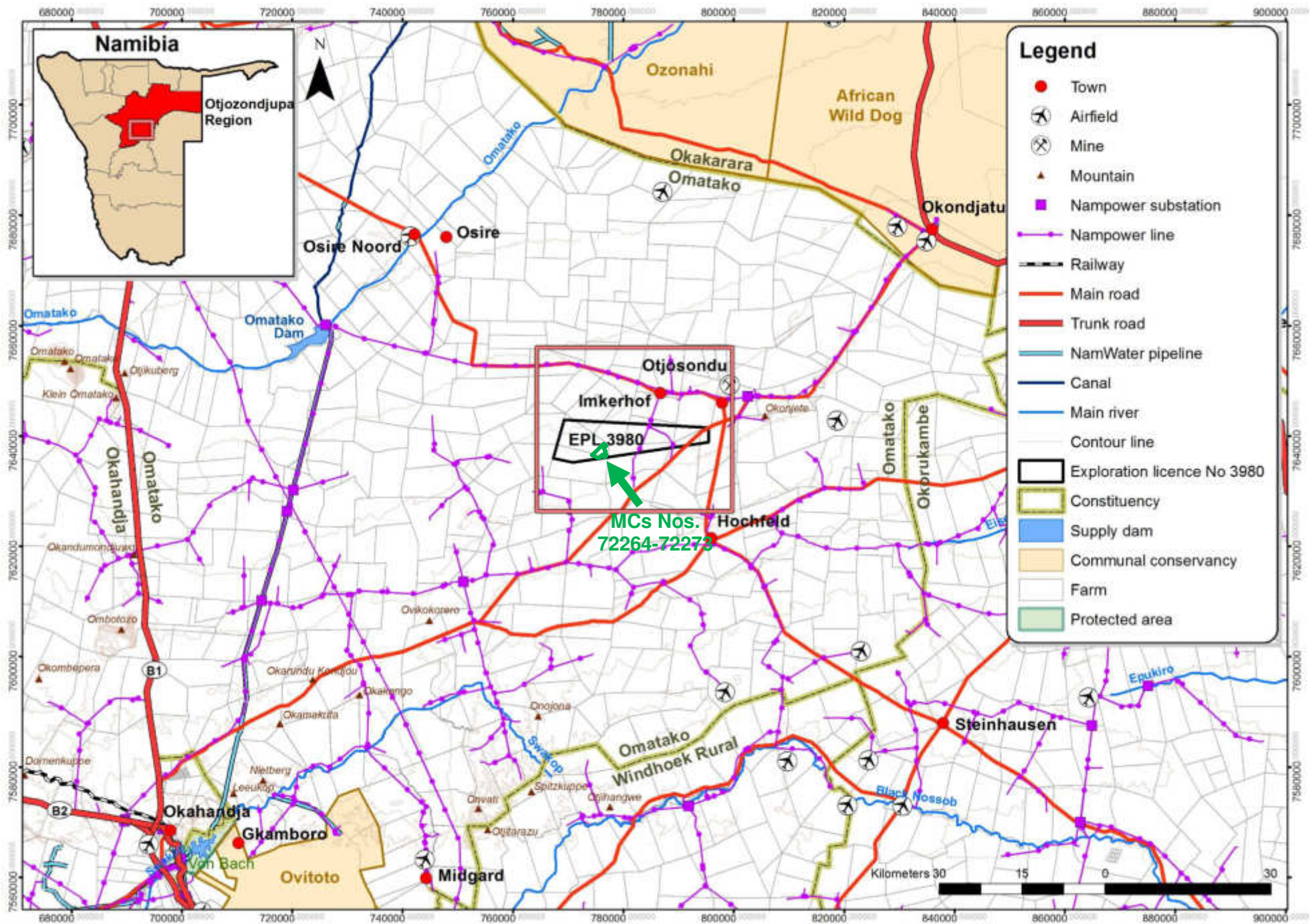


Figure 1.2: Regional location of the MCs Nos. 72264-72273 falling within the EPL No. 3980.

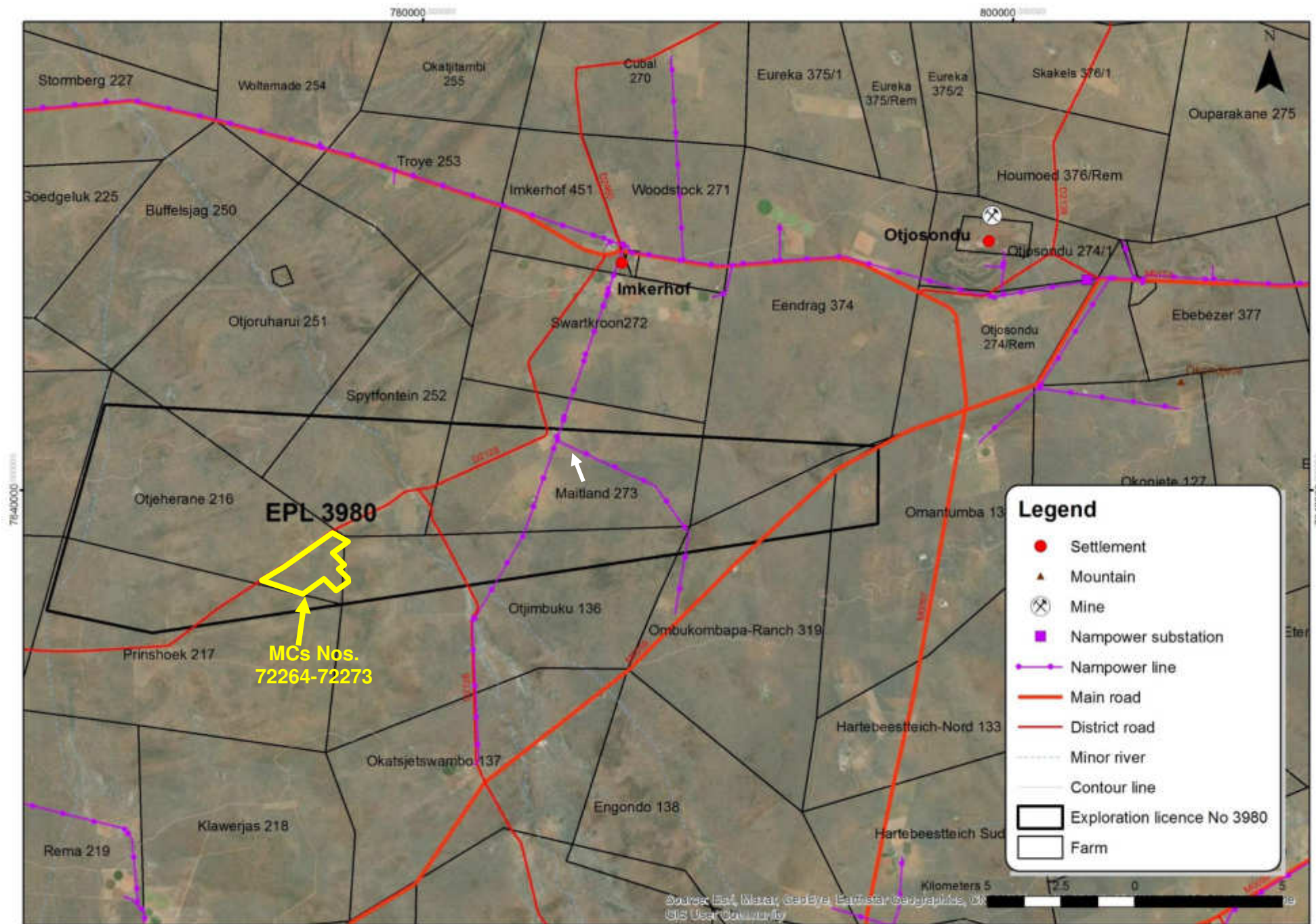


Figure 1.3: Detailed regional location of the MCs Nos. 72264-72273 within Otjeherani (Sterkfontein) No. 216 inside the EPL 3980 with key access.

NO.	Format	LAT			LONG		
		DEG	MIN	SEC	DEG	MIN	SEC
1	216L	-21°	20'	4.10165"	17°	40'	23.6563"
2	216M	-21°	20'	6.50976"	17°	40'	27.33534"
3	ROAD	-21°	19'	58.58005"	17°	40'	14.91994"
4	ROAD3	-21°	20'	39.70995"	17°	39'	16.85986"
5	OTJB1	-21°	20'	31.33121"	17°	39'	30.34723"
6	OTJB2	-21°	20'	23.0785"	17°	39'	42.18721"
7	OTJB3	-21°	20'	14.45452"	17°	39'	53.71044"
8	OTJB4	-21°	20'	5.83033"	17°	40'	5.2333"
9	OTJB5	-21°	19'	58.47496"	17°	40'	15.06032"
10	OTJB6	-21°	20'	6.97754"	17°	40'	27.32892"
11	OTJB7	-21°	20'	16.62602"	17°	40'	14.43848"
12	OTJB8	-21°	20'	25.25038"	17°	40'	2.91554"
13	OTJB9	-21°	20'	33.87454"	17°	39'	51.39223"
14	OTJB1	-21°	20'	42.49848"	17°	39'	39.86855"
15	OTJB1	-21°	20'	52.16304"	17°	39'	48.10906"
16	OTJB1	-21°	20'	52.80707"	17°	39'	49.72529"
17	OTJB1	-21°	20'	44.67045"	17°	40'	0.59764"
18	OTJB1	-21°	20'	39.54075"	17°	40'	7.45175"
19	OTJB1	-21°	20'	36.04612"	17°	40'	12.12102"
20	OTJB1	-21°	20'	30.86557"	17°	40'	19.04269"
21	OTJB1	-21°	20'	27.42155"	17°	40'	23.64403"
22	OTJB1	-21°	20'	40.0504"	17°	40'	26.8751"
23	OTJB1	-21°	20'	42.71643"	17°	40'	26.83852"
24	OTJB2	-21°	20'	50.33637"	17°	40'	16.65757"

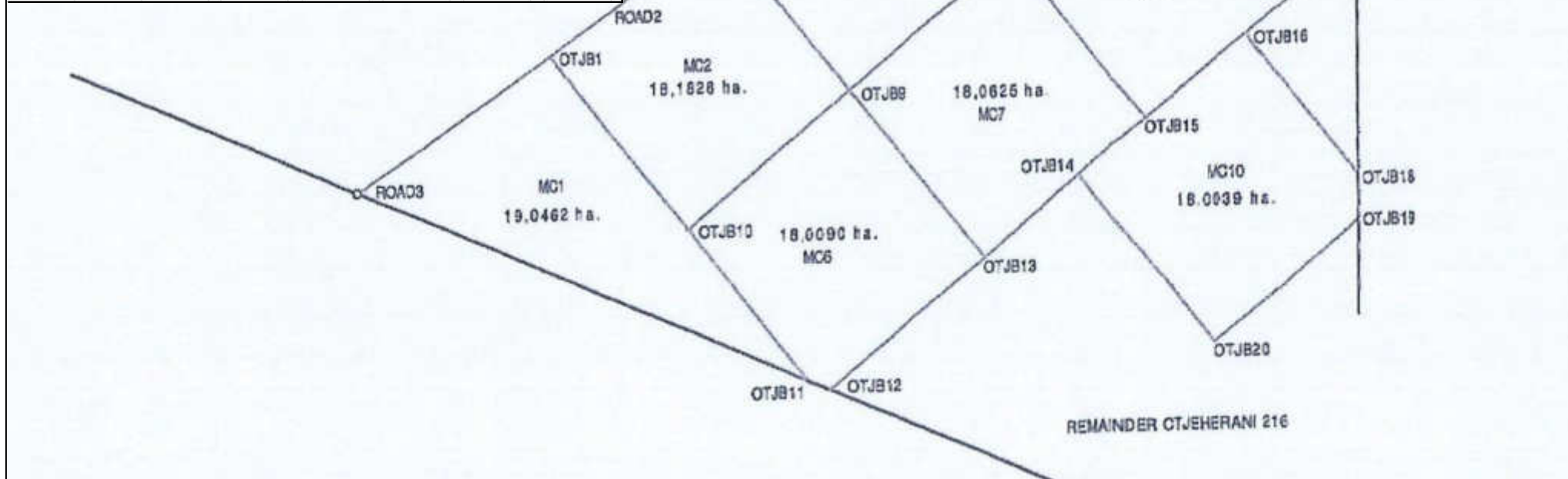


Figure 1.4: Detailed local location of the MCs No. Nos. 72264-72273 with coordinates.

1.5 Summary of the Receiving Environment

1.5.1 Topography

Topography around the MCs Area average around 1500mams (Fig. 1.5). The local landscape is characterised by general flat topography with minor valleys created by tributaries of the Otjikwara and Maramba Ephemeral River cutting the MCs Area at the western edge and central part respectively (Fig. 1.6). The river channels of these three (3) Ephemeral Rivers are key habitats and are a vital link to the local ecosystems. Other land use activities found in the general surrounding areas includes: agriculture, minerals exploration and growing tourism activities.

1.5.2 Habitats and Ecosystem

The MCs Nos. 72264-72273 falls within the Thornbush shrubland dominated by *Acacia mellifera*, *Acacia reficiens*, *Acacia fleckii*, *Boscia albitrunca*, *Lonchocarpus nelsii* and *Acacia erioloba* (Fig. 1.6). It is estimated that at least 77 reptile, 9 amphibian, 84 mammal, 208 bird species (breeding residents), at least 79-110 larger trees and shrubs and up to 111 grasses are known to or expected to occur in the general Otjiwarongo area of which a high proportion (e.g. 35.1% endemic reptiles) are endemics.

The most important areas in the general MCs Nos. 72264-72273 area are:

- (i) **Protected species:** The protected tree species – *Acacia erioloba*, *Albizia anthelmintica*, *Aloe litoralis*, *Boscia albitrunca* and *Ziziphus mucronata* – are viewed as the most important if found within the EPL particularly around any targeted site-specific development area (Figs. 1.5 and 1.6), and.
- (ii) **Rocky area / rock heads:** Rocky areas generally have high biodiversity and consequently viewed as important habitat for all vertebrate fauna and flora. Mountains and inselbergs are generally considered as sites of special ecological importance high in biotic richness and endemism (Curtis and Barnard 1998). Hills/ridges in particular have unique fauna – e.g. *Pachydactylus* and *Rhoptropus* species – and flora – e.g. *Aloe asperifolia*, *A. namibensis*, various *Commiphora* species, etc, and.
- (iii) **Ephemeral drainage lines:** Ephemeral drainage lines usually support larger trees and consequently viewed as important habitat for all vertebrate fauna and flora. Ephemeral rivers are viewed as sites of special ecological importance mainly for its biotic richness; large desert-dwelling mammals; high value for human subsistence and tourism (Curtis and Barnard 1998). Such vegetated rivers in an otherwise extreme arid environment are unique habitat and a virtual lifeline to many desert dwelling faunas. Temporary rainwater pools and seeps are also known to occur in some of the major Ephemeral Rivers making these habitats a virtual lifeline to various desert dwelling fauna.

The general MCs Area is regarded as “moderate to high” in overall (all terrestrial species) diversity and endemism (Mendelsohn *et al.* 2002). According to Simmons (1998b) central Namibia has between 161-200 endemic vertebrates (all vertebrates included).

The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “high” with 7-8 species while the overall diversity of large carnivorous mammals (large predators) is determined at 4 species with leopard and cheetah being the most important with “high” densities followed by brown hyena with “medium” densities (Mendelsohn *et al.* 2002).

1.5.3 Geology

The MCs Nos. 72264-72273 Area falls within the eastern part of the southern Central Zone of the north-easterly trending intracontinental branch of the Pan-African Damara orogenic belt, just north of the Okahandja lineament (Fig. 1.7, Roesener, *et al.*, 2004 and Miller 2008).

The MCs Area cover part of the well-known Otjosundu Manganese field comprising Neoproterozoic ferromanganese rocks that occur in an area of poor exposure in the eastern part of the southern Central

Zone of the Damara Orogen and has been studied mined around Otjosondu (De Villiers, 1951, Vermass, 1952, Roper, 1959, Miller, 1983, Miller, 1992, Bühn *et al.*, 1992, Bühn and Stanistreet, 1992/93, Steven, 1993, Bühn *et al.*, 1995, Bühn and Stanistreet, 1997, Geological Survey of Namibia, 1999, Miller, 2008, Cabral, *et al.*, 2011).

The local geology of the MCs Area is shown in Fig. 1.7

1.5.4 Water

According to the Department of Water Affairs and Forestry, (2001) and the regional and local geology, the MCs Nos. 72264-72273 falls within an area with very limited economic groundwater water resources (aquifers) (Fig. 1.7). Water supply in the general area is from local groundwater resources (Department of Water Affairs, 2001).

The proposed project activities (exploration programme) will utilise local groundwater resources. No site-specific hydrogeological specialist study, groundwater modelling or water sampling and testing activities have been undertaken for this study.

Some parts of the MCs Area are covered by local fractured, fissured, karstified and porous rocks that seems to have localised moderate groundwater potential (Figs. 1.7 and 1.8). The overall water be vulnerability to pollution as a result of the proposed exploration as well as other existing activities is moderate.

1.5.5 Socioeconomic

Locally, the MCs Nos. 72264-72273 falls within Omatako Constituency with population of 17, 619. The exploration area has a relatively low population density of 0.7 /km² and Omatako Constituency is the least populated constituency in Otjozondjupa Region.

The household main income in Omatako constituency are: Farming, wages and salaries, cash remittance business, non-farming and pension.

1.5.6 Archaeology, Historical and Cultural Resources

The MCs Area is likely to evidence from the early colonial period relates to mining in the general area and a combination of trade, missionary activity and indigenous tribes use of iron for various applications. Early colonial remains are expected to be relatively abundant on MCs Nos. 72264-72273, although it is likely that if these are related to historical mining activity, they will form part of the general area of mining interest in the vicinity.

It is expected that the area of interest will be extensively disturbed and that little might remain of either pre-colonial or early colonial sites in the near vicinity.

The Proponent must not disturb major natural shelters or cavities that may be unearthed because they could hold some highly significant historical or cultural sites that would require detailed documentation and possibly mitigation measures to be adopted in the event of encroachment by mining activity.

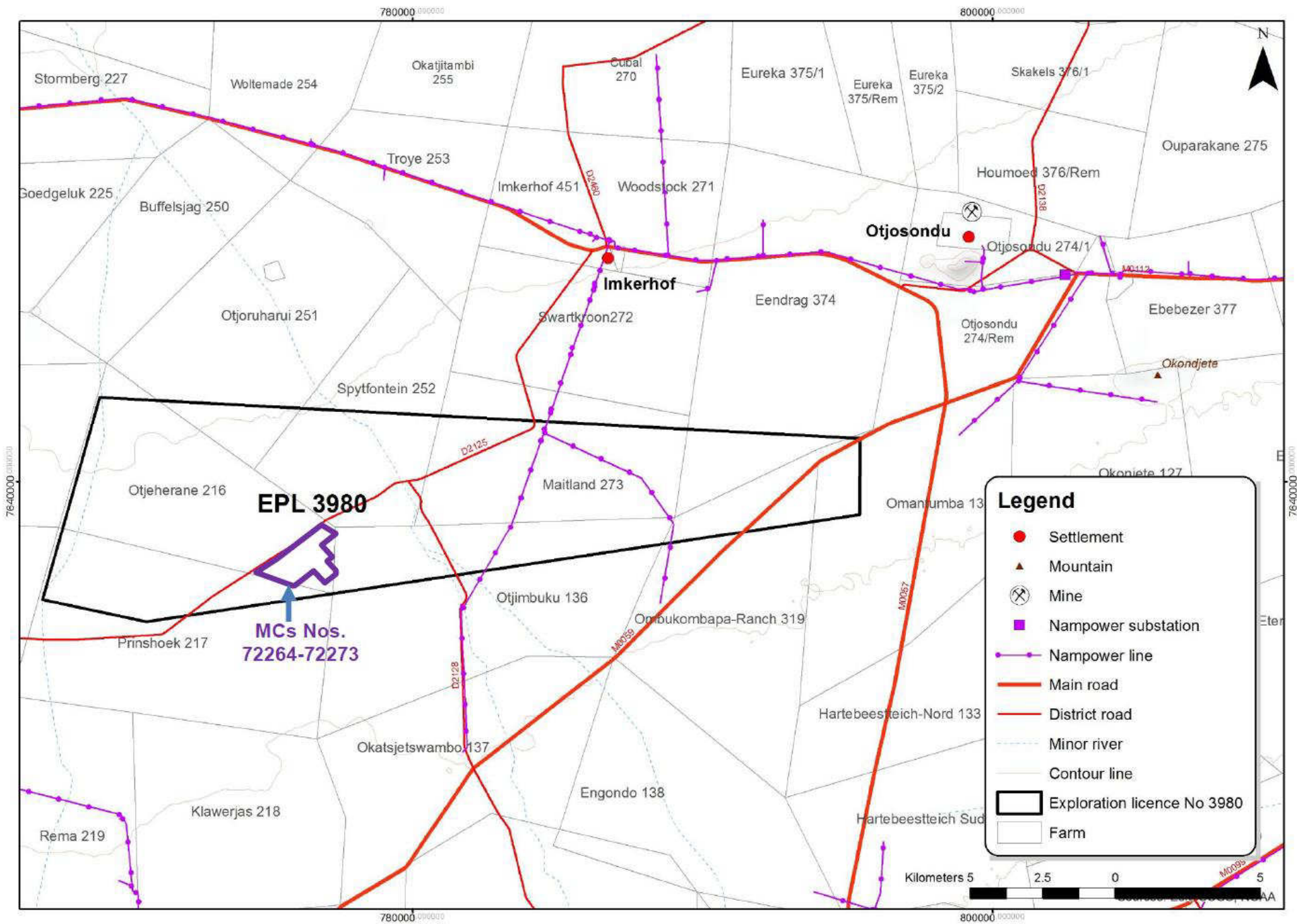


Figure 1.5: Detailed topographic map of the MCs Nos. 72264-72273 and surrounding areas.

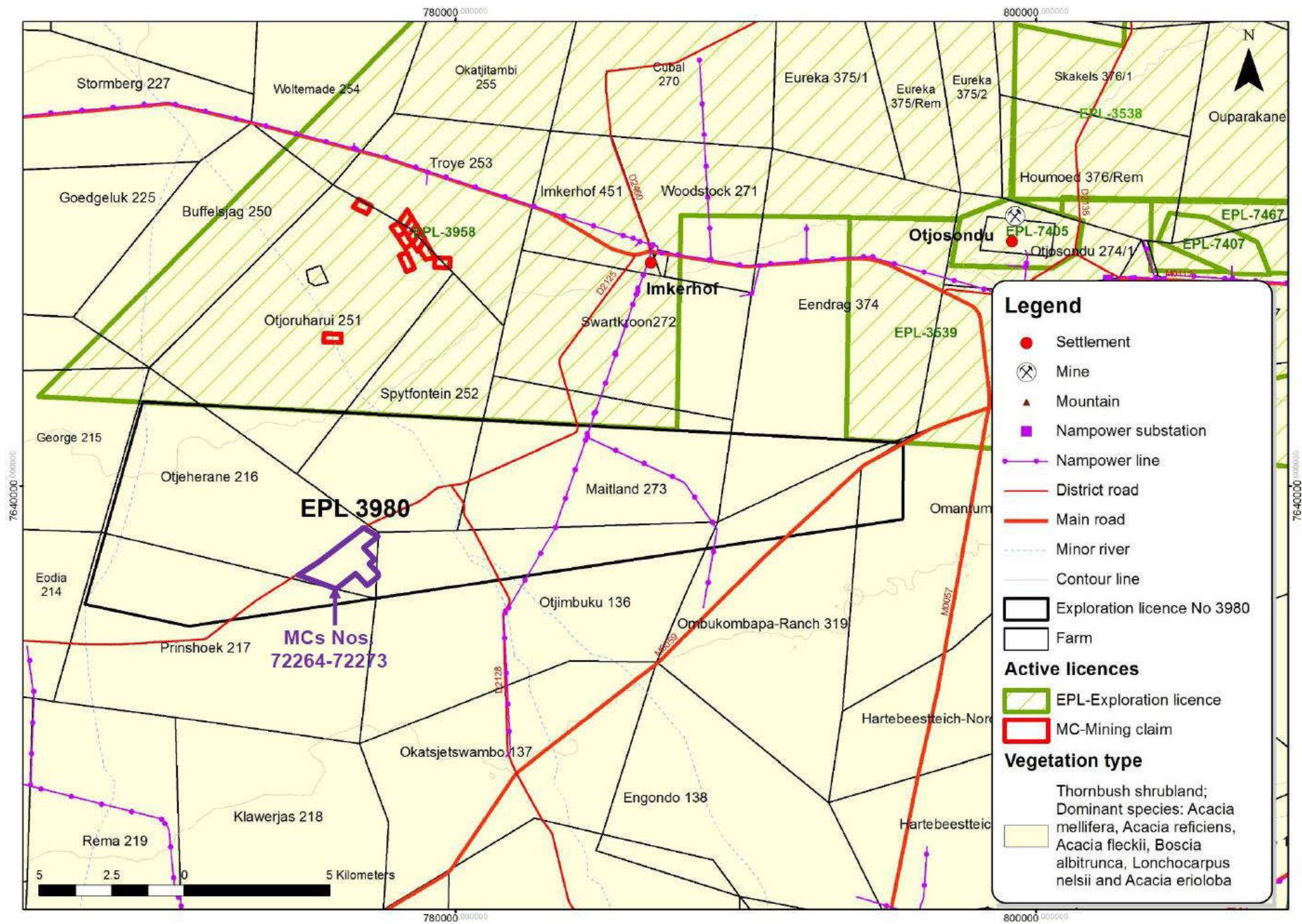


Figure 1.6: Vegetation map of the MCs Nos. 72264-72273 other existing minerals licenses and infrastructures in the surrounding areas.

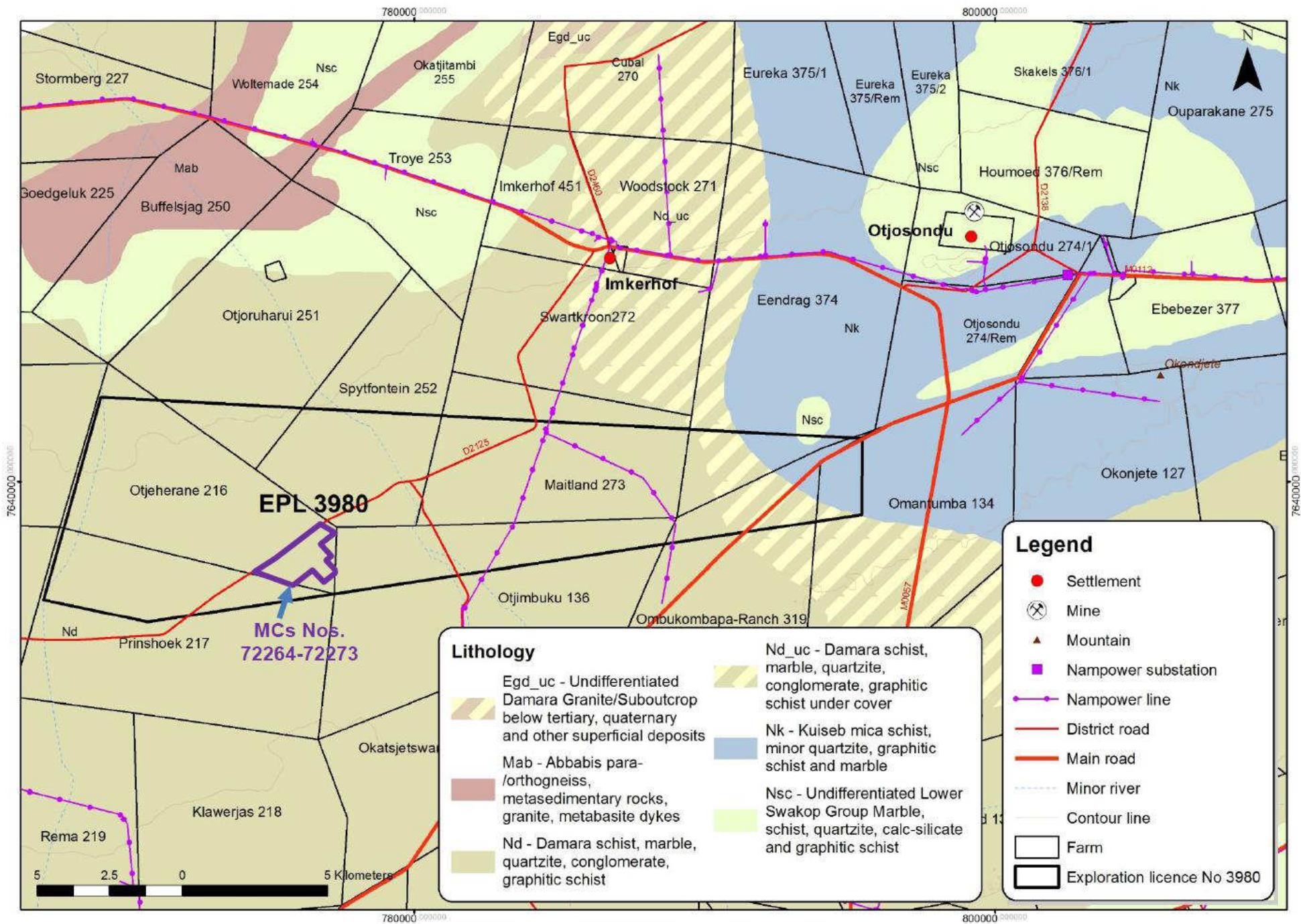


Figure 1.7: Simplified local geological map of the MCs Nos. 72264-72273.

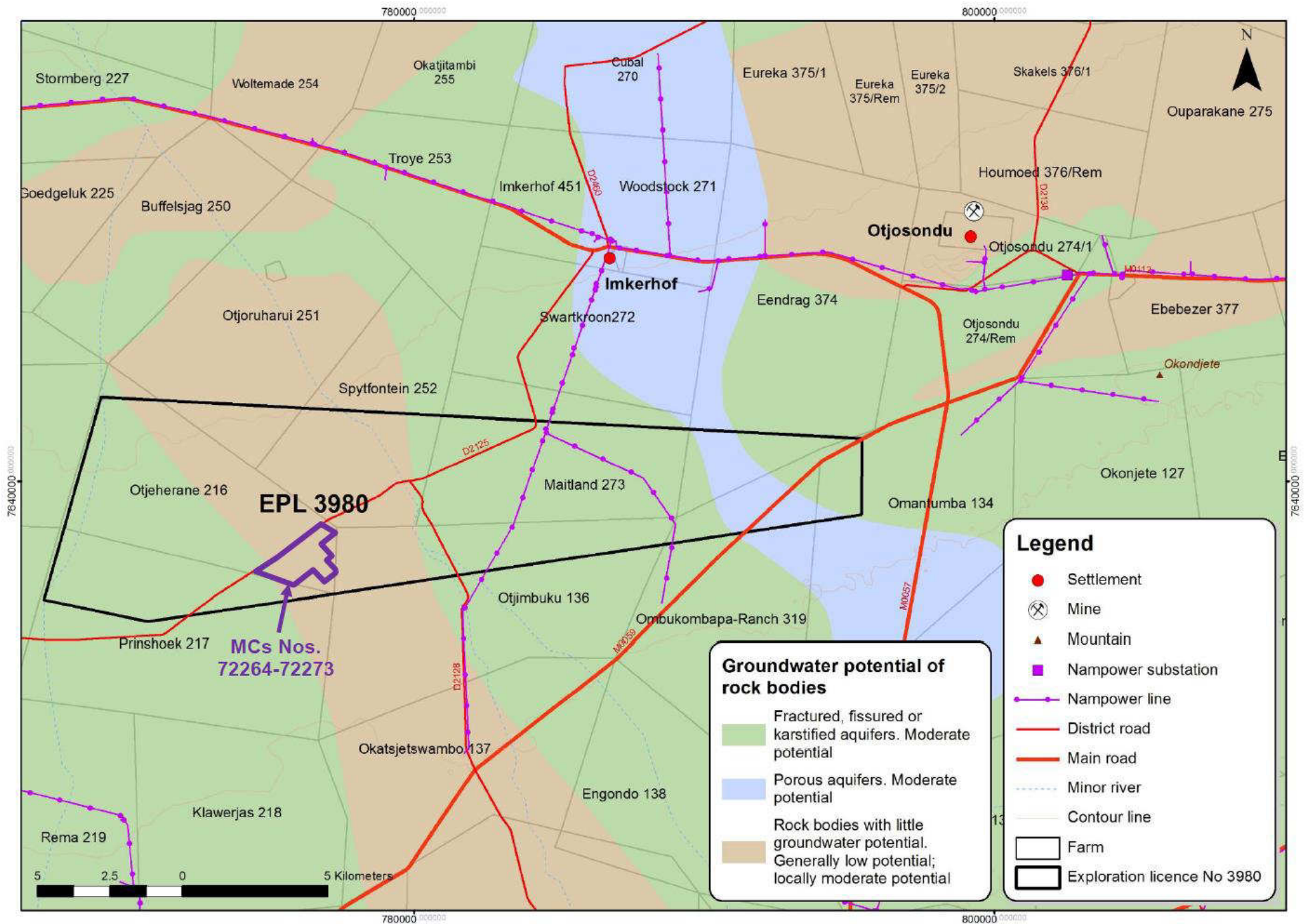


Figure 1.8: Simplified hydrogeological map of the MCs Nos. 72264-72273.

2. OBJECTIVES OF THE EMP

2.1 Summary Objectives

This EMP provides a detailed plan of actions required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively. The EMP also provides the management actions with roles and responsibilities requirements for the successful implementation of environmental management strategies by Proponent.

2.2 EMP Management Linkages

The mitigation measures described in this EMP report are based on the impacts assessment results detailed in the EIA Report. The EMP must be continuously updated during the implementation of the proposed project activities and throughout the project lifecycle. This EMP Reports incorporates the provisions of the Namibian Environmental regulations and policies as well as international environmental best practices in mining development, operational, rehabilitation, closure and aftercare activities.

2.3 Summary of Impact Assessment Results

2.3.1 Summary of Impacts Assessment Methodology

The EIA and EMP process used for this project took into considerations the provisions of the Environmental Impact Assessment (EIA) Regulations, 2012 and the Environmental Management Act (EMA), 2007, (Act No. 7 of 2007) as outlined in Fig. 2.1.

The Proponent intends undertake exploration activities covering desktop studies, followed by site-specific activities on targets that may be delineated and using exploration techniques/ methods such as geophysical surveys, geological mapping, trenching, drilling, bulk sampling and test mining. The detailed outline of all the activities associated with each of the exploration stages as sources of potential environmental impacts are outlined in Table 2.1. The impact assessment methodology adopted a two-dimensional matrix approach in predicting the potential impacts of the proposed project on the receiving environment. The two-dimensional matrix consisted of the following cross-referencing (Tables 2.2 and 2.3):

- ❖ The activities linked to the project that could have an impact on the receiving environment, and.
- ❖ The existing environmental and social conditions that could possibly be affected by the project.

The impact assessment considerations included land disturbance/land use impacts. potential impacts to specially designated areas. impacts to soil, water and air resources. impacts to vegetation, wildlife, wildlife habitat, and sensitive species. visual, cultural, paleontological, socioeconomic and potential impacts from hazardous materials are provided in the EIA Report.

2.3.2 Summary of Impact Assessment Results

To determine the likely environmental impacts as well as the overall significant impacts of individual sources associated with the proposed exploration activities within the MCs Area (Table 2.1), an impact identification and assessment process was undertaken as detailed in this report. Details of the impact assessment results, definitions, methodology as well as the baseline \ receiving environment are provided in the EIA Report.

As detailed in the EIA Report, the significant impact identification and assessment processes focused on the evaluation of the influences of the proposed project activities pathways and the likely targets or receptor (receiving environment). In this process, components of the project activities that are likely to impact the natural environment (physical, biological and socioeconomic) were broken down into individual development stages and activities.

The summary of the overall impact and significant impact assessment results as detailed in the EIA Report associated with the proposed activities / sources of potential impacts with respect to the receiving environment that could potentially be affected are presented in Tables 2.2-2.4 and Table 2.5 respectively.

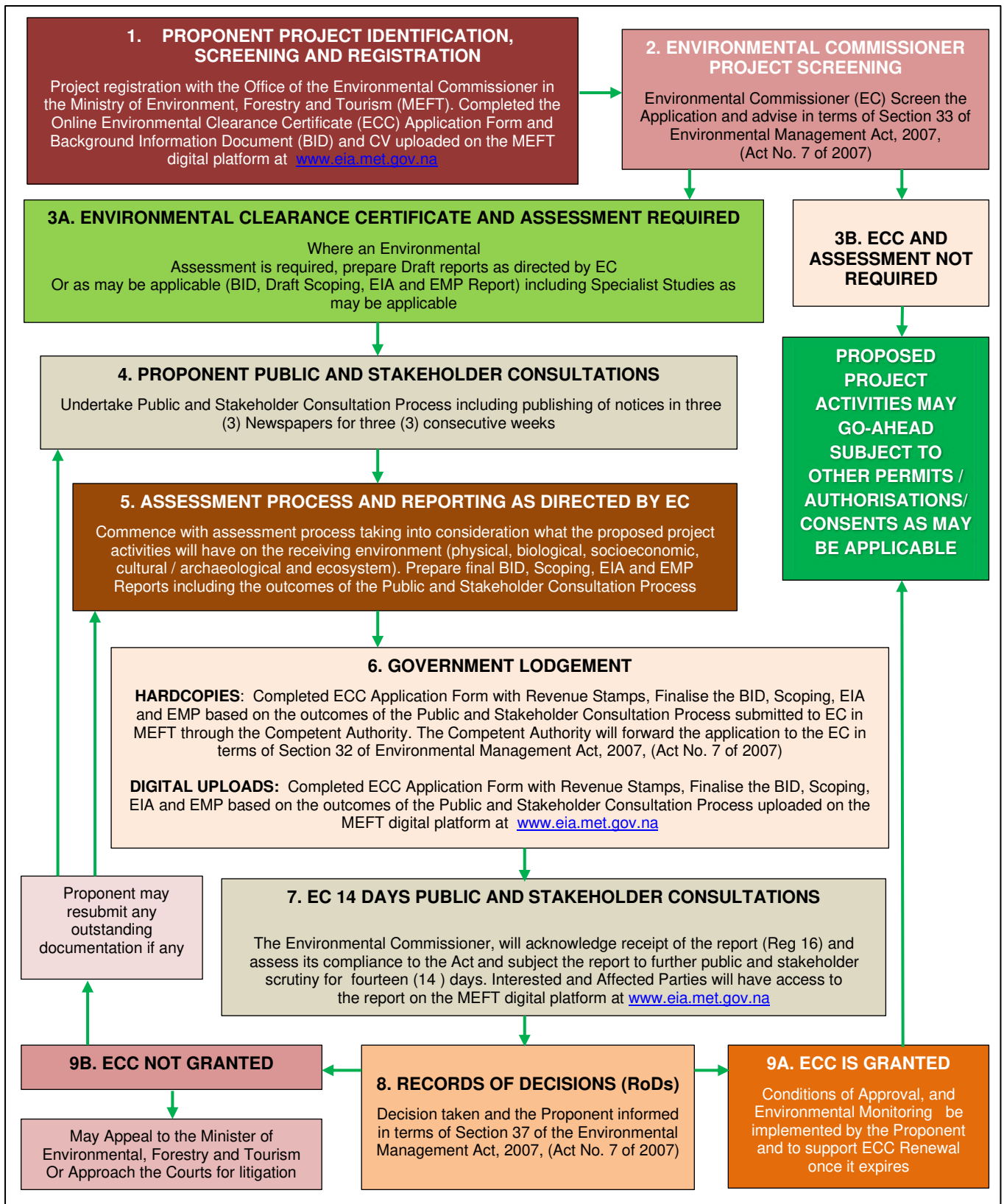


Figure 2.1: RBS Schematic presentation of Namibia's Environmental Assessment Procedure.

Table 2.1: Summary of the proposed activities, alternatives and key issues considered during the environmental assessment (EA) process for the proposed exploration and small-scale mining operations in the MCs Nos. 72264-72273.

PROJECT ACTIVITIES		ALTERNATIVES CONSIDERED	Key Issues to be Evaluated and Assessed with Environmental Management Plan (EMP) / Mitigation Measures Developed	
1. Project Implementation and Initial Desktop Exploration Activities	Review of existing information and all previous activities in order identify any potential target/s in within the MCs Area	(i) Location for Minerals Occurrence: Several economic deposits are known to exist in different parts of Namibia and some have been explored by different companies over the years. The proponent intends to explore / prospect for possible economic minerals occurrence in the MCs Area as licensed. Minerals occurrence is linked to the geology or local rock outcrops and site-specific. (ii) Other Alternative Land Uses: Game farming, tourism and agriculture (iii) Ecosystem Function (What the Ecosystem Does. (iv) Ecosystem Services. (v) Use Values. (vi) Non-Use, or Passive Use. (vii) The No-Action Alternative (viii) Others to be identified during the public consultation process and preparation of the EIA and EMP Reports	Potential land use conflicts / opportunities for coexistence between proposed exploration and other existing land uses such as conservation, tourism and agriculture	
2. Regional Reconnaissance Field-Based	Regional mapping and sampling to identify and verify potential targeted areas based on the recommendations of the desktop work undertaken under (1) above		PHYSICAL ENVIRONMENT	<ul style="list-style-type: none"> Water Quality Physical infrastructure and Resources Air quality, Noise and dust Landscape and topography value Soil quality Climate Change Influences
3. Initial Local Field-Based Activities	May include: Widely spaced geological mapping, sampling, surveying and possible trenching and drilling in order to determine the viability of any delineated local target/s		BIOLOGICAL ENVIRONMENT	<ul style="list-style-type: none"> Habitat Protected Areas Flora Fauna Ecosystem functions, services, use values and non-Use or passive use
4. Detailed Local Field-Based Activities on Delineated Targets If Any	Following the delineation of potential target/s, conduct detailed mapping, trenching, sampling, surveying and drilling in order to determine the viability of the project.			
5. Prefeasibility and Feasibility Studies	Assess the viability of any delineated local target/s and more detailed mapping, trenching, bulk sampling, drilling and test mining activities where applicable. If the project proves viable, a feasibility report and application for Mining License will be undertaken.		SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT	<ul style="list-style-type: none"> Local, regional and national socioeconomic settings Commercial Agriculture Community Protected Areas Tourism and Recreation Cultural, Biological and Archaeological Resources
6. Small-Scale Manganese Mining Operations	Preconstruction, Construction, Operation, ongoing exploration, monitoring and rehabilitation, Closure, decommissioning, and aftercare.			

Table 2.2: Results of the sensitivity assessment of the receptors (Physical, Socioeconomic and Biological environments) with respect to the proposed exploration small-scale mining operations without mitigations.

RECEPTOR SENSITIVITY			PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT					
SENSITIVITY RATING		CRITERIA	Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.																
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance																
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(ii) Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(iii) Purchase and analysis of existing Government aerial hyperspectral	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical, and remote sensing mapping and data analysis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 2.2: Cont.

RECEPTOR SENSITIVITY			PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT				
SENSITIVITY RATING		CRITERIA	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.																
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance																
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																
3. Initial Local Field-Based Activities	(i)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(ii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(iii)	Ground geophysical survey	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(iv)	Possible Trenching	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(v)	Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(vi)	Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
4. Detailed Local Field-Based Activities	(i)	Access preparation and related logistics to support activities	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	+3	-3	-3	-3	-3
	(ii)	Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(iii)	Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+2	-2	-2	-2	-2
	(iv)	Ground geophysical survey, trenching, drilling and sampling	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	+3	-3	-3	-3	-3
5. Prefeasibility and Feasibility Studies	(i)	Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	+3	-3	-3	-3	-3
	(ii)	Detailed drilling and bulk sampling and testing for ore reserve calculations	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	+3	-3	-3	-3	-3
	(iii)	Geotechnical studies for mine design	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	+3	-3	-3	-3	-3
	(iv)	Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities	1	1	1	1	1	1	1	1	1	1	1	+1	1	1	1	1
	(v)	EIA and EMP to support the ECC for mining operations	1	1	1	1	1	1	1	1	1	1	1	+1	1	1	1	1
	(vi)	Preparation of feasibility report and application for Mining License	1	1	1	1	1	1	1	1	1	1	1	+1	1	1	1	1
6. Small-Scale Mining Operations	(i)	Preconstruction and construction stages	-4	-4	-4	-4	-4	-4	-3	-3	-3	-3	-3	+4	-3	-3	-3	-3
	(ii)	Small-scale mining operations	-4	-4	-4	-4	-4	-4	-3	-3	-3	-3	-3	+4	-3	-3	-3	-3
	(iii)	Decommissioning, final rehabilitation, closure, and aftercare	-4	-4	-4	-4	-4	-4	-3	-3	-3	-3	-3	+4	-3	-3	-3	-3

Table 2.3: Results of the scored time (duration) over which the impact is expected to last during the exploration and small-scale mining operations without mitigations.

RECEPTOR SENSITIVITY		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT												
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources							
<table border="1"> <thead> <tr> <th>SCALE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>T</td> <td>Temporary</td> </tr> <tr> <td>P</td> <td>Permanent</td> </tr> </tbody> </table>		SCALE	DESCRIPTION	T	Temporary	P	Permanent																	
SCALE	DESCRIPTION																							
T	Temporary																							
P	Permanent																							
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(ii) Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(iii) Purchase and analysis of existing Government aerial hyperspectral	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical, and remote sensing mapping and data analysis	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T						

Table 2.3: Cont.

DURATION OF IMPACT		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT					
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources	
SCALE		DESCRIPTION																
T		Temporary																
P		Permanent																
3. Initial Local Field-Based Activities	(i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(iii) Ground geophysical survey	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(iv) Possible Trenching	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
4. Detailed Local Field-Based Activities	(i) Access preparation and related logistics to support activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(iv) Ground geophysical survey, trenching, drilling and sampling	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
5. Prefeasibility and Feasibility Studies	(i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(ii) Detailed drilling and bulk sampling and testing for ore reserve calculations	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(iii) Geotechnical studies for mine design	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(iv) Mine planning and designs including all supporting infrastructures (water, energy and access) and test mining activities	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(v) EIA and EMP to support the ECC for mining operations	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	(vi) Preparation of feasibility report and application for Mining License	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
6. Small-Scale Mining Operations	(i) Preconstruction and construction stages	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
	(ii) Small-scale mining operations	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
	(iii) Decommissioning, final rehabilitation, closure, and aftercare	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

Table 2.4: Results of the scored geographical extent of the induced change during the exploration and small-scale mining operations without mitigations.

GEOGRAPHICAL EXTENT OF IMPACT		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT																	
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources												
<table border="1"> <thead> <tr> <th>SCALE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>limited impact on location</td> </tr> <tr> <td>O</td> <td>impact of importance for municipality</td> </tr> <tr> <td>R</td> <td>impact of regional character</td> </tr> <tr> <td>N</td> <td>impact of national character</td> </tr> <tr> <td>M</td> <td>impact of cross-border character</td> </tr> </tbody> </table>		SCALE	DESCRIPTION	L	limited impact on location	O	impact of importance for municipality	R	impact of regional character	N	impact of national character	M	impact of cross-border character																
SCALE	DESCRIPTION																												
L	limited impact on location																												
O	impact of importance for municipality																												
R	impact of regional character																												
N	impact of national character																												
M	impact of cross-border character																												
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Purchase and analysis of existing Government high resolution magnetic and radiometric geophysical data	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Purchase and analysis of existing Government aerial hyperspectral	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical, and remote sensing mapping and data analysis	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												

Table 2.4: Cont.

GEOGRAPHICAL EXTENT OF IMPACT		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT																
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources												
<table border="1"> <thead> <tr> <th>SCALE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>limited impact on location</td> </tr> <tr> <td>O</td> <td>impact of importance for municipality</td> </tr> <tr> <td>R</td> <td>impact of regional character</td> </tr> <tr> <td>N</td> <td>impact of national character</td> </tr> <tr> <td>M</td> <td>impact of cross-border character</td> </tr> </tbody> </table>		SCALE	DESCRIPTION	L	limited impact on location	O	impact of importance for municipality	R	impact of regional character	N	impact of national character	M	impact of cross-border character																
SCALE	DESCRIPTION																												
L	limited impact on location																												
O	impact of importance for municipality																												
R	impact of regional character																												
N	impact of national character																												
M	impact of cross-border character																												
3. Initial Local Field-Based Activities	(i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Ground geophysical survey	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iv) Possible Trenching	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
4. Detailed Local Field-Based Activities	(i) Access preparation and related logistics to support activities	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iv) Ground geophysical survey, trenching, drilling and sampling	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
5. Prefeasibility and Feasibility Studies	(i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Detailed drilling and bulk sampling and testing for ore reserve calculations	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Geotechnical studies for mine design	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iv) Mine planning and designs including all supporting infrastructures (water, energy, and access) and test mining activities	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(v) EIA and EMP to support the ECC for mining operations	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(vi) Preparation of feasibility report and application for Mining License	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
6. Small-Scale Mining Operations	(i) Preconstruction and construction stages	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(ii) Small-scale mining operations	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												
	(iii) Decommissioning, final rehabilitation, closure, and aftercare	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L												

Table 2.5: Results of the qualitative scale of probability occurrence during the exploration and small-scale mining operations without mitigations.

IMPACT PROBABILITY OCCURRENCE		PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT					
		Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
SCALE		DESCRIPTION															
A		Extremely unlikely (e.g. never heard of in the industry)															
B		Unlikely (e.g. heard of in the industry but considered unlikely)															
C		Low likelihood (egg such incidents/impacts have occurred but are uncommon)															
D		Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)															
E		High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)															
1. Initial Desktop Exploration Activities	(i)	General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data															
	(ii)	Purchase and analysis of existing Government high resolution magnetics and radiometric geophysical data															
	(iii)	Purchase and analysis of existing Government aerial hyperspectral															
	(iv)	Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets															
2. Regional Reconnaissance Field-Based Activities	(i)	Regional geological, geochemical, topographical, and remote sensing mapping and data analysis															
	(ii)	Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken															
	(iii)	Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken															
	(iv)	Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days															
	(v)	Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets															

Table 2.5: Cont.

IMPACT PROBABILITY OCCURRENCE		PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT				
SCALE	DESCRIPTION	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
A	Extremely unlikely (e.g. never heard of in the industry)																
B	Unlikely (e.g. heard of in the industry but considered unlikely)																
C	Low likelihood (egg such incidents/impacts have occurred but are uncommon)																
D	Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)																
E	High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)																
3. Initial Local Field-Based Activities	(i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	(ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	(iii) Ground geophysical survey	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	(iv) Possible Trenching	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	(v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	(vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
4. Detailed Local Field-Based Activities	(i) Access preparation and related logistics to support activities	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(iv) Ground geophysical survey, trenching, drilling, and sampling	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
5. Prefeasibility and Feasibility Studies	(i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(ii) Detailed drilling and bulk sampling and testing for ore reserve calculations	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(iii) Geotechnical studies for mine design	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(iv) Mine planning and designs including all supporting infrastructures (water, energy, and access) and test mining activities	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	(v) EIA and EMP to support the ECC for mining operations	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
	(vi) Preparation of feasibility report and application for Mining License	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
6. Small-Scale Mining Operations	(i) Preconstruction and construction stages	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	(ii) Small-scale mining operations	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	(iii) Decommissioning, final rehabilitation, closure, and aftercare	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Table 2.6: Significant impact assessment matrix for the proposed exploration and small-scale manganese mining activities without mitigations.

SIGNIFICANT IMPACT						PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT																					
IMPACT SEVERITY <small>Magnitude, Duration, Extent, Probability</small>	RECEPTOR CHARACTERISTICS (SENSITIVITY)					Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources															
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)																															
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																															
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																															
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																															
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																															
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																															
1. Initial Desktop Exploration Activities	(i) General evaluation of satellite, topographic, land tenure, accessibility, supporting infrastructures and socioeconomic environment data					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(ii) Purchase and analysis of existing Government high resolution magnetic and radiometric geophysical data					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(iii) Purchase and analysis of existing Government aerial hyperspectral					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(iv) Data interpretation and delineating of potential targets for future reconnaissance regional field-based activities for delineated targets					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
2. Regional Reconnaissance Field-Based Activities	(i) Regional geological, geochemical, topographical, and remote sensing mapping and data analysis					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(ii) Regional geochemical sampling aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(iii) Regional geological mapping aimed at identifying possible targeted based on the results of the initial exploration and regional geological, topographical, and remote sensing mapping and analysis undertaken					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(iv) Limited field-based support and logistical activities including exploration camp site lasting between one (1) to two (2) days					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																
	(v) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets for future detailed site-specific exploration if the results are positive and supports further exploration of the delineated targets					-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1																

Table 2.6: Cont.

SENSITIVITY						PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT					
IMPACT SEVERITY [Magnitude, Duration, Extent, Probability]	RECEPTOR CHARACTERISTICS (SENSITIVITY)					Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Commercial Agriculture	Community Protected Areas	Tourism and Recreation	Cultural, Biological and Archaeological Resources
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)																
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																
3. Initial Local Field-Based Activities	(i) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during regional reconnaissance field activities	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1	
	(ii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1	
	(iii) Ground geophysical survey	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(iv) Possible Trenching	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(v) Field-based support and logistical activities will be very limited focus on a site-specific area for a very short time (maximum five (5) days)	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(vi) Laboratory analysis of the samples collected and interpretation of the results and delineating of potential targets	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1	
4. Detailed Local Field-Based Activities	(i) Access preparation and related logistics to support activities	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-3/2	-3/2	-3/2	-3/2	-3/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(ii) Local geochemical sampling aimed at verifying the prospectivity of the target/s delineated during the initial field-based activities	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-3/2	-3/2	-3/2	-3/2	-3/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(iii) Local geological mapping aimed at identifying possible targeted based on the results of the regional geological and analysis undertaken	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(iv) Ground geophysical survey, trenching, drilling, and sampling	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-3/2	-3/2	-3/2	-3/2	-3/2	+2/2	-2/2	-2/2	-2/2	-2/2	
5. Prefeasibility and Feasibility Studies	(i) Detailed site-specific field-based support and logistical activities, surveys, detailed geological mapping	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	+2/2	-2/2	-2/2	-2/2	-2/2		
	(ii) Detailed drilling and bulk sampling and testing for ore reserve calculations	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	
	(iii) Geotechnical studies for mine design	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	-2/2	+2/2	-2/2	-2/2	-2/2	-2/2	
	(iv) Mine planning and designs including all supporting infrastructures (water, energy, and access) and test mining activities	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	-3/3	+3/3	-3/3	-3/3	-3/3	-3/3	
	(v) EIA and EMP to support the ECC for mining operations	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1	
	(vi) Preparation of feasibility report and application for Mining License	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1	
6. Small-Scale Mining Operations	(i) Preconstruction and construction stages	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	+4/4	-4/4	-4/4	-4/4	-4/4	
	(ii) Small-scale mining operations	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	+4/4	-4/4	-4/4	-4/4	-4/4	
	(iii) Decommissioning, final rehabilitation, closure, and aftercare	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	-4/4	+4/4	-4/4	-4/4	-4/4	-4/4	

2.4 Implementation of the EMP

2.4.1 Roles and Responsibilities

Management of the environmental elements that may be affected by the different activities of the proposed / ongoing exploration is an important element of the proposed / ongoing exploration activities. The EMP also identifies the activity groups / environmental elements, the aspects / targets, the indicators, the schedule for implementation and who should be responsible for the management to prevent major impacts that the different exploration activities may have on the receiving environment (physical and biological environments).

All the responsibilities to ensure that the recommendations are executed accordingly, rest with the Proponent. The company must provide all appropriate resource requirements for the implementation of the EMP. It is the responsibility of Proponent to make sure that all members of the workforce including contractors and subcontractors are aware of the EMP and its objectives. The following abbreviations are used to indicate who should be responsible for the implementation:

1. Project Developer (PD) / Project Operator (PO),
2. Project Manager (PM).
3. Project Engineer (PE).
4. Site Engineer (SE)
5. Project Geologist (PG).
6. Geological Technician (GT).
7. Team Leader (TL).
8. Contractor (CONT)
9. Subcontractor (SCONT).
10. Environmental Control Officer (ECO).
11. Environmental Coordinator (EC).
12. Environmental Social Government (ESG).
13. Otjovondjupa Regional Council (ORC).
14. Ministry of Environment, Forestry and Tourism (MET).
15. Ministry of Mines and Energy (MME), and.
16. Interested and Affected Parties (I&APs).

2.4.2 Proponent's Representative (PR) / Project Manager (PM)

The Proponent is to appoint a **Proponent's Representative (PR) / Project Manager (PM)** with overall project management responsibilities and EMP implementation, monitoring and reporting not limited to the following as may be applicable:

- ❖ Act as the site project manager and implementing agent.

- ❖ Ensure that the Proponent's responsibilities are executed in compliance with the relevant legislation.
- ❖ Ensure that all the necessary environmental authorisations and permits have been obtained.
- ❖ Assist the project team and contractor/s in finding environmentally responsible solutions to challenges that may arise.
- ❖ Should the PR believe a serious threat to, or impact on the environment may be caused by the ongoing activities, he/she may stop work. The Proponent shall be informed of the reasons for the stoppage as soon as possible.
- ❖ The ER or as may be contractually delegated, has the authority to institute disciplinary proceedings in accordance with the provisions of the national laws for transgressions of basic conduct rules and/or contravention of the EMP.
- ❖ Should the Contractor or his/her employees fail to show adequate consideration for the environmental aspects related to the EMP, the ER can have person(s) and/or equipment removed from the site or work suspended until the matter is remedied.
- ❖ Report to the Employer on the implementation of the EMP on site (with input from the HSE and Environmental Social Governance (ESG) / EMP Coordinators and/or independent environmental auditor).
- ❖ Maintain open and direct lines of communication between the Employer, ESG/ EMP Coordinators, Contractor, and stakeholders with regards to environmental matters, and.
- ❖ Attend regular site meetings and inspections.

2.4.3 Project Health, Safety and Environment (Project HSE)

The Proponent is to appoint a Project Health, Safety and Environment (Project HSE) with responsibilities not limited to the following as may be applicable and with respect to the EMP implementation, monitoring and reporting:

- ❖ Manage the site HSE day to day issues.
- ❖ Assist the PR and Contractor in finding environmentally responsible solutions to challenges that may arise.
- ❖ Conduct HSE site reviews.
- ❖ Carry out regular site inspections (on average once per week) of all exploration areas with regards to compliance with the EMP and document any non-compliance(s) and report to the PR as soon as possible.
- ❖ Support external HSE regulatory inspections / audits as may be required.
- ❖ Continuously review the site HSE requirements and recommend additions and/or changes to the EMP and other documents.
- ❖ Monitor the Contractor's HSE awareness training for all new personnel coming onto site.
- ❖ Keep records of all activities related to HSE control and monitoring. the latter to include a photographic record of the site preparation, construction, drilling operations / activities, rehabilitation process, and a register of all major incidents, and.
- ❖ Attend regular site meetings / debriefing and training.

2.4.4 Environmental Social Governance (ESG) / EMP Coordinator/s

The **Environmental Social Governance (ESG) / EMP Coordinator/s** shall have responsibilities not limited to the following as may be applicable and with respect to the EMP implementation, monitoring and reporting:

- ❖ Provide guidance on the implementation of the EMP and Environmental Social Governance (ESG) requirements.
- ❖ Coordinates, implement and monitor all the Corporate Social Responsibilities (CSRs) projects.
- ❖ Assist the project team in ensuring that the necessary environmental authorisations and permits are in place and valid.
- ❖ Assist the project team in finding environmentally responsible solutions to challenges that may arise.
- ❖ Conduct internal environmental review / monitoring as per EMP requirements.
- ❖ Oversee basic EMP conduct rules/ protocols and/or contraventions.
- ❖ Advise the PM / Proponent on the removal of person(s) and/or equipment not complying with the specifications of the EMP.
- ❖ Carry out regular site inspections / reviews (on average once per week) of all operations project areas with regards to compliance with the EMP provisions and report any non-compliance(s) to the PM as soon as possible.
- ❖ Support regulatory / inspections on the implementation of and compliance to the EMP.
- ❖ Organise and support regular independent environmental monitoring as may be required.
- ❖ Continuously review the EMP and recommend additions and/or changes to the EMP document as may be applicable.
- ❖ Monitor the Contractor's environmental awareness training for all new personnel coming onto site.
- ❖ Keep records of all activities related to environmental control and monitoring. the latter to include a photographic record of the construction and environmental control and rehabilitation process, and a register of all major incidents, and.
- ❖ Attend site and community/ stakeholders engagements or consultations meetings as may be required.

2.4.5 Contractors and Subcontractors

The responsibilities of the **Contractors and Subcontractors** that may be appointed by the Proponent to undertake certain field-based activities related to the project:

- ❖ Comply with the relevant legislation and the EMP provision.
- ❖ Preparation and submission to the Proponent through the Project HSE of the following Management Plans:
 - Environmental awareness training and inductions.
 - Emergency preparedness and response.

- Waste management, and.
- HSE.
- ❖ Ensure adequate environmental awareness training for senior site personnel.
- ❖ Environmental awareness presentations (inductions) to be given to all site personnel prior to work commencement. the Project HSE is to provide the course content and the following topics, at least but not limited to, should be covered:
 - The importance of complying with the EMP provisions.
 - Roles and responsibilities, including emergency preparedness.
 - Basic rules of conduct (Do's and Don'ts).
 - EMP: aspects, impacts and mitigation.
 - Disciplinary actions to be taken for failure to adhere to the EMP, and.
 - Health and safety requirements.
- ❖ Record keeping of all environmental awareness training and induction presentations, and.
- ❖ Attend regular site meetings and environmental inspections.

2.4.6 Construction Supporting Teams

The construction of mine, processing plant and supporting infrastructure will require an array of specialist teams working very closely with their suppliers and core Proponent Namibia onsite operations team. The following is a summary of some of the specialists that will be required during the construction phase as part of the team of contractors:

- ❖ Civil/Structural Contractors, Metallurgist, Mechanical and Crane Contractors, Electrical Contractors and each with their respective Sub-contractors and Suppliers, would report directly to the Employer's Representative (ER), acting as the onsite Project Manager.

3. EMP MITIGATION MEASURES

3.1 Hierarchy of Mitigation Measures Implementation

A hierarchy of methods for mitigating significant adverse effects has been adopted in order of preference and as follows:

- (i) Enhancement, e.g. provision of new habitats.
- (ii) Avoidance, e.g. sensitive design to avoid effects on ecological receptors.
- (iii) Reduction, e.g. limitation of effects on receptors through design changes, and.
- (iv) Compensation, e.g. community benefits.

3.2 Mitigation Measures Implementation

The Environmental Management Plan (EMP) provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively.

The EMP also provides the management actions with roles and responsibilities requirements for implementation of environmental management strategies by the Proponent through the Contractors and Subcontractors who will be undertaking the exploration activities.

The EMP gives commitments including financial and human resources provisions for effective management of the likely environmental liabilities during and after the implementation of the proposed / ongoing exploration programme.

Based on the findings of the EIA, key mitigation measures as detailed in Tables 3.1 – 3.18 have been prepared to be implemented by the Proponent with respect to the proposed / ongoing exploration programme activities and in particular for the field-based exploration activities. The following is the summary of the key areas of the migration measures provided in Tables 3.1-3.18:

1. Project planning and implementation.
2. Implementation of the EMP.
3. Public and stakeholders relations.
4. Measures to enhance positive socioeconomic impacts.
5. Environmental awareness briefing and training.
6. Erection of supporting exploration and small-scale mining infrastructure.
7. Use of existing access roads, tracks and general vehicle movements.
8. Mitigation measures for preventing flora destruction.
9. Mitigation measures for preventing faunal destruction.
10. Mitigation measures to be implemented with respect to the exploration, small-scale mining, and infrastructure support areas.
11. Mitigation measures for surface and groundwater protection as well as general water usage.
12. Mitigation measures to minimise negative socioeconomic impacts.

13. Mitigation measures to minimise health and safety impacts.
14. Mitigation measures to minimise visual impacts.
15. Mitigation measures to minimise vibration, noise and air quality.
16. Mitigation measures for waste (solid and liquid) management.
17. Rehabilitation plan, and.
18. Environmental data collection.

Table 3.1: Project planning and implementation.

OBJECTIVES	INDICATOR	SCHEDULE	RESPONSIBILITY
<p>Establish a strong environmental awareness protocol from project implementation to final closure in order to ensure the least possible impact to the environment.</p>	<ol style="list-style-type: none"> 1. Resources (Human and Financial) are provided for the Environmental Awareness and Training, Regular Safety, Health and Environment meetings and for internal and external Environmental Monitoring Costs as well as for any rehabilitation costs that may arise. 2. Appointment of a senior and experienced persons as Proponent's Representative (PR), Project Manager (PM) and Project HSE to assume responsibility for environmental issues. 3. All individuals including sub-contractors who work on, or visit, the sites are aware of the contents of the Environmental Policy and the EMP. 4. The EMP and Environmental Policy will be included in Tender Documents. 5. Field visit will take place during which main access tracks will be discussed in cooperation with the land owner/s 	<ol style="list-style-type: none"> 1. Regional reconnaissance field-based mapping and sampling activities. 2. Initial local field-based mapping and sampling activities. 3. Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. 4. Prefeasibility and feasibility studies. 5. Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.2: Implementation of the EMP.

OBJECTIVES	INDICATOR	SCHEDULE	RESPONSIBILITY
<ol style="list-style-type: none"> 1. Define roles and responsibilities in terms of the EMP. To make all personnel, contractors and subcontractors aware of these roles and responsibilities to ensure compliance with the EMP provisions. 2. Implement environmental management that is preventative and proactive. 3. Establish the resources, skills, etc. required for effective environmental management. 	<ol style="list-style-type: none"> 1. Senior staff and senior contractors are aware of, and practice the EMP requirements. These persons shall be expected to know and understand the objectives of the EMP and will, by example, encourage suitable environmentally friendly behaviour to be adopted during the exploration 2. Recognition will be given to appropriate environmentally acceptable behaviour. 3. Inappropriate behaviour will be corrected. An explanation to why the behaviour is unacceptable must be given, and, if necessary, the person will be disciplined. e.g. fees set out for non-compliance 	<ol style="list-style-type: none"> 1. Regional reconnaissance field-based mapping and sampling activities. 2. Initial local field-based mapping and sampling activities. 3. Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. 4. Prefeasibility and feasibility studies. 5. Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare. 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.3: Public and stakeholders relations.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Maintain sound relationships with the Other land users/ land owner/s and another stakeholders / public	<ol style="list-style-type: none"> No littering or any other activity prohibited Permission to utilise water as well as all applicable permits are obtained. 	<ol style="list-style-type: none"> Regional reconnaissance field-based mapping and sampling activities. Initial local field-based mapping and sampling activities. Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. Prefeasibility and feasibility studies. Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)

Table 3.4: Measures to enhance positive socioeconomic impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Measures to enhance positive socioeconomic impacts in order to:</p> <ol style="list-style-type: none"> Avoid exacerbating the influx of unemployed people to the area. Develop a standardised recruitment method for sub-contractor and field workers. 	<ol style="list-style-type: none"> Stipulate a preference for local contractors in its tender policy. Preference to local contractors should still be based on competitive business principles and salaries and payment to local service providers should still be competitive. Develop a database of local businesses that qualify as potential service providers and invite them to the tender process. Scrutinise tender proposals to ensure that minimum wages were included in the costing. Stipulate that local residents should be employed for temporary unskilled/skilled and where possible in permanent unskilled/skilled positions as they would reinvest in the local economy. Must ensure that potential employees are from the area, they need submit proof of having lived in the area for a minimum of 5 years. Must ensure that contractors adhere to Namibian Affirmative Action, Labour and Social Security, Health and Safety laws. This could be accomplished with a contractual requirement stipulating that monthly proof should be submitted indicating payment of minimum wages to workers, against their ID numbers, payment of social security and submission of affirmative action data. Encouraged to cater for the needs of employees to increase the spending of wages locally. 	<ol style="list-style-type: none"> Regional reconnaissance field-based mapping and sampling activities. Initial local field-based mapping and sampling activities. Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. Prefeasibility and feasibility studies. Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)

Table 3.5: Environmental awareness briefing and training.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Implement environmental awareness briefing / training for individuals who visit, or work, on site.	<ol style="list-style-type: none"> 1. Every senior/supervisory member of the team shall familiarise themselves with the contents of the EMP. They shall understand their roles and responsibilities with regard to personnel and project compliance with the EMP. 2. Subject to agreement of the parties, the Environmental Coordinator will hold an Environmental Awareness Briefing meeting, which shall be attended by all contractors before the start of the mineral exploration activities. 3. Briefings on the EMP and Environmental Policy shall discuss the potential dangers to the environment of the following activities: public relations, littering, off-road driving, waste management, poaching and plant theft etc. The need to preserve soil, conserve water and implement water saving measures shall be presented. 4. Individuals can be questioned on the Environmental Philosophy and EMP and can recall contents. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)

Table 3.6: Erection of supporting exploration and small-scale mining infrastructure.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<ol style="list-style-type: none"> 1. Get Environmental Clearance before implementation 2. Establishment of the supporting exploration infrastructure done on an area with the least disturbance to the environment and within the non-sensitive areas 	<ol style="list-style-type: none"> 1. Documented Environmental Clearance from MET. 2. All on site exploration infrastructure (e.g. water tanks, sewage tanks, waste disposal) are not situated on environmental sensitive area and have disturbed as less as possible. 3. No littering. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)

Table 3.7: Use of existing access roads, tracks, and general vehicle movements.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>1. Plan a road/track network that considers the environmental sensitivity of the area and a long-term tourism potential, and which is constructed in a technically and environmentally sound manner.</p> <p>2. Stick to the recommended track and sensitivity management zones.</p>	<ol style="list-style-type: none"> 1. Avoid unnecessary affecting areas viewed as important habitat – i.e. Ephemeral River and its network of tributaries of ephemeral rivers. rocky outcrops. clumps of protected tree species. 2. Make use of existing tracks/roads as much as possible throughout the area. 3. Do not drive randomly throughout the area (could cause mortalities to vertebrate fauna and unique flora. accidental fires. erosion related problems, etc.). 4. Avoid off-road driving at night as this increases mortality of nocturnal species. 5. Implement and maintain off-road track discipline with maximum speed limits (e.g.30km/h) as this would result in fewer faunal mortalities and limit dust pollution. 6. Use of "3-point-turns" rather than "U-turns". 7. Where tracks have to be made to potential exploration sites off the main routes, the routes should be selected causing minimal damage to the environment – e.g. use the same tracks. cross drainage lines at right angles. avoid placing tracks within drainage lines. avoid collateral damage (i.e. select routes that do not require the unnecessary removal of trees/shrubs, especially protected species). 8. Leave vehicles on tracks and walk to point of interest, when possible. 9. Rehabilitate all new tracks created. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.8: Mitigation measures for preventing flora and ecosystem destruction and promotion of conservation.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Prevent flora and ecosystem destruction and promote conservation</p>	<ol style="list-style-type: none"> 1. Limit the development and avoid rocky outcrops throughout the entire area. 2. Avoid development and associated infrastructure in sensitive areas – e.g. Ephemeral River, in/close to drainage lines, cliffs, boulder and rocky outcrops in the area, etc. This would minimise the negative effect on the local environment especially unique features serving as habitat to various species. 3. Avoid placing access routes (roads and tracks) through sensitive areas – e.g. over rocky outcrops/ridges and along drainage lines. This would minimise the effect on localised potentially sensitive habitats in the area. 4. Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks – especially during the detailed field-based exploration phase. This would minimise the effect on localised potentially sensitive habitats in the area. 5. Stick to speed limits of maximum 30km/h as this would result in less dust pollution which could affect certain flora – e.g. lichen species. Speed humps could also be used to ensure the speed limit. 6. Remove unique and sensitive flora (e.g. all Aloe sp.) before commencing with the development activities and relocate to a less sensitive/disturbed site if possible. 7. Prevent and discourage the collecting of firewood as dead wood has an important ecological role – especially during the development phase(s). Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g. chopping down of live and/or protected tree species such as Acacia erioloba which is a good quality wood. 8. Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna. 9. Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires causing problems (e.g. loss of grazing and domestic stock mortalities, etc.) for the neighbouring farmers. 10. Rehabilitation of the disturbed areas – i.e. initial development access route “scars” and associated tracks as well as temporary accommodation sites. Preferably workers should be transported in/out to the MCs Area on a daily basis to avoid excess damage to the local environment (e.g. fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment. 11. Implement erosion control. The area(s) towards and adjacent the drainage line(s) are easily eroded and further development may exacerbate this problem. Avoid undertaking any exploration activities including supporting activities such as camping within 20m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated fauna. 12. Conduct a thorough investigation on the flora associated with the proposed exploration site(s). 13. Prevent the introduction of potentially invasive alien plant species (e.g. Tecoma stans, Pennisetum setaceum, etc.) for ornamental purposes as part of the landscaping should mining activities eventually commence. Alien species often “escape” and become invasive causing further ecological damage. 14. A thorough investigation of water use and ground water extraction should take place before actual mining activities commence as this would affect the local flora, especially the ephemeral riparian vegetation, not only locally, but downstream as well. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.9: Mitigation measures for preventing faunal and ecosystem destruction and promotion of conservation.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Prevent faunal and ecosystem destruction and promote conservation</p>	<ol style="list-style-type: none"> 1. Limit the development and avoid rocky outcrops throughout the entire area. 2. Avoid development & associated infrastructure in sensitive areas – e.g. in/close to drainage lines, cliffs, boulder and rocky outcrops in the area, etc. This would minimise the negative effect on the local environment especially unique features serving as habitat to various species. 3. Avoid placing access routes (roads & tracks) through sensitive areas – e.g. over rocky outcrops/ridges and along drainage lines. This would minimise the effect on localised potentially sensitive habitats in the area. 4. Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks – especially during the detailed field-based exploration phase. This would minimise the effect on localised potentially sensitive habitats in the area. 5. Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit. 6. Remove (e.g. capture) unique fauna and sensitive fauna before commencing with the development activities and relocate to a less sensitive/disturbed site if possible. 7. Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g. tortoises, etc.), indiscriminate killing of perceived dangerous species (e.g. snakes, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the development phase(s). 8. Attempt to avoid the removal of bigger trees during the development phase(s) – especially with the development of access routes – as these serve as habitat for a myriad of fauna. 9. Prevent and discourage fires – especially during the development phase(s) – as this could easily cause runaway veld fires affecting the local fauna, but also causing problems (e.g. loss of grazing & domestic stock mortalities, etc.) for the neighbouring farmers. 10. Rehabilitation of the disturbed areas – i.e. initial development access route “scars” and associated tracks as well as temporary accommodation sites. Preferably workers should be transported in/out to the MCs Area on a daily basis to avoid excess damage to the local environment (e.g. fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment. 11. Implement erosion control. The area(s) towards & adjacent the drainage line(s) are easily eroded and further development may exacerbate this problem. Avoid undertaking exploration activities including supporting activities such as camping within 20m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated fauna. 12. Conduct a thorough investigation on the fauna associated with the proposed exploration site(s). 13. Prevent the number of domestic pets – e.g. cats & dogs – accompanying the workers during the field-based exploration activities as cats decimate the local fauna and interbreed & transmit diseases to the indigenous African Wildcat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna. The indiscriminate and wanton killing of the local fauna by such pets should be avoided at all costs. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.10: Mitigation measures to be implemented with respect to the exploration, small-scale mining, and infrastructure support areas.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of conservation through preservation of flora, fauna and ecosystem around the exploration camps and exploration sites</p>	<ol style="list-style-type: none"> 1. Select camp sites and other temporary lay over sites with care – i.e. avoid important habitats. 2. Use portable toilets to avoid faecal pollution around camp and exploration sites. 3. Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g. baboon, black-backed jackal, etc.. 4. Avoid and/or limit the use of lights during nocturnal exploration activities as this could influence and/or affect various nocturnal species – e.g. bats and owls, etc. Use focused lighting for least effect. 5. Prevent the killing of species viewed as dangerous – e.g. various snakes – when on site. 6. Prevent the setting of snares for ungulates (i.e. poaching) or collection of veld foods (e.g. tortoises) and unique plants (e.g. various Aloe and Lithop) or any form of illegal hunting activities. 7. Avoid introducing dogs and cats as pets to camp sites as these can cause significant mortalities to local fauna (cats) and even stock losses (dogs). 8. Remove and relocate slow moving vertebrate fauna (e.g. tortoises, chameleon, snakes, etc.) to suitable habitat elsewhere on property. 9. Avoid the removal and/or damaging of protected flora potentially occurring in the general area – e.g. various Aloe, Commiphora and Lithop species. 10. Avoid introducing ornamental plants, especially potential invasive alien species, as part of the landscaping of the camp site, etc., but rather use localised indigenous species, should landscaping be attempted, which would also require less maintenance (e.g. water). 11. Remove all invasive alien species on site, especially Prosopis sp., which is already becoming a major ecological problem along various water courses throughout Central Namibia. This would not only indicate environmental commitment, but actively contribute to a better landscape. 12. Inform contractors/workers regarding the above-mentioned issues prior to exploration activities and monitor for compliance thereof throughout. 13. Rehabilitate all areas disturbed by the exploration activities – i.e. camp sites, exploration sites, etc.. 14. Implement a policy of replacing 2 tree species (preferably the same species) for every 1 protected tree species having to be removed (if necessary). 15. Although fires are not expected to be a major issue in the general area due to the overall lack of grass cover, some years it may be necessary to consider fire prevention. Ensure that adequate firefighting equipment (e.g. fire beaters, extinguishers, etc.) is available at camp sites and clear kitchen areas to avoid accidental fires. 16. Employ an independent environmental auditor to ensure compliance, especially of the rehabilitation of all the affected areas. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.11: Mitigation measures for surface and groundwater protection as well as general water usage.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Effective management / protection of surface and groundwater resources and general water resources usage</p>	<ol style="list-style-type: none"> 1. Always use as little water as possible. Reduce, reuse and re-cycle water where possible. 2. All leaking pipes / taps must be repaired immediately they are noticed. 3. Never leave taps running. Close taps after you have finished using them. 4. Never allow any hazardous substance to soak into the soil. 5. Immediately tell your Contractor or Environmental Control Officer / Site Manager when you spill, or notice any hazardous substance being spilled during the field-based exploration activities or around the camp site. 6. Report to your Contractor or Environmental Control Officer / Site Manager when you notice any container, which may hold a hazardous substance, overflow, leak or drip. 7. Immediately report to your Contractor or Environmental Control Officer / Site Manager when you notice overflowing problems or unhygienic conditions at the ablution facilities. 8. No washing of vehicles, equipment and machinery, containers and other surfaces. 9. Limit the operation to a specific site and avoid sensitive areas and in particular the Ephemeral River Channel. This would sacrifice the actual area for other adjacent Ephemeral River areas and thus minimise any likely negative effect on water resources. 10. Disposal of wastewater into any public stream is prohibited. 11. The Proponent must obtain permission of the land owners before utilising any water resources or any associated infrastructure. 12. If there is a need to drilling a water borehole to support the exploration programme the Proponent must obtain permission form the land owner and Department of Water Affairs in the Ministry of Agriculture and Forestry. In an event of discovery of economic minerals resources, the sources of water supply for the mining related operations will be supplied by NamWater. 13. If there are any further (larger scale) exploration/drilling activities and/or mining activities to follow from the initial planned drill holes, groundwater monitoring must be implemented to include water level monitoring and also water sampling on a bi-annual basis. In order to have greater transparency on the water monitoring activities, the affected landowners / farmers must be given full access to the results of the water monitoring analyses. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.12: Mitigation measures to minimise negative socioeconomic impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Effective management of socioeconomic benefits of the proposed / ongoing project activities</p>	<ol style="list-style-type: none"> 1. The employment of local residents and local companies should be a priority. To ensure that potential employees are from the area, they need submit proof of having lived in the area for a minimum of 5 years. 2. Providing information such as the number and types of jobs available, availability of accommodation facilities and rental costs and living expenses, could make potential job seekers wary of moving to the area. 3. Addressing unrealistic expectations about large numbers of jobs would be created. 4. Exploration camp if required should be established in close consultation with the land owners. 5. Exploration camp should consider provision of basic services. 6. When the contracts an employee is terminated or not renewed, contractors should transport the employee out of the area to their hometowns within two days of their contracts coming to an end. 7. Tender documents could stipulate that contractors have HIV/Aids workplace policies and programmes in place and proof of implementation should be submitted with invoicing. 8. Develop strategies in coordination with local health officers and NGO's to protect the local communities, especially young girls. 9. Contract companies could submit a code of conduct, stipulating disciplinary actions where employees are guilty of criminal activities in and around the vicinity of the EPL. Disciplinary actions should be in accordance with Namibian legislation. 10. Contract companies could implement a no-tolerance policy regarding the use of alcohol and workers should submit to a breathalyser test upon reporting for duty daily. 11. Request that the Roads Authority erect warning signs of heavy exploration vehicles on affected public roads. 12. Ensure that drivers adhere to speed limits and that speed limits are strictly enforced. 13. Ensure that vehicles are road worthy and drivers are qualified. 14. Train drivers in potential safety issues. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.13: Mitigation measures to minimise health and safety impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of health and safe working environment in line with national Labour Laws</p>	<ol style="list-style-type: none"> 1. Physical hazards: Follow national and international regulatory and guidelines provisions, use of correct Personal Proactive Clothing at all times, training programme, as well as the implementation of a fall protection program in accordance with the Labour Act. 2. Some of the public access management measures that may be considered in an event of vandalism occurring are: <ul style="list-style-type: none"> • All exploration equipment must be in good working condition and services accordingly. • Control access to the exploration site through using gates on the access road(s) if required. • The entire site, must be fenced off. the type of fencing to be used would, however, be dependent on the impact on the visual resources and/or cost. and. • Notice or information boards relating to public safety hazards and emergency contact details to be put up at the gate(s) to the exploration area. 3. There is a comprehensive First Aid Kit on site and that suitable anti-histamine for bee stings / snake bites should be available. 4. Rubber gloves are used in case of an accident to reduce the risk of contracting HIV/AIDS. 5. All individuals have received instructions concerning the dangers of dehydration or hyperthermia. Encourage all to drink plenty of clean water not directly from the surface water bodies. 6. No person under the influence of alcohol or drugs is allowed to work on site. 7. The Exploration Manager ensures compliance with the requirements of the relevant Namibian Labour, Mining and Health and Safety Regulations. 8. Dangerous or protected / sensitive areas are clearly marked and access to these areas is controlled or restricted. 9. Due care must be taken when driving any vehicles on any roads particularly the gravel roads. ALL Drivers must drive with their headlights switched on when travelling on the gravel roads (day and night). 10. Persons driving a vehicle must be in possession of a valid driver's license 11. Awareness on HIV/AIDS among workers is raised 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.14: Mitigation measures to minimise visual impacts.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Preserve the landscape character in the development of supporting infrastructure and choice of visual screening</p>	<ol style="list-style-type: none"> 1. Consider the landscape character and the visual impacts of the exploration area including camp site from all relevant viewing angles, particularly from public roads. 2. Use vegetation screening where applicable. Do not cut down vegetation unnecessary around the site and use it for site screening. 3. Avoid the use of very high fencing. 4. Minimise access roads and no off-road that could result in land scarring is allowed. 5. Minimise the presence of secondary structures: remove inoperative support structures. 6. Remove all infrastructure and reclaim, or rehabilitate the project site after exploration activities are completed. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE), Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.15: Mitigation measures to minimise vibration, noise and air quality.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promote of effective management of vehicle movement, drilling and blasting operations and use of Personal Protective Equipment (PPE) in mitigating air quality and vibrations impacts in line with national laws</p>	<ol style="list-style-type: none"> 1. Limit vehicle movements and adhere to the speed of 60 km/h. 2. Vehicles and all equipment must be properly serviced to minimise noise pollution. 3. Use of Personal Protective Equipment (PPE) to minimise Occupational Health Safety impacts due to noise pollution around the site. 4. National or international acoustic design standards must be followed. 5. Drilling and blasting operations can major sources of vibration, noise and dust and where required the following mitigation measure shall be implemented. <ul style="list-style-type: none"> • Drilling and blasting operations shall only be done by a qualified person who must at all times adhere to the required blasting protocol. • Prior warning shall be given to all persons, neighbour and visitors before the blasting takes place. • Careful planning and timing of the blast program to minimise the size of the charge. • Where practicable, use of explosive products with lower detonation velocities, but noting that this would require more explosives to achieve the same blast result. • Use of detonating caps with built-in time delays, as this effectively reduces each detonation into a series of small explosions. • Use of a procedure ("decking the charge") which subdivides the charge in one blast hole into a series of smaller explosions, with drill patterns restricted to a minimum separation from any other loaded hole. • Over-drilling the holes to ensure fracturing of the rock. • Staggering the detonation for each blast hole in order to spread the explosive's total overpressure over time. • Matching, to the extent possible, the energy needed in the "work effort" of the borehole to the rock mass to minimise excess energy vented into the receiving environment. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.16: Mitigation measures for waste (solid and liquid) management.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of effective waste (solid and liquid) management through the adoption of sound and hierarchical approach to waste management, which would include waste minimisation, re-use, recovery, recycling, treatment, and proper disposal.</p>	<ol style="list-style-type: none"> 1. Burial of waste on anywhere within the MCs Area is not allowed and all generated solid waste must be disposed at the at an approved municipal waste disposal site. 2. Toilet and ablution facilities must be provided on site and should not be located close to Ephemeral Rivers or visible discontinuities (fractures, joints or faults). 3. Provide site information on the difference between the two main types of waste, namely: <ul style="list-style-type: none"> • General Waste. and • Hazardous Waste. 4. Sealed containers, bins, drums or bags for the different types of wastes must be provided. Never dispose of hazardous waste in the bins or skips intended for general waste. 5. All solid and liquid wastes generated from the proposed / ongoing project activities shall be reduced, reused, or recycled to the maximum extent practicable. 6. Trash may not be burned or buried, except at approved sites under controlled conditions in accordance with the municipal regulations. 7. Never overfill any waste container, drum, bin or bag. Inform your Contractor or the Environmental Control Officer / Site Manager if the containers, drums, bins or skips are nearly full. 8. Never litter or throwaway any waste on the site, in the field or along any road. No illegal dumping. 9. Littering is prohibited. 10. Latrines and French drains built >100m from watercourses or pans to avoid pollution of primary and secondary aquifers. 11. Chemical toilets or suitable waste water management system shall be provided on site and around the camp as may be required. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.17: Rehabilitation plan.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Contributions toward environmental preservation and sustainability through rehabilitation of disturbed areas such as exploration sites and remove all unwanted part of the fixtures and restore the sites to close an approximation of the pristine state as is technically, financially and reasonably possible.</p>	<ol style="list-style-type: none"> 1. The following rehabilitation actions are practiced: <ul style="list-style-type: none"> • Small samples are preferably removed from site to avoid additional scars in the landscape. • Litter from the site has been taken to the appropriate disposal site. • Debris, scrap metal, etc is removed before moving to a new site or closure of the mine. • Water tanks are dismantled and removed if not need for after use. • Tracks on site and the access road are rehabilitated by smoothing the 'middle mannetjie'(middle ridge between the tracks) and raking the surface. 2. The following should be undertaken at all disturbed areas that require further rehabilitation: <ul style="list-style-type: none"> • if applicable the stockpiled subsoil to be replaced (spread) and/or the site is neatly contoured to establish effective wind supported landscape patterns. • Replace the stored topsoil seed bank layer. • Five (5) years after rehabilitation the sites are not visible from 500 m away. 	<ol style="list-style-type: none"> (i) Regional reconnaissance field-based mapping and sampling activities. (ii) Initial local field-based mapping and sampling activities. (iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling. (iv) Prefeasibility and feasibility studies. (v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare 	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

Table 3.18: Environmental data collection.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>1. Collect data that will add value to environmental monitoring and reporting to the regulators</p> <p>2. Collect data that will add to the general scientific and geographic knowledge of the environment in which the exploration process takes place.</p> <p>3. Acknowledged that the required skills and knowledge to collect all the suggested data may not be available within the mine /exploration team, however, as much data as is practical should be collected.</p>	<p>1. Environmental Monitoring Report Compiled and submitted by the Environmental Coordinator to the regulators</p> <p>2. The following types of information should be gathered:</p> <ul style="list-style-type: none"> • Fauna. What tracks or signs of animal activity have been seen? (photographs and GPS recording) What animals, birds etc were identified? Alternatively provide a description and/ or photo if unidentified. • Unusual weather conditions, e.g. records of the prevailing wind direction and the direction from which storm events come. Was there fog or rain, frost overnight or intense heat? Preferably have a thermometer and rain gauge on site. • Vegetation. Record trees, shrubs, grass, etc. that are found in the vicinity along each of the profiles. Some plants do only occur after rainfall and might not have been seen for decades. • Any archaeological, cultural or historical sites that may be found. GPS coordinates, photograph and plot the position on a 1: 50 000 maps. • other including surface water, spring, large scale geological features etc 	<p>(i) Regional reconnaissance field-based mapping and sampling activities.</p> <p>(ii) Initial local field-based mapping and sampling activities.</p> <p>(iii) Detailed local field-based activities such as local geological mapping, geochemical mapping and sampling, trenching and drilling of closely spaced boreholes and bulk sampling.</p> <p>(iv) Prefeasibility and feasibility studies.</p> <p>(v) Small-scale mining operations covering preconstruction and construction stages, mining operations, decommissioning, final rehabilitation, closure, and aftercare</p>	<p>Developer / Operator (Project Manager (PM), Project Engineers (PE), Site Engineers (SE) Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)</p>

4. EMP GUIDANCE, MONITORING AND REHABILITATION

4.1 EMP Guidance and Awareness Materials

The following is the summary of the key EMP guidance and awareness materials that the Proponent shall consider in the implementation of this EMP:

- (i) The Environmental Rules apply to EVERYBODY. This includes all permanent, contract, or temporary workers as well as any other person who visits the mine settlement, mining and exploration area. Any person who visits the license areas will be required to adhere to the company Environmental Code of Conduct.
- (ii) The Exploration Geologist or Site Manager will issue warnings and will discipline ANY PERSON who breaks anyone of the Environmental Rules and Procedures. Repeated and continued breaking of the Rules and Procedures will result in a disciplinary hearing and which may result in that person being asked to leave the site permanently.
- (iii) The ENVIRONMENT means the whole surroundings around us. The environment is made-up of the soil, water, air, plants, and animals. and those characteristics of the soil, water, air, plant, and animal life that influence human health and wellbeing.
- (iv) If any member of the WORK FORCE does not understand, or does not know how to keep any of Environmental Rule or Procedure, that PERSON must seek advice from the ENVIRONMENTAL COORDINATOR, PROJECT GEOLOGIST or SITE MANAGER or CONTRACTOR. The PERSON that does not understand must keep asking until s/he is able to keep to the all the Environmental Rules and Procedures.

4.2 Environmental Awareness Training Guidance Materials

The following is the summary of the key environmental awareness training guidance materials that the Proponent shall consider before and during the implementation of this EMP:

1) Control of Fires / Fire management

- ❖ Never start any open fire and do not burn any vegetation.
- ❖ Do not smoke near refuelling depots or any other area where fuel, oil, solvents, or paints are used or stored. Make sure that cigarette butts are put-off before throwing them into the refuse bin.
- ❖ Do NOT throw cigarette butts anyhow in the field.
- ❖ Immediately notify your Contractor or the Environmental Coordinator, Exploration Geologist / Site Manager if you see a fire on site.

2) Natural Environmental Management

- ❖ Never feed, tease or play with, hunt, kill, destroy or set devices to trap any wild animal (including birds, reptiles and mammals), livestock or pets. Do not bring any wild animal or pet to the exploration site.
- ❖ Do not pick any plant or take any animal out of the exploration area EVER. You will be prosecuted and asked to leave the project area.
- ❖ Never leave rubbish and food scraps or bones where it will attract animals, birds or insects. Rubbish must be thrown into the correct rubbish bins or bags provided.
- ❖ Protect the surface material by not driving over it unnecessarily.

- ❖ Do not drive over, build upon, or camp on any sensitive habitats for plants and animals.
- ❖ Do not cut down any part of living trees / bushes for firewood.
- ❖ Do not destroy bird nest, dens, burrow pits, termite hills etc or any other natural objects in the area.

3) Vehicle Use and Access

- ❖ Never drive any vehicle without a valid licence for that particular vehicle and do not drive any vehicle that appears not to be road-worthy.
- ❖ Never drive any vehicle when under the influence of alcohol or drugs.
- ❖ DO NOT make any new roads without permission. Stay within demarcated areas.
- ❖ Avoid U-Turns and large turning circles. 3-point turns are encouraged. Do not ever drive on rocky slopes.
- ❖ Stay on the road, do not make a second set of tracks and do not cut corners.
- ❖ DO NOT SPEED - keep to less than 60 km per hour on the tracks and site roads.
- ❖ No off-road driving is allowed.
- ❖ Vehicles may only drive on demarcated roads.
- ❖ Adhere to speed limits and drive with headlights switched on along any gravel road.

4) Control of Dust

- ❖ Do not make new roads or clear any vegetation unless instructed to do so by your Contractor or the Environmental Coordinator / Project Geologist / Site Manager.
- ❖ Try to disturb the surface of the natural landscape as little as possible.

5) Health and Safety

- ❖ Drink lots of water every day, but only from the fresh water supplies.
- ❖ Take the necessary precautions to avoid contracting the HIV/AIDS virus.
- ❖ Only enter or exit the exploration area at the demarcated gates.
- ❖ Always keep the gates as you found them.
- ❖ Any damage to the fence or gate must be report to the Environmental Coordinator / Exploration Geologist / Project Manager who will then inform the land owner of any damage with all the repairs done to the satisfaction of the land owner or Environmental Coordinator for communal land on behalf of the local community.
- ❖ Never enter any area that is out of bounds, or demarcated as dangerous or wander off without informing or permission of team leader.
- ❖ Never climb over any fence or trespass on private property without permission of the landowner or consultation with the Environmental Coordinator, Project Geologist / Site Manager.

- ❖ Report to your Contractor or the Project Geologist / Site Manager if you see a stranger or unauthorised person in the exploration area.
- ❖ Do not remove any vehicle, machinery, equipment or any other object from the exploration camp site or along the profile or at a seismic testing station without permission of your Contractor or the Project Geologist / Site Manager.
- ❖ Wear protective clothing and equipment required and according to instructions from your Contractor or the Exploration Geologist or Site Manager.
- ❖ Never enter or work in the mine or exploration area when under the influence of alcohol or drugs.

6) Preventing Pollution and Dangerous Working Conditions

- ❖ Never throw any hazardous substance such as fuel, oil, solvents, etc. into streams or onto the ground.
- ❖ Never allow any hazardous substance to soak into the soil.
- ❖ Immediately tell your Contractor or Environmental Coordinator/ Project Geologist / Site Manager when you spill, or notice any hazardous substance being spilled anywhere in the field or camp.
- ❖ Report to your Contractor or Environmental Coordinator / the Project Geologist / Site Manager when you notice any container, which may hold a hazardous substance, overflow, leak, or drip.
- ❖ Immediately report to your Contractor or Environmental Coordinator / the Project Manager when you notice overflowing problems or unhygienic conditions at the ablution facilities.
- ❖ Vehicles, equipment and machinery, containers and other surfaces shall be washed at areas designated by the Contractor or Environmental Coordinator / the Project Geologist / Site Manager.
- ❖ If you are not sure how to transport, use, store or dispose any hazardous substance - ASK your Contractor or Environmental Coordinator / the Project Geologist / Site Manager for advice.

7) Saving Water

- ❖ Always use as little water as possible. Reduce, reuse and re-cycle water where possible.
- ❖ Report any dripping or leaking taps and pipes to your Contractor or Environmental Coordinator/ the Project Geologist or Site Manager.
- ❖ Never leave taps running. Close taps after you have finished using them.

8) Disposal of Waste

- ❖ Learn to know the difference between the two main types of waste, namely:
 - ✓ General Waste. and
 - ✓ Hazardous Waste.
- ❖ Learn how to identify the containers, bins, drums, or bags for the different types of wastes. Never dispose of hazardous waste in the bins or skips intended for general waste or

exploration rubble.

- ❖ Never burn or bury any waste on the camp or in the field.
- ❖ Never overfill any waste container, drum, bin, or bag. Inform your Contractor or the Environmental Coordinator/ the Project Geologist / Site Manager if the containers, drums, bins, or skips are nearly full.
- ❖ Never litter or throwaway any waste on the site, in the field or along any road. No illegal dumping.
- ❖ Littering is prohibited.

9) Religious, Cultural, Historical and Archaeological Objects

- ❖ If you find any suspected religious, cultural, historical, or archeologically object or site around the campsite or in the field, you must immediately notify your Contractor or Environmental Coordinator / the Project Geologist / Site Manager, and.
- ❖ Never remove, destroy, interfere with, or disturb any religious, cultural, historical, or archaeological object or site around the campsite or in the field.

10) Dealing with Environmental Complaints

If you have any complaint about dangerous working conditions or potential pollution to the environment, immediately report this to your Contractor or the Environmental Coordinator / the Project Geologist / Site Manager.

If any person complains to you about noise, lights, littering, pollution, or any other harmful or dangerous condition, immediately report this to your Contractor or the Environmental Coordinator / the Site Manager.

4.3 Manganese Toxicological and Environmental Performance Reporting

4.3.1 Manganese Occurrence and Toxicological Profile

The Proponent intend to mine manganese if the exploration results are successful. Manganese is the eighth most abundant metal in nature, and occurs in several ores. In aquatic ecosystems, manganese does not occur naturally as a metal but is found in various salts and minerals, frequently in association with iron compounds (Röllin, 2011)¹. According to the South African Water Quality Guidelines, (1996)², the uptake of manganese by humans mainly takes place through inhalation and ingestion. Manganese may exist in the soluble manganous (Mn^{2+}) form, but is readily oxidised to the insoluble manganic (Mn^{4+}) form. The Mn^{2+} ion occurs at low redox potentials and low pH. Permanganates (Mn^{7+}) do not persist in the environment. They rapidly oxidise organic materials and are therefore reduced. Nitrate, sulphate and chloride salts of manganese are fairly soluble in water, whereas oxides, carbonates, phosphates, sulphides and hydroxides are less soluble.

Manganese minerals are widely distributed and oxides, silicates, and carbonates are the most common (Röllin, 2011). Manganese is one out of three toxic essential trace elements, which means that it is not only necessary for humans to survive, but it is also toxic when too high concentrations are present in a human body. Manganese (Mn) is essential to iron and steel production by virtue of its sulphur-fixing,

¹ Röllin HB, Nogueira CMCA, 2011. Manganese: environmental pollution and health effects. *Encycl Environ Health* 617–629.

² South African Water Quality Guidelines, 1996. *Aquatic Ecosystems First Edition*, Vol. 7, Department of Water Affairs & Forestry, Pretoria, South Africa

deoxidising, and alloying properties. Steelmaking, including its ironmaking component, accounts for most domestic manganese demand, presently in the range of 85% to 90% of the total. Manganese ferroalloys, consisting of various grades of ferromanganese and silicomanganese, are used to provide most of this key ingredient to steelmaking. Products for construction, machinery, and transportation are leading end uses of manganese. Manganese also is a key component of certain widely used aluminium alloys and, in oxide form, dry cell batteries. As ore, additional quantities of manganese are used for such nonmetallurgical purposes as plant fertilizers, animal feed, and colorants for brick.

4.3.2 Manganese Toxicological Profile

The manganese toxicological profile presented in this section is based on the retrieval and scientific interpretation of ecotoxicological information publication by van Niekerk, (2019)³ expert opinion that was provided with respect to the project on export of Manganese from South Africa through the Port of Lüderitz. According to van Niekerk, (2019), the major concern about environmental exposure to manganese relates to its neurotoxicity. Manganese is subject to many homeostatic controls, but overload or breakdown of these mechanisms at high exposure levels leads to increased delivery to the brain. There is conclusive evidence that long-term occupational exposure to manganese at high levels can lead to progressive neurological dysfunction, which can produce a disabling syndrome known as manganism. Evidence of these effects has been observed from studies of humans exposed to excessive levels of manganese dusts in mines and factories.

According to van Niekerk, (2019), human exposure to manganese in dust generated from stockpiles of manganese ore is not comparable to occupational exposures, and should also be viewed in terms of bio-accessibility. Manganese does not exist in elemental form in the ore, but mainly as oxides, carbonates, and silicates, present in more than 100 minerals. Manganese must be released from these mineralogical structures to exert its toxic effects, i.e., it must become bio-accessible in the alveolar fluid. Alveolar fluid covers the inside lining of sac-like alveoli, the sections of the lungs where gas exchange takes place. The potential for exposure to manganese in particulates in manganese ore dust under storage conditions is much lower than in mines, and the risks are more severe when exposure is to manganese as fumes in manganese smelters. It is thus not surprising that the issue of manganism is associated exclusively with occupational exposures, generally at very high concentrations. Environmental levels in air are too low to trigger the sequence of neurological effects that leads to manganism.

According to van Niekerk, (2019), inhalation of particulate manganese compounds such as manganese dioxide or manganese tetroxide by humans can lead to an inflammatory response in the lung. However, it must be noted that inflammatory response of this type is not unique to manganese-containing particles, but is characteristic of nearly all inhalable particulate matter. According to ATSDR (2012)⁴, this suggests that it is not the manganese per se that causes this adverse response, but more likely the particulate matter itself. Dust control is thus critical in all transport and storage scenarios, not only for manganese ore, and is generally regulated by legislation.

According to Finley, (2004)⁵, dietary studies demonstrated that daily ingestion of relatively high doses of manganese can be safely tolerated by healthy adults. High dietary manganese levels are compensated for by adaptive changes, amongst others by reduction in the gastrointestinal absorption as well as enhanced biliary and pancreatic excretion of manganese, in order to maintain physiologically-relevant concentrations. There is evidence, however, that ingestion of high concentrations of manganese in drinking water and inhalation exposure near manganese smelters may cause adverse health effects in infants and children (O'Neal and Zheng, 2015)⁶, but this is not relevant to exposure to airborne manganese in the vicinity of stockpiles of manganese ore.

³ Van Niekerk W., 2019. Report No 002-2019 Rev 1.0: Manganese Toxicological Profile. INFOTOX (Pty) Ltd, Retrieval and scientific interpretation of ecotoxicological information, Waterkloof Heights 0065 South Africa.

⁴ ATSDR. 2012. Toxicological Profile for Manganese. US Agency for Toxic Substances and Disease Registry.

⁵ Finley JW. 2004. Does environmental exposure to manganese pose a health risk to healthy adults? Nutr Rev, 62:148–153

⁶ O'Neal SL and Zheng W. 2015. Manganese Toxicity Upon Overexposure: a Decade in Review. Curr Environ Health Rep, 2(3):315-328. Maria Nandelila Vei MCs Nos. 72264-72273

This toxicological profile does not suggest that manganese does not have toxic properties (van Niekerk, 2019). The important aspect in the evaluation is to recognise that the manifestation of health risks does not depend only on the toxicity of a substance, but exposure levels must be sufficient to trigger health effects. Exposure levels refer to exposure concentrations and duration of exposure. Even if a substance is toxic, if exposure levels are below a certain threshold, health risks would be too low to be of any significance.

In the case of handling manganese ore, it must be recognised that it is a low-temperature process, other than in smelters, and health risks associated with manganese are thus not of concern. Appropriate management of fine dust particulates is the only matter of importance in terms of potential environmental health risks (van Niekerk, 2019).

4.4 Monitoring and Environmental Performance

The monitoring process of the EMP performances for the proposed exploration and small-scale mining project is divided into following two parts:

- (i) Ongoing monitoring activities and effects to be undertaken and supported by the Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), and.
- (ii) Preparation of an Environmental Monitoring Report covering all activities related to the Environmental Management Plan throughout the life cycle of the proposed mining project to be undertaken and supported by the Environmental Control Officer (ECO) Environmental Coordinator (EC), Environmental Social Government (ESG).

The second part of the monitoring of the EMP performance will require a report outlining all the activities related to effectiveness of the EMP at the end of the following stages:

- (i) Completion of various exploration phase.
- (ii) Preconstruction.
- (iii) Construction.
- (iv) Operation and ongoing monitoring.
- (v) Decommissioning.
- (vi) Closure and final rehabilitation, and.
- (vii)Aftercare (On Annual intervals throughout the specified aftercare period).

The types of the data sets to be used in the preparation of such a report are outlined in Tables 4.1 - 4.9. The objective will be to ensure that corrective actions are reviewed and steps are taken to ensure compliance for future EIA and EMP implementation.

The report shall outline the status of the environment and any likely environmental liability after every key developmental stage. The report shall be submitted to the Ministry of Environment, Forestry and Tourism via the Ministry of Mines and Energy and will represent the final closure and fulfilment of the Environmental obligations for this project.

4.5 Environmental Performance Reporting

Proponent will be required to report to the Ministry of Mines and Energy (MME) and Ministry of Environment, Forestry and Tourism (MEFT), the environmental performances for every six (6) months or as per the conditions of the ECC that may be granted by the Environmental Commissioner in the MEFT.

The environmental performance monitoring of the EMP is both part of the ongoing environmental monitoring programme to be undertaken throughout the proposed exploration and small-scale mining project lifecycle.

The process of undertaking appropriate monitoring of the EMP as per specific topic (Tables 4.1 - 4.8) and tracking performances against the objectives and documenting all environmental activities is part of internal and external auditing to be coordinated by the Environmental Control Officer/ EMP Coordinator, ESG Coordinator / Consultant / Suitable qualified in-house resource person.

Tables 4.1 – 4.9 outline the type of information that shall need to be recorded on a regular by the Environmental Control Officer as part of the monitoring process of the activities and the effects.

Table 5.1: Monitoring of environmental performance implementation / environmental awareness training.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Is there an Environmental awareness training programme?	Environmental Management Act No. 7 of 2007	Ensure that all personnel before participating in the proposed project activities attend and understand the content of the EMP.	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities.	
How many people have been given environmental awareness training?		Ensure that, all personnel on site attend the environmental awareness training programme		At the start and during the duration of the project activities.	
Is a copy of the EMP on site?		Regularly follow up to ensure availability of the EMP copy on site.		At the start and during the duration of the project activities.	
How effective is the awareness training? Do people understand the contents of the EMP? Where are the weaknesses? Ask 3 people at random various questions about the EMP.		All personnel must indicate that they understand the contents of the EMP.		During the training programme	

Table 5.2: Monitoring of environmental performance for the settlement.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Is the mine settlement positioned to avoid sensitive zones, river channels and potential archaeological sites?	Environmental Management Act No. 7 of 2007, (MET)	Adhere to site layout plan for the designated project zones.	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities.	
Has new infrastructure been created? If so, what, and how well planned / built with respect to environment?		Adhere to site layout plan for the designated project zones.		At the start and during the duration of the project activities.	
Have pit latrines been provided? Where are they situated?		Adhere to site layout plan for the designated project zones.		During pre construction, and construction phases of project	
Do receptacles for waste have scavenging animal proof lids?		Adhere to guidelines as mentioned in the Disposal Waste Guidance		At the start and during the duration of the project activities.	
What litter is there – who is littering?		Adhere to guidelines as mentioned in the Disposal Waste Guidance		At the start and during the duration of the project activities.	

Table 5.2: *Cont.*

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Are there facilities for the disposal of oils / etc and how often is it removed to an approved disposal site?	Environmental Management Act no. 7 of 2007	Adhere to guidelines as mentioned in the Disposal Waste Guidance	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities.	
Is there evidence of oil / diesel spills? Bunding or not?	<ul style="list-style-type: none"> • Environmental Management Act no. 7 of 2007 • Disposal of Waste Guidance • Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991) 	Regular monitory and compliance with effective measure to handle oil spills and contamination with soil.		At the start and during the duration of the project activities.	
What fuel source is being provided for cooking?	Environmental Management Act no. 7 of 2007	Adhere to Energy saving measures		At the start and during the duration of the project activities.	
Housekeeping				At the start and during the duration of the project activities.	

Table 5.3: Environmental data collection.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Are records being kept?	Environmental Monitoring Report requirements	Regular monitoring of project site.	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities.	
Have archaeological sites been found / disturbed / described?		Regular monitoring of project site.		At the start and during the duration of the project activities.	

Table 5.4: Health and safety.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Is there First Aid Kit containing anti-histamines etc?	Health and Safety Guidance	Regular checking of First Aid Kits	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities	
Are dangerous areas clearly marked off?	Health and Safety Guidance	Regular monitoring of sites.		At the start and during the duration of the project activities	
Do vehicles appear to maintain the recommended speed limits?	<ul style="list-style-type: none"> Vehicle Use and Access Guidance Health and Safety Guidance 	Regular monitoring of traffic on site.		At the start and during the duration of the project activities	
Do vehicles always drive with headlights on along the gravel roads?	<ul style="list-style-type: none"> Vehicle Use and Access Guidance Health and Safety Guidance 	Regular monitoring of traffic on site.		At the start and during the duration of the project activities	

Table 5.5: Recruitment of labour.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
What labour source is used?	Labour Act, 2007 (Act No. 7 of 2007)	Adhere to the regulations stipulated in the labour Act.	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	During recruitment process (at the start and during project activities).	
How has the recruitment practice been done?		Adhere to the regulations stipulated in the labour Act.		During recruitment process (at the start and during project activities).	

Table 5.6: Management of the natural habitat and surficial materials management.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Has there been camp development on or very close sensitive areas?	<ul style="list-style-type: none"> Environmental Management Act No. 7 of 2007 	Adhere to site layout plan for designated project zones.	Environmental Control Officer (ECO),	During pre-construction and construction camp.	
Has anyone been caught with plants or animals in their possession?	<ul style="list-style-type: none"> Environmental Management Act No. 7 of 2007 	Regular monitoring of project site	Environmental Coordinator (EC), Environmental Social Government (ESG),	At the start and during the duration of the project activities	
Has there been wilful or malicious damage to the environment?	<ul style="list-style-type: none"> Nature Conservation Ordinance 4, 1975 	Regular monitoring of project site	Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities.	
Has topsoil / seed bank layer been removed from demarcated camp, mining and exploration areas and appropriately stored?	<ul style="list-style-type: none"> Environmental Management Guidance 	Regular monitoring of project activities	ENV, PG, GT, CONT.	At the start and during the duration of the project activities	

Table 5.7: Tracks and off-road driving.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Are existing tracks used and maintained?	<ul style="list-style-type: none"> Environmental Management Act No. 7 of 2007 	Regular monitoring	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities	
What new tracks have been developed and are they planned?		<ul style="list-style-type: none"> Adhere to proposed existing access roads and tracks Regular Monitoring 		At the start and during the duration of the project activities	
What evidence is there of off-road driving? Who appears to be responsible?		Regular monitoring		At the start and during the duration of the project activities	
Are corners being cut, what type of turning circle are there? Three point turns vs. U turns?		Regular monitoring		At the start and during the duration of the project activities	
Have unnecessary tracks been rehabilitated and how well?		Regular monitoring		During Rehabilitation process	

Table 5.8: Management of surface and groundwater.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
How is potable water supplied and how often? Position of tanks?	<ul style="list-style-type: none"> Water Resources Management Act, 2004 (Act No. 24 of 2004) Saving Water Guidance 	Regular monitoring	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities	
Is water being wasted?		Regular monitoring		At the start and during the duration of the project activities	
Is there any leakage from pipes or taps?		Regular monitoring of pipes and taps for leakages		At the start and during the duration of the project activities	
Has casing been left when boreholes hit water and have any records of water strikes been kept? Were water samples taken and RWL measured?		Regular monitoring and record keeping.		At the start and during the duration of the project activities	

Table 5.9: Public relations.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Have any complaints been made about the mining and exploration activities by the different I&APs? If so, what, and how was the issue resolved?	Environmental Management Act No. 7 of 2007	Create platform for I&APs to present their concerns. These should be collected and addressed accordingly.	Environmental Control Officer (ECO), Environmental Coordinator (EC), Environmental Social Government (ESG), Team Leaders (TL), Contractors (CONT) and Subcontractors (SCONT)	At the start and during the duration of the project activities	

4.6 Mine Closure Plan Monitoring and Reporting

4.6.1 Mine Closure Plan

The Proponent must prepare separate Mine Closure Plan (MCP) for the proposed small-scale mining operations in the MCs area. The Mine Closure Plan activities consist of following five (5) steps that will be implemented by Proponent and where applicable in consultation with the key stakeholders:

- (i) Ongoing rehabilitation: This will be implemented during the exploration phase and from day one (1) of the small-scale mining activities starting to produce coupled with the recruitment of a new workforce. Unwanted exploration and mine sites excavated or disturbed during the mine operation phase shall not wait for the final mine closure rehabilitation but shall be attended to as ongoing activities and financed within an ongoing annual mine operational budget allocation to be detailed in the Mine Closure Plan Report.
- (ii) Mine closure: Once production stops, the number of workers will be reduced and a small labour force will be retained to permanently shut down the mine. The mining company may have to provide re-training or early retirement options to their workers before the mine is closed. The cost of the re-skilling, early retirement and retrenchments will be funded from the final Mine Closure Plan budget allocations to be detailed in the Mine Closure Plan Report.
- (iii) Decommissioning: Will be undertaken by a small crews or contractors who will be responsible for decommissioning or taking apart the mining supporting infrastructure and equipment. Pipelines will be drained, equipment and valuable parts will be cleaned and may be sold, buildings will be repurposed or demolished, warehouse materials will be recovered, and waste will be disposed of. The cost of the decommissioning will be funded from the final Mine Closure Plan budget allocations to be detailed in the Mine Closure Plan Report.
- (iv) Final rehabilitation\Remediation\reclamation: The objective of reclamation will be to return the MCs area to an acceptable standard of socioeconomic use, ensuring that any landforms and structures are stable, and any watercourses are of acceptable water quality. Reclamation will involve a number of activities such as removal of any hazardous materials, reshaping the land, restoring topsoil, and planting native grasses, trees, or ground cover as may be applicable. The cost of the remediation/reclamation will be funded from the final Mine Closure Plan budget allocations to be detailed in the Mine Closure Plan Report, and.
- (v) Post-closure and aftercare including monitoring: Monitoring programmes will be used to assess the effectiveness of the reclamation measures and to identify any corrective action that may be needed during the post closure and aftercare stage. In addition, the project area MCs Nos. 72264-72273 will also require long-term care and maintenance after mine closure such as periodic monitoring and maintenance of waste rock containment structures and secured hazardous areas, and monitoring any ongoing remediation technologies that have been implemented. The aftercare period will run for period of between two (2) to five (5) years or as may be agreed with the stakeholders especially the land owners and relevant Government regulators such as MME, MEFT and MAWLR. The cost for post-closure and aftercare will be funded from the final Mine Closure Plan budget allocations to be detailed in the Mine Closure Plan Report.

4.6.2 Mine Closure Environmental Monitoring

Environmental monitoring with respect to the implementation of the Mine Closure Plan will be undertaken to measure the achievement of outcomes for both the ongoing rehabilitation and final mine closure and aftercare activities.

Both the ongoing rehabilitation and final mine closure and aftercare monitoring activities will cover the following components:

- (i) Air quality and dust emissions.

- (ii) Stability of the following engineered structures:
 - (a) Tailings Storage Facility (TSF).
 - (b) Waste Rock Facility (WRF).
 - (c) Waste disposal site.
 - (d) Surface and subsurface excavated areas.
 - (e) Drainage systems, and.
 - (f) Pollution Control Dam (PCD).
- (iii) Surface and groundwater quality, and.
- (iv) Fauna and flora recovery in ongoing and final rehabilitated areas.

The Proponent shall report on the technical and financial monitoring performances of the Mine Closure Plan and this will be provided to all the key stakeholders. The monitoring report will also be made available to the public on the website of the Proponent.

The following performance indicators will be measured against the Mine Closure Plan implementation and monitoring of the ongoing rehabilitation and final mine closure and aftercare activities:

- (i) Compliance to the national regulations.
- (ii) Compliance to the conditions of the MCs, ECC, freshwater abstraction and wastewater discharge permits as well as all other granted statutory permits \ authorisations\ consents.
- (iii) Compliance to the key Agreements \ contracts with key stakeholders such as the land owners \ unions \ employees, and.
- (iv) Compliance with the Mine Closure Plan, as indicated by internal and statutory reporting.

The Proponent shall strive to continually improve on the mine's environmental performance by applying the precautionary principles as enshrined in the Environmental Management Act, 2007, Act No. 7 of 2007 and the principles of best practice to mining operations, including where cost-effective and practicable, the adoption of new best practice technologies and improved ongoing rehabilitation and final mine closure and aftercare control measures.

4.6.3 Annual Reviews of the Mine Closure Plan

The Mine Closure Plan to be prepared shall be reviewed, and if necessary revised, to the satisfaction of all the stakeholders and in consultation with stakeholders, in accordance with the requirements of the Environmental Management Act, 2007, Act No. 7 of 2007 with respect to the review, update and approval of environmental reporting. Technical reviews will be undertaken annually and or because of the following:

- ❖ Following changes to project approval or licence conditions relating to mine closure management or monitoring.
- ❖ Following any significant mine closure related incident.
- ❖ When a relevant/significant improvement has been identified.
- ❖ For necessary or any unforeseen changes to mine closure domains.
- ❖ Where a risk assessment identifies the requirement to alter the Plan, and.

❖ Annually.

Closure cost estimates should be reviewed regularly to reflect changing circumstances that may be linked to the technical review. The Proponent shall on the annual basis review the cost estimates contained in Mine Closure Plan and must account for the following:

- (i) Inflation and escalation.
- (ii) Changes in legislation.
- (iii) Changes in available technology to better address ongoing rehabilitation and final closure and aftercare risks.
- (iv) Changes in the 'Life of Mine' plan (for instance, expansions, changes in process or new activities), and.
- (v) Changes in stakeholder and \ or public expectations.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusions

Maria Nandelila Veii (**the Proponent**) intends to undertake exploration and small-scale mining activities in the MCs Nos. 72264-72273 covering base and rare metals with special focus on manganese. The exploration activities to be undertaken as assessed in this environmental assessment covers the following:

- (i) Initial desktop exploration activities.
- (ii) Regional reconnaissance field-based activities.
- (iii) Initial local field-based activities including detailed mapping, sampling, and drilling operations.
- (iv) Detailed local field-based activities including detailed mapping, sampling, and drilling operations, and.
- (v) Prefeasibility and feasibility studies including possible test mining.

The following is the summary of the envisaged multi-phased small-scale mining project development process that will be implemented if the proposed above exploration is successful:

- (i) Feasibility, planning and permitting.
- (ii) Preconstruction and site clearing for the open pit mining areas and supporting infrastructure area such as onsite and offsite workers accommodation, administration block, processing plant area, storage, tailings and rock waste dumps, external and internal access/ transportation system, and all related services points for water and energy supplies.
- (iii) Construction of the proposed mine and all the supporting infrastructure.
- (iv) Mine operation, processing, stockpiling, transportation via road or new rail link to Walvis Bay through Okahandja for manganese export. The mining operations will be supported by ongoing monitoring and rehabilitation, and.
- (v) Decommissioning, final rehabilitation, closure, and aftercare.

The proposed exploration and small-scale mining activities will be implemented as soon as all the required regulatory permits such as the Environmental Clearance Certificate (ECC) have been granted by the Government as well as all key agreements have been concluded with the land owners, contractors, and services providers

5.2 Recommendations

It is hereby recommended that the proposed exploration and small-scale mining activities in the MCs Nos. 72264-72273 shall be issued with an Environmental Clearance Certificate (ECC). The following is the summary of the key conditions that shall be implemented by the Proponent for the proposed project activities:

- 1) The Proponent shall implement the conditions of the land lease agreement/s to be concluded with the owner/s of the land as may be required to support the proposed exploration and small-scale mining activities.
- 2) The proponent shall implement and adhere to all the provisions of this EMP report.
- 3) Mitigation measures shall be implemented and monitored as detailed in this EMP report.

- 4) The Proponent shall prepare a mine closure plan and ongoing and final rehabilitation shall be always undertaken.
- 5) The Proponent shall adhere to all the applicable national regulations and standards as well as Good International Industry Practice (GIIP) that defines leading industry best practices as provided for in the Equator Principles and International Finance Corporation (IFC) environmental management guidelines and frameworks, and.
- 6) The Proponent shall adopt the precautionary approach / principles in instances where baseline information, national or international guidelines or mitigation measures have not been provided or do not sufficiently address the site-specific project impact.
- 7) Appoint an Environmental Control Officer to lead and further develop, implement and promote environmental culture through awareness raising of the workforce, contractors and sub-contractors in the field during the whole duration of the proposed project.
- 8) Provide with other support, human and financial resources, for the implementation of the proposed mitigations, rehabilitation plans and effective environmental management during the planned mine project life cycle.
- 9) Develop a simplified environmental induction and awareness programme for all the workforce, contractors and sub-contractors.
- 10) Where contracted service providers are likely to cause environmental impacts, these will need to be identified and contract agreements need to be developed with costing provisions for environmental liabilities.
- 11) Implement internal and external monitoring of the actions and management strategies developed during the project duration and a final Environmental Monitoring report to be prepared by the Environmental Control Officer and to be submitted to the regulators, and.
- 12) Develop and implement a monitoring programme that shall be integrated into the overall company's Environmental Management Systems (EMS) as well as for any future EIA related to the expansion of the current delineated resources or development of completely new mine site/s within the general area.

All the responsibilities to ensure that the recommendations and provisions of this EMP Report are executed accordingly, rest with the Proponent. The Proponent shall provide all appropriate resource requirements for the implementation of this EMP as well as an independently managed (not directly controlled by the company) funding instrument for final mine rehabilitation and associated short and long-term environmental liabilities.

It is the responsibility of the Proponent to make sure that all members of the workforce including contractors and subcontractors are aware of the provisions of this EMP and its objectives. It is hereby recommended that the Proponent take all the necessary steps to implement all the recommendations of this EMP for the successful execution of the proposed exploration programme.

6. REFERENCES

1. FURTHER GENERAL READING

Bühn, B. 1991. Genesis and tectonothermal evolution of Late Proterozoic stratiform manganese deposits of Otjosondu, Damara Belt, east central Namibia. – Unpubl. Ph.D. thesis, Univ. Würzburg, 231 pp.

Bühn, B. and Stanistreet, I.G., 1992/93. A correlation of structural patterns and lithostratigraphy at Otjosondu with the Damara Sequence of southern Central Zone, Namibia. Communications of the Geological Survey of Namibia, 8, 15–21.

Bühn, B. and Stanistreet, I.G., 1997. Insight into the enigma of Neoproterozoic manganese and iron formations from the perspective of supercontinental break-up and glaciation. In: K. Nicholson, J.R. Hein, B. Bühn and S. Dasgupta (Editors), Manganese Mineralization: Geochemistry and Mineralogy of Terrestrial and Marine Deposits. Geological Society Special Publication, 119, 81–90.

Bühn, B., Stanistreet, I.G. and Okrusch, M., 1992. Late Proterozoic outer shelf manganese and iron deposits at Otjosondu (Namibia) related to the Damaran oceanic opening. Economic Geology, 87, 1393–1411.

Bühn, B., Okrusch, M., Woermann, E., Lehnert, K. and Hoernes, S., 1995. Metamorphic evolution of Neoproterozoic manganese formations and their country rocks at Otjosondu, Namibia. Journal of Petrology, 36, 463–496.

Cabral, A. R., Moore, J. M., Mapani, B. S., Koubová, M., & Sattler, C. D., 2011. Geochemical and mineralogical constraints on the genesis of the Otjosondu ferromanganese deposit, Namibia: hydrothermal exhalative versus hydrogenetic (including snowball-earth) origins. South African Journal of Geology, 114(1), 57-76.

Department of Water Affairs and Forestry, 2001. Groundwater in Namibia: An explanation to the hydrogeological map. MAWRD, Windhoek, 1, 128 pp.

Dickson, A.F. 1940. Report on examination of manganese deposits in the neighbourhood of Otjosondu 22-27/11/1941. – Unpubl. rep., 7 pp.

De Villiers, J.E., 1951. The manganese ores of Otjosondu, South-West Africa. Transactions of the Geological Society of South Africa, 54, 89–98.

Geological Survey of Namibia, 1999. Regional geological map of Namibia. Ministry of Mines and Energy, Windhoek, Namibia.

Miller, R.McG. 2008. The geology of Namibia. Geological Survey, Ministry of Mines and Energy, Windhoek, Vol. 3.

Miller, R. McG., 1992. Stratigraphy. *The mineral resource of Namibia, Geological Survey of Namibia, MME*, Windhoek, 1.2 .1 -1.2.13.

Miller, R. McG., 1983a. The Pan – African Damara Orogen of S.W.A. / Namibia, Special Publication of the Geological Society of South Africa, **11**, 431 - 515.

Miller, R. McG., 1983b. Economic implications of plate tectonic models of the Damara Orogen, Special Publication of the Geological Society of South Africa, **11**, 115 -138.

Ministry of Environment, Forestry and Tourism (MEFT), 2002. Atlas of Namibia. Comp. J. Mendelsohn, A. Jarvis, T. Roberts and C. Roberts, David Phillip Publishers, Cape Town.

Müller, M.A.N. 1984. Grasses of South West Africa/Namibia. John Meinert Publishers (Pty) Ltd, Windhoek, Namibia.

National Statistics Agency (NSA) 2011. Otjozondjupa Region Census Regional Profiles: 2011 Population and Housing Census, Otjozondjupa Region Basic Analysis with Highlights, National Statistics Agency, Windhoek.

Roesener, H., Schneider, G., and Petzel, V., 2004. Okahandja – Otjiwarongo – Tsumeb – Tsumeb: The Roadside Geology of Namibia, (G. Schneider ed.), Gebruder Borntraeger, Berlin, 9.19: 214 – 219.

Roper, H., 1959. The geology of the Otjosundu manganese area, South West Africa. Unpublished Ph.D. thesis, University of Witwatersrand, South Africa, 164pp.

Servant, J. (1956): The manganese deposits at Otjosundu, South West Africa. Congr. geol. intern., 20th Session, Mexico City (1956), 115-22

Schneider, G.I.C., 1992. Manganese, the mineral deposits of Namibia. Geological Survey of Namibia, Windhoek, pp. 2.6-122.6-9.

Steven, N. M., 1993. A study of epigenetic mineralization in the Central Zone of the Damara Orogen, Namibia, with special reference to gold, tungsten, tin, and rare earth element. *Geological Survey of Namibia, Memoir 16*, 166 pp.

Vermaak, C.F. 1969. The geology of the Otjosundu manganese occurrence. – Unpubl. rep. S.A. Minerals Corporation Ltd., 7 pp.

World Travel and Tourism Council, 2018, Travel and Tourism Economic impact 2018, Namibia, London, United Kingdom.

South African National Standards (SANS), 2005. South African National Standard, Ambient Air Quality – Limits for Common Pollutants. SANS 1929:2005. Standards South Africa, Pretoria.

2. REFERENCES AND FURTHER READING ON FAUNA AND FLORA

Alexander, G. and Marais, J. 2007. A guide to the reptiles of southern Africa. Struik Publishers, Cape Town, RSA.

Barnard, P. 1998. Underprotected habitats. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Bester, B. 1996. Bush encroachment – A thorny problem. *Namibia Environment 1*: 175-177.

Branch, B. 1998. Field guide to snakes and other reptiles of southern Africa. Struik Publishers, Cape Town, RSA.

Branch, B. 2008. Tortoises, terrapins and turtles of Africa. Struik Publishers, Cape Town, RSA.

Boycott, R.C. and Bourquin, O. 2000. The Southern African Tortoise Book. O Bourquin, Hilton, RSA.

Broadley, D.G. 1983. Fitzsimons' Snakes of southern Africa. Jonathan Ball and AD. Donker Publishers, Parklands, RSA.

Brown, C.J., Jarvis, A., Robertson, T. and Simmons, R. 1998. Bird diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

Brown, I, Cunningham, P.L. and De Klerk, M. 2006. A comparative study of wetland birds at two dams in central Namibia. *Lanioturdus 39*(1): 2-9.

Buys, P.J. and Buys, P.J.C. 1983. Snakes of Namibia. Gamsberg Macmillan Publishers, Windhoek, Namibia.

- Carruthers, V.C. 2001. Frogs and frogging in southern Africa. Struik Publishers, Cape Town, RSA.
- Channing, A. 2001. Amphibians of Central and Southern Africa. Protea Bookhouse, Pretoria, RSA.
- Channing, A. and Griffin, M. 1993. An annotated checklist of the frogs of Namibia. *Madoqua* 18(2): 101-116.
- Coats Palgrave, K. 1983. Trees of Southern Africa. Struik Publishers, Cape Town, RSA.
- Cole, D.T. and Cole, N.A. 2005. Lithops Flowering Stones. Cactus and Co. Libri
- Craven, P. 1998. Lichen diversity in Namibia. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Craven, P. (ed.). 1999. A checklist of Namibian plant species. Southern African Botanical Diversity Network Report No. 7, SABONET, Windhoek.
- Crouch, N.R., Klopper, R.R., Burrows, J.E. and Burrows, S. M. 2011. Ferns of southern Africa – a comprehensive guide. Struik Nature, Cape Town, RSA.
- Cunningham, P.L. 1998. Potential wood biomass suitable for charcoal production in Namibia. *Agri-Info* 4(5): 4-8.
- Cunningham, P.L. 2006. A guide to the tortoises of Namibia. Polytechnic of Namibia, Windhoek, Namibia.
- Curtis, B. and Barnard, P. 1998. Sites and species of biological, economic or archaeological importance. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Curtis, B. and Mannheimer, C. 2005. Tree Atlas of Namibia. National Botanical Research Institute, Windhoek, Namibia.
- De Graaff, G. 1981. The rodents of southern Africa. Buterworths, RSA.
- Du Preez, L. and Carruthers, V. 2009. A complete guide to the frogs of southern Africa. Struik Publishers, Cape Town, RSA.
- Estes, R.D. 1995. The behaviour guide to African mammals. Russel Friedman Books, Halfway House, RSA.
- Giess, W. 1971. A preliminary vegetation map of South West Africa. *Dinteria* 4: 1 – 114.
- Griffin, M. 1998a. Reptile diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Griffin, M. 1998b. Amphibian diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Griffin, M. 1998c. Mammal diversity. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Griffin, M. 2003. Annotated checklist and provisional national conservation status of Namibian reptiles. Ministry of Environment, Forestry and Tourism (MEFT), Windhoek.
- Griffin, M. and Coetzee, C.G. 2005. Annotated checklist and provisional national conservation status of Namibian mammals. Ministry of Environment, Forestry and Tourism (MEFT), Windhoek.

- Hebbard, S. n.d. A close-up view of the Namib and some of its fascinating reptiles. ST Promotions, Swakopmund, Namibia.
- Hockey, P.A.R., Dean, W.R.J. and Ryan, P.G. 2006. Roberts Birds of Southern Africa VII Edition. John Voelcker Bird Book Fund.
- IUCN, 2015. IUCN red list of threatened animals, IUCN, Gland, Switzerland.
- Joubert, E. and Mostert, P.M.K. 1975. Distribution patterns and status of some mammals in South West Africa. *Madoqua* 9(1): 5-44.
- Komen, L. n.d. The Owls of Namibia – Identification and General Information. NARREC, Windhoek.
- Maclean, G.L. 1985. Robert's birds of southern Africa. John Voelcker Bird Book Fund.
- Maggs, G. 1998. Plant diversity in Namibia. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Mannheimer, C. and Curtis, B. (eds) 2009. Le Roux and Müller's field guide to the trees and shrubs of Namibia. Macmillan Education Namibia, Windhoek.
- Marais, J. 1992. A complete guide to the snakes of southern Africa. Southern Book Publishers, Witwatersrand University Press, Johannesburg, RSA.
- Mendelsohn, J., Jarvis, A., Roberts, A. and Robertson, T. 2002. Atlas of Namibia. A portrait of the land and its people. David Philip Publishers, Cape Town, RSA.
- Monadjem, A., Taylor, P.J., F.P.D. Cotterill and M.C. Schoeman. 2010. Bats of southern and central Africa. Wits University press, Johannesburg, RSA.
- Müller, M.A.N. 1984. Grasses of South West Africa/Namibia. John Meinert Publishers (Pty) Ltd, Windhoek, Namibia.
- Müller, M.A.N. 2007. Grasses of Namibia. John Meinert Publishers (Pty) Ltd, Windhoek, Namibia.
- NACSO, 2010. Namibia's communal conservancies: a review of progress and challenges in 2009. NACSO, Windhoek.
- Passmore, N.I. and Carruthers, V.C. 1995. South African Frogs - A complete guide. Southern Book Publishers, Witwatersrand University Press, Johannesburg, RSA.
- Rothmann, S. 2004. Aloes, aristocrats of Namibian flora. ST promotions, Swakopmund.
- SARDB, 2004. CBSG Southern Africa. In: Griffin, M. 2005. Annotated checklist and provisional national conservation status of Namibian mammals. Ministry of Environment, Forestry and Tourism (MEFT), Windhoek.
- Schultz, M. and Rambold, G. 2007. Diversity shifts and ecology of soil lichens in central Namibia. Talk, Ecological Society of Germany, Austria and Switzerland (GfÖ), 37th Annual Meeting, Marburg: 12/9/2007 to 15/9/2007.
- Schultz, M., Zedda, L. and Rambold, G. 2009. New records of lichen taxa from Namibia and South Africa. *Bibliotheca Lichenologica* 99: 315-354.
- Simmons, R.E. 1998a. Important Bird Areas (IBA's) in Namibia. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.
- Simmons, R.E. 1998b. Areas of high species endemism. In: Barnard, P. (ed.). Biological diversity in Namibia: a country study. Windhoek: Namibian National Biodiversity Task Force.

- Simmons R.E., Brown C.J. and Kemper J. 2015. Birds to watch in Namibia: red, rare and endemic species. Ministry of Environment, Forestry and Tourism (MEFT) and Namibia Nature Foundation, Windhoek.
- Skinner, J.D. and Smithers, R.H.N. 1990. The mammals of the southern African subregion. University of Pretoria, RSA.
- Skinner, J.D. and Chimimba, C.T. 2005. The mammals of the southern African subregion. Cambridge University Press, Cape Town, RSA.
- Stander, P. and Hanssen, L. 2003. Namibia large carnivore atlas. Unpublished Report, Ministry of Environment, Forestry and Tourism (MEFT), Windhoek.
- Steyn, M. 2003. Southern African Commiphora. United Litho, Arcadia.
- Tarboton, W. 2001. A guide to the nests and eggs of southern African birds. Struik Publishers, Cape Town, RSA.
- Taylor, P.J. 2000. Bats of southern Africa. University of Natal Press, RSA.
- Tolley, K. and Burger, M. 2007. Chameleons of southern Africa. Struik Nature, Cape Town, RSA.
- Van Oudtshoorn, F. 1999. Guide to grasses of southern Africa. Briza Publications, Pretoria, South Africa.
- Van Wyk, B. and Van Wyk, P. 1997. Field guide to trees of Southern Africa. Cape Town: Struik Publishers.