ENVIRONMENTAL IMPACT ASSESSMENT, ENVIRONMENTAL MANAGEMENT PLAN, WASTE MANAGEMENT LICENSE AND WATER USE LICENSE FOR VANADIUM ORE, IRON ORE, TITANIUM, IRON ORE, PHOSPHATE, AGGREGATE AND SAND MINING RIGHT APPLICATION

WITHIN THE MAGISTERIAL DISTRICT OF MANKWE IN NORTH WEST PROVINCE.

SEPTEMBER 2021

Prepared for Ikwezi Vanadium (Pty) Ltd

Building 5, Thornhill Business Park,

94 Bekker Road, Voma Valley,

Midrand,

1686

Telephone no.: 010 446 8452

Prepared by Envirostep (Pty) Ltd

47602 Carlswald North Estate,

Tambotie Street,

Midrand

1685

Telephone no.: 0734337453

Reports	Date of submission	Authors	Signature
DEIAR & EMPR	01/10/2021	Thabelo Nelwamondo (Pr.Sci.Nat) Mpho Morotoba (Pr.Sci.Nat)	
FEIAR & EMPR	05/11/2021	Thabelo Nelwamondo (Pr.Sci.Nat) Mpho Morotoba (Pr.Sci.Nat)	

DISTRIBUTION LIST

Officer Name	Institution
Pinky Chuene	Department of Mineral Resources (Klerksdorp)
Rona Schröder	Ikwezi Vanadium (Proprietary) Ltd
	National Department of Agriculture, Forestry and Fisheries
	Department of Water and Sanitation (National)
	North West Department of Economic Development, Environment, Conservation and Tourism (DEDECT)
	Provincial Heritage Resources Agency (PHR)- North West

STRICTLY CONFIDENTIAL

List of Abbreviations

%	: Percent
°C	: Degrees Celsius
<	: Less than
>	: Greater than
BID	: Background Information Document
CARA	: Conservation of Agricultural Resources Act
cm	: Centimeter
CR	: Critically Rare
CSI	: Corporate Social Investment
CSR	: Corporate Social Responsibility
dB	: decibel
dBA	: Decibels (Weighted)
DEA	: Department of Environmental Affairs
DM	: District Municipality
DMR	: Department of Mineral Resources
DMS	: Dense Medium Separation
DWS	: Department of Water and Sanitation
EAP	: Environmental Assessment Practitioner
ECA	: Environment Conservation Act
EIA	: Environmental Impact Assessment

EIS	: Ecological Importance and Sensitivity analysis
EMP	: Environmental Management Plan/Programme
EN	: Endangered
ESR	: Environmental Scoping Report
Ha	: Hectare
HIA	: Heritage Impact Assessment
I&APs	: Interested and Affected Parties
IDP	: Integrated Development Plan
IRR	: Issues and Response Register
IWUL	: Integrated Water Use License
IWULA	: Integrated Water Use License Application
IWWMP	: Integrated Water and Waste Management Plan
LED	: Local Economic Development
LM	: Local Municipality
LOM	: Life of Mine
m	: Metres
m^2	: Square Meters
m^3	: Cubic Metres
masl	: Metres Above Sea Level
MPRDA	: Mineral and Petroleum Resources Development Act
NEMA	: National Environmental Management Act

NEM: BA	: National Environmental Management: Biodiversity Act
NEM: WA	: National Environmental Management: Waste Act
NT	: Near Threatened
NWA	: National Water Act (Act No. 36 of 1998)
PCD	: Pollution Control Dam
PES	: Present Ecological State
PPP	: Public Participation Process
ROM	: Run of Mine
S&EIR	: Scoping and Environmental Impact Report
SAHRA	: South African Heritage Resource Agency
SANBI	: South African National Biodiversity Institute
SANRAL	: South African National Roads Agency Limited
SANS 10103	: South African National Standard 10103
SAWS	: South African Weather Service
SDF	: Strategic Development Framework
SLP	: Social and Labour Plan
sms	: Short Message Services
SWMP	: Storm-water Management Plan
t	: Ton
WMA	: Water Management Area
WULA	: Water Use License Application

Definitions of Terms

Affected Environment: The affected environment refers to those parts of the socio-economic and biophysical environment impacted on by the development.

Consultation: A two-way communications process between the applicant and the community or interested and affected party wherein the former is seeking, listening to, and considering the latter's response, which allows openness in the decision-making process.

Community: A group of historically disadvantaged persons with interests or rights in a particular area of land on which the members have or exercise communal rights in terms of an agreement, custom or law: Provided that, where as a consequence of the provisions of the Act negotiations or consultations with the community are required, the community shall include the members of the community or part of the community, directly affected by prospecting or mining, on land occupied by such members or part of the community.

Environment: The surroundings within which humans exist and that are made up of (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. This includes the economic, cultural, historical, and political circumstances, conditions and objects that affect the existence and development of an individual, organism or group.

Environmental Impact Assessment: A planning and management tool for sustainable development, aimed at providing decision-makers with information on the likely consequences of their actions.

Environmental Impact: The positive or negative effects on human well-being and/or on the environment.

Interested and affected parties: Individuals, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. These may include local communities, investors, business associations, trade unions, customers, consumers and environmental interest groups, Host Communities, Landowners (Traditional and Title Deed owners), Land Claimants, Lawful land occupier.

Mitigate: The implementation of practical measures to reduce adverse impacts.

Public Participation Process: A process in which potential interested and affected parties are given an opportunity to comment on or raise issues relevant to the proposed development.

Proponent: Any individual, government department, authority, industry or association proposing an activity (e.g. project, programme or policy).

Scoping: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an environmental assessment process. The main purpose of scoping is to focus the environmental assessment on a manageable number of important questions. Scoping should also ensure that only significant issues and reasonable alternatives are examined.

Study Area: The area that will be covered by the EIA process within which possible study corridors will be investigated.

Stakeholders:	A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (I&APs).

EXECUTIVE SUMMARY

Introduction

Envirostep (Pty) Ltd was appointed by Ikwezi Vanadium (Pty) Ltd, as an independent Environmental Assessment Practitioner (EAP) to conduct an Environmental Impact Assessment, Environmental Management Plan, Waste Management License and associated specialist studies for the Mining Right application for Vanadium, Titanium, Iron Ore, Phosphate, Sand and Aggregate on portions 1, 2 and the remaining extent of farm Morewag 921 JQ, portion 7 of farm Haakdoornfontein 12 JQ and portions 7 & 10 of farm Varkfontein 13 JQ within the Magisterial District of Mankwe, North West Province.

Ikwezi Vanadium (Pty) Ltd holds the Prospecting Right that was granted in terms of the Mineral and Petroleum Resources Development Act 28 of 2002 as amended by Act 49 of 2008 ("MPRDA"). Ikwezi Vanadium herewith apply for a Mining right in terms of the Section 23 (a), (b) and (c) read together with regulation 11(1) (g) of the MPRDA (Act 28 of 2002).

Contact Person and Correspondence Address

This report set out the proposed scope of the Environmental Impact assessment (EIA) that will be conducted. This document therefore will discuss a range of aspects to mention the details of the appointed Environmental Assessment Practitioner (EAP), her qualifications and a summary of her experience.

Description of the Property.

The Ikwezi Vanadium project is in the Northwest Province within the Mankwe Magisterial District. The mining right is on on portions 1, 2 and the remaining extent of farm Morewag 921 JQ, portion 7 of farm Haakdoornfontein 12 JQ and portions 7 & 10 of farm Varkfontein 13 JQ. A locality map of the proposed project area is included as Figure 1, the immediate adjacent landowners to the proposed project are summarised and tabulated.

Description of the Scope of the Proposed Overall Activity.

The EIA Regulations (GNR 983 to 985) as amended by (GNR 327, 325 and 324) published in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA), lists activities that potentially could have a detrimental impact on the environment. Activities listed in the EIA Regulations require environmental authorisation prior to commencement. A Waste Management License application submitted to the Department of Mineral Resources

in terms of activities listed in GNR 718, National Environmental Management: Waste Act, 2008 (NEMA: WA).

Description of the Scope of the Proposed Overall Activity.

The proposed activity might trigger the following listing activities;

NEMA, EIA Regulation, 2017 (Amendment of GNR 983- 985 of EIA Regulation)

GNR 325- Listing Notice 1: Activity 4, Activity 15 & Activity 17.

GNR 327- Listing Notice 2: Activity 12, Activity 13 & Activity 22.

Waste Management License

GNR 178 Category B: Activity 10 and Activity 11

The proposed activities that Ikwezi Vanadium is intending to undertake will include the excavation of an open cast mine. Contractors are utilised to design the pit for the mine, to ensure that all waste within the ultimate pit can be accommodated throughout the life of Mine (LOM), a Waste Dump Design was completed. Crushers will be used to reduce large rocks into smaller rocks, gravel, or rock dust. Conveyors will be used to transport material such as the ore and the overburden. Water supply for the plant area will be obtained from pit dewatering, service providers and other water resources. The power supply will be supplied by Eskom. Gravel Surface roads will be constructed. For the purpose of administration, general buildings will be built. The Surface Mine Layout is presented in Figure 4.

Need and Desirability of the Proposed Activities.

This Chapter focuses on the positive impacts that this proposed project will contribute to the communities and the country. Amongst other benefits, employment opportunities will be created, growth in the Gross Domestic Product (GDP), poverty alleviation and the minerals to be mined have a significant economic benefits to the industry.

Description of the process followed to reach the proposed preferred site.

The preferred activity is the mining of Vanadium, Aggregate, Sand, Phosphate, Titanium and Iron Ore and it will be extracted through open cast mining method. The selected site layout is represented in Figure 4, the selection was based on the position and of the mineral reserves to be exploited, land ownership, geo-hydrological impacts and the ease and available

transport modes and routes. The ore will be mined from an open pit using excavators, bulldozers, trucks, bowl scraper and shovel. A tripper conveyor is proposed for the stacking method. The proposed technologies were based on their long-term success in terms of mining history, therefore no alternatives are indicated.

The operation aspects of the proposed mining involve the open cast mining, the processing plant, pollution control dams, workshops, material stockpiles, storage, excavations, access roads, diesel and wash bays. No feasible alternative operational aspect methods currently exist. The No-go option might be considered if the mining right application is rejected however, the applicant will loss the opportunity to utilise the reserves and the agricultural activity will continue.

PURPOSE OF THIS REPORT

The overarching objectives of this EIA/EMPr Report are to:

- Identify and assess potential environmental and social impacts associated with the proposed waste management activities associated with the Ikwezi Vanadium Project; and
- Recommend mitigation and management measures to ensure that the development is undertaken in such a way as to enhance positive impacts and minimise negative impacts.

This report also describes the status quo of the biophysical and socio-economic environment of the Project area through specialist studies undertaken. Furthermore, an EMPr has been developed to mitigate and manage environmental and social impacts associated with each project activity. The EIA/EMPr Report will be submitted to the public for their input and comments for a period of thirty (30) days on the 01st of October 2021 to the 30th of October 2021. The EIA/EMPr Report will be updated based on inputs from the public consultation period prior to submitting to the Competent Authority.

PUBLIC PARTICIPATION PROCESS

A Public Participation Process (PPP) has been designed not only to comply with the regulatory requirements set out in the EIA Regulations (April 2019, as amended), but is also designed to provide Interested and Affected Parties (I&APs) with an opportunity to evaluate all aspects of the proposed Project. No public meeting was held during the EIA Phase, the confirmation with the legal representative for the community regarding the meeting has been attached to this report. Meetings were held during Scoping Phase and to the community

satisfactory. Newspaper used for advertising the EIA Phase for the proposed project is the Platinum Publishers (13 August 2021). All issues and concerns raised during Scoping and EIA Phase are addressed in this report. The aim is to maximise the Project benefits while minimising its adverse effects. The EIA/ EMPr Report will be made available for public review from 01 October 2021 to 30 October 2021.

SUMMARY OF THE POTENTIAL IMPACTS ASSOCIATED WITH THIS MINING RIGHT APPLICATION

Specialist studies conducted for Ikwezi Vanadium Right Application to assess all negative and positive impacts associated with the mining of Vanadium, Titanium, Iron Ore, Phosphate, Sand and Aggregate on portions of farms under application.

- Air Quality Impact Assessment
- Heritage Impact Assessment
- Aquatics
- Traffic Impact Assessment
- Blasting Impact Assessment
- Agricultural Agro-ecosystem Impact Assessment
- Geochemistry report
- Visual Impact Assessment
- Noise Impact Assessment
- Hydrogeological

A. Air Quality Impact Assessment

The main findings with regards to predicted health and nuisance impacts are summarised below:

• Criteria pollutants: Exceedances of the National Ambient Air Quality Standards (NAAQS) of South Africa at a nearby residential area (Mononono), were noted for simulated ground level concentrations of daily PM10 for Scenarios 1 and 2. No exceedances of the SA NAAQS for PM2.5 at the nearby residential areas or sensitive receptors were simulated for any of the scenarios. Simulated gaseous concentrations (SO2, NO2, and CO) were well below the SA NAAQS at all off-site locations including at all residential areas and sensitive receptor locations. Simulated VOC concentrations were below the referenced ECA guidelines for alkanes at all off-site locations.

• Critical levels for Vegetation: Simulated GLCs for NO2 exceed the annual guidelines for vegetative protection when screened against the critical levels for vegetation as defined by the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Trans-Boundary Air Pollution Limits (CLRTAP, 2015). Simulated SO2 concentrations were below the critical levels for vegetation outside the mine boundary.

• Dustfall: Simulated highest monthly dust fallout rates due to each of the scenarios assessed was well below the NDCR residential and non-residential limits at all off-site locations, including at residential areas and sensitive receptor locations.

• Construction and closure: Construction and closure phase emissions were not quantified since construction and closure schedules were not available (due to their temporary nature); and the likelihood that these activities will not occur concurrently at all portions of the site. For mining operations, construction activities are similar to operational phase activities and are generally less severe in magnitude.

Recommendations

In order to ensure the lowest possible impact on nearby AQSRs and the environment, it is recommended that the air quality management plan as set out in this report be adopted. To ensure that fugitive emissions are kept to a minimum, thus minimising adverse health effects to the receiving environment, additional mitigation is also recommended.

B. Heritage Impact Assessment

Background research indicated that there are a number of cultural heritage (archaeological and historical) sites and features in the larger geographical area within which the study area falls. There are no known sites in the specific study area, but the potential for a number of cultural heritage (archaeological and/or historical) sites, features and material located here was evident. The May 2021 fieldwork identified a number of sites and material of cultural heritage (mainly archaeological) origin and significance in the study area.

Five sites or find locations were identified during the field assessment in the Haakdoornfontein area. These were all found in open patches or eroded sections. With very dense vegetation cover characterizing the largest part of the study area there could therefore be many more invisible similar sites and finds situated here.

Site 1 contains a small number of MSA/LSA stone tools. It is recommended that a surface collection of the Stone Age material in the area be undertaken for a representative sample

and to preserve the Stone Age record. A sampling permit from SAHRA will be required for this. Sites 2 & 3 is located in fairly close proximity to Site 1 and contains scatters of undecorated pottery fragments. A broken upper grinding stone was also found here and this indicates that some settlement and agricultural activities took place here during Iron Age times. There are no stone-walling visible in the area, and the lack of this could indicate that these finds and sites are related to the Early Iron Age periods. Site 4 is represented by a single lower grinding stone and could again be indicative of earlier Iron Age settlement and agricultural activities in the area. Site 5 is located close to and in a recent graded road in the area and is represented by a fairly large number of undecorated pieces of pottery.

From a Cultural Heritage point of view it is however recommended that the proposed mining activities be allowed to continue once the recommended mitigation measures that have been provided has been implemented.

C. Traffic Impact Assessment

A traffic volume determination process was followed in order to determine base operational conditions and respective LoS for the road link expected to be impacted, which in this case is considered to be the R510 during both construction and operational stages. The traffic volume determination process provides a passenger car equivalent design flow measured as passenger cars per hour per lane (pc/h/ln) for each direction of travel.

A baseline road link capacity analysis assessment was carried out under Scenario 1. The analysis was done to determine the existing operational performance of the road link (R510) based on baseline traffic volumes and existing geometrical features.

A construction stage road link capacity analysis assessment was carried out under Scenario 2 and Scenario 3. The analysis was done to determine the operational performance of the road link (R510) based on construction stage traffic volumes and the associated impact thereof on road link performance.

An operational stage road link capacity analysis assessment was carried out under Scenario 4 and Scenario 5. The analysis was done to determine the operational performance of the road link (R510) based on operational stage traffic volumes and the associated impact thereof on road link performance.

The analysis indicates that there would be no change to baseline LoS when operational traffic is introduced to the road link (R510). The road link would perform at LoS B at year

2022 and LoS C, at year 2032. Impact of the proposed development on road link performance is considered negligible.

D. Blasting Impact Assessment

The potential impacts of ground vibration, air blast levels and fly rock risks were determined using methods provided by the USBM. A blast design was provided by the developer and evaluated in this assessment. This assessment indicated that:

- That ground vibration levels may be unpleasant to intolerable to BSRs when blasting take place within 1,500 m from structures used for residential activities. The impact is of **High** significance and mitigation required and proposed that could reduce the vibration levels. However, due to the sensitivity to blast effects, it is possible that people may complain about the perceived blast effects;
- That ground vibration levels will be of **High** significance to potential BSSs in the vicinity of the mining area. Mitigation is required and measures are proposed that could reduce the vibration levels;
- Air blast levels will be clearly audible to all surrounding receptors and the significance may be **High** for the closest BSRs. Mitigation is required and measures are proposed that could reduce the airblast levels. Due to the sensitivity of people to the significant loud noise as well as secondary vibration of large surfaces (due to the change in air pressure), BSRs must be informed about the potential impacts;
- There are no risks of fly rock to BSRs or BSSs, but blasting close to the mine infrastructure may result in fly rock damage. Management measures are available to ensure the risks are minimised.

<u>Recommendations</u>

The significance of blasting risks is **High** and blasting monitoring is recommended from the start of mining operations.

In addition, community involvement throughout the project is of utmost importance. This is especially true for opencast mining projects close to residential dwellings. Blasting relates impacts are definite to upset the community and complaints will be one of the tools that the community may use to express their annoyance with the project, rather than a rational reaction to the vibration or air blast level itself.

At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. Even with the best measures, blasting related impacts will be perceived and the community members may complain. It is therefore in the best interest of the mine to continually monitor and manage the blast in an effort to improve and minimise potential blasting effects.

It is highly recommended that the mine conducts a detailed photographic survey at selected structures (that does not belong to the applicant) located within 1,500 m from the mine (from the opencast boundary limit) before any mining activities start (before the construction phase start where blasting is to take place). This should include a survey (condition assessment with photographic records) of residential structures, water boreholes and cement dams to determine the status of these structures.

E. Agricultural Agro-ecosystem Impact Assessment

The project area is dominated by Hutton, Valsrivier and Arcadia and the soil textures of representative soil forms are predominantly clay, and sandy clay loam. Most of the analysed soil forms are slightly acidic to neutral (4 < pH < 7). The cation status of the soils is moderate to high for all soils analysed. The concentration of phosphorus (Bray-1) in majority of the soils is low (Bray 1 P < 48 mg/kg). The analytical data shows that Copper, Manganese and Zinc concentrations did not exceed the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality in the Republic of South Africa (GN R 37603, May 2014) promulgated in terms of NEM: WA for SSV1 and SSV2.

Agricultural impact:

- There will be no change in agricultural production because there has been no agricultural production on the site.
- There will be no change in agricultural employment because there has been no agricultural employment on the site.

The key soil and land use aspects affected due to the project activities are soil quality degradation, loss of soil as a resource, land use change, soil contamination, soil compaction and soil erosion. These impacts have high impact significance and when mitigated have low to moderate impact significance. An extensive soil quality monitoring programme as per the environmental monitoring programme should be implemented to minimise and/or eliminate the identified impacts. The residual impacts include soil degradation due to vegetation

clearance and soil disturbances, and insufficient soil available for surface rehabilitation at closure.

F. Geochemistry report

- The samples received from the client, and sent to Waterlab laboratory illustrate that the samples are non-acid generating based on the total sulphur level, the NAGpH and ABA results;
- At any mine, geochemical assessments should not be considered as once-off investigations, further geochemical analysis of residue stockpile in future with a larger number of samples for basic ABA and NAG tests to add greater statistical value to the evaluation of AMD potential;
- The geochemical assessment conducted is static and provides the total amount of acid generation and/or neutralising potential. Static tests do not provide information on when the acid generation or neutralisation will occur. Long term (20 to 45 weeks) kinetic tests are often required to assess the long-term geochemical behaviour of the residue stockpiles;
- Kimopax (specialist who conducted the study) proposes that the residue stockpile be classed as Type 4 waste that needs to be deposited on Class D landfill;
- The results of geochemistry samples should be modelled as part of plume model;
- Drilling of monitoring boreholes (shallow and deep) close to the stockpiling area; and
- Monitoring boreholes are proposed to monitor the movement of polluted groundwater migrating away from the mine area and the lowering of the groundwater table due to mine dewatering. This will include water level and water quality monitoring monthly in the first year and quarterly from year two onwards.

G. Visual Impact Assessment

The project area harbours a number of CBAs and ESAs, and also in close proximity to more of these areas. The proposed infrastructure for Haakdoornfontein coincides with areas classified as CBA 2, while the proposed Varkfontein infrastructure will occur in areas classified as ESA 1. The Pilanesberg National Park, a national asset and home to several CBAs, is located 6.5 km southwest from the MRA's southernmost border, and about 12.5 km and 14 km from the Haakdoornfontein and Varkfontein areas, respectively.

Vegetation of the area is characterised by Dwaalboom Thornveld in the northern parts, while Central Sandy Bushveld dominates the south. The land cover towards the north, west and southwest is dominated by settlements, associated agriculture and mining activities, while

large natural grasslands can be found towards the south and southeast. Limited settlements and cultivation can be found towards the east and southeast.

Receptors in the area with a high sensitivity include several communities, such as Mononono, Sefikile and Manamakhoteng, while the R510 and homesteads can also be included with this group. A number of secondary roads and tracks will also experience an impact. Receptors with a lower sensitivity include agricultural practices, mines and mining residences.

Results from the viewshed analysis suggested a **high** visibility given its size of 285.09 km^2. The footprint and heights of the proposed operations will be substantial, which will result in a **moderate** visual exposure. It should be noted that the existing bushveld vegetation will shield many of these activities, hence the lower visual exposure.

The visual sensitivity of the area was rated at **moderate** given the combination of highly sensitive areas such as CBAs and less sensitive areas comprising of agricultural practices and mining operations. Similarly, the sensitivity of potential receptors range from communities and the R510 (high) to agriculture and mines (low), resulting in a **moderate** classification. The VAC has been rated in Table 7-1 and is classified as **moderate.** Additionally, the area's *sense of place* has already been altered due to the presence of existing mines in more exposed sites within the region. Therefore the visual intrusion can be classified as **moderate**

H. Biodiversity Impact Assessment

The identified watercourses associated with the project area have no freshwater priority areas designated to them. The A24E-00652 SQR (Phufane) is directly associated with the project area and spans 31 km of the Phufane River. The desktop Present Ecological State (PES) of the Phufane River is a class B (Largely natural), Ecological Sensitivity (ES) and Ecological Importance (EI) are rated as high.

Anthropogenic impacts identified within the sub-quaternary catchment included road crossings (causeways), irrigation for rural villages, subsistence farming, over-grazing which results in erosion and sediment deposition. There were nine (9) fish species that were expected within the project area. None of the expected fish species were of conservation concern.

Three (3) aquatic sampling points were selected for the assessment namely IKW 01, IKW 02 and IKW 03. All the sampling point were along the Phufane River. IKW 01 and IKW 03 were beyond the Mining Right area to establish baseline data before the river enters the project area and after it has passed through. IKW 02 was along the Phufane River within the project area to establish baseline conditions of the river within the project area. Sampling points IKW 01 and IKW 02 were determined to be dry and could not be assessed. Sampling point IKW 03 to hold a low and disconnected flow that was largely isolated pools and could not be sampled as the watercourse did not meet the minimum requirements for an aquatic survey.

I. Noise Impact Assessment

Conceptual scenarios were developed for the future construction and operational phase with the output of the modelling exercise indicating a potential medium to high risk of a noise impact at all receptors. Mining noises may increase the noise levels at the houses closest to the project activities.

It is concluded that the noise from the proposed activities would be at acceptable levels. It is therefore the recommendation that the proposed activities at the VTM Mining Project be authorized (from a noise impact perspective).

No further noise investigations or assessments are recommended, though it is recommended that the developer design and implement a noise monitoring program.

J. Social Impact Assessment

Potential socio-economic impacts associated with the construction phase of the Project and in some cases impacts that occur across all Project phases. Construction related impacts identified include:

The creation of local employment and business opportunities, skills development, and training. Opportunities and capabilities within the supply chain.

- Change sense of place.
- Impacts associated with population influx.
- Community unrest due to a perceived lack economic opportunities and unmet expectations.

Project impacts associated with the operational phase include:

- Creation of employment, work skills development and experience.
- Opportunities and capabilities within the supply chain.
- Multiplier effects on the local and regional economy.
- Increased competition for water resources.
- Potential economic impacts on eco-tourism operators and establishments.
- Impacts associated with blasting on neighbouring landowners.
- Workforce health, safety, and security risks.
- Impacts associated with decreased community health, safety, and security.

The negative impacts associated with the proposed Project include:

- Movement of the workers and heavy vehicles to and from the site as it affects biophysical environment.
- Community health.
- Safety and security impacts.
- Loss of grazing, traffic impact.
- Disturbance of sense of place.
- Mine closure impacts.

CONCLUSIONS AND RECOMMENDATIONS

Mitigation and management measures have been recommended to prevent, avoid and reduce the significance of the potential impacts of the Project. Conversely, enhancement measures will be implemented to increase the significance of the potential positive impacts at Ikwezi Vanadium Mine. Should the mitigation and management measures be correctly implemented, the potential impacts will reduce in their significance impacts.

The proposed activities requiring Environmental Authorisation are critical for the mining activities and the prevention of pollution of the environment, as well as to ensure the efficient and successful operation of the Project. With the implementation of the recommended mitigation measures to manage potential impacts, it is recommended that the proposed Project be granted an Environmental Authorisation.

TABLE OF CONTENTS

List of Figures

List of Tables

Appendices

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

Name of Applicant	**: Ikwezi Vanadium (Pty) Ltd**
Tel No	**: 010 446 8452**
Fax No	**:**
Postal Address	**: Building 5, Thornhill Business Park, 94 Bekker Road, Vorna Valley, Midrand, 1686**
Physical Address	**: Building 5, Thornhill Business Park, 94 Bekker Road, Vorna Valley, Midrand, 1686**
File Reference Number Samrad	**: NW 30/5/1/2/2/10178 MR**

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

1 OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
(d) determine the—-
    (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

    (ii) degree to which these impacts—

        (aa) can be reversed;

        (bb) may cause irreplaceable loss of resources, and

        (cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
(g) identify suitable measures to manage, avoid or mitigate identified impacts; and
(h) identify residual risks that need to be managed and monitored.

PART A

SCOPE OF ASSSSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

2 CONTACT PERSON AND CORRESPONDENCE ADDRESS

2.1 Details of

2.1.1 Details of the EAP

Name of The Practitioner : Thabelo T. Nelwamondo (Matshisevhe)

Tel No. : 081 760 7362

Fax No. : 086 604 5465

e-mail address : nelwamondothabelo50@gmail.com

2.1.2 Expertise of the EAP. *(The qualifications of the EAP with evidence)*

Thabelo T. Nelwamondo has an Honours degree in Environmental Management from the University of Venda. She is a Senior Environmental Consultant at Envirostep (Pty) Ltd and a member of South African Council for Natural Scientific Professions (SACNASP). She has more than 7 years working experience in the field of Mining applications, Construction, Waste Management, Environmental Management and Environmental Management Systems (EMS) Implementation and Auditing. She has worked on several municipality and state-owned companies' projects.

2.1.3 Summary of the EAP's past experience. *(In carrying out the Environmental Impact Assessment Procedure)*

She has worked on several municipality projects among them included the following:

a. Upgrade of Makwarela stadium for Thulamela Local Municipality in Limpopo Province
b. Waste Management license and Basic Assessment Process for St. Lucia waste disposal site in KwaZulu- Natal Province.
c. Prospecting right application for Diamond and Manganese for Mivami Agri Mining Pty Ltd in Northwest Province.

d. Mining Right Application for Iron Ore for Muhlava Mining Pty Ltd in Thabazimbi, Limpopo Province.
e. Mining Right Application for magnetite for SASOL in Heidelberg, Gauteng Province.
f. Basic Assessment Process for the expansion of a consolidation loop in Phalaborwa for Transnet Capital Projects, Limpopo Province.
g. Basic Assessment Process for the expansion of a Railway line at Pyramid South for Transnet Capital Projects, Gauteng Province.
h. Mining Right Application for Coal for Woestalleen Mining Pty Ltd in Mpumalanga Province.

Apart from doing municipality projects, Thabelo has also managed many Environmental Impact Assessment Projects and Environmental Monitoring for construction projects in South Africa.

2.2 Description of the property.

Table 1: Description of the property

Farm Name:	Morewag 921 JQ; Haakdoornfontein 12 JQ; and Varkfontein 13 JQ
Application area (Ha)	9297.8 hectares
Magisterial district:	Mankwe
Distance and direction from nearest town	Approximately 70 km north of Rustenburg and 53 km south of Thabazimbi.
21 digit Surveyor General Code for each farm portion	**Morewag 921 JQ** Remaining Extent: T0JQ00000000092100000 Portion 1: T0JQ00000000092100001 Portion 2: T0JQ00000000092100002 **Haakdoornfontein 12 JQ** Portion 12: T0JQ00000000001200000

	Varkfontein 13 JQ Portion 7: T0JQ00000000001300007 Portion 12: T0JQ00000000001300012

Land tenure and use of immediately adjacent land

The owners of the farm portions immediately adjacent to the Ikwezi Vanadium site are listed in the

Table 2 below. The adjacent land is mostly used for agricultural activities.

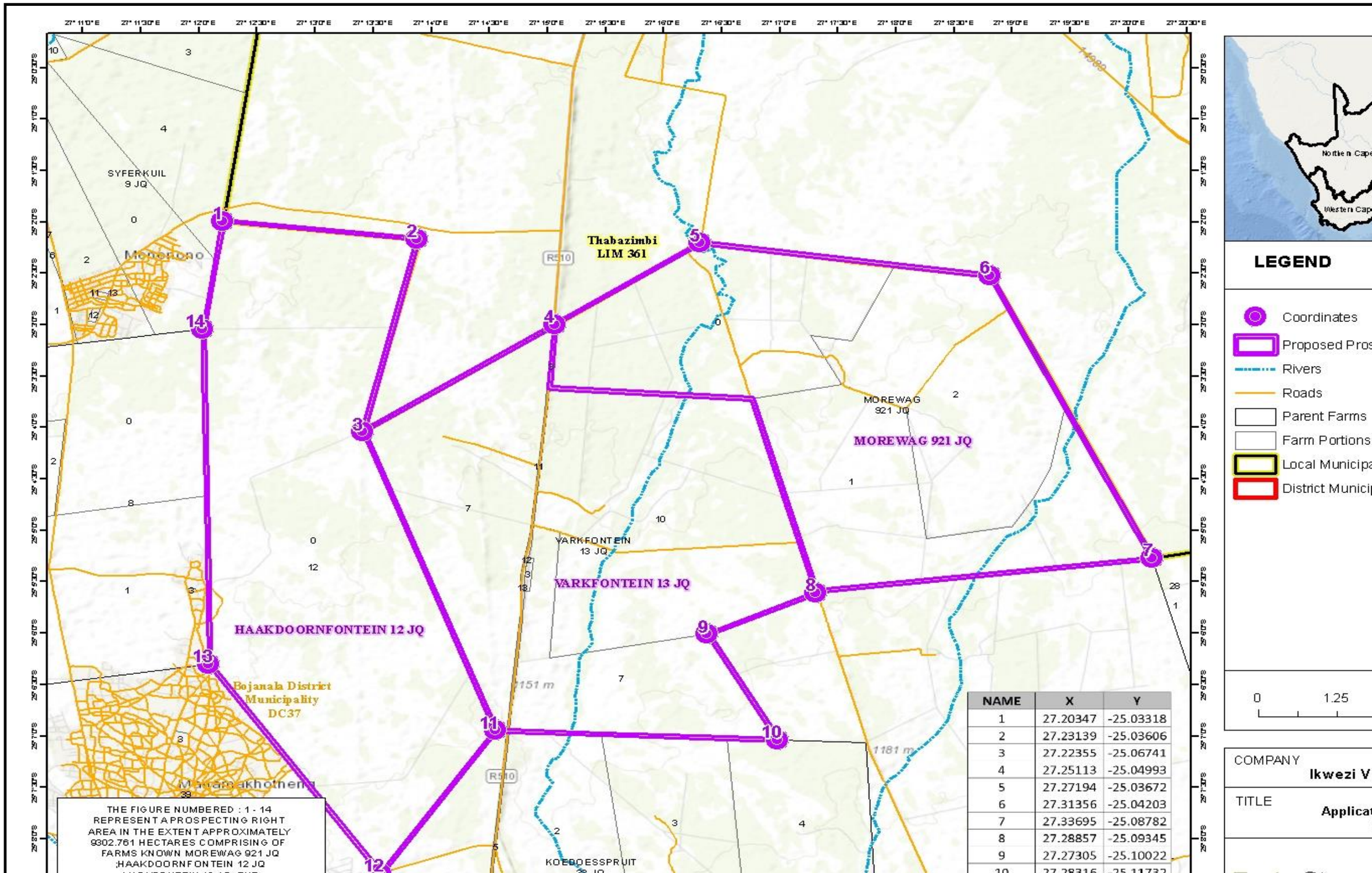
Table 2: Adjacent land owners of the site

Farm name	**Province**
DRIEFONTEIN 922 JQ	North-West
KOEDOESSPRUIT 33 JQ	North- West
SYFERKUIL 9 JQ	North- West
NOOITGEDACHT 11 JQ	Limpopo
TUSSCHENKOMST 15 JQ	Limpopo
UITDUIKER 17 JQ	Limpopo
MAKAYSKRAAL 18 JQ	Limpopo

2.3 Locality map

(Show nearest town, scale not smaller than 1:250000).

The locality of the proposed Ikwezi Vanadium area is presented below in Figure 1. The map shows the the farm portions on which the proposed activity will take place as well as the adjacent farm portions that may be affected by mining activities.



NAME	X	Y
1	27.20347	-25.03318
2	27.23139	-25.03606
3	27.22355	-25.06741
4	27.25113	-25.04993
5	27.27194	-25.03672
6	27.31356	-25.04203
7	27.33695	-25.08782
8	27.28857	-25.09345
9	27.27305	-25.10022
10	27.28316	-25.11732

3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY.

(Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site)

3.1 Listed and specified activities

Table 3: Listed and specified activities.

APPLICABLE LISTING NOTICE ***(GNR 544, GNR 545 or GNR 546)/Not Listed)***	**NAME OF ACTIVITY** ***(All activities including activities not listed) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)***	**LISTED ACTIVITY** ***(Mark with an X where applicable or affected.)***
GNR 325 Activity 4	**Hazardous Storage** **"**The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres."	X
GNR 325 Activity 15	**Excavations** "The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan".	X
GNR 325 Activity 17	**Processing plant and Mining Rights Application** "Any activity including the operation of that activity which requires a mining right as	X

APPLICABLE LISTING NOTICE ***(GNR 544, GNR 545 or GNR 546)/Not Listed)***	**NAME OF ACTIVITY** ***(All activities including activities not listed) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)***	**LISTED ACTIVITY** ***(Mark with an X where applicable or affected.)***
	contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including— (a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource ; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies**."**	
GNR 327 Activity 13	**Storage** "The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014."	X
GNR 327	**Mining Right Application**	X

APPLICABLE LISTING NOTICE ***(GNR 544, GNR 545 or GNR 546)/Not Listed)***	**NAME OF ACTIVITY** ***(All activities including activities not listed) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)***	**LISTED ACTIVITY** ***(Mark with an X where applicable or affected.)***
Activity 22	**"**The decommissioning of any activity requiring- (i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or (ii) a prospecting right, mining right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure: (a) mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource: or (b) petroleum resource, including the refining of gas, beneficiation, oil or petroleum products; – in which case activity 31 in this Notice applies.**"**	
GNR 27 Activity 12	**Water Supply Dams** "The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more: where such development occurs- (a) within a watercourse; (b) in front of a	X

APPLICABLE LISTING NOTICE *(GNR 544, GNR 545 or GNR 546)/Not Listed)*	NAME OF ACTIVITY *(All activities including activities not listed) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)*	LISTED ACTIVITY *(Mark with an X where applicable or affected.)*
	development setback; or (c) if no development setback exists, within 2 metres of a watercourse, measured from the edge of a watercourse"	
LISTED ACTIVITIES IN TERMS OF THE WASTE ACT		
GNR 178 Category B Activity 10	**Processing plant** "Construction of facilities and associated structures and infrastructure (the construction of a facility for a waste management activity listed in Category B of this Schedule not in isolation waste management)".	X
GNR 178 Category B Activity 11	**Stockpiles** "Residue stockpiles or residue deposits (the establishment or reclamation of a residue stockpile or residue deposit resulting from activity which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)".	X

3.2 Description of the activities to be undertaken

(Describe methodology or technology to be employed, including the type of commodity to be mined and for a linear activity, a description of the route of the activity)

3.2.1 Activities to be undertaken by Ikwezi Vanadium (Pty) Ltd

Ikwezi Vanadium is applying for a Mining Right on on portions 1, 2 and the remaining extent of farm Morewag 921 JQ, portion 7 of farm Haakdoornfontein 12 JQ and portions 7 & 10 of farm Varkfontein 13 JQ within the Magisterial District of Rustenburg, North West Province.

a. **Mining Method**

The project will entail excavation of an open cast during mining of the identified minerals. The proposed mining method commences with a box cut. Opencast mining is also known as an open-pit mining, open-cut mining, and strip mining, which basically refers to a method of extracting rock or minerals from the earth by removing the material from an open-pit. This activity will result in the transformation of the proposed site to mining use. The proposed site will be cleared off vegetation, followed by the removal of topsoil and the blasted overburden material. Mining will be performed with the use of excavator, bulldozers, trucks, bowl scraper and shovel.

The stockpile will be stockpiled for later transportation to the rehabilitation area so that it can be used promptly to avoid prolonged stockpiling of the soil and due to minimal availability of topsoil. The topsoil and overburden will be stockpiled separately. A rollover mining technique will be practised, in such a case the topsoil and overburden from the initial cut of the opencast mine are stockpiled at the position of the final cut. As the opencast mine progresses, the overburden and topsoil from each successive cut will be backfilled into the void from the previous cut, the surface will then have shaped to be free from draining, topsoil will be analysed and treated appropriately, and the surface will be fertilised and revegetated with locally indigenous species of grass, shrubs and trees.

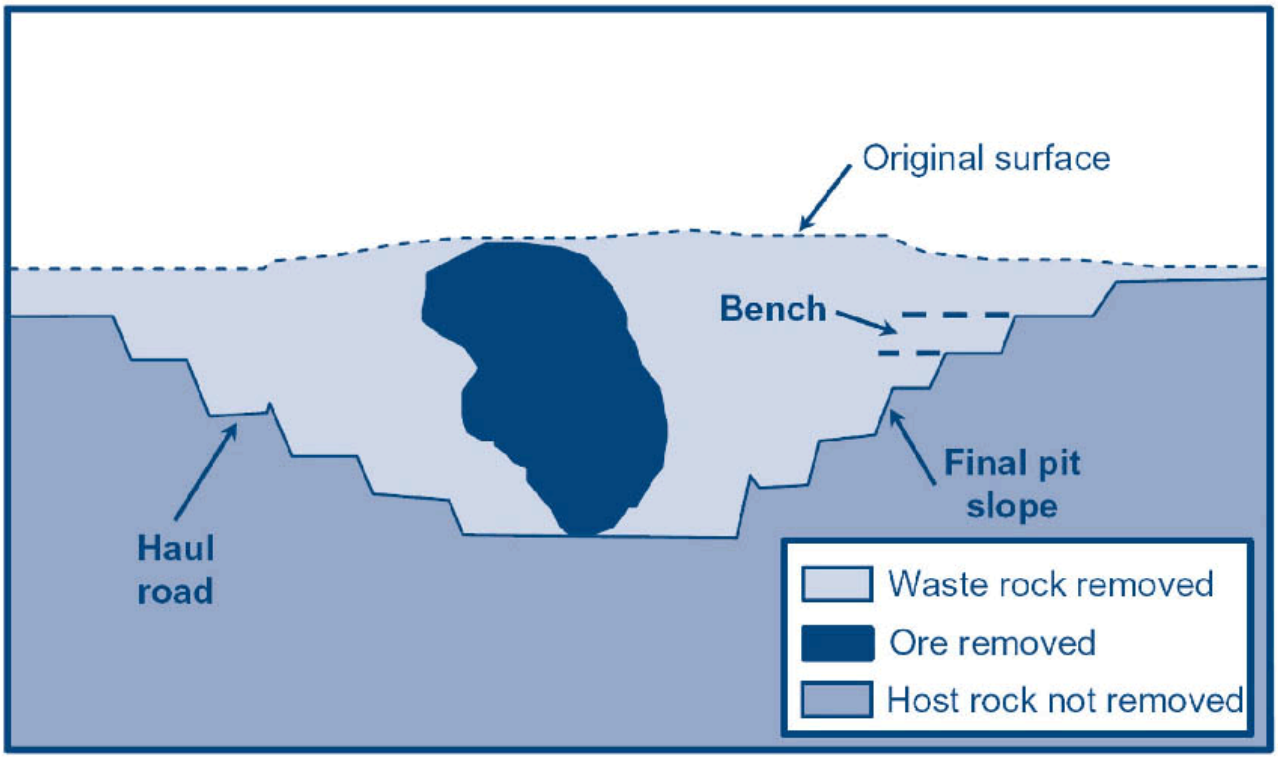


Figure 2: Schematic illustration of an open cast mining (Canada, 2017)

Based on the requirement for a 2 mtpa ROM feed and a simple lumpy DSO product without beneficiation, it is assumed that a typical iron ore ROM feed size distribution and a simulated a three-stage crushing, and screening circuit is viable as defined in the attached block flow.

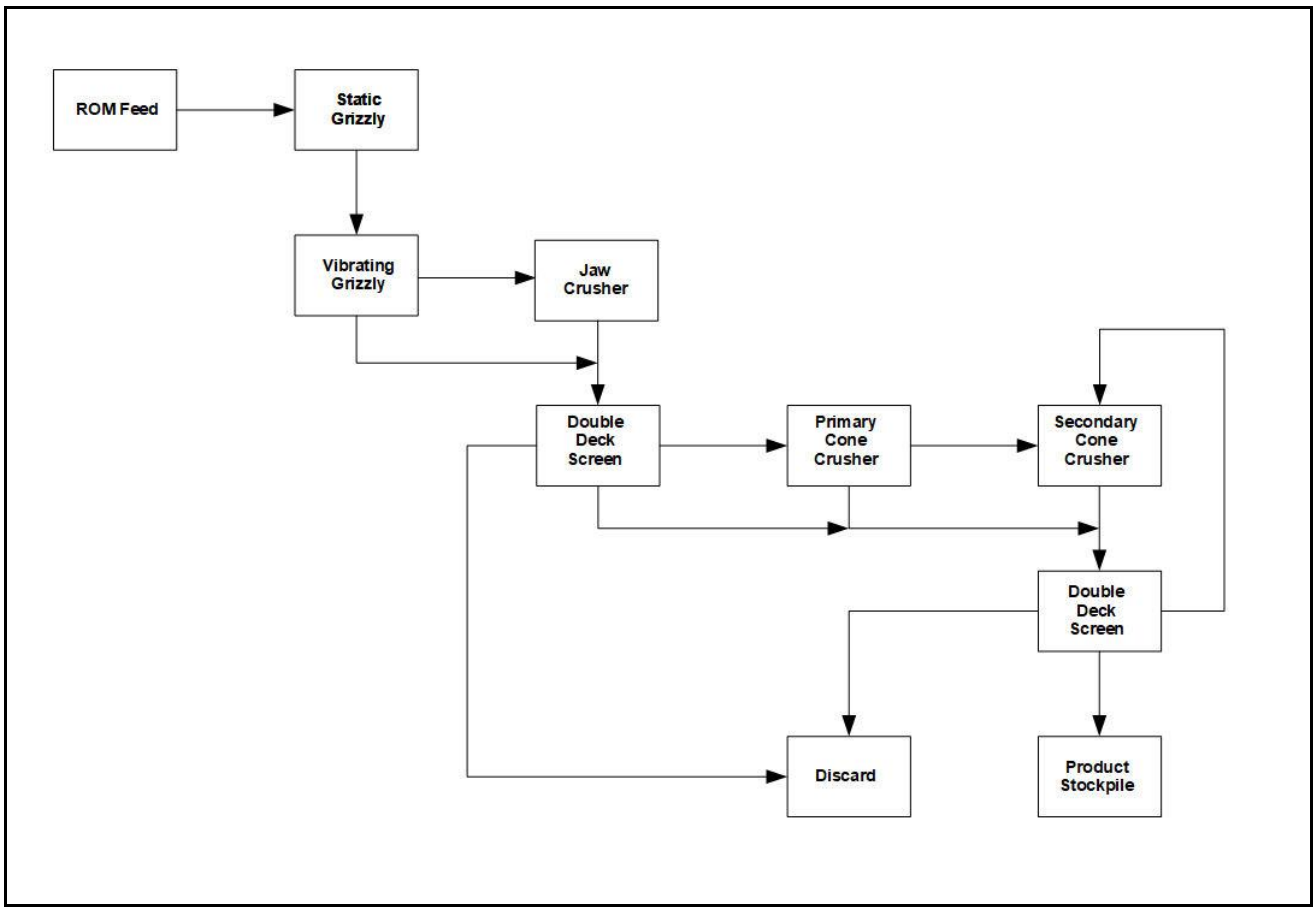


Figure 3: Ore processing flowchart

The ROM feed of 517tph includes about 40.6tph of -6 mm material and after three stages of crushing a further 59.6tph of -6 mm material is generated. The lumpy product of -32mm and +6mm amounts to an estimated 416.8 tph or 80.6% of ROM feed. The flow chart presented in Figure 3 above will be confirmed through additional crushing test work.

Apron Feeder

Apron feeders are very rugged in design and are commonly used in iron ore applications. They are used to extract ore from bins at a predetermined rate and can handle impact loadings as is prevalent from intermittent truckloads being deposited into the receiving bin at the primary tip. The length of the apron feeder will be determined from the layout while the width and power factors will be calculated from the required capacity and speed.

Crushers

Gyratory crushers are very commonly used in high capacity iron ore primary crushing applications as they are beneficial in cost and operation when the capacities are higher than what a single jaw crusher can handle, the civil and structural work becomes too expensive for lower capacities. A single jaw crusher is the preferred option in a lower production requirement.

A single jaw crusher (Metso C140) with a capacity of 750mm, top size, was selected as the primary crusher. A static grizzly is placed at the primary tip to remove oversize material, with a vibrating grizzly placed before the crusher to screen off the fines before it enters the crusher. Secondary and tertiary crushing is required to reduce the size of the material to less than 32mm. Cone crushers are commonly used for this application, but it will have to be confirmed whether the technology is suitable for this ore through further test work. Toothed roll crushers and mineral sizers are ideal to minimise fines but can only handle soft to medium hard type ores. Cone crushers were selected for the secondary open circuit and closed-circuit tertiary crushing applications. The tertiary crusher has a high capacity requirement due to the re-circulating load.

Conveyors

The conveyor profiles were determined from the plant layout. Good engineering practice and industry accepted standards were used to calculate the conveyor widths and speeds for the various capacities. The conveyors include drives, idlers, pulleys, belting, take-ups, cleaners, steelwork, walkways, guards, and foundations.

Stockpile stacking and reclaiming

Various methods exist for stacking and extracting material from the stockpile, each with its' own advantages and disadvantages. In the effort to reduce the capital, a tripper conveyor is proposed for the stacking method. The mechanical components cost is essentially equivalent as for a conventional conveyor. Additional steel and civil work are required to extend the conveyor over the stockpile.

Bottom extraction was selected as the reclaim method of the stockpile. A tunnel underneath the stockpile houses a travelling rotary plough feeder and a conveyor. The capital required for this method is less than a conventional bucket or drum re-claimer, but more civil work is required due the construction of the tunnel. Due to the size of the operation, a small stacker/ re-claimer might be a viable alternative solution and should be investigated further.

Water supply

It is assumed that sufficient make-up water will be supplied to the perimeter of the plant area, either from service provider or other nearby water sources. Holding and settling dams are required to contain the water for water distribution.

Power Supply

It is assumed that sufficient power will be supplied at the perimeter of the plant area. The onsite power distribution will be done from the incoming substation through step-down transformers and via electrical reticulation to the various plant MCC's. Provision is included for a backup generator.

Access and Plant Roads

Secure access and fencing were included for the plant area, with access control via a single gate with guard houses and booms. 8m wide with 4m wide lanes were provided dual purpose roads and working areas within the main plant area. These will be as gravel surfaced roads. The final layer (wearing course) will comprise a suitable gravel material for plant type roads.

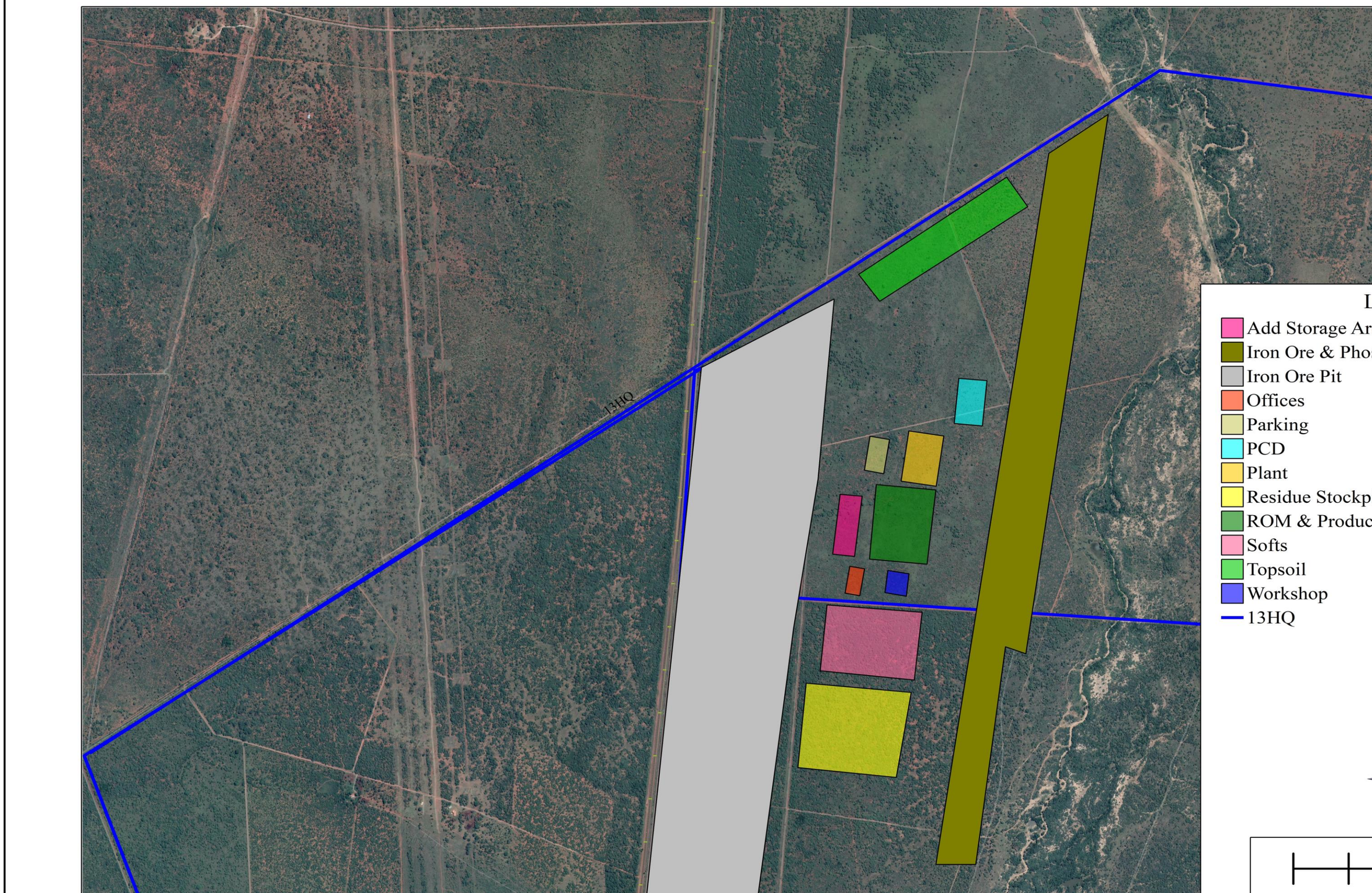
General Buildings

General buildings will be built for the plant and general administration sections. All visitors and employees of the mine will need to report to the security clearance area in the administration complex on arrival at the mine. Public buses and cars have access to the bus terminus and visitor parking areas respectively. All other access will be controlled by the security guard station with access control booms.

There will be a training section and clinic adjacent to the security offices for induction and training purposes, including emergency medical response. Once personnel or visitors have passed through security, they have immediate access to the plant change house facility or canteen. Personnel on lunch break or returning from their shift again have access to the canteen or change house facility before passing back through the security gates and returning home.

The plant and administrative offices are located across the road from the change house and canteen, with the possibility of direct road access via one of the gate-controlled access points with authorised plant vehicles. The road passes in front of the plant offices (with dedicated parking adjacent to the office building), continues first to the plant services area, and then to the various plant operational areas.

The plant services area contains the plant stores, capital spares yard/ laydown area and plant workshop (mechanical and electrical). All brick buildings are single-storey semi face brick buildings, with inverted box rib (“IBR”) galvanized roof sheeting. Internal walls are plastered and painted. All floors are tiled or covered with raised computer flooring.


13HQ
Add Storage Ar
Iron Ore & Pho
Iron Ore Pit
Offices
Parking
PCD
Plant
Residue Stockp
ROM & Produc
Softs
Topsoil
Workshop
13HQ

3.3 Policy and Legislative Context

Table 4: Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996).	The Bill of Rights, in the Constitution of South Africa (No. 108 of 1996), Section 24 states that everyone has a right to an environment that is not harmful to health and wellbeing and requires that reasonable measures are applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development. These principles are embraced in NEMA and given further expression. The development will ensure that as little damage as possible will be left on the surrounding environment and local community. This report is drafted to ensure compliance to this piece of legislation.
National Environmental Management Act (Act 107 of 1998) (NEMA). The	The National Environmental Management Act (Act 107 of 1998 as

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
Environmental Impact Assessment Regulation GNR. 982 dated 04 December 2014 as amended in April 2017.	amended on the 8th of December 2014) (NEMA) and the Regulations and associated listed activities identified under Regulations 982, 983, 984 and 985, is the key national legislation underpinning environmental Authorisations in South Africa. NEMA requires that environmental authorisation is obtained for any development activity prior to its commencement. The Act requires that all environmental impacts (including social impacts) due because of the development are assessed and where possible, minimised or mitigated. NEMA and associated regulations are directly relevant to this authorisation Application
Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) including-

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
	Associated infrastructure, structures and earthworks directly related to the extraction of a mineral resource including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
Occupational Health and Safety Act (No. 85 of 1993)	The employer needs to manage his/her staff and crew in strict accordance with the Occupational Health and Safety Act in order to prevent injuries to the staff.
National Water Act (Act 36 of 1998) (NWA).	In terms of Chapter 4 of the NWA, activities and processes associated with the proposed mine and associated infrastructure, are required to be licensed by the Department of Water and Sanitation (DWS). The National Water Act, 1998 (Act No. 36 of 1998) (NWA) is primary legislation regulating both the use of water and the pollution of water resources.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
	An Integrated Water Use Licence Application (IWULA) will be lodged with the DWS in terms of Section 21 of the NWA, which lists several water uses requiring authorisation. Ikwezi Vanadium's proposed mining operations involves the following water uses: under section 21: a) taking water from a water resource; c) impeding or diverting the flow of water in a watercourse; disposing of waste in a manner which may detrimentally impact on a water resource; f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; g) disposing of waste in a manner which may detrimentally impact on a water resource i) altering the bed, banks, course or characteristics of a watercourse; and j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
National Environmental Management Waste (No 59 of 2008) (NEM: WA).	In terms of section 18, Schedule 3 of the National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014) (NEM: WAA), by default the mining residues are classified as hazardous wastes. According to the Regulations GN R.632 and R.633, that was inaugurated on the 24 of July 2015, the mining residues must be characterised and classified, and the design and management of residue stockpiles and deposits must be based on an assessment of the potential impacts and risks.
National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004).	The objectives of the Act are to reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
	all spheres of government; for specific air quality measures; and for matters incidental thereto.
National Environmental Management: Biodiversity Act (No. 10 of 2004).	The Act identifies that all people and organizations should act with due care to conserve and avoid negative impacts on biodiversity, and to use biological resources sustainably, equitably and efficiently. Biodiversity is defined to include “the number and variety of living organisms on earth, the millions of plants, animals, and microorganisms, the genes they contain, the evolutionary history and potential they encompass, and the ecosystems, ecological processes and landscapes of which they are integral parts. Biodiversity thus refers to the life-support systems and natural resources upon which we depend”. The National Environmental Management: Biodiversity Act provides for: The sustainable usage of resources, the fair and equitable sharing benefits arising from the use and application of genetic resources and

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
	material and the management and conservation of the biological diversity of South Africa.
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003 as amended)	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.
Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983) (CARA)	CARA provides for control over the utilization of the natural agricultural resources of the Republic of South Africa to promote the conservation of soil, water sources and vegetation and the combating of weeds and invader plants.
Restitution of Land Rights Act, 1994, Land Reform (Labour Tenants) Act, 1996 and the Extension of Security of Tenure Act, 1997	Department of land affairs confirmed that there are no existing claims on the affected properties.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
National Heritage Resources Act (Act 25 of 1999).	The National Heritage Resources Act requires all developers (including mines) to undertake cultural heritage studies for any development exceeding 0.5 ha. It also provides guidelines for impact assessment studies to be undertaken where cultural resources may be disturbed by development activities. The document will be approved by The South African Heritage Resources Agency (SAHRA) as part of the impact assessment process.
Promotion of Access to Information Act, 2000 (Act 2 of 2000 as amended)	To give effect to the constitutional right of access to any information held by the State and an information that is held by another person and that is required for the exercise or protection of any rights.
National Development Plan (NDP)	The Province of North-West published its latest Provincial Development Plan (PDP) in 2016. This document is aimed at interventions to eliminate poverty and social inequality by 2030.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT *(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)*	**REFERENCE WHERE APPLIED**
Bojanala Platinum District Municipality (BPDM) Integrated Development Plan (IDP) (2012/2017)	To ensure a better life for all communities through local economic development and job creation.
Moses Kotane Local Municipality (MKLM) Integrated Development Plan (IDP) (2016/17)	Its strategy to address the main causes of unemployment and poor economic development must focus on a number of sectors, amongst the few mentioned is the mining sector.
Environmental Management Frameworks (BPDM) and Environmental Management Frameworks (MKLM)	The MKLM and BPDK EMF share the common goal of balancing economic development, social development and environmental resource management.
Spatial Development Framework (MKLM)	To ensure sustainable Spatial Development with integrated human settlement.

Please note, the applicable legislations and guidelines are not only limited to the above mentioned.

4 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The mining project forms part of a larger scheme for the alleviation of poverty within the local municipality, which will not only improve the living standards for several previously disadvantaged communities, but also potentially allow for the future development of this area.

The project will provide positive impacts in the form of employment opportunities and skills development, skills transfer and ultimately resulting to Gross Domestic Product (GDP) growth, therefore eradicating poverty in such a case stimulating Local Economic Development. Not only that, the business opportunities will be encouraged through infrastructural development such as roads which will be constructed and improved to access the mining area, this will assist in increasing the demand for goods and services in the affected area/s in a long term. According to the outcomes of the IDP Moses Kotane (2016 -2021), community consultation meetings conducted, the main issue that was raised was the need for Local Economic Development, with unemployment as the main concern highlighted in all the different wards within the local Municipality. In the strive to poverty alleviation, the municipality greatly consider employment generation as a required tool and might be achieved through developments similar to the proposed mining project.

Since the local labour from adjacent farm communities such as Manamakgotheng, Legogolwe, Lesobeng, Mononono and Sefikile will be employed by the mine. This will have a positive impact on the well-being of employees with a multiplier effect on households of the employed. Moreover, the development will encourage development of Black Economic Empowerment (BEE) opportunities during construction, operation and eventual closure and rehabilitation

The economic use of the products that will be mined are discussed below:

Vanadium

One of the most important industrial uses of vanadium is in the making of steel alloys. Vanadium steel uses the strength, toughness and anti-corrosive properties that vanadium adds to it. This steel (ferrovanadium) is used to make special tools and equipment. The equipment is used in cars for gears, crank shafts, pipes and tubes in the chemical industry (ScienceStruck, 2018).

Iron Ore

Iron is primarily used to make steel which is used in the manufacturing of automobiles, locomotives, ships, beams used in buildings, furniture, paper clips, tools, reinforcing rods for concrete, bicycles etc, therefore the need of Iron mining remains high and can only be fulfilled through mining of ore.

Titanium

Moreover, due to titanium's low density and ability to withstand extreme temperatures it is used as an alloying agent with many metals including aluminium, molybdenum and iron. It is mainly used in aircraft, spacecraft, missiles, watches and laptop computers.

Sand

Apart from being used as a building material for sandcastles, sand plays a key role in the manufacturing of other items. For instance, concrete, a major construction material, is made from the mixture of sand and gravel.

Phosphate

Phosphate rock is processed to produce phosphorous, which is one of the three main nutrients most commonly used in **fertilizers** (the other two are nitrogen and potassium). Phosphate can also be turned into phosphoric acid, which is used in everything from food and cosmetics to animal feed and electronics.

5 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE.

(NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.)

5.1 Details of the development footprint alternatives considered.

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

a) the property on which or location where it is proposed to undertake the activity;
b) the type of activity to be undertaken;
c) the design or layout of the activity;
d) the technology to be used in the activity;
e) the operational aspects of the activity; and
f) the option of not implementing the activity.

The intension of identifying alternatives in the Ikwezi Vanadium proposed project is to provide a basis for choice among other options available. It should be noted that the examination of these alternatives will allow for the incorporation of more practical, feasible, relevant, reasonable, technologically and the least environmentally impacting options available, and reducing or avoiding potentially significant negative impacts at the same time meeting the need and purpose of the proposed projects.

As per the Department of Environmental Affairs (DEA) Criteria for Determining Alternatives in EIA Guideline (2004), the types or categories of alternatives, including:

5.2 Activity Alternative

The proposed and preferred option to mine Vanadium, Titanium, Phosphate, Aggregate, Sand and Iron ore is thus far, the most preferred activity owing to the presence of these minerals within the proposed site. The mining opportunity will by far economically and socially empower and uplift the local communities. The land is presently utilised for agricultural purpose including grazing activities.

Furthermore, opencast mining method is the preferred option in comparison to underground mining. This is due to the shallow nature of Iron Ore, Phosphate, Aggregate, Sand, Vanadium and Titanium deposit that can easily be mined by means of opencast mining. Underground mining has a greater safety risk to the miners as compared to the open cast mining method. Underground mining method may be considered in future when the commodity priced get favourable and near surface resources are depleted.

5.3 Layout Alternative

The design or layout of the activity entails the consideration of the different options to place project mine. The site was selected based on the geographic location of the potentially underling required mineral reserves. The layout of the site was however selected based on considerations made for the surrounding environment where possible, ease of operations and mining activities on site as well as minimal disturbance to the community near the site. Buffer zones and flood lines were also incorporated in choosing the preferred layout for the Mine.

The site/land area for run of activity was selected based on the size (according to the geology of the area), and position and of the mineral reserves to be exploited. The preferred layout was more considered more importantly owing to the availability of the Vanadium, Aggregate, Sand, Phosphate, Titanium and Iron Ore minerals, the land ownership, the geo-hydrological impacts and the ease and available transport modes and routes therefore the proposed layout is therefore the most suitable and economically/environmental viable option for the open pit mining.

5.4 The technology alternative

The project will entail excavation of an open cast during mining of the identified minerals. Mining will be performed with the use of bulldozers, trucks, bowl scraper and shovel. Gyratory crushers are normally used in high capacity iron ore primary crushing applications as they are beneficial in cost and operation when the capacities are higher than what a single jaw crusher can handle, the civil and structural work becomes too expensive for lower capacities. The conveyor profiles were determined from the plant layout. Good engineering practice and industry accepted standards were used to calculate the conveyor widths and speeds for the various capacities. The conveyors include drives, idlers, pulleys, belting, take-ups, cleaners, steelwork, walkways, guards, and foundations. A tripper conveyor is proposed for the stacking method.

In terms of the technologies proposed, these have been chosen based on their long-term success in terms of mining history, therefore no alternatives are indicated.

5.5 Operation aspects of the activity

The operations of the proposed mining involve the open cast mining, the processing plant, pollution control dams, workshops, material stockpiles, storage, excavations, access roads diesel, and wash bays. No feasible alternative operational aspect methods currently exist.

5.6 The option of not implementing the activity.

Should the mining right application be rejected, there will be a significant loss to valuable information regarding the mineral status present on these properties. In addition to this, should economical reserves be present, and the applicant does not have the opportunity to mine, the opportunity to utilize these reserves for future phases will be lost and the limited agricultural activities currently undertaken will continue.

6 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED.

This section provides details of the public participation process followed to date and focuses on:

6.1 Introduction to the approach followed;
6.2 Identification of Interested and Affected Parties (I&APs);
6.3 Background to the public participation process; and
6.4 Public participation process undertaken for this environmental authorization.

6.1 Approach

The Public Participation Process (PPP) is a vital component of EIA, and it is a regulatory requirement for an environmental authorisation process. It is conducted in terms of Regulations 39 to 44 of the Environmental Impact Assessment (EIA) Regulations GN R.982 (December 2014). PPP is intended to ensure a joint effort of the Interested and affected parties, the stakeholders, technical specialists, the authorities and the proponent/developer who work together to produce better decisions than if they had acted independently. The Scoping Phase enables the I&AP to raise issues of concern and suggestions for enhanced benefits to ensure that their issues have been considered; and assists in identifying reasonable alternatives; allows for comment on the plan of the specialist studies to be undertaken during the impact assessment phase and most importantly allows for the I&APs to contribute relevant local information and traditional knowledge to the environmental assessment.

The public participation process followed for this environmental authorisation is an integrated and comprehensive process with the purpose to provide I&APs with sufficient and accessible information in an objective manner to assist them to:

During the pre-application and scoping phase:

a) Raise comments and make recommendations to be considered during the impact assessment phase **(All comments raised were addressed on the EIA-EMP report);**
b) Provide comments on project alternatives and the proposed process of assessment;
c) Verify that their issues were recorded and understood; and

6.1.1 Contribute local knowledge to the process.

During the impact assessment phase

a) Verify that their comments have been considered in the Scoping and EIA & EMP; and
b) Comment on the findings of the specialist studies and the EIA.

During the decision-making phase

a) Advise I&APs of the outcome of the environmental authorization (i.e. DMR decision), and the appeals process and procedure.

6.2 Compilation of Interested and Affected Database

The compilation of a database for I&APs started during the pre-consultation process and is currently ongoing. Attached as Appendix C1. People are responding to the newspaper adverts and requesting to be registered in the database. Regarding state organs, a search was done on the internet for contact details and contact people to include on the database. Envirostep also conducted a deeds search to identify the landowners adjacent to and in the immediate surroundings of the area.

6.3 Notification of Interested and Affected Parties of the Project

Pre-consultation meetings with the affected communities were held on different dates and venues to advise them of the intention of Ikwezi Vanadium to submit the Mining Right application on the prospecting right area.

6.4 Consultation Meetings with Interested and Affected Parties

Public participation meetings are currently ongoing with the affected villages. During the meetings Background Information Documents (BIDs) are distributed to all the meeting attendees and a presentation on the Mining Right Application process is presented by Envirostep. The BID and the Consultation Register is attached as Appendix C2 and C5 respectively.

6.5 Newspaper Advertisements

A newspaper advertisement was placed in the Platinum Bushvelder and The Daily Sun both in English and Setswana. The Newspaper Advert is attached as Appendix C3.

Details of the press advert included:

a. Project name and description
b. Details of the client and the Environmental Practitioner
c. Project locations
d. Dead line for Comments
e. A copy or proof of published advert is attached as Appendix C3.

6.6 Site Notices

Laminated A3 site notices in English and Setswana were erected with the assistance of the communities in all key position on the around the proposed area. Copies of the site notices and photographs of the places where site notices were placed/ displayed will be attached in the Appendix C4.

6.7 Public Review of EIR/EMP Report

Draft EMP/ EIR report will be distributed to all registered I&APs and also state organs for review and comments.

6.8 Description of the tasks that will be undertaken during the environmental impact assessment process

The proposed Vanadium, Aggregate, Sand, Phosphate, Titanium and Iron Ore mining and related infrastructure project will include several activities which require a Scoping and EIA/EMP.

The EIA/EMP process followed for the proposed mining development is tailored to cater for both the National Environmental Management Act (NEMA) (Act 107 of 1998) as amended; Mineral and Petroleum Resources Development Act (MPRDA) (Act 28 of 2002) and EIA Regulations 2014. The authorisation process will include the following:

Scoping Phase:

a. Stakeholder identification and notification process
b. State and Non-state Authority Consultation
c. Registration of issues raised by Interested and Affected Parties (Database registration)
d. Impacts identification and assessment
e. Specialist study identification
f. Compiling the Scoping report (Draft and Final)
g. Distribution of reports to stakeholders for review and informative purposes
h. Submissions of Reports to competent authorities for approval.

Impact Assessment Phase:

a. Completion of specialist studies
b. Environmental Impact Assessment
c. Environmental Management Plan.
d. EIA Report development
e. Distribution of Reports to stakeholders for review
f. Submission of Final reports to Competent Departments for decision making purposes.

Lead Authority's decision

As soon as the DMR has taken a decision on the proposed project, Envirostep will immediately notify I&APs of this decision and also, they will be given the opportunity to appeal. The registered I&AP will be provided with a letter summarising the competent authority's decision and where ever

they disagree to the decision of the authority, they can lodge an appeal. Moreover, the Authorities decision will be published through Platinum Bushveld and Daily Sun newspaper advertisements.

6.9 Summary of Issues Raised by I&APS

All comments and responses received during the announcement and scoping public review period have been captured in the Appendix C 6.

The main categories of comments raised during the Scoping Phase including the pre-consultation meeting with the Manamakgotheng, Mononono, Legogolwe, Sefikile and Cattle post communities had reference to the following:

a. The appointment of specialists, in particular, the ventilation specialist (Air Quality),
b. What measures are in place to deal with the impacts of the mine, more especially air pollution and blasting when the mine is in operation,
c. The issue that the Social and Local Plan (SLP) should be done separately,
d. Employment opportunities associated with the proposed mining project

Conclusions of the PPP

The Public Participation exercise has provided adequate information to enable an understanding of what the Ikwezi Vanadium Right entails and to address the concerns and comments received during the process. Comments raised before, during and after the public meeting are captured in Table 5 below.

6.10 Summary of issues raised by I&Aps

(Complete the table summarising comments and issues raised, and reaction to those responses)

Table 5: Summary of issues raised by I&Aps.

Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments** **Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**
AFFECTED PARTIES				
Landowner/s				
1. T.N.A Rakgase 2. S.J Rakgase 3. M.P Rakgase 4. J.N Rakgase	X	03/09/2021	As one of the user of the Haakdoornfontein 12 JQ farm, we do not have an objection to the intended development however the following are our concerns to the business we run on the farm: 1. The effects of mining development on	Response from the Applicant Question 2 & 4 - In accordance with Mine Health and Safety Act and Authorisations, the mining area will be fenced off to prevent

5. L.J Rakgase 6.M.F Rakgase 7. D.R Rakgase 8. K.C Moatshe 9. M.R Tau 10. P. Sima 11. I. Metsileng 12. R.N Ndlovu 13. S. Ndlovu 14. A.M Monkwe 15. G.J Pilane 16. R. Mokotedi 17. S Monageng			agricultural activities practiced especially livestock. 2. Security of livestock with mining activities taking place. 3. Reduction of grazing area as the mine competes for land with livestock farming. 4. Infrastructure management of land including boundary fences. 5. Responsibility of the mining company to the livestock farmer. I and other farmers will be at ease if the above stated areas are responded to comprehensively as the affected land rights users protected by the interim protection of informal land act 31 of 1996.	unauthorised persons or livestock to enter the active mining sites. Mining company property will be the responsibility of the Mine to maintain. Unauthorised entrance into the Mine Site will be dealt with accordingly. Question 1, 3 & 5 - In accordance with Section 54 of the MPRDA and to the extent applicable, the Mine will compensate livestock farmers, who have legality to use the area affected by the mining activities. Compensation will be calculated on an effected area basis. The Mine is engaging and will continue to engage with livestock farmers who have the legality to graze on the affected area and discuss any concerns once the Mining Right has been issued.

Lawful occupier/s of the land				
Landowners or lawful occupiers on adjacent properties				
Municipal councillor				
Municipality				
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA e				
Communities				
Dept. Land Affairs				

Traditional Leaders				
Dept. Environmental Affairs				
Other Competent Authorities affected				
OTHER AFFECTED PARTIES				
INTERESTED PARTIES				

7 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES.

(The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

7.1 Baseline Environment

7.1.1 Type of environment affected by the proposed activity. *(its current geographical, physical, biological, socio- economic, and cultural character).*

The Information in this section has been obtained from the South African Weather Services (SAWS) and previous studies that were undertaken within the Moses Kotane Local Municipality.

7.1.1 Climate

7.1.1.1 Regional Climate

The mining right area falls within the Highveld Climatic Zone. According to the Safari bookings (2018), Moses Kotane Local Municipality is located within an area of summer rainfall, which is characterised by afternoon thunderstorms. Winter (May to September) is the dry season and has moderate daily temperatures and cool nights. There is virtually no rainfall during winter, and the humidity is very low.

As indicated in Figure 5, the temperatures gradually drop in the month of May, marking the beginning of winter. Average temperatures vary from 7°C/45°F in the mornings to 23°C/73°F in the afternoons. During the months of June, July and August skies are sunny and clear with daytime temperatures averaging 22°C/72°F. In September the average temperatures are a mild and pleasant 27°C/81°F during the day with cooler mornings (10°C/50°F).

As illustrated in wet season is notable from October to April. The regular rains break up the heat. They usually come in the form of afternoon storms, but sometimes it drizzles for a longer period. Average daytime temperatures are around 29°C/84°F. The month of October and November gets warmer and the first rains clear the haze in the sky. It rains more as the season progresses. Temperatures range from a typical 15°C/59°F in the morning to 29°C/84°F in the afternoon. December and January are the wettest months, characterised by torrential downpours in the afternoon. Daytime temperatures are typically around 30°C/86°F.

In March and April, the rainfall decreases and slowly gets colder. It further continues in April, which has lovely, clear weather and few clouds. The nights get a bit colder at about 13°C/55°F. Daytime temperatures are pleasant, around 27°C/81°F (Safaribookings, 2018).

7.1.1.2 Temperature

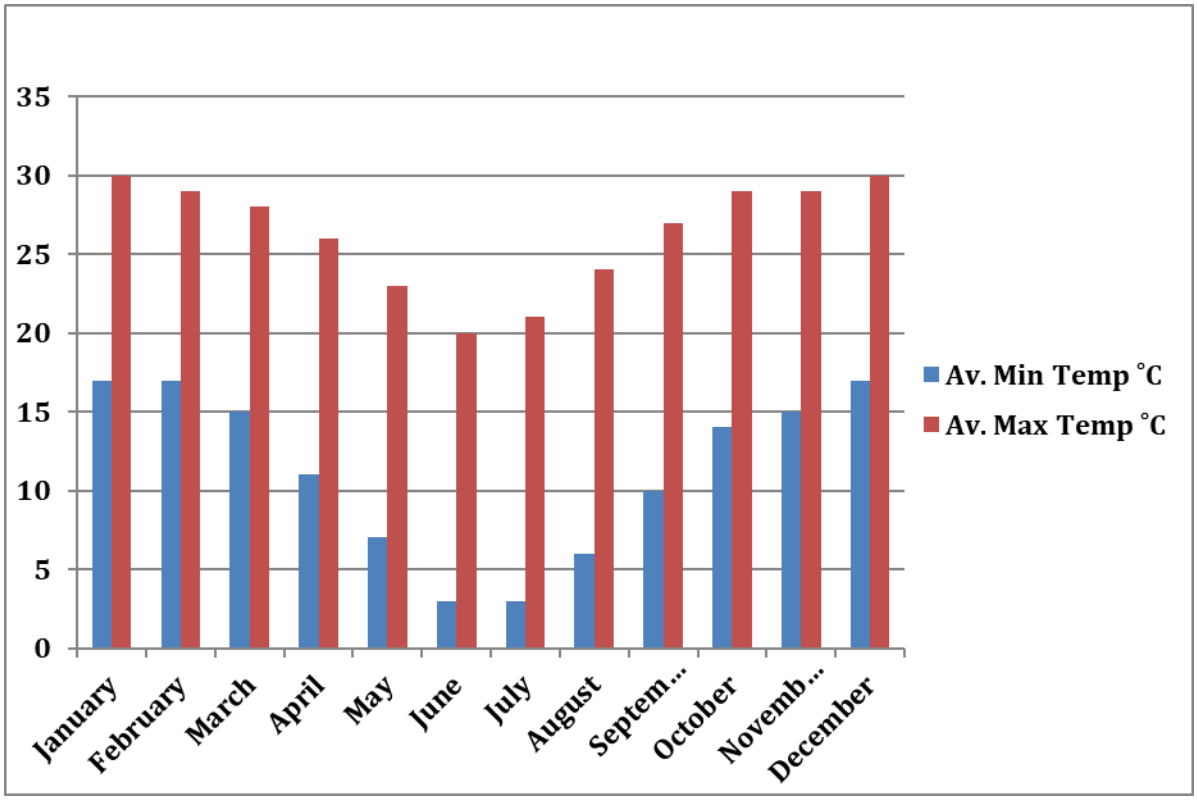


Figure 5: Average Monthly Temperature (Safaribookings, 2018)

7.1.1.3 Rainfall

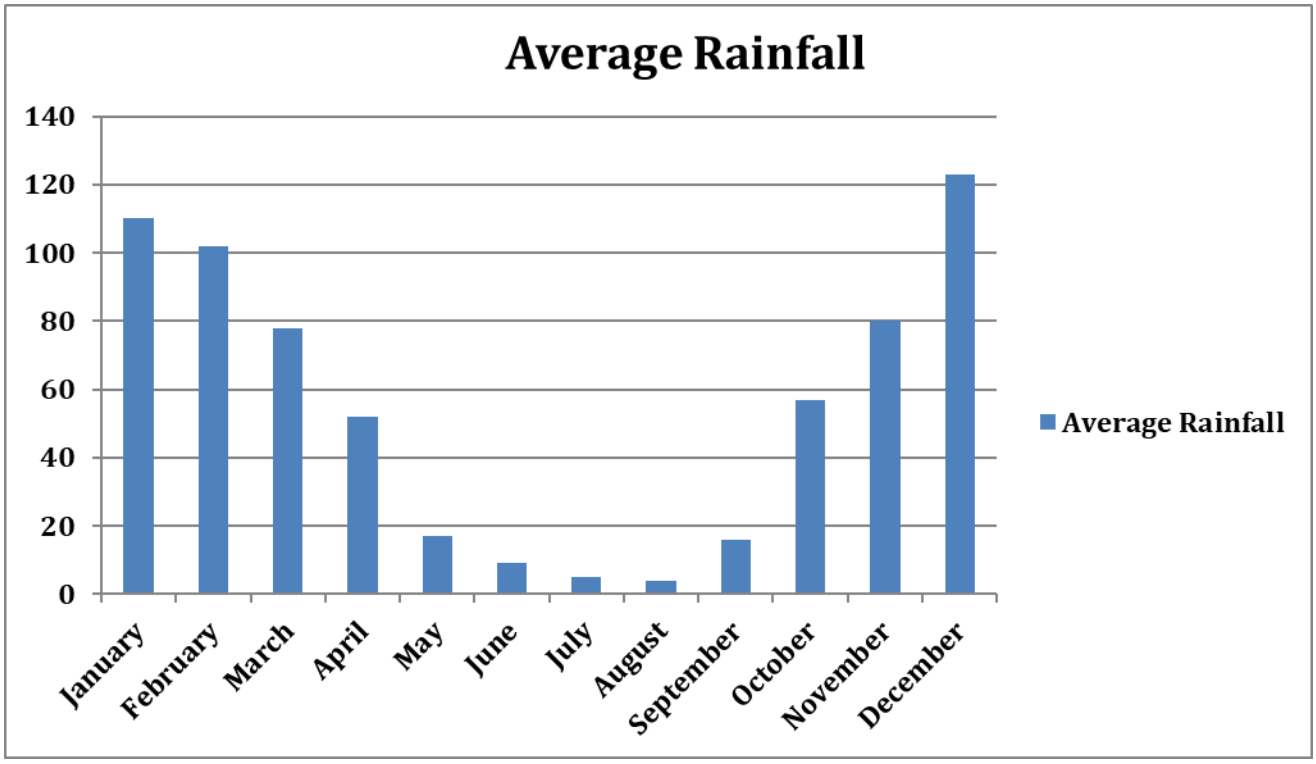


Figure 6: Total Monthly Precipitation (Safaribookings, 2018)

7.1.1.4 Wind Speed

One of the aspects that favour the suspension and resuspension of loose particulates in the atmosphere is the intensity of the wind speed regime. Wind speed greater than 5.4 m/s leads to erosion of loose dust PM and the degree of dispersion across the landscape (South African Weather Services, 2018).

7.1.2 Air Quality

It is worth noting that environmental dust is an inherent property of the natural environment, even without anthropogenic influences such as the proposed mining and transport activities. The baseline air quality status quo based on levels of pollutants within the study area was assessed using the South African Air Quality Information System (SAAQIS). The main findings with regards to predicted health and nuisance impacts are summarised below:

- **Criteria pollutants:**
    - Exceedances of the SA NAAQS at a nearby residential area (Mononono), were noted for simulated ground level concentrations of daily PM10 for Scenarios 1 and 2. No exceedances of the SA NAAQS for PM2.5 at the nearby residential areas or sensitive receptors were simulated for any of the scenarios.
    - Simulated gaseous concentrations (SO2, NO2, and CO) were well below the SA NAAQS at all off-site locations including at all residential areas and sensitive receptor locations.
    - Simulated VOC concentrations were below the referenced ECA guidelines for alkanes at all off-site locations.

- **Critical levels for Vegetation:**
    - Simulated GLCs for NO2 exceed the annual guidelines for vegetative protection when screened against the critical levels for vegetation as defined by the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Trans-Boundary Air Pollution Limits (CLRTAP, 2015).
    - Simulated SO2 concentrations were below the critical levels for vegetation outside the mine boundary.

- **Dustfall:**
    - Simulated highest monthly dust fallout rates due to each of the scenarios assessed was well below the NDCR residential and non-residential limits at all off-site locations, including at residential areas and sensitive receptor locations.

- **Construction and closure:**
    - Construction and closure phase emissions were not quantified since construction and closure schedules were not available (due to their temporary nature); and the likelihood that these activities will not occur concurrently at all portions of the site. For mining operations, construction activities are similar to operational phase activities and are generally less severe in magnitude.

7.1.3 Noise

Noise is part of our daily exposure to different sources which is part of daily living and some of these physical attributes which may at times be intrusive forms part of the ambient levels that

people get used to without noticing the higher levels. A Noise specialist study conducted reveals the current state of Noise on site. Ambient (background) noise levels were measured during October 2015 by the Author (De Jager, 2016). Measurements were done in accordance with the South African National Standard SANS 10103:2008 "*The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication*". The SANS guideline specifies the acceptable techniques for sound measurements including: type of equipment (Class 1); minimum duration of measurement; microphone positions and height above ground level; calibration procedures and instrument checks; and supplementary weather measurements and observations.

Considering the sound level measurements, the area has a complex and varying soundscape. Most of the area is naturally quiet, with natural (faunal) noises dominating.

Ambient sound levels were higher closer to the R510 road as well as the denser communal areas. Average sound levels were: 48.3 dBA for the daytime period (12 measurements) and 41.3 dBA for the night-time period (10 measurements).

The area has a rural development character, with sound levels ranging between that of a rural to sub-urban noise district. Considering international guidelines, acceptable noise limits for residential use would be: - 55 dBA for the daytime period and - 45 dBA for the night-time period.

7.1.4 Blasting and Vibration

Blasting activity will be performed in the proposed mining project for rock excavation. As part of the process, the explosive energy is exhibited in the form of elastic waves. These waves travel in all directions from the blasting area, thereby giving rise to ground vibrations, which in excess may cause damage to the nearby structures.

The blasting impact assessment study conducted for this project covers the proposed development of the VTM Mining Project south of Northam, North-west Province, evaluating the potential impact due to blasting activities of the mine.

The potential impacts of ground vibration, air blast levels and fly rock risks were determined using methods provided by the USBM. A blast design was provided by the developer and evaluated in this assessment. This assessment indicated that:

- That ground vibration levels may be unpleasant to intolerable to BSRs when blasting take place within 1,500 m from structures used for residential activities. The impact is of High significance and mitigation required and proposed that could reduce the vibration levels. However, due to the sensitivity to blast effects, it is possible that people may complain about the perceived blast effects;
- That ground vibration levels will be of High significance to potential BSSs in the vicinity of the mining area. Mitigation is required and measures are proposed that could reduce the vibration levels;
- Air blast levels will be clearly audible to all surrounding receptors and the significance may be High for the closest BSRs. Mitigation is required and measures are proposed that could reduce the airblast levels. Due to the sensitivity of people to the significant loud noise as well as secondary vibration of large surfaces (due to the change in air pressure), BSRs must be informed about the potential impacts;
- There are no risks of fly rock to BSRs or BSSs, but blasting close to the mine infrastructure may result in fly rock damage. Management measures are available to ensure the risks are minimised.

7.1.5 Traffic

According to the Traffic Impact Assessment Guideline (2015), the purpose of the Traffic Impact study is to determine the expected transport related impacts of the proposed development on the surrounding road network. Understanding the fact that all infrastructure development generates traffic, and that it may generate enough traffic to create congestion that may lead to a need for improvements to the existing infrastructure; therefore the Traffic impact assessment (TIA) is a powerful tool for engineers and transport planners to determine the possible effects of development on the transportation and traffic system and to mitigate any negative impacts.

The study area includes the intersections and road links anticipated to be used during the construction and operational stages of the Project. These locations consist of public formed roads (paved and gravel) as well as a gravel access track to provide accessibility to and from the Project site. The primary construction routes is anticipated to be contained to the existing road network both paved and gravel and will primarily be used to transport materials, equipment and workforce for the construction of the Project. This will consist of the R510 from Rustenburg and Northam to site and vice versa. All other roads might also be used for the transport of construction activities,

although these roads would not be the primary construction routes and will have significantly less construction traffic volumes.

The major transport tasks during the operational phase of the Project are expected to be haulage of material from the Project site to various offset areas as provided by Ikwezi Vanadium (Pty) Ltd. The same routes used during construction are envisaged to be used during the operational stage.

7.1.6 Geology

7.1.6.1 Regional Geology

According to available geological maps, the proposed Ikwezi Vanadium project is located on the Bushveld Igneous Complex (BIC) that is estimated to have developed approximately 2,060 million years ago. The mafic rock sequence of the BIC, the Rustenburg Layered Suite (RLS), is the world's largest known mafic igneous layered intrusion containing approximately 90% of the world's known platinum group metals (PGMs) reserves. In addition to the PGM's, extensive deposits of iron, tin, chromium, titanium, vanadium, copper, nickel and cobalt also occur.

The Bushveld Complex extends approximately 450 km east to west and approximately 250 km north to south. It underlies an area of some 65 000 km², spanning parts of the Limpopo, North West, Gauteng and Mpumalanga Provinces. The Bushveld Complex consists of four distinct igneous suites, namely, in age order, early mafic sills, the Rooiberg Group felsites, multiple mafic and ultramafic layers of the Rustenburg Layered Series which host platinum group element mineralisation and the latest Lebowa Granite Suite which cross-cuts the 110 km thick Rustenburg Series. Covering of the Bushveld by younger sediments and intrusion of later magmas means that the outcrop of the Rustenburg Layered Series is limited to two basin-like lobes to the west and east and a linear lobe to the north.

7.1.6.2 Local Geology

The study area is underlain by the Bierkraal Magnetite Gabbro (BMG) from the Rustenburg Layered Suite of the Bushveld Complex (geological map 2526 Rustenburg 1:250 000). The Bierkraal Magnetite Gabbro (BMG) is classified as a ferrogabbroic Upper Zone according to the Standard zonal subdivision (Johnson & Thomas, 2006). The BMG of the Rustenburg Layered Suite consists of magnetite gabbro, diorite and a magnetite layer.

The 1:500 000 Geohydrological Map of Johannesburg (2526), developed by the Department of Water and Sanitation (DWS), characterise the underlying aquifers present on site as “Inter-granular” and “Fractured Type” aquifer.

The proposed application area is classified as having a moderate potential for groundwater occurrence with typical borehole yields between 0.5 and 2.0 L/s being reported. Higher-yielding boreholes are usually related to regional linear geological features like lineaments, fractures or faults.

7.1.6.3 Hydrological Setting

The project site falls within quaternary catchment No. A24E which forms part of the catchment of the Crocodile River which ultimately feeds into the Limpopo. Watercourses over the site are likewise classified as non-perennials flowing only during the wet season or after rainfall events. The 1:50,000 topographic map for the site indicates the presence of a few small dams.

One primary non-perennial rivers drain the site, namely; the Phufane River to the east. The larger Phufane River is associated with a number of tributaries adding to the total catchment area drained by this river. Both of the aforementioned rivers intersect the site before they join the Sefathlane River, which in turn drains into the Brakspruit River. The Brakspruit River is the primary river associated with quaternary catchment A24E into which the site falls. Quaternary catchment A24E has its headwaters in the Pilanesberg situated to the south of the site.

7.1.7 Topography

The project site is relatively flat, at an average elevation of 1040 metres above mean sea level (mamsl), with various non-perennial drainage lines crossing the site. The topographic relief can be described as relatively gently sloping towards the north-east, while the topographic elevation varies between 1075 mamsl in the north-east of the project site to 1015 mamsl in the north. To the south of the project site is the Pilanesberg Mountain Range and the associated hills that vary between 1330 and 1534 mamsl.

7.1.8 Soils

Soils are a significant component of most ecosystems. As an ecological driver, soil is the medium in which most vegetation grows, and a range of vertebrates and invertebrates exist. In the context of mining operations, soil is even more significant if one considers that mining is a temporary land

use where-after rehabilitation (using soil) is the key to re-establishing post closure land capability that will support post-closure of land uses. The concentrations of natural salts and stores of nutrients within soils are a sensitive balance due to the extremes of rainfall, wind and temperature. The ability of a soil to retain moisture and nutrients and in turn influence the sustainability of vegetative growth and dependence of animal life is determined by the consistency and degree of soil moisture retention within the profile but out of the influence of evaporation. These conditions and the sensitivity of these variables must be noted, and their importance to the overall bio-diversity balance understood if the sustainability equation is to be managed and mitigated.

Mining projects have the potential to damage the soil resource through physical loss of soil and/or the contamination of soils, thereby impacting on the soils ability to sustain natural vegetation and altering land capability. Contamination of soils may, in turn, contribute to the contamination of surface and groundwater resources. Loss of the topsoil resource reduces chances of successful rehabilitation and restoration. To understand the basis of these potential impacts, please refer to the Agricultural Agro-ecosystem study conducted for this project attached to Appendix C of this report. The majority of the mining right area is covered red-yellow a pedal, freely drained red soils.

7.1.9 Heritage and Paleontology

Site clearance, deposition of overburden, waste and earth moving activities to allow for the construction of mine infrastructure and the development of the mine could impact on potential heritage and paleontological resources. The severity of potential impacts on paleontological resources is expected to be moderate/high and permanent, with little mitigation possible. A Heritage Impact Assessment conducted indicated that there are a number of cultural heritage (archaeological and historical) sites and features in the larger geographical area within which the study area falls. There are no known sites in the specific study area, but the potential for a number of cultural heritage (archaeological and/or historical) sites, features and material located here was evident. The May 2021 fieldwork identified a number of sites and material of cultural heritage (mainly archaeological) origin and significance in the study area. This report discusses the results of the both the background research and field work and provides a number of required mitigation measures at the end.

7.1.10 Visual Baseline

Mining-related activities have the potential to alter the landscape character of the site and surrounding area through the establishment of both temporary (such as pits, mineral processing

infrastructure and support facilities) and permanent infrastructure (such as the tailings storage facility and waste rock dumps). As a baseline, this section provides an understanding of the visual aspects of the area against which to measure potential change as a result of mine infrastructure and activities.

In describing the visual landscape, a number of factors will be considered, including landscape character, sense of place, scenic quality, and sensitive views. It is important to note that the area defined for the visual study is a 15km radius around the mine area; because beyond this distance, the project components would be 'absorbed' into the landscape setting. A Visual Impact Specialist will conducted for this project showed that no information was present on the Life of Mine (LoM) and it is assumed that it would not exceed 20 years.

It is assumed that a Rollover mining method would be employed and therefore only sections of the total footprint will be mined at any given time. This mining method should have a less intrusive visual impact on its surrounds. Despite this, the opencast footprint in its totality was considered and used in the modelling exercise as a worst-case scenario.

The 30m ALOS DEM, used in the modelling exercise, is the highest quality DEM that was available for this VIA. The vertical and horizontal accuracy was limited by the inherent accuracy of the dataset. Night-time operations and possible mitigation measures to reduce their impacts will be discussed in the impact assessment. However, no photographs of similar operations at night were taken as a safety precaution, given general community unrest at the time. As a consequence, no night-time modelling was performed. The validity of third-party data, such as elevation, land cover and vegetation cannot be guaranteed as no ground-truthing or data validation procedures were used. This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. For example, localized visual perceptions of the economically depressed communities may be influenced by the short term economic and job opportunities that will exist, rather than the direct visual perception of the project. As a result, a limitation of this study is the unavoidable subjectivity relating to the assessment of the visual impact.

7.1.10.1 Landscape Character

The landscape character of the study area is defined by relatively flat plains, punctuated by isolated hills in the west and the dominant hills associated with the Pilanesberg National Park

(PNP) in the south. While the plains have been disturbed by anthropogenic activities, the hills are relatively 'untouched' with a dense vegetation cover of bushveld species associated with the Dwaalboom vegetation type. Current land uses in and adjacent to the study area is a combination of grazing, crops, mining, residential and general community activities.

7.1.10.2 Visual Receptors

Public views (sensitive viewing areas) to the mine could be experienced by people living and visiting the adjacent communities, employees travelling to work, as well as tourists visiting the attractions in the area or travelling through the area to other destinations.

7.1.11 Biodiversity

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of biodiversity and ecosystems is as follows:

a. Soil formation and fertility maintenance;
b. Primary production through photosynthesis, as the supportive foundation for all life;
c. Provision of food and fuel;
d. Provision of shelter and building materials;
e. Regulation of water flows and water quality;
f. Regulation and purification of atmospheric gases;
g. Moderation of climate and weather;
h. Control of pests and diseases; and
i. Maintenance of genetic resources.

The establishment of mining-related infrastructure and support facilities have the potential to result in the loss of vegetation, habitat and related ecosystem functionality through physical disturbance and/or contamination of soil and/or water resources.

7.1.11.1 Vegetation

As a baseline, this section provides an outline of the type of vegetation occurring in the study area and the status of the vegetation, highlights the occurrence of sensitive ecological environments including sensitive/ endangered species (if present) that require protection and/or additional mitigation should they be disturbed.

The region, in which the study area is located, is typical of the Dwaalboom Thornveld, which is a component of the Savanna Biome. The Savanna Biome covers a large area and is subdivided into various components, with the Dwaalboom Thornveld comprising a part of the Central Bushveld Bioregion. The features of this vegetation type include plains with layers of scattered, low to medium-high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species, and an almost continuous herbaceous layer dominated by grass species. The conservation status of this vegetation type is considered Least Threatened, and the nationally set conservation target is 19%, with 6% statutorily conserved, mostly in the Madikwe Nature Reserve and Pilanesberg Nature Reserve.

The Harkdoornfontein area was characterised by remnants of the Dwaalboom Thornveld vegetation and characterised by a well-developed tree layer with a sparse understory. The Varkfontein-Morewag area was characterised by remnants of the Central Sandy Bushveld vegetation with a shrub layer and slightly dense e understory. Faunal activity within the area was determined to be low as a result of the seasonal changes and dry site conditions.

7.1.11.2 Faunal Assessment

7.1.11.2.1 Mammals

Domestic cattle, donkeys, sheep, goats, pigs, dogs and cats were common in the site area. Grazing and trampling by livestock have had an obvious adverse impact on vegetation, while predation by dogs and cats is likely to have had a negative impact on certain fauna (e.g., large terrestrial birds and reptiles). Hybridization and disease transmission may also present a problem between domestic animals and wildlife.

7.1.11.2.2 Birds

Alien birds including the Common Myna (*Acridotheres tristis*), House Sparrow (*Passer domesticus*) and Rock Dove (*Columba livia*) have the potential of existing in the study area but are expected to have a limited impact on biodiversity due to their current low abundance. Due to its proximity to Pilanesberg Nature Reserve there could be a possibility of the existence if the following bird species:

a. Secretary bird (*Sagittarius serpentarius*) which is a near threatened species based on the South African Red Data Species

b. Kori Bustard (*Ardeotis kori*) which is a vulnerable species based on the South African Red Data Species
c. Tawny Eagle (*Auila rapax*) which is a vulnerable species based on the South African Red Data Species
d. Martial Eagle (*Polemaetus bellicosus*) which is a vulnerable species based on the South African Red Data Species

7.1.11.2.3 Terrestrial Macro-invertebrates

Except for butterflies, comprehensive data of the IUCN status of any particular order of invertebrate is limited. However, the NEMBA Schedule of 2007 lists a number of South African invertebrate taxa as protected. Potentially occurring protected invertebrates which may occur within the study area include the following:

a. Tiger Beetles (Dromica spp.): protected species
b. Stag Beetles (Oonotus spp.): protected species
c. Burrowing Scorpion (*Opistothalmus glabifrons)*: protected species
d. Common Baboon Spiders (*Harpactira spp*.): protected species

7.2 Socio-Economic Environment

7.2.1 Socio-Economic Profile

This section describes the socio-economic characteristics of the potentially affected area in order to develop an understanding of the broad social and economic conditions of the environment. The proposed project has the potential to result in both positive and negative socio-economic impacts. As such, it is essential that the socio-economic baseline conditions are understood to ensure accurate identification and assessment of potential impacts associated with the proposed project.

The data used in this socio-economic analysis was obtained from the MKLM 2017/2018, BPDM 2017/2022 IDP, Statistics South Africa, 2011, Community Survey, 2016 and BBKTA Masterplan

7.2.1.1 Traditional Authorities

Traditional authorities refer to mainly rural areas whereby chiefs and their councils are responsible for administrative tasks at a community level and in mobilising local communities if there are any investment Projects within their area of jurisdiction. The Ikwezi Vanadium proposed project is located within a traditional area, namely Bakgatla-Ba- Kgafela Traditional Authority (BBKTA), however, there are other traditional authority/ies in close proximity to the proposed project area namely Bathalerwa and Baphalane Traditional Authorities which share immediate borders with the BBKTA jurisdiction and Mmatsere Traditional Authority (MTA) and Bakubung Ba Ratheo (BBR) (Development, 2014).

The BBKTA community consists of 32 villages and is located in the North West province along the Western Bushveld Complex, the world's largest known platinum reef, and as such is greatly influenced by the platinum mining industry. The area is also impacted by the demographic and economic realities of neighbouring communities. This includes urban areas in Gauteng, provincial developments in the North West and Limpopo, market activity in southern Botswana, and interactions with other traditional authorities

7.2.1.2 Administrative Authorities

The application falls within the jurisdiction of Moses Kotane Local Municipality. The Municipality covers an area of approximately 5 719km² and is mostly rural in nature, comprising 107 villages and two formal townships of Mogwase and Madikwe with an estimated population of 242 553. The 2011 Census report's estimate that there are 75 193 households. Moses Kotane Local Municipality is one of the five constituent local municipalities of Bojanala Platinum District Municipality in North West Province of the Republic of South Africa. It shares borders with Rustenburg, Kgetleng Rivier, Ramotshere Moiloa and Thabazimbi Local Municipalities

7.2.1.3 Villages Affected

Communities that are affected by the proposed project are Manamakgotheng, Mononono, Legogolwe, Lesobeng and Sefikile.

7.2.2 Demographic Profile

7.2.2.1 Population and Growth Trends

According to StatsSA (Census 2011), NWP has a population of approximately 242 554. According to the 2011 Census, Moses Kotane Local Municipality has a total population of 242 554 people, of which 98,3% are black African, 0,8% are white, with the other population groups making up the remaining 0,9 %. Of those aged 20 years and older, 9,3% have no schooling, 17,1% have some primary school education, 35,3% have some secondary education, 27,4% have completed matric, and 5,3% have some form of higher education. An average household size of 3.2.

NWP has a population of approximately 3,5 million residents, with an average household size of 3.2 and a growth rate of 1,6%. The BPDM population constitutes 42% of the provincial population with an average household size of 2.9 and 2,2% growth rate. MKLM population constitutes approximately 16% of the District Municipality population with an average household size of 3.2 (same as the province) and 0,2% growth rate (Census, 2011).

The population of NWP, BPDM and MKLM is also young with an average of 58% being under 35 years of age (Census 2011). There are also more men in the Province (50,7%) and in BPDM (57,8%). Contrary to the Province and District municipality, there are marginally more females in MKLM (50,2%). Black Africans compromise the majority population group in the Province (90%) followed by Whites (7,3%), Coloureds (2%), and Indian/Asians (0,6%). A similar pattern is also observed at the municipal levels. The majority of the population in NWP, BPDM and MKLM (64,7%, 68% and 63%, respectively) is within the working age group. Dependency ratios in NWP, BPDM and MKLM are estimated at 54,5%, 47,3% and 58,6% respectively (StatsSA (Census, 2011). Table 1below present statistical information for the wards located within the Project area.

Table 6: **Moses Kotane Local Municipality Wards 7, 8 and 22 Population Information**

Aspect	Ward 7	Ward 8	Ward 22
Population	4 227	1 999	10 842
Males	55%	52.1%	50.2%
Females	45.1%	47.9%	49.8%
Black Africans	99.5%	99%	99.6%

Aspect	Ward 7	Ward 8	Ward 22
Whites	0.0%	0.4%	0.1%
Other Races	1%	0.6%	1%

Source: Stats SA (Census, 2011)

The Bakgatla Ba Kgafela tribe consists of approximately 350 000 people. The total number of people living in the BBKTA jurisdiction in 2012 was estimated to be 117 000. This is approximately 35% of the total population in the MKLM. Therefore, it is assumed that only one-third of the Bakgatla Ba Kgafela tribe reside permanently in the BBKTA jurisdiction. This low level of residency is attributed to local joblessness which forces many community members to leave the area in search of employment (Development, 2014).

7.2.2.2 Household Size and Composition

The socio-economic survey conducted by BBKTA reveals that each household in the BBKTA jurisdiction accommodates an average of 4.2 people. Approximately 54.5% of residents are female. This high female to male ratio is attributed to the limited economic opportunities in the region which force many men to leave in search of employment as well as the higher life expectancy among women. As a result, the majority of households in the jurisdiction are headed by females. This results in socioeconomic consequences including lower incomes, a greater number of dependants and, as a result, higher levels of poverty (Development, 2014).

7.2.2.3 Employment and Income

The unemployment rate in the BBKTA is approximately 49% which is higher than the 37,9% unemployment rate for the MKLM. The mining sector is the largest employer of Bakgatla community members. Approximately 48% of employed Bakgatla residents work in the mines. The second largest employer is the retail sector accounting for approximately 12% of the local workforce, and 8%, 6%, 5%, 4% and 2% in social services, domestic work, government, manufacturing, construction and tourism respectively. Approximately 77% of residents earn less than R 3 000 per month with 39% of residents in the R 750 to R 1 500 bracket (Development, 2014).

7.2.2.4 Education Levels

The level of school attendance and educational achievement in a study area is an important indicator of development as well as the potential for economic growth. The socio-economic survey found that 26% of household members are currently full-time students. The rate of attendance was the highest among primary school-aged children (99%) but dropped steadily as ages increased. This indicates that many students drop out of school prior to finishing their matric, likely as a result of limited motivation, support and post-graduation opportunities. The highest level of education achieved by local residents according to the socio-economic survey is illustrated in Figure 7 It shows that approximately one-quarter of residents have no formal schooling while 57% have some schooling. It should be noted however that, although this lack of schooling is problematic, the rate of non-attendance is higher among those outside of the working age population (the very young and old population) (Development, 2014).

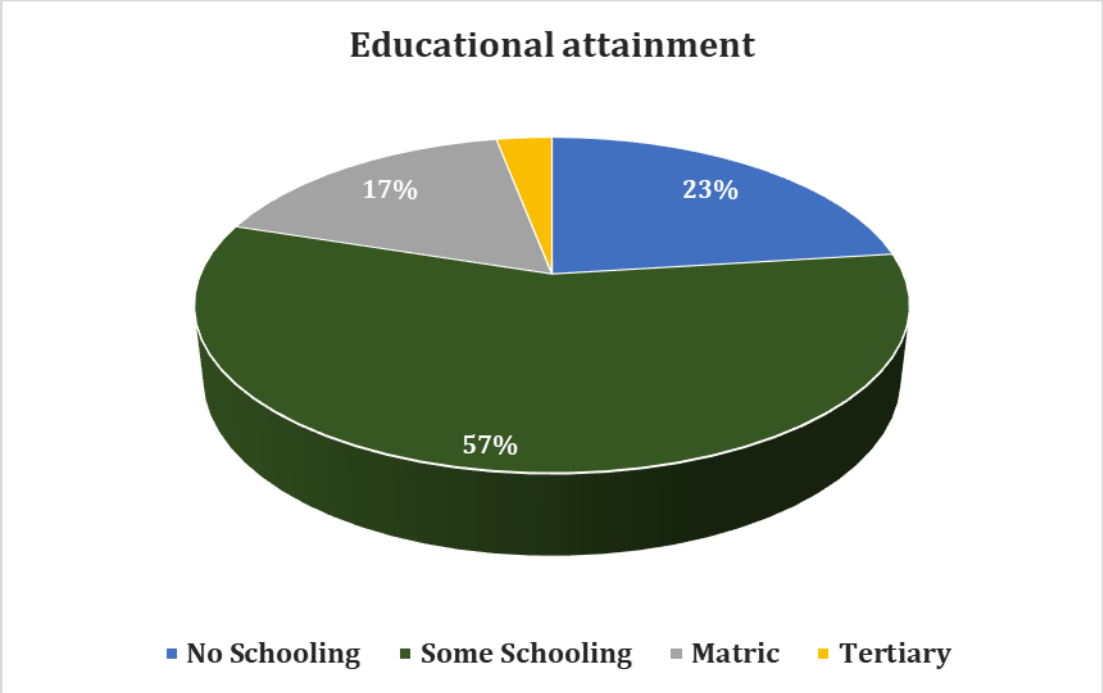


Figure 7: Educational attainment (Development, 2014)

More problematic, however, regarding economic development, is the low percentage of residents that have completed matric (17%) and/or tertiary studies (3%), as well as the fact that less than 1% of the population is currently enrolled in a tertiary institution. This is attributed to high levels of out-migration among the educated as well as a lack of local emphasis on educational attainment. It is therefore important that the BBKTA emphasis attendance at local high schools and FET colleges, as well as encourage educated ex-community members and other professionals to move to the

area. These interventions are deemed imperative for the successful implementation of planned socio-economic projects, many of which require a semi-skilled workforce (Development, 2014).

7.2.2.5 Health

The BBKTA jurisdiction, as with much of rural South Africa, is home to a large proportion of elderly residents as well as low-income households. These demographics combined with the prevalence of HIV/AIDS and the lack of access to hospitals and high-quality clinics contribute to poorer health statistics. This, in turn, limits the potential for economic growth, lowers quality of life, and increases the burden on caregivers. The socio-economic survey questioned residents about their health and the health of those in their households the results of which are illustrated in Figure 8. It was revealed that only 66% of residents are deemed to be in good health, with 12% considered in poor health. Interestingly these figures varied widely throughout the BBKTA jurisdiction with regions in the central and northern area reporting significantly poorer health than those located closer to clinics and hospitals. More specifically the level of poor health increased to 15% in Mopyane and as high as 28% in Motlhabe. The relatively high instance of ill health is also related to the overall lack of health insurance. In total, only 7% of households surveyed had a health insurance plan contributing an average of R600 per month. Approximately three-quarters of those with health insurance received coverage through their employer, which was most common among government and mine workers (Development, 2014).

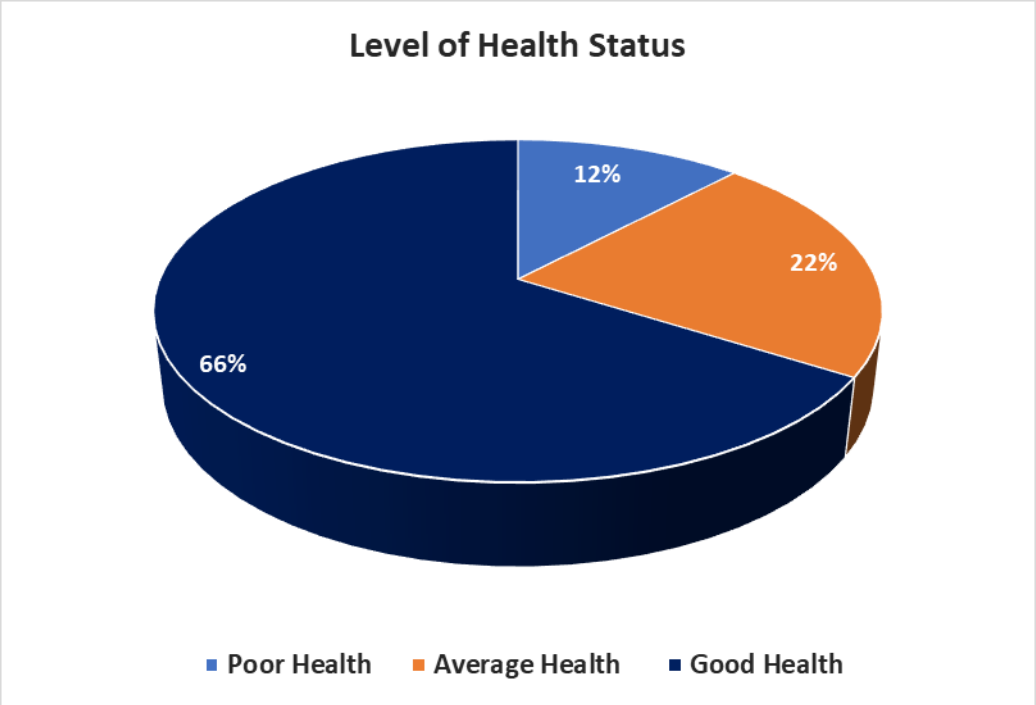


Figure 8: Level of health status (Development, 2014).

8 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE.

8.1 Infrastructure

8.1.1 Powerlines and Pipelines

According to the general mine layout for Ikwezi mining, there are no existing powerlines that traverse the site or any existing pipe lines that also traverse the site. Powerlines and pipelines will be constructed were required on the mine site.

8.1.2 Access Road

A site access road is required to link the site to the national road system. The nearest national road is the R510 which is approximately 15 kilometers (“km”) to the east of the site. The current gravel road (9km) requires upgrading. Access roads will be constructed during the life of mine. Access roads will change as the mined areas change.

8.2 Environmental and current land use map.

(Show all environmental, and current land use features)

The proposed mining site is an agricultural area and is characterized by farming and mining activities, generally the land use is open veld and wilderness as illustrated in Picture 1.

Picture 1: Property used for grazing

The properties have also been used for subsistence crop farming as illustrated in Picture 2

Picture 2: Evidence of cultivation

Although there is evidence of past agricultural use, the current land use is largely natural veld interspersed with some exotic plant species. Woodlands is identified on the farm in the higher altitude areas.

8.3 Environmental and Current Land Use Map.

(Show all environmental and current land use features)

The mining right area is characterised by mining, rural communities, grazing areas and portions of cultivated land.

9 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

The potential impacts are discussed according to each Phase of the proposed Project: The Construction, Operational, Decommissioning and Post-Closure Phases/ Rehabilitation Phase. The Project and listed activities as per NEMA, EIA Regulation are summarised in Table 3. Project activities have been summarised in detail in Table 7 below.

This section also rates the significance of the potential impacts pre-mitigation and post- mitigation. The impacts below are a result of both the environment in which the activity takes place, as well activity itself. The impacts associated with the Project include the NEMA, EIA Regulations Listed Activities, as well as the mining activities to take place at Ikwezi Vanadium Project. The methodology utilised to assess the significance and extent of the potential impacts is described in Table 8.

Table 7: Summary of Project Activities

Activity No.	Activity
Construction Phase	
1	Construction of surface infrastructure.
2	The construction of stockpiles.
Operational Phase	
3	Dirty water management.
4	PCD operation.

5	Stockpile operation and maintenance.
6	Concurrent replacement.
Decommissioning Phase	
7	Demolition of infrastructure.
8	Final rehabilitation.
Post-closure Phase	
9	Monitoring and Rehabilitation.

10 METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

The significance will be determined by both the extent and duration of the impact. The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk

Table 8: Methodology to determine the extent of the impact

PARAMETERS	DESCRIPTIONS
Extent	Refers to the physical or geographical size that is affected by the impact. It can be categorised into the following ranges: • Onsite – Within specific site boundary

PARAMETERS	DESCRIPTIONS
	(weight value – 1) • Local – Within municipal boundary (weight value – 2) • Regional – Outside municipal boundary (weight value – 3)
Duration	Time span associated with impact: a. Short term – 1 Year or less (weight value – 1) b. Medium term – 1-5 Years (weight value – 2) c. Long term – Longer than 5 Years (weight value – 3
Intensity and reversibility	The severity of an impact on the receiving environment: a. Low – Natural and/or cultural processes continue in a modified way and is reversible (weight value – 1) b. Medium – Natural and/or cultural processes stop and is partially reversible (weight value – 2) c. High – Natural and/or cultural processes disturbed to an irreversible state (weight value – 3)
Impact Significance/Consequence	Adding the extent, duration and intensity together provides the significance of the impact (High, Medium or Low). Extent + Duration + Intensity = High/Medium/Low Impact

PARAMETERS	DESCRIPTIONS
Probability	The likelihood of an impact occurring: a. Unlikely – 0% - 45% chance of the potential impact occurring (weight value – 1) b. Possible – 46% - 75% chance of the potential impact occurring (weight value – 2) c. Likely - >75% chance of the potential impact occurring (weight value – 3)
Environmental Risk Refer to table below	Multiplication of the significance of the impact by the probability of the impact occurring produces a final conclusion of the overall risk that an impact poses to the surrounding environment. High/Medium/Low Impact X Probability = High/Medium/Low Environmental Risk

	Risk Assessment Matrix			
	Low Impact (1 -5)	Medium (6-8)	High Impact (9)	
Probability	Definite/Very Likely (3)	9 - 15 L-M	18-24 M-H	27 H
	Possible (2)	6-10 L-M	12-16 M	18 M-H
	Unlikely (1)	3-5 L	6-8 L	9 L
ENVIRONMENTAL RISK	**Guidelines for Control Strategies**			
(H)-High	Proactively reduced risk level, short term response			
(M-H) -Medium High	Proactively reduce risk level, short term response			
(M)-Medium	Management strategies to reduce risk level, short to medium term response			

(L-M) Low -Medium	Management strategies to reduce risk level, short to medium term response, operational control and housekeeping
(L) Low	Operational Control

10.1 The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

Table 9: Positive and Negative impact of the proposed activity

Alternative		Advantages	Disadvantages
Activity alternatives (mining method alternatives)	Prefered Alternative (Opencast mining methods)	The shallow nature of Iron Ore, Vanadium and Titanium deposit can easily be mined by means of opencast mining. Economically and socially empowerment of the local communities	Opencast mining methods may result in direct and indirect impacts on several aspects of the environment including: Soil (compaction), flora (clearance and dust), fauna (habitat destruction, noise), air quality (dust, vehicle emissions), noise (animal life and surrounding communities), and surface- and groundwater (spillages, inadequate separation of clean and dirty water, potential leaching of water)
	Alternative 1 (Underground mining method)	In comparison to the preferred alternative, if underground mining would have been feasible there could be less surface-related environmental impacts that would have resulted from mining.	Underground mining has greater safety risk to the miners as compared to the open cast mining method. Owing to the shallow nature of the proposed minerals it is not feasible to undertake underground mining.
No-go versus Open cast mining	Open cast Mining	Mining activity was prefered on the proposed site based on the availability of Vanadium, Titainium and Iron–Ore reserves within the area. The open cast mining is	**Visual impacts** The development of the mine will have a visual impact on the proposed area due to the dust generation and

Alternative		Advantages	Disadvantages
		prefered such that the shallow nature of the mineral deposit can easily be mined by means of opencast mining. If the mining right is granted local communities will be positively impacted through employment opportunities that will arise and the proposed area's economy will grow through trading activities associated with mining activities like transport, increase in health facility as well as an increase turnover in hospitality and tourism sectors. Most importantly the proposed mining project will create skills development and community building opportunities to the local community therefore eradicating poverty in such a case stimulating Local Economic Development. Not only that, the business opportunities will	construction activies resulting to the mining activities. **Dust** The excavation activities and the use of the access dusty roads will result in the emission of dust into the surrounding atmosphere. This will not only impact on the surrounding communities but also the plants surrounding the area as the dust is deposited on the leaves. This interferes with the photosynthesis process of the plants. Furthermore, animals that feed on the plants will be impacted upon as this will affect their forage. **Noise** Noise pollution will be generated from the mining activities, namely through the movement of trucks and vehicles, machinery operations, trenching activities. Depending on the size, noise levels of the trucks and excavators may cause the noise to be localised in the specific site. **Soil contamination**

Alternative		Advantages	Disadvantages
		be encouraged through infrastructural development as roads will be constructed, this will assist in increasing the demand of goods and services in the affected area/s in a long term. The project will contribute directly and indirectly to the Country's GDP. Moreover, the development will encourage income generation in the area as well as the development of BEE opportunities during construction, operation and eventual closure and rehabilitation.	Soil pollution due to the leakages of oil and other industrial liquids from the trucks and machineries. This is a potential risk of soil contamination, which will change the soil chemistry and soil nutrients of the affected soil. Ultimately this could also potentially affect the vegetation growth in the contaminated areas. **Impact on heritage resources** The mining activity could result in danger of negatively impacting on unidentified heritage resources during site assessment however, the possibility of the impact is very minimal as education and training on heritage resources will be given to mine employees. **Fauna disruption** Due to the impacts of noise, dust, movement and operation of trucks and vehicles, the potential loitering of the employees and the trenching itself will disrupt the surrounding animals. This disruption can further lead to injury or death in cases where animals fall into the

Alternative		Advantages	Disadvantages
			trenches. **Stripping (Removal of vegetation)** While all means will be applied to minimise disturbance, removal of vegetation cannot be avoided altogether. Deforestation will occur to clear the land for the opencast mining, this will leave the ground bare and prone to erosion. **Soil erosion** Erosion of the soil will occur through runoff and wind. **Habitat destruction** The habitat that support the animal within the project site will be disturbed and destructed by the movement and operations during the mining activities. This could possibly cause the relocation of some of the animals, and result in habitat fragmentation. **Waste generation**

Alternative		Advantages	Disadvantages
			Debris (slimes), waste rock, litter and other solid waste will be generated and deposited in and around the site. This could potentially attract nuisance and affect the natural scenery of the site. The slimes and waste rock will be used to backfill the trenches. This will be undertaken in a concurrent rehabilitation manner. **Surface and ground water impacts** The hazardous chemical spills may lead to surface water containation and ground water due to the leakages.
	No-go Alternative	The implementation of the no-go option would result in the continuation of the current land uses (farming). Therefore, no additional impacts on the bio-physical environment will occur, besides those that are currently occurring, and / or which may potentially occur if the areas are not managed appropriately.	It is also very important to note that the implementation of the no-go option may not necessarily prevent the mining of these resources on the property, as other companies may apply to mine the resources, unless the DMR sterilizes the reserves.

Alternative		Advantages	Disadvantages
Prefered Layout (No Layout Alternative was identified)	The Layout plan presented in Figure 4.	The site was selected based on the geographic position of the potentially underling required Vanadium, Titanium and Iron reserves, ease of operations and mining activities on site as well as minimal disturbance to the community near the sit.e	No disadvantanges have been identified presently
Technology Prefered (No techology Alternative was identified).	Excavators, apron feeders, bulldozers, trucks, bowl scraper, crushers, conveyors and shovels	The technologies have a long-term success in terms of mining history. According to Mclanahan (2018), due to their long service life with low-maintenance applications, apron feeders are a popular feeder choice	No disdvantanges have been identified presently
Operation Prefered (No Operation Alternative was identified)	The operation includes the open cast mining, the processing plant, pollution control dams, workshops,	The mine and its related activies will generate employment opportunies.	Relocation and loss of cattle grazing area for the herders at the Cattle post, overcrowding of the area in search of greener pastures.

Alternative		Advantages	Disadvantages
	material stockpiles, storage, excavations, access roads diesel and wash bays		

10.2 The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Table 10: Mitigation measures

Activity	Potential Impact	Mitigation
Construction Phase		
Site clearance for road construction, powerlines, water pipelines, Construction of infrastructure and the plant	Loss of vegetation and subsequent loss of habitat for fauna. The indigenous and natural vegetation will be impacted upon within the proposed open casted mining area as a result of clearance of vegetation due to mining. Noise generated by the mining and mining related activities may frighten animals which may lead to injuries, deaths as well as the animals migrating away from the site.	a. Removal of vegetation should be restricted to the relevant infrastructure footprints only; b. Topsoil should be stored separately to be used in rehabilitation and landscaping, c. Transformation of natural areas should exclude any areas designated as having high or very high sensitivities; d. Prevent all effluent from the mining activities from entering the wetland habitat e. Management of the topsoil stockpile to

Activity	Potential Impact	Mitigation
		preserve the seedbed; f. Fence development footprint area prior to commencement of construction; g. No off-road driving into natural vegetation h. Implement alien invasive species eradication program.
Site clearance for road construction, powerlines, plant, ttrenches and foundations for surface infrastructure development, Topsoil stripping and Stockpiling.	Loss of soil resource and land use	a. Limiting the area of impact to as small a footprint as possible, inclusive of waste management facilities, resource stockpiles and the length of servitudes, access and haulage ways and conveyancing systems wherever possible; b. Implement a soil utilization plan; c. Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction;

Activity	Potential Impact	Mitigation
		d. Topsoil to be stripped and stockpiled separately.
Site clearance	Increased risk of erosion	a. Minimise the construction footprint within any wetland areas. Clearly demarcate the required construction servitude and maintain all activities within the demarcated area; b. Maintain flow connectivity in any valley bottom wetlands during the construction phase by temporarily diverting streams around the construction area; c. Install erosion prevention measures prior to the onset of construction activities;
Stripping, dumping activities and vehicular movements on dust roads	Increase in ambient dust levels	a. Regular watering of the site roads; b. Dressing off of tip faces, unused roads and disturbed areas; c. Minimizing unnecessary disturbance of non-

Activity	Potential Impact	Mitigation
		operational areas; d. Use of chemical additives to control dust to be employed if necessary.
Trenching activities, Equipment use and vehicular activity	Increase in ambient noise levels. The noise from the mining machinery will be audible if opencast mining operations are undertaken during the night time, exceedances of all but the guidelines for industrial districts would be experienced and the noise levels at the nearest sensitive receptors would be objectionable;	a. Regular planned mobile plant maintenance, with special attention paid to the maintenance of engine efficiency and silencer effectiveness; b. Regular planned vehicle services.
Vehicles maintenance, fuel storage, servicing areas and construction equipment storage	Pollution of surface water resource including wetlands due to hydrocarbon spillages	a. Servicing of construction vehicles will take place only in dedicated areas that are equipped with drip trays; b. Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil; c. Spill-sorb or a similar product will be kept on

Activity	Potential Impact	Mitigation
		site, and used to clean up hydrocarbon spills if they should occur; d. Hazardous material will be placed in bunded areas; e. Spill kits to clean up hydrocarbon spills will be available; f. Clean upslope runoff will be diverted around construction areas. Prevent all effluent from the mining activities from entering the wetland habitat.
Site Clearance and Excavation of an open cast mine	Potential impact on heritage Resources	a. Conduct heritage impact assessment to identify heritage sites within the project area; b. If any heritage sites are identified, appropriate steps as per the Heritage Resources Act will be undertaken; c. Education and training on heritage resources

Activity	Potential Impact	Mitigation
		will be given to mine employees
Vehicular movements	Increase in traffic volumes on existing traffic network	a. Traffic signage at site access point; b. Undertake traffic impact study; c. Traffic signage at site access points; d. Upgrade gravel roads to tarred roads.
Employment	Spontaneous settlement and increased pressure on social services	a. Develop a clear and concise employment and recruitment policy that prioritizes local recruitment; b. Identify and support community development programs that address challenges raised by population influx and spontaneous settlement; c. Support local government capacity for integrated development planning.
Operational Phase		

Activity	Potential Impact	Mitigation
Blasting, loading, hauling, stockpiling, backfilling and tailings storage and vehicle operations	Release of fugitive emissions in the form of N2O, CH4 and CO2 impact on air quality within and near the project area, particularly in the downwind direction	a. Efficiency will be applied to reduce wastage and unnecessary fuel consumption; b. Carbon offsets will be considered if required; c. Concurrent best practice rehabilitation and vegetation monitoring will be applied to allow for the restoration of some the carbon sink functionality within the mining right area.
Excavation for an open cast mine	Influx of groundwater into the pits, leading to a decrease in groundwater quality and yield	a. Detailed geological mapping to identify geological features; b. Mining will take place according to design mine stability safety factors; c. Mining will not take place in the weathered overlying strata; d. Identify boreholes (undertake hydrocencus) within mining area and plug deep boreholes to prevent inflow into the pit;

Activity	Potential Impact	Mitigation
		e. Monitor groundwater levels and yields of external borehole users.
Excavation of an open cast mine	The formation of Acid Mine Drainage in groundwater resources.	a. Optimise storage of mine water to minimize exposure to oxygen; b. Develop a groundwater monitoring program to assess the groundwater quality; Should Acid Mine Drainage (AMD) be identified within the groundwater resources, the polluted water will be remediated accordingly.
Equipment, vehicle operations, leakages of oil and other industrial liquids from the trucks and machineries and stockpiling.	Contamination of soil	a. Spill leak detection plan should be implemented.
Vehicles maintenance, Fuel storage, servicing areas and construction, spilled construction materials such as cement, paint, fuel and oil.	Surface water and wetland resources due to hydrocarbon spills and carbonaceous material.	a. Implement storm water management plan; b. Divert clean storm water around construction areas; c. Surface water management structures be constructed first as to ensure that runoff and

Activity	Potential Impact	Mitigation
		dirty water spills are contained;
Loading, stockpiling, backfilling and Co-Disposal Facility storage.	Dust generated during the mining may cause a negative visual impact and altered visibility	a. Regular watering of the site roads; b. Dressing off tip faces, unused roads and disturbed areas; c. Minimizing unnecessary disturbance of non-operational areas; d. Use of chemical additives to control dust to be employed if necessary.
Blasting and vibrations	General increase in Blasting and vibrations	a. Blasting and other noise generating activities should be conducted during the day when surrounding noise levels is high.
Vehicular operation, hauling and transportation of material	General increase in ambient noise levels	a. Regular planned mobile plant maintenance, with special attention paid to the maintenance of engine efficiency and silencer

Activity	Potential Impact	Mitigation
		effectiveness; Regular planned vehicle services.
Waste disposal	Waste generation including Debris (slimes), waste rock, litter and other solid waste will be generated and deposited in and around the site. This could potentially attract nuisance and affect the natural scenery of the site.	a. The slimes and waste rock will be used to backfill the trenches. This will be undertaken in a concurrent rehabilitation manner.
Employment	Spontaneous settlement and Increase pressure on social services	a. Develop an employment and recruitment policy that prioritises local recruitment; b. Identify and support community development programmes; c. Support local government capacity for integrated development planning.
Employment	Benefits resulting from employment and income opportunities created by the mine	a. Positive impact that need to be enhanced.
Decommissioning Phase		
Backfilling of the open cast mine	Compaction of soil and contamination of soil	a. Reinstatement of stored soils onto areas of

Activity	Potential Impact	Mitigation
	resources	disturbance where infrastructure has been demolished; b. Contour and stabilize slopes to be free-draining; c. Cultivation of growing medium, the planting of required vegetative cover and irrigation if required.
Backfilling of the open cast mine	Pollution of surface water resources	a. The storm water management infrastructure, including the PCD, will be decommissioned last to ensure adequate storm water management during the rehabilitation phase; b. Erosion protection measures will be implemented at steep areas; c. Spill kits will available and hydrocarbon spills will be cleaned up immediately; d. All traces of hydrocarbons and residual waste will be removed before infrastructure is

Activity	Potential Impact	Mitigation
		demolished.
Backfilling of the open cast mine	Increase in dust fallout	a. Regular watering of the site roads; b. Dressing off tip faces, unused roads and disturbed areas; c. Minimising unnecessary disturbance of non-operational areas; d. Use of chemical additives to control dust to be employed if necessary.
Hauling, Equipment and vehicular operations	General increase in ambient noise levels	a. Regular planned mobile plant maintenance, with special attention paid to the maintenance of engine efficiency and silencer effectiveness; b. Regular planned vehicle services.
Loss of employment	Loss of employment and enterprise development opportunities	a. Develop and implement Labour and Human Resources Plan (LHRP) that address the impacts associated with retrenchment, job

Activity	Potential Impact	Mitigation
		losses and reduced demand for local goods and services; b. Develop a closure plan which will aim to reinforce the objectives of the SLP by reducing the reliance on LoM for employment by promoting skills transfer to ensure alternative livelihoods portable skills.

11 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED.

The pit site for the proposed open-cast mining operations was selected based on availability of Vanadium, Titanium and Iron- Ore reserves to be mined. Minerals can only be mined where there are identified and verified, therefore it was not practical to select any other sites. The No-Go option is the only other alternative identified during the Scoping phase. If the proposed operation were not to proceed, the land may or may not be utilized for agricultural, or grazing activities in the future. It is worth noting that as much as the no go option may result in the protection of the environment in situ; the consequences of not proceeding with the proposed operation will include the forfeiture of a mining opportunity and therefore the loss of support towards the Moses Kotane municipality. It would further suggest that no new employment opportunities would be created as well as any resultant community upliftment and development programs would likely take place in the surrounding communities.

If an alternative resource cannot be identified this will limit the development of the proposed mine. The site is therefore regarded as the preferred site and alternative sites are not considered.

11.1 Statement Motivating the Preferred Site.

(Provide a statement motivation the final site layout that is proposed)

The location of the proposed mining activity was influenced by the following factors;

a. Availability of the Vanadium, Titanium, Phosphate, Sand, Aggregate and Iron Ore;
b. Land ownership;
c. Geo-hydrological impacts; and
d. Available transport modes and routes.

The proposed layout is therefore the most suitable and economically/environmental viable option for the open pit mining.

12 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE

(In respect of the final site layout plan) through the life of the activity. (Including (i) a description of all environmental issues and risks that erer identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

12.1 Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Activity	Potential impact	Aspects affected	Phase	Significance	Mitigation type	Significance
Contraction of Infrastructure	Fugitive Dust generation	Air Quality	Contraction Phase	Minor Negative	Monitor and manage through: Mine plan	Minor Negative
	Topography and visual alteration	Topography and visual environment	Minor negative	Minor Negative	Avoid and minimise through: Mine plan	Minor Negative
	Degradation to soil resources	Soils	Construction phase and Operational phase	Moderate negative	Prevent through: Soil rehabilitation plan and storm water management plan	Negligible Negative
	Influx of alien invasive vegetation	Flora and fauna	Construction phase	Minor negative	Prevent through: Storm water Management plan and alien invasive management	Minor negative
	Noise generation	Noise	LoM	Negligible Negative	Manage and prevent through: Regular	Moderate Positive

					vehicle inspections	
	Sedimentation and siltation of water courses	Wetland& Aquatic Ecology	Construction Phase	Minor negative	Monitor and prevent through: Aquatic monitoring programme; Storm water management plan	Negligible Negative
		Surface water				
PCD	Contamination of water resources	Wetland and Aquatic ecology	Operational phase	Minor negative	Monitor and manage through: Storm water management plan and Aquatic monitoring programme	Minor negative
		Surface water			Manage and prevent through: storm water management plan	Negligible Negative
		Ground water			Monitor and manage through: Storm water management plan; Ground water monitoring programme and emergency response plan	

Demolition of infrastructure	Fugitive dust generation	Air Quality	Decommission phase	Minor Negative	Monitor & manage through: Dust management plan and Dust monitoring programme.	Negligible Negative
	Alteration of topography and visual environment	Topography &visual environment			Remedy through: rehabilitation plan and closure plan	N/A
	Hydro-Carbons and waste material contamination	Soils		Moderate Negative	Manage through: Emergency response plan	Minor negative
	Alien invasive vegetation establishment	Flora and Fauna		Negligible Negative	Manage through: Alien Invasive and Management programme	Negligible Negative
	Noise generation	Noise			Prevent and manage through: Vehicle maintenance plan	
	Sedimentation	Wetlands and		Minor negative	Monitor remedy	Minor negative

	and contamination of water resources	aquatic ecology			through: Emergency response plan and Aquatic monitoring programme	
		Surface water			Remedy through: emergency response plan	Negligible negative

13 SUMMARY OF SPECIALIST REPORTS.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
Air Quality Impact Assessment	In order to ensure the lowest possible impact on nearby AQSRs and the environment, it is recommended that the air quality management plan as set out in this report be adopted. To ensure that fugitive emissions are kept to a minimum, thus minimising adverse health effects to the receiving environment, additional mitigation is also recommended.
Traffic Impact Assessment	The analysis indicates that the road link currently operates at LoS B at base year 2021 conditions. The operational performance would decrease to LoS C by future year 2032. **Construction Stage**: The analysis indicates that there would be no change to baseline LoS when construction traffic is introduced to the road link (R510). The road link would perform at LoS B during year 2021 and year 2022. **Operational Stage:** The analysis indicates that there would be no change to baseline LoS when operational traffic is introduced to the road link (R510). The

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	road link would perform at LoS B at year 2022 and LoS C at year 2032. Impact of the proposed development on road link performance is considered negligible.
Heritage Impact Assessment	With very little known about the Iron Age occupation and settlement in the area from an archaeological point of view, sites such as these are fairly scarce and therefore of some heritage significance. The fact that these sites are being eroded out by water and other erosion actions, as well as the grading of roads could mean that many more sites and find are present here and that proposed future mining activities would expose them. The lack of any visible stone walling normally associated with Late Iron Age settlements could furthermore be indicative of an Early Iron Age origin and age for these finds. It is therefore recommended that archaeological mitigation be undertaken in the areas where Sites 1 – 5 were recorded. This will entail archaeological excavations and more detailed mapping of the sites and the general area around them. A permit from SAHRA will be required for this to be done. No sites, features or material of any cultural heritage (archaeological and/or historical) origin or significance could be identified in the Morewag and Varkfontein study area. It is possible that similar to Haakdoornfontein that these do exist but that they are invisible and covered by sand and soil deposits. None were however

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	noted in the areas that have recently been cleared of vegetation cover.
Blasting Impact Assessment	The significance of blasting risks is **High** and blasting monitoring is recommended from the start of mining operations. In addition, community involvement throughout the project is of utmost importance. This is especially true for opencast mining projects close to residential dwellings. Blasting relates impacts are definite to upset the community and complaints will be one of the tools that the community may use to express their annoyance with the project, rather than a rational reaction to the vibration or air blast level itself. At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. Even with the best measures, blasting related impacts will be perceived and the community members may complain. It is therefore in the best interest of the mine to continually monitor and manage the blast in an effort to improve and minimise potential blasting effects. It is highly recommended that the mine conducts a detailed photographic survey at selected structures (that does not belong to the applicant) located within 1,500 m from the mine (from the opencast boundary limit) before any mining activities start (before the construction phase start where

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	blasting is to take place). This should include a survey (condition assessment with photographic records) of residential structures, water boreholes and cement dams to determine the status of these structures. It is concluded that, if the mine considers the recommendations in this report (incorporated in the Environmental Management Plan), that blasting risks do not constitute a fatal flaw. It is, therefore, the recommendation that the VTM Mining Project be authorized (from a blasting impact perspective) subject to compliance with the conditions of the EMP.
Social Impact Assessment	The adjacent farmers will experience permanent impacts on their livelihoods. Based on the SIA the following general recommendations are made: • Compile and implement a community relations strategy; • Appoint a community liaison officer to assist with management of social impacts and dealing with community issues; • Consult with the directly affected communities and note special concerns; • Install proper grievance and communication systems; • Employ and procure locally as far as possible;

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	• Honour existing lease agreements or resolve to satisfaction of all parties involved; • Make sure construction teams can be identified easily; and • Make monitoring activities part of the Safety, Health and Environmental systems The mitigation measures should be adhered to ensure the proper management and mitigation of impacts. The Applicant, however, should remain cognizant of possible strained relationships with surrounding communities which may result due to the failure to meet expectations in terms of employment and socio-economic development initiatives associated with the project and increased production. The proposed Project has the potential to assist the local South African economy in creating entrepreneurial development, albeit very limited, especially if local business could be involved in the provision of general material and services during the construction and operational phases The proposed development also represents an investment in infrastructure for a more sustainable and reliable food production technique, which, given the challenges created by climate change, represents a positive social benefit for

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	society. The proposed development represents greater positive social potential than negative implications. The most important mitigation measures for ameliorating negative socio-economic impacts include the consideration of surface infrastructure /placement thereof to avoid resettlement or relocation of the existing farming community, minimize loss of land (arable and grazing) as well as disruption to movement patterns and access and disturbance of sense of place. Additionally, community health, safety and security impacts and disturbance of sense of place can be minimized if the mitigation measures recommended in the other specialist studies are implemented. Such studies will include the following impact assessments: Noise, air quality, blasting and vibration, traffic, and water. Negative socio-economic impacts associated with decommissioning and mine closure can also be minimized with adherence to the commitments in the SLP.
Terrestrial Biodiversity Impact Assessment	An impact statement is required as per the NEMA regulations with regards to the proposed development. The impacts as described, rated and mitigated in this Report do pose a risk to aquatic habitats present on site that could be affected by the activities proposed.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	Although the project will not pose direct impacts to the aquatic habitat, impacts may further degrade the aquatic habitat and cause water quality impairment; however, with firm adherence to the mitigation measures prescribed in this Report, the impacts have been rated as acceptable and it is the opinion of the specialist the proposed project will not cause irreplaceable biodiversity loss.
Aquatics BIA	An impact statement is required as per the NEMA regulations with regards to the proposed development. The impacts as described, rated and mitigated in this Report do pose a risk to the vegetation, habitat and species present on site that could be affected by the activities proposed. Although the project area is considered largely modified, impacts may further degrade the sparse habitat structures; however, with firm adherence to the mitigation measures prescribed in this Report, the impacts have been rated as acceptable and it is the opinion of the specialist the proposed project will not cause irreplaceable biodiversity loss. Furthermore, the natural areas are linked to wetland habitats and the Wetland Specialist Report must be regarded for the preservation of the freshwater areas.
Agricultural Agro- Ecosystems	The major impact on soil resources associated with open pit mining occurs through destruction of the soil profile. Soil layers are stripped and stockpiled for later use in

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	rehabilitation. During this process there can be a loss of topsoil through erosion and dilution of topsoil through mixing with deeper soil horizons. Compaction and loss of soil structure commonly also occur as well as a loss of biological activity if topsoil is deeply stockpiled for long periods. Thus, the rehabilitated land is typically less suitable for agriculture than it was before mining. The following recommendations are made to minimise the impact on the soils: • No construction or operational activities may be undertaken within the wetland soils. • The proposed management and mitigation measures should be included in Environmental Management Programme (EMPr). • Soil monitoring programs should be implemented by Ikwezi. Assess and restore soil fertility by means of sampling and analysed for chemical properties of soil. Soil chemical and physical amelioration to enhance the growth capability of the soils. • The soil stockpile should have a maximum height of 3m to minimise adverse effects on soil chemical and physical properties. Revegetation on soil stockpiles should be done immediately to minimise erosion.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	• Soil fertility should be assessed and restored by means of sampling and chemical analysis, during mining and after rehabilitation. • If possible, topsoil should be stripped when the soils are not saturated or not during rainy season, as to reduce compaction, adhering to clearly defined guidelines for stripping, with topsoil being saved separately. • Stockpiles should be protected by a berm wall to prevent erosion of stockpiled material and deflect surface water runoff. • Runoff must be controlled and managed by use of proper storm water management. • Fuel and oils spills are common, remediate using commercially available emergency clean up kits and focus on awareness of prevention.
Visual Impact Assessment	Structures with the most profound visual impact will be the dumps and stockpiles due to their footprints and height, but also to act as screening for the other operations. Therefore mitigation measures for potential visual impacts of these structures are exceedingly important. This includes the safe storage of excavated topsoil and overburden to prevent material loss and erosion, in order to safeguard this material for backfilling and shaping of the affected area in the closure and post-closure phases. No slopes should exceed a ratio of 1:3, depending on the

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS
	material excavated, while successive vegetation communities should be established on these dumps and stockpiles. Not only will it improve soil stability and reduce erosion and dust generation, but it will also soften the visual impact considerably. In conclusion it can be said that, given the scale of the proposed development and surrounding receptors, its negative visual impact has the potential to be **moderate**. Nevertheless, should mitigation measures be ignored, the negative visual impacts can escalate and cause a meaningfully higher visual disturbance.

Attach copies of Specialist Reports as **APPENDIX D**

14 ENVIRONMENTAL IMPACT STATEMENT

14.1 Summary of the key findings of the environmental impact assessment;

Table 11: Aspects to be assessed

Environmental Aspect	Potential Impact	Activities
Soil	Soil compaction	a. Open pit development; b. Trenches and foundations for surface infrastructure development;
	Soil erosion	a. Removal of vegetation; b. Topsoil stripping; c. Stockpiles; d. Road development;
	Soil pollution	a. Oil and fuel spills from vehicles; b. Waste generation; c. Leakage from waste storage facilities;
	Sterilization of topsoil	a. Stripping of topsoil during construction will remove this fertile layer;

Environmental Aspect	Potential Impact	Activities
	layer	
Fauna	Loss of faunal habitat and ecological structure	a. Placement of infrastructure within sensitive faunal habitat areas; b. Site clearing and the removal of faunal habitat; c. Inadequate design of infrastructure; d. Construction of infrastructure; e. Construction of access and haul roads; f. Fire;
	Loss of faunal diversity and community integrity	a. Use of subject property; b. Construction related; disturbance; c. Removal of faunal habitat and migratory corridors; d. Collision of construction; vehicles with faunal species; e. Vehicles accessing site;

Environmental Aspect	Potential Impact	Activities
		f. Poaching;
Surface Water and Wetland	Reduction in resources	a. Use of Potable water;
	Reduction in surface water quantity	a) River diversions; b) Opencast and construction activities at tributaries;
	Deterioration in water quality	a. V River diversions (bridges & Opencast sections); Spilled construction materials such as cement, paint, fuel and oil;
	Water/ deterioration of surface water quality	a. Chemical contaminants; b. Vehicle wash bays and workshop; c. Spillages from sanitary conveniences, fuel deposits or storage facilities;
Ground Water	Impact on the availability of groundwater	a. Developmet of the blasting opencast mining
	Impact on the quality of groundwater	

Environmental Aspect	Potential Impact	Activities
Air Quality	Reduction in air quality	a. The dust and vehicle emissions generated by the mining activities;
Noise	Day and night time noise impact	a. Preparation of the boxcut area
	Noise above ambient noise levels in the surrounding settlements and farm holdings	2) Waste Rock Dump area (close to noise sensitive area); 3) Bulldozer clearing vegetation and topsoil; 4) Excavator loading topsoil/softs on LHD trucks for removal to stockpiles; 5) Drilling activities; 6) LHD trucks idling or offloading; 7) Pouring of concrete for foundations at plant; and 8) Diesel generator.
Blasting and Vibration	Excess may cause damage to the nearby structures	a. Rock excavation
Visual	Alter the overall landscape character and sense of place of	a. Preparing and planning of the site;

Environmental Aspect	Potential Impact	Activities
	the region	9) Construction of mining infrastructure; 10) Siting of mining infrastructure; 11) Construction of mining infrastructure such - offices and plant areas; 12) Removal of vegetation; and 13) Loss of topsoil and creation of topsoil stockpiles.
	Dust generated during the construction phase may cause negative visual impacts	a. Preparing and planning of site; 14) Construction of infrastructure; 15) Removal of vegetation cover; and 16) Dust generation due to movement of vehicles
	The mining facilities may impact negatively on receptors (residents and motorists) situated in or utilising the identified receptor sites	a. Preparing and planning of the site; 17) Construction of mining infrastructure; 18) Siting of mining infrastructure;

Environmental Aspect	Potential Impact	Activities
		19) Construction of mining infrastructure such as offices and plant areas; 20) Removal of vegetation;
Cultural and Heritage Aspects	Destruction of heritage or cultural aspects	a. Construction of mining infrastructure;
Socio-economic aspects	Economic Opportunities, Infrastructure Development and Employment	a. Increase in disposable income may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.
Sioil and land capability	Loss of current land capability	a. Change of land use from natural vegetation and agriculture (livestock grazing and commercial) to industrial.
Traffic	Incease in traffic congestion	a. Mine workers traveling to and from the mine

14.2 Final Site Map

(Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers.)

Mine Layout plan is on Figure 9 below.

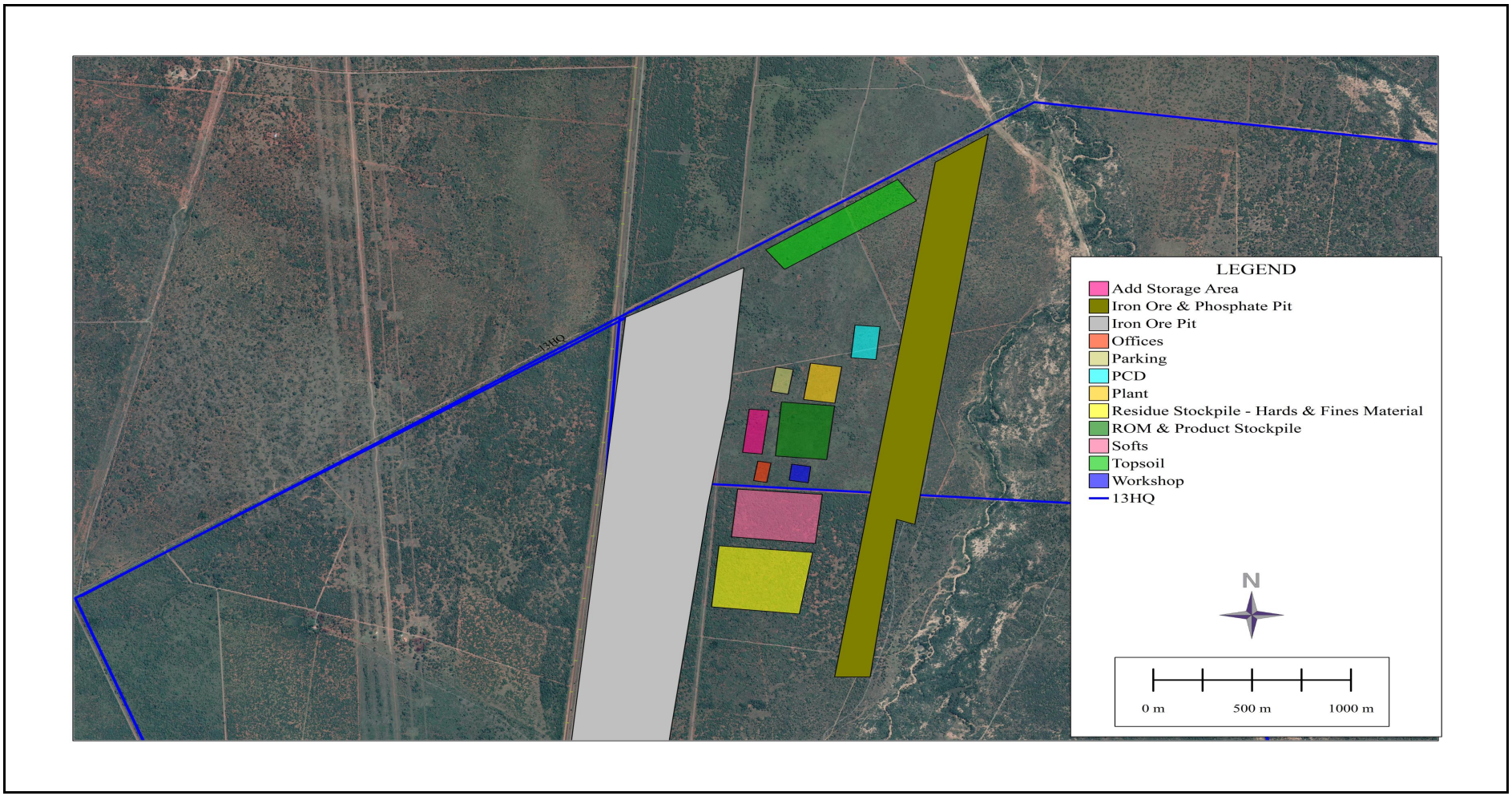


Figure 9: Mine Layout Plan

14.3 Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

The predominant impacts on the biophysical environment during the Construction Phase are associated with the construction of the PCDs and overburden stockpiles. Such activities could lead to soil erosion and contamination, loss of biodiversity and habitats, as well as the contamination and sedimentation of wetlands on site. The potential impacts on soils are significant due to the high agricultural potential and erosion potential of the soils within the Project area. Potential contamination from hydrocarbon spillages, erosion due to vegetation clearance, exposure of soil surfaces and stockpiling and degradation due to compaction, could all lead to the overall loss of soil resources. The loss of soil resources impacts on the sustainability of the soil and the land capability, which will limit the final land use of the site following rehabilitation, as well as require costly remediation practices. The removal of vegetation and presence of disturbed areas will be a likely contributor for the establishment of alien invasive vegetation.

The construction and development of the Ikwezi mining by proponent within the Highveld grassland biome will result in the permanent removal of vegetation (grass and forbs species) composing this biome. Although the farms were highly invaded by alien trees and shrubs, the site has shown potential habitat that could support various individuals of the protected Species of Conservation Concern (annual species that may have not been detected during the study).

Despite of the non-occurrence of the CI species in the farms and extremely low chances of finding a red listed data species it is a necessity to continuously check such species within the farm during construction and development. A field guide encompassing pictures has been appended in the report, with the information sourced from South African National Biodiversity Institute (SANBI).

The farm areas also pose threat to the nearby sheep, goat and cattle species as it hosts high diversity of alien invasive plants species. However, based on the vegetation composition within the both farms, construction and development would pose low impact. Nevertheless, mitigation and management measures of the alien invasive species should be implemented to minimise spread and infesting nearby farms and elsewhere.

The presence of dumping and old mining activities within the farm areas have already decreased the abundance as well as diversity of the faunal assemblage. Therefore, the impact that would be caused by the development was of significantly low or moderate prior and after implementation of mitigation and management measure suggested.

According to the faunal diversity and assemblage's data collected, there was no Red Data Listed (RDL) species identified within the both farms. It was assumed that, due to the disturbance activities associated with this site and lack of suitable breeding sites, it is unlikely that RDL species would still have existing diversity. Moreover, it has been concluded that, RDL species would most likely be avifaunal species utilizing the site. Terrestrial birds are not necessarily restricted to common habitat unit, unlike aquatic adapted species that may be confined/ localized. Although there was a pond of water, it is unlikely to attract high diversity of birds and other conservation important species as it is contaminated with previous mining tailings. Therefore, the likelihood of the proposed Ikwezi mining development would result in low or moderate significant impact on breeding habitants of SCC species.

The proposed Project is a mining right application for Ikwezi. The impacts listed in this report are because of the open-pit mining operations, underground operations and associated infrastructure and activities on the farms under application. Mitigation and management measures have been recommended to prevent, avoid and reduce the significance of the potential impacts of the Project. Conversely, enhancement measures will be implemented to increase the significance of the potential positive impacts on all farms under application. Should the mitigation and management measure be correctly implemented, the potential impacts will reduce in their significance. The proposed activities requiring Environmental Authorisation are critical for the mining activities and the prevention of pollution of the environment, as well as to ensure the efficient and successful operation of the Project. With the implementation of the recommended mitigation measures to manage potential impacts, it is recommended that the proposed PCDs and overburden stockpiles be issued a Waste Management License.

15 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR;

(Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.)

The EMP seeks to achieve a required end state and describes how activities that have, or could, an adverse on the environment will be mitigated, controlled and monitored.

The EMP will address the environmental; impacts during construction, operational, Decommissioning and post -closure phases of the project. Due regard must be given to environmental protection. These recommendations are aimed at ensuring that the contractors maintain adequate control over the project to:

a. Minimize the extent of an impact during the life of the PCDs and overburden stockpiles;
Ensure appropriate restoration of areas affected by the PCDs and overburden stockpiles; and
Prevent long term environmental degradation.

15.1 Final proposed alternatives.

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

The layout was informed by previous environmental and technical studies, as well as due to the location of mineral resource, the area is rich with magnetite mineral. The initial will consider the placement of infrastructure in a manner that will avoid and minimise potential environmental impact. Where impacts cannot be avoided, mitigation and management measures will be provided.

Refer to Appendix B for the final layout.

15.2 Aspects for inclusion as conditions of Authorisation.

(Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation)

Not applicable

15.3 Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

It is Envirostep (Pty) Ltd opinion that no knowledge gaps or uncertainties exist regarding the investigations undertaken by specialist studies as part of the Ikwezi Vanadium (Pty) Ltd mining right application.

15.4 Reasoned opinion as to whether the proposed activity should or should not be authorised

15.4.1 Reasons why the activity should be authorized or not.

a) The desktop studies have proven that the site is located on a magnetite rich mineral zone, and there were prospecting activities taking place at these zones and by that these mining right application must be authorised.
b) It has also been noted that mining sector is the pillar of South African economy and provides employment opportunities for many.
c) The option of not approving the activities will result in a significant loss to valuable information regarding the status of the ore bodies present on these properties.

15.4.2 Conditions that must be included in the authorisation

15.4.2.1 Specific conditions to be included into the compilation and approval of EMPr

No specific conditions are required in addition to the requirements stipulated in the EMPr.

15.4.2.1.1 Rehabilitation requirements

A Rehabilitation Plan has not been compiled, as required and described in the MPRDA. A Rehabilitation Plan is an important planning tool designed to assist in preventing, minimising or mitigating adverse long-term environmental and social impacts caused by the proposed Project, as well as to create a self-sustaining ecosystem and to ensure the optimal management of rehabilitation issues that may arise. The overall proposed rehabilitation objectives for the Ikwezi Vanadium Project are as follows:

a. Maintain and minimise impacts to the ecosystem within the Project area;
b. Establishment of a suitable post-mining land capability, vegetation and biodiversity;
c. Implement progressive rehabilitation measures where possible;
d. Prevent soil, surface water and groundwater contamination;
e. Comply with the relevant local and national regulatory requirements; and
f. Maintain and monitor the rehabilitated areas.

15.4.3 Period for which the Environmental Authorisation is required.

The Environmental Authorisation will be required for a period of 30 years.

15.4.4 Undertaking

(Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.)

All mitigation measures as described in this EIAR was included in the EMPr. We hereby confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the EIAR and the EMPr.

15.5 Financial Provision

(State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.)

The amount required to manage and rehabilitate the environment in respect of rehabilitation is R 10383893.

15.5.1 Explain how the aforesaid amount was derived.

As part of the requirements of the MPRDA, Envirostep calculated the environmental closure liability for Ikwezi Vanadium (Pty) Ltd according to the DMR guidelines. The financial provision will be made available to the DMR in the form of a guarantee from a financial institution to ensure that adequate rehabilitation will be undertaken following the Mining Right for Ikwezi Vanadium (Pty) Ltd. The financial provision was calculated as R 10383893.

The environmental closure liability for Ikwezi Vanadium (Pty) Ltd was calculated according to the DMR's "Guideline Document for the Evaluation of the Quantum of Closure-related Financial Provision Provided by a Mine". The DMR Guideline format makes use of a set template for which defined rates and multiplication factors are utilised.

During this assessment, the 2018 Master Rates, as published by the DMR, were increased by an average inflation rate of 5.6% (Statistics SA, 2013). An average rate of inflation of 5.9% (Statistics SA, 201411) was added to the 2019 Master Rates to reflect 2021 costs.

The DMR Guideline Document classifies a mine according to a number of factors which allows one to determine the appropriate weighting factors to be used during the quantum calculation. The following factors are considered:

a. The mineral mined;
b. The risk class of the mine;
c. Environmental sensitivity of the mining area;
d. Type of mining operation; and
e. Geographic location.

15.6 Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

Envirostep (Pty) Ltd confirms that the amount determined in Section 15.5 can be provided for from the operating expenditure of Ikwezi Vanadium Project.

16 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY.

16.1 Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

This submission to the DMR for the amendment of the Ikwezi Vanadium Right is being undertaken in terms of Section 22 of the MPRDA. As a result, no Scoping Report was compiled in terms of the requirements of the MPRDA. A Scoping Report was compiled in terms of NEMA for Listed Activities and was submitted to the DMR as a commenting authority. The Plan of Study and methodology used in this EIA Report, however, did not deviate from the Scoping Report sent to the Department of Mineral Resources.

16.2 Motivation for the deviation.

No deviations were undertaken from the scoping report

17 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

(Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the: -)

17.1 Impact on the socio-economic conditions of any directly affected person.

The potential socio-economic impacts expected to arise because of the project have been investigated and assessed in detail. These include identification and quantification of impacts to the socio-economic environment, based on the baseline conditions prior to the project being implemented.

Mining activities can cause considerable disruption to local cultures, especially when the operations occur, as is increasingly the case, in areas occupied by indigenous people who have had little contact with the outside world.

Much of the environmental damage caused by mining affects local communities, most significantly in terms of their livelihoods and health. Environmental health problems may become evident not just close to the mine, but some distance away.

At these Ikwezi Vanadium right application, the greatest socio-economic impact is the likely displacement of farm owners or agricultural land being disturb and these could have impact on food production of the area around.

17.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix E and confirm that the applicable mitigation is reflected in 217.2. herein).

The sub-surface materials may still be lying hidden from surface surveys. Therefore, absence (during surface survey) is not evidence of absence all together. The following monitoring and reporting procedures must be followed in the event of a chance find, to ensure compliance with heritage laws and policies for best-practice. This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. Accordingly, all mining and construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds.

If during the construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance, work must cease at the site of the find and this person must report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. The senior site Manager must then make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area before informing ISS. The mine manager will then contact a professional archaeologist for an assessment of the finds who will in turn inform SAHRA/PHRA.

17.3 Other matters required in terms of sections 24(4)(a) and (b) of the Act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as Appendix 4).

Not applicable

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

18 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME.

18.1 Details of the EAP

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(1.1) herein as required).

The details of the EAP have been provided in Section 1, Item 1.1 in Part A of this report.

18.2 Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (7.1.1) herein as required).

The details of the aspects of the activity are covered on PART A, Section 7, item 7.1.1.

18.3 Composite Map

(Provide a map (Attached as an Appendix) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers).

Attached as an Appendix B.

18.4 Description of Impact management objectives including management statements

18.4.1 Determination of closure objectives.

(ensure that the closure objectives are informed by the type of environment described in 18.4.1. herein)

The closure objectives have been formulated for Ikwezi Vanadium mine. The closure objectives for Ikwezi Vanadium (Pty) Ltd Mining Right Application are as follows:

a. Identify post-closure uses of land occupied by mine infrastructure in consultation with the surrounding land owners. Should a suitable use for any mine infrastructure not be found, it will be demolished and removed;
b. Rehabilitate all disturbed land to a condition that is suitable for its post-closure uses;
c. Rehabilitate all disturbed land to a condition that facilitates compliance with applicable environmental quality objectives, such as air and water quality objectives as an example;
d. Reduce the visual impact of the mine components through rehabilitation of all disturbed land and residue deposits;
e. Rehabilitate all disturbed land and residue deposits to a condition where post-closure management is minimised;
f. Develop a retrenchment programme in a timely manner;
g. Keep authorities informed of the progress of the activities during the Decommissioning Phase;
h. Submit monitoring results to the relevant authorities; and
i. Maintain the required pollution control facilities and the condition of the rehabilitated land following closure.

The closure objectives are to:

a. Eliminate any safety risk associated with drill holes and sumps though adequate drill hole capping and backfilling;
b. Remove and/ or rehabilitate all pollution and pollution sources such as waste materials and spills;
c. To establish rehabilitated area which is not subject to soil erosion which may result in the loss of soil, degradation of the environment and cause pollution of surface water resources; and
d. Restore disturbed area and re- vegetate these areas with grass species naturally occurring in the area to res tore the ecological function of such areas as far as is practicable.

18.4.2 The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

An Environmental Response Plan is a process to respond rapidly and effectively to and manage emergency situations that may arise on farm portions under this Mining Right Application. The Environmental Response Plan has the following objectives:

a. To categorize emergency situations through hazard identification and to define procedures for responses to the situations;
b. To assign responsibilities for responding to emergency situations;
c. To implement an effective system to receive, record and communicate reports of environmental incidents and emergencies; and
d. To ensure that all environmental incidents or emergencies are investigated, and the necessary procedures are in place to implement corrective and preventative actions to prevent a recurrence of the incident.

The Ikwezi Vanadium mine emergency preparedness and response code of practice must be compiled in accordance with the following:

a. Occupational Health and Safety (OHSAS) 18001;
b. The Mine Health and Safety Act, 1996 (Act No. 29 of 1996); and
c. The Mineral Act, 1991 (Act No. 50 of 1991).

In the event of an emergency, the Emergency Response Plan/Procedure will be consulted, and the required actions implemented. To facilitate the effective implementation of the procedures, copies of the Emergency Response Plan will be placed in accessible and visible locations around the farms which are under applications. *Figure 10* provides a general overview of the emergency response procedures.

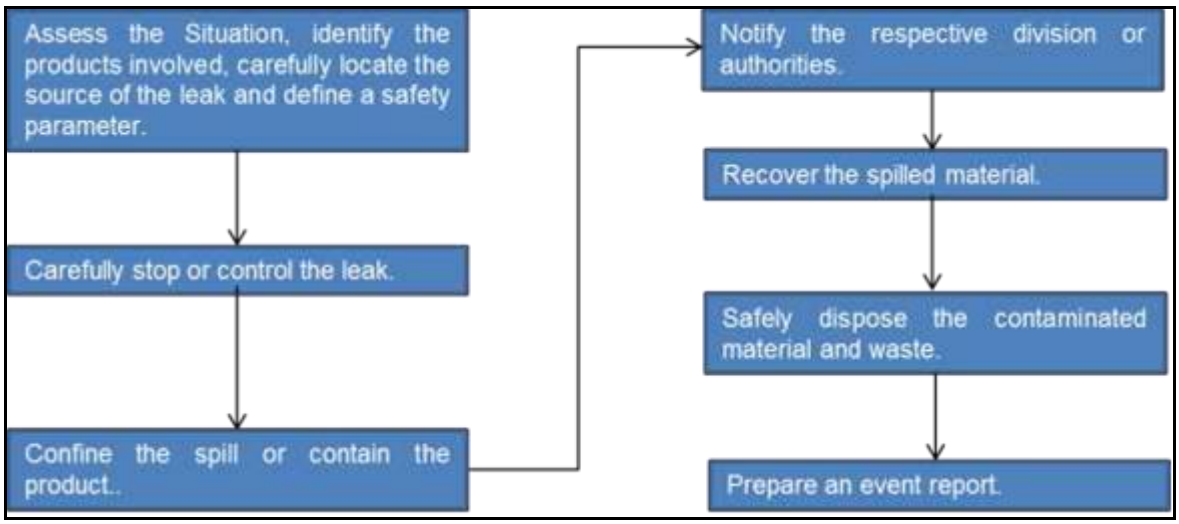


Figure 10: Emergency Response Procedure Overview

a. Communication

A list of emergency contact numbers will be displayed at various locations around Klipbank colliery. If the emergency has the potential to affect surrounding communities, the communities will be alerted via alarm signals or contacted in person.

b. Training and Emergency

The efficiency of the emergency response plan must be tested by running training programmes and frequent emergency simulations. This will aid to prepare employees to respond in case of emergencies.

13.4.1. Potential risk of Acid Mine Drainage.

(Indicate whether or not the mining can result in acid mine drainage).

This section needs the lab results for Surface and Groundwater investigations for farm portions under applications, respectively for the Mining Right Application for Vanadium, Phosphate, Sand, Aggregate, Titanium and Iron Ore.

Geochemistry report recommended that that the residue stockpile be classed as Type 4 waste that needs to be deposited on Class D landfill; The results of geochemistry samples should be modelled as part of plume model; Drilling of monitoring boreholes (shallow and deep) close to the stockpiling area; and Monitoring boreholes are proposed to monitor the movement of polluted

groundwater migrating away from the mine area and the lowering of the groundwater table due to mine dewatering. This will include water level and water quality monitoring monthly in the first year and quarterly from year two onwards.

18.4.3 Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.

AMD is the process where mining and ore processing methods expose sulphates and metals in the source material to water and oxygen, producing low pH waters often associated with heavy metal contamination. By performing geochemical analysis on the source material, it is possible to estimate the acid generating and neutralising potential of the source rocks as a basis for an impact assessment.

18.4.4 Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage.

Ikwezi Vanadium (Pty) Ltd will design a clean and dirty water management system consisting of a series of canals, pipelines, berms and PCDs for each overburden stockpile.

Dirty water from the open pit will be pumped to the respective PCDs; the overburden stockpile located to the north of Pit BD will have PCDs located to the east and west of the stockpile, with a PCD located to the northeast of the topsoil stockpile and a PCD located to the southwest of the overburden stockpile to the west of Pit BD.

The PCDs will temporarily store water from the pit dewatering activities, as well as surface water run-off from the respective stockpiles to ensure no contaminated water is discharged or reports to the surrounding environment and catchment. The water will then be pumped to the existing PCD located within the boundary of Klipbank farm. Water from the PCD is recycled and used in the beneficiation process at PCPP. No dirty water is discharged from site.

The separation of clean and dirty water is essential in avoid the generation of acid mine water.

18.4.5 Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

The measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage includes:

a. Groundwater monitoring of the water quality and levels must take place quarterly to identify impacts;
b. Quarterly water monitoring will assist the mine to identify water quality and level trends over time. Seasonal variations will be identified, as well as potential impacts to the groundwater environment. Should potential impacts be identified, management measures will be put in place based on the type of potential contaminant or level change;
c. A Storm Water Management Plan will be implemented to separate clean and dirty water to minimise the volume of dirty water produced, thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water;
d. Monitoring and maintenance of the dirty water diversion channels and berms must be undertaken to ensure that they are not silted up to allow for free drainage;
e. The conceptual and numerical models must be refined and annually for the first four years and thereafter every five years based on groundwater monitoring results. This will help to quantify impacts to water quantity and quality;
f. All contaminant, storm water, waste and hazardous waste storage facilities and other contaminated water storage areas (PCDs) must be lined to pro-actively prevent infiltration of contaminated seepage water;
g. The backfilled material must be compacted where possible and the pre-mining drainage pattern must be emulated;
h. Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage. The monitoring programme will assist with the identification of potential AMD occurring. All contaminated water must be contained in the PCD;
i. The backfill material must be placed in such a manner to reduce the potential leaching impacts on the underlying aquifers. Material with a high neutralising effect needs to be placed at the bottom followed by waste rock and slurry higher up. The top layers can again be material with a high neutralising capacity. The top layer needs to ensure free draining of the rain water from the rehabilitated areas;

j. Should contamination plumes exist near sensitive receptors, intercept boreholes or trenches must be installed to collect the contaminated water before disposal in PCD; and
k. The rehabilitated areas must be flooded as soon as possible to reduce the amount of time the potential acid producing material is exposed to oxygen. This will reduce the potential AMD risk and volumes.

18.4.6 Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

It is expected that approximately ≤ 5000 cubic metres of water will be required per day during the Operational Phase of the Ikzwezi mine. (This will be confirmed when the WULA process starts)

18.4.7 Has a water use licence has been applied for?

No, Water use Licence has not been applied for this Mining Right Application.

18.5 Impacts to be mitigated in their respective phases

Table 12: Measures to rehabilitate the environment affected by the undertaking of any listed activity

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Construction Phase						
Construction of Infrastructure	Air Quality	Construction Phase	Local	a. Ensure that the areas of disturbance are minimised and restricted to the required footprint areas; and b. Ensure that dust suppressants are applied to exposed surfaces.	a. Dust Management Plan; and b. Dust Monitoring Programme in accordance with NEM: AQA.	Daily
	Topography and Visual Environment	Construction Phase	Local	a. Limit the footprint areas of the of the surface infrastructure, where possible, especially the width of the haul roads;	Mine Plan Development	On-going during Construction and Operational Phase

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				b. Ensure that access and haul roads are contoured to limit erosion from surface runoff, preventing further alteration to the topography; c. Establish vegetation, where possible, to aid in screening infrastructure; d. Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape; e. Pylons and metals structures should be galvanised or painted with a neutral matt finish; and f. Limit construction activities at night and down lighting must be used to minimise light pollution.		

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Soils	Construction Phase	Local	a. Ensure soils are stripped and stockpiled prior to the excavation of infrastructure foundations; and b. Implement Storm Water Management designs to prevent erosion	a. Soil Rehabilitation Plan; b. Storm Water Management Plan in accordance with MPRDA Regulation 56 (1) to (8); and Soil pollution and erosion control.	Weekly during construction and operational phase
	Fauna and Flora	Construction Phase	Local	a. Vegetate open and exposed areas to prevent soil erosion and the establishment of alien invasive vegetation; b. Ensure a Storm Water	a. Conservation Management Plan; and b. Alien Invasive	Weekly

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				Management Plan is implemented; and c. Alien invasive vegetation to be identified and removed throughout the LoM.	Management Plan in accordance with NEM:BA and ECA.	
	Wetland and Aquatic Ecology	Construction Phase	Local	a. Ensure the statutory buffers are implemented from the wetlands systems and watercourses, unless otherwise stated in the IWUL; b. Ensure a Storm Water Management Plan is implemented; and c. Implement a biannual Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions,	a. Storm Water Management Plan; and b. Aquatic Monitoring Programme in accordance with NWA.	a. On-going and Biannually during Life of Mine.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				should it be required.		
	Surface Water	Construction Phase	Local	a. Ensure that the topsoil stockpiles are vegetated to prevent soil erosion; b. Implement Storm Water Management designs to prevent erosion and divert dirty water to the appropriate storage dams (PCDs); and c. The design, construction, operation and maintenance of water management facilities must be in accordance with GN R 704 capacity requirements. The PCDs must have a freeboard of 0.8 m and must be able to contain a 1: 50-year, 24-	Storm Water Management Plan in accordance with NWA.	On-going during Construction Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				hour extreme rainfall event.		
	Noise	Life of Mine	Project Area	a. Ensure construction activities are only undertaken during daylight hours; b. Construction related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and c. Ensure equipment and machinery is switched off when not in use.	Regular Vehicle Inspections in accordance with NEM: AQA and ECA.	a. Daily and according to Maintenance Plan during Construction Phase.
	Heritage	Construction Phase	Local	a. Consultation with the bona fide Next of Kin must be undertaken in accordance with the NHRA Regulations and any other	Entitlement Framework in Accordance with NHRA.	Prior to Construction Phase

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		Operational Phase		applicable legislation; and b. Develop an entitlement framework for the Next of Kin in which the health and safety risks are identified and remedial preventative measures are agreed upon.		
Construction of stockpiles	Soils	Construction Phase Operational Phase	Local	a. Minimise topsoil stockpile heights as far as possible; b. Ensure soils are stripped in accordance with the Rehabilitation Soil Management Plan. It is recommended that the topsoil (upper 0.3 m) and subsoil (0.7 m to 0.9 m in thickness) of the soil profile should be stripped and stockpiled separately; c. Ensure soils are stripped and	a. Soil Rehabilitation Plan; b. Storm Water Management Plan in accordance with MPRDA Regulation 56 (1) to (8); Soil pollution and	a. On-going and Annually during Construction Phase and Operational Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				stockpiled prior to the excavation of infrastructure foundations; d. Ensure stockpiles are maintained in a fertile and erosion free state by sampling and analyzing for macro nutrients and pH on an annual basis; e. Traffic and access to the stockpiles will be restricted; f. Ensure that the topsoil stockpiles are vegetated to prevent soil erosion and to reinstitute the ecological processes within the soil; and g. Implement Storm Water Management designs to prevent erosion.	erosion control.	
	Fauna and	Construction	Limited	a. Vegetate open and exposed	a. Conservation	a. On-going

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	flora	Phase		areas to prevent soil erosion and the establishment of alien invasive vegetation; b. Ensure a Storm Water Management Plan is implemented; and c. Alien invasive vegetation to be identified and removed throughout the Life of Mine.	Management Plan; and b. Alien Invasive Management Plan in accordance with NEM:BA and ECA.	during Life of Mine.
	Wetland and Aquatic Ecology	Construction Phase	Local	a. Ensure the statutory buffers are implemented from the wetlands systems and watercourses, unless otherwise stated in the IWUL; b. Ensure a Storm Water Management Plan is implemented; and c. Implement a biannual Aquatic	Storm Water Management Plan; and Aquatic Monitoring Programme in accordance with NWA.	a. On-going and Biannually during Life of Mine.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				Monitoring Programme to monitor potential impacts and implement corrective actions, should it be required.		
	Surface Water	Construction Phase	Local	a. Ensure that the topsoil stockpiles are vegetated to prevent soil erosion; b. Implement Storm Water Management designs to prevent erosion and divert dirty water to the appropriate storage dams (PCDs); and c. The design, construction, operation and maintenance of water management facilities must be in accordance with GN R 704 capacity requirements.	Storm Water Management Plan in accordance with NWA-GN R. 704;	a. On-going during Construction Phase

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Groundwater	Construction Phase Operational Phase	Local	a. A groundwater monitoring system must be implemented and test the water on a quarterly basis for changes in water quality and water levels. Should impacts be identified, management measures must be implemented based on the contaminant or water level change; b. Implement a Surface Water Management Plan to minimise the volume of dirty water produced, as well as the effectiveness of the containment of dirty water, thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water;	a. Groundwater Monitoring Programme; Storm Water Management Plan; and • Numerical and conceptual model in accordance with NWA.	a. On-going, Quarterly and Annually during Life of Mine.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				c. Refine and update the conceptual and numerical models annually for the first four years and thereafter every five years based on groundwater monitoring results. This will help to better quantify impacts to water quantity and quality; and d. All contaminant, waste and hazardous waste storage facilities and other contaminated water storage areas (PCD) must be lined to pro-actively prevent infiltration of contaminated seepage water.		
Operational Phase						
Dirty Water Management	Wetlands and Aquatic	Operational Phase	Provincial	a. Ensure a Storm Water Management Plan is	a. Storm Water Management	On-going, Daily and Biannually

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
System	Ecology			implemented; b. Dirty water from the open-pit must be diverted by channels and berms and separated from clean water. The dirty water must be stored in the PCD; c. The operation and maintenance of the PCD must be in accordance with the NWA Regulations set out in GN R704 and must have a minimum freeboard of 0.8 m and be able to contain a 1:50 year, 24-hour storm event; and d. Implement a biannual Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions,	Plan; b. Dust Management Plan; c. Dust Monitoring Programme; and d. Aquatic Monitoring Programme in accordance with NWA.	during Life of Mine

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				should it be required.		
	Surface Water	Operational Phase	Municipal	a. Diversion berms and pipelines used for dewatering activities need to be sized based on the dewatering rates and volumes; b. The operation and maintenance of the PCD must be in accordance with the NWA Regulations set out in GN R704 and must have a minimum freeboard of 0.8 m and be able to contain a 1:50 year, 24-hour storm event; c. Monitor the dirty water management facilities monthly to identify potential leaks and implement management measures to rectify potential	a. Storm Water Management Plan b. Surface Water Monitoring Programme in accordance with NWA.	a. On-going and Monthly during Operational Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				issues; and d. Monitor surface water resources up and downstream of the Project area to identify potential contamination.		
	Groundwater	Operational Phase	Limited	a. Ensure that monitoring and maintenance of the dirty water diversion channels and berms are undertaken to ensure that they are not silted up to allow for free drainage; b. Ensure that pipelines and diversion channels and berms are monitored for potential leaks and structure failures; c. Potential leaks and spills must be contained and cleaned up immediately, as well as the	a. Storm Water Management Plan b. Groundwater Monitoring Programme in accordance with NWA.	a. Monthly and Quarterly during Operational Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				leakage location repaired; d. Ensure that a Storm Water Management Plan is in place to separate clean and dirty water; and e. Groundwater monitoring of the water quality and levels must take place quarterly especially for the water supply boreholes to ensure a sustainable resource and identify impacts on local users.		
Pollution Control Dam	Wetlands and Aquatic Ecology	Operational Phase	Provincial	a. Ensure a Storm Water Management Plan is implemented; b. Dirty water from the open-pit must be diverted by channels and berms and separated from	a. Storm Water Management Plan b. Dust Management Plan;	a. On-going, Daily and Biannually during Life of Mine

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				clean water. The dirty water must be stored in the PCD; c. The operation and maintenance of the PCD must be in accordance with the NWA Regulations set out in GN R704 and must have a minimum freeboard of 0.8 m and be able to contain a 1:50 year, 24-hour storm event; and d. Implement a biannual Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions, should it be required.	c. Dust Monitoring Programme; and Aquatic Monitoring Programme in accordance with NWA.	
	Surface Water	Operational Phase	Municipal	a. The operation and maintenance of the PCD must be in accordance with the NWA	a. Storm Water Management Plan	On-going and Monthly during Operational

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				Regulations set out in GN R704 and must have a minimum freeboard of 0.8 m and be able to contain a 1:50 year, 24-hour storm event; and b. Monitor the dirty water management facilities monthly to identify potential leaks and implement management measures to rectify potential issues.	b. Surface Water Monitoring Programme in accordance with NWA.	Phase.
	Groundwater	Operational Phase	Limited	a. The operation and maintenance of the PCD must be in accordance with the NWA Regulations set out in GN R704; b. The PCD must be monitored for potential leaks and structure failures;	a. Groundwater Monitoring Programme in accordance with NWA.	a. Monthly and Quarterly during Life of Mine.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				c. Potential leaks and spills must be contained and cleaned up immediately, as well as the leakage location repaired; d. Monitor PCDs' water quality on a quarterly basis to understand water quality and potential impacts on the groundwater should seepage occur; and e. Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage.		
Stockpiles	Air Quality	Operational Phase	Municipal	a. Monitor the establishment of vegetation	a. Dust Management Plan; and b. Dust Monitoring	a. Monthly during Operational Phase

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
					Programme in accordance with NEM: AQA.	
	Topography and Visual Environment	Operational Phase	Local	a. Ensure topsoil stockpiles are contoured and have a steepness of less than 18° to prevent slope failure and erosion and aid in vegetation establishment; b. Limit and reduce the stockpile heights as far as possible; c. Ensure that the topsoil stockpiles are vegetated; and d. Establish and maintain vegetation screens.	a. Mine Plan Development	a. On-going during Operational Phase.
	Soils	Operational Phase	Local	a. Ensure stockpiles are maintained in a fertile and erosion free state	a. Storm Water Management	Annually and on-going during

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				by sampling and analyzing for macro nutrients and pH on an annual basis; b. Ensure topsoil stockpiles are vegetated to prevent erosion; c. Ensure access to the stockpiles is restricted to prevent unauthorized use and borrowing of topsoil; d. Ensure topsoil stockpiles are clearly demarcated; and e. Implement Storm Water Management designs to prevent erosion.	Plan; and b. Soil Rehabilitation Plan in accordance with MPRDA Regulation 56 (1) to (8); c. Soil pollution and erosion control	Construction Phase and Operational Phase.
	Wetlands and Aquatic	Life of Mine	Local	a. Ensure a Storm Water Management Plan is implemented; and b. Implement a biannual Aquatic	a. Storm Water Management Plan b. Aquatic	a. On-going and Biannually during Life of

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Ecology			Monitoring Programme to monitor potential impacts and implement corrective actions, should it be required.	Monitoring Programme in accordance with NWA.	Mine.
	Surface Water	Operational Phase	Local	a. Ensure a Storm Water Management Plan is implemented; and b. Monitor surface water resources up and downstream of the Project area to identify potential contamination.	a. Storm Water Management Plan b. Surface Water Monitoring Programme in accordance with NWA.	On-going and Monthly during Operational Phase.
	Groundwater	Operational Phase	Limited	a. Buffer acid generating overburden material with acid neutralising material, where possible;	a. Groundwater Monitoring Programme in accordance	On-going and Monthly during operational phase

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				b. Divert water run-off from the stockpiles to the PCD to prevent water ingress; and c. Groundwater monitoring of the water and levels must take place quarterly to identify potential impacts and seepage.	with NWA.	
Concurrent Rehabilitation	Air Quality	a. Operational Phase b. Decommissioning Phase	Municipal	a. Ensure the rehabilitated areas are vegetated to prevent erosion and surface exposure to winds; and b. Monitor the establishment of vegetation.	a. Dust Management Plan; b. Dust Monitoring Programme in accordance with NEM: AQA	As required and Monthly during Operational Phase and Decommissioning Phase.
	Topography and Visual	Operational	Local	a. The open-pit must be backfilled; and	Rehabilitation Plan in accordance with	As required during Operation Phase

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Environment	Phase Decommissioning Phase		b. Topsoil must be backfilled over the open-pit area and the area vegetated.	ECA.	and Decommissioning Phase.
	Soils	Life of Mine	Very limited	a. All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; b. Spillage control kits will be readily available on site to contain the mobilization of contaminants and clean up spills; c. All vehicles and machinery to be serviced in a hard park area or at an off-site location; and d. Vehicles with leaks must have drip trays in place.	a. Emergency Response Plan Vehicle Maintenance Plan in accordance with MPRDA Regulation 56 (1) to (8); Soil pollution and erosion control and Hazardous Substances Act 1973	As required during Life of Mine.
		Operational		a. Ensure that the topography of	a. Soil	On-going and

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		Phase Decommissioning Phase		rehabilitated areas takes the pre-mining landscape into consideration and that the topography is free draining; b. Ensure that the soil layers are backfilled in reverse order of the stripping and the subsoil must underlie the topsoil; c. Ensure that the yellow and red soils are placed in upland landscape positions and wetland soils placed in the lower landscape positions; d. It is recommended that the soil cover should be at least 0.8 m in depth, consisting of 0.5 m of subsoil and 0.3 m of topsoil on top of the reconstructed profile to mimic the pre-mining land	Rehabilitation Plan; b. Soil monitoring in accordance with MPRDA Regulation 56 (1) to (8); soil pollution and erosion control.	Prior to vegetation establishment during Operational Phase; Decommissioning Phase and Post-Closure Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				capability. However, the soil cover must be at least 0.3 m depth in order to sustain the identified end land use of grazing; and e. Investigate soil quality prior to establishment of vegetation on rehabilitated areas through representative sampling and laboratory analysis. Soil fertility and acidity must be corrected prior to vegetation establishment, if required.		
	Surface Water	Operational Phase	Limited	a. Rehabilitation activities must be monitored to ensure that the pre-mining drainage pattern is emulated, and that vegetation establishment is successful;	a. Rehabilitation Plan in accordance with NEMA.	Monthly during Operational Phase, Decommissioning Phase and Post-

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		Decommissioning Phase		b. The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies; c. Monitor surface water resources up and downstream of the Project area to identify potential contamination; and d. Where rehabilitation (grass seeding of topsoil cover) is not effective, the associated soil erosion must be mitigated by installing silt traps in affected areas.		Closure.
	Groundwater	Operational Phase Decommission	Local	a. Ensure that the backfilled material is compacted where possible and the pre- mining drainage pattern is emulated;	a. Rehabilitation Plan; and b. Groundwater Monitoring	As required and Quarterly during Operational Phase and

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		ing Phase		b. Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage. The monitoring programme will assist with the identification of potential AMD occurring. All contaminated water must be contained in the PCD; and c. The backfill material must be placed in such a manner to reduce the potential leaching impacts on the underlying aquifers. Material with a high neutralizing effect needs to be placed at the bottom followed by waste rock and slurry higher up. The top layers can again be	Programme in accordance with NWA.	Decommissioning Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				material with a high neutralizing capacity. d. The top layer needs to ensure free draining of the rain water from the rehabilitated areas.		
	Fauna and Flora	Operational Phase Decommissioning Phase	Very limited	a. Vegetate disturbed and rehabilitated areas with indigenous vegetation; b. Alien invasive vegetation to be identified and removed throughout the LoM; and c. Establish and implement an Alien Invasive Management Programme.	a. Rehabilitation Plan; and b. Alien Invasive Management Plan in accordance with NEM:BA; and ECA.	As required and On-going during Operational Phase, Decommissioning Phase and Post-Closure.
	Noise	Construction Phase	Project Area	a. Rehabilitation related machines and vehicles should be serviced on a regular basis to ensure	a. Regular Vehicle Inspections in	Daily and according to Maintenance Plan

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		Operational Phase		noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and b. Ensure equipment and machinery is switched off when not in use.	accordance with NEM: AQA and ECA.	during Operational Phase.
Decommission Phase						
Demolition of Infrastructure	Air Quality	Decommissioning Phase	Local	a. The area of disturbance must be restricted to the required footprint size; b. Demolition activities should be undertaken judiciously during windy periods (winds greater than 5.4 m per second); and c. The area of disturbance must be minimized to limit the area exposed to wind erosion.	a. Dust Management Plan; b. Dust Monitoring Programme in accordance with NEM: AQA.	On-going during Decommissioning Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Topography and Visual Environment	Decommissioning Phase	Limited	a. Demolish all unnecessary infrastructure; b. Ensure that all demolished infrastructure is removed from site's surface; and c. Ensure that rehabilitated areas are rehabilitated and vegetated.	a. Rehabilitation Plan; and b. Closure Plan in accordance with ECA.	As required during Decommissioning Phase and Post-Closure.
	Soils	Decommissioning Phase	Very limited	a. Ensure that demolished infrastructure is removed off-site and disposed of by a reputable contractor; b. All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; c. Spillage control kits will be readily available on site to contain the mobilization of	a. Emergency Response b. Vehicle Maintenance Plan in accordance with MPRDA Regulation 56 (1) to (8); Soil pollution and erosion control;	As required during Life of Mine.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				contaminants and clean up spills; d. All vehicles and machinery to be serviced in a hard park area or at an off-site location; and e. Vehicles with leaks must have drip trays in place.	Hazardous Substances Act 1973	
	Fauna and Flora	Decommissioning Phase Post-Closure	Limited	a. Restrict vehicles and machinery to existing roads and designated areas to prevent vegetation destruction; and b. Alien invasive vegetation to be identified and removed throughout the LoM and c. Establish and implement an Alien Invasive Management Programme.	a. Conservation Management Plan b. Alien Invasive Management Plan in accordance with NEM:BA and ECA.	On-going during Decommissioning Phase and LoM.
	Wetlands	Decommission	Provincial	a. Restrict vehicles and machinery	a. Storm Water	On-going and

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	and Aquatic Ecology	ing Phase		to existing roads and designated areas to prevent vegetation destruction; b. All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; c. Spillage control kits will be readily available on site to contain the mobilization of contaminants and clean up spills; d. All vehicles and machinery to be serviced in a hard park area or at an off-site location; and e. Implement a biannual Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions,	Management Plan b. Aquatic Monitoring Programme in accordance with NWA.	Biannually during: LoM.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				should it be required.		
	Surface Water	Decommissioning Phase	Local	a. Reputable and accredited contractors will be used for the transport and disposal of wastes and demolished material off-site; b. All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated; c. Spillage control kits will be readily available on site to contain the mobilization of contaminants and clean up spills; and d. Vehicles with leaks must have drip trays in place.	a. IWWMP; b. Emergency Response Plan c. Vehicle Maintenance Plan in accordance with NWA.	As required during Life of Mine.
	Noise	Decommission	Project Area	a. Ensure demolition activities only	a. Regular	Daily and

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		ing Phase		take place during daylight hours; b. Demolition related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and c. Ensure equipment and machinery is switched off when not in use.	Vehicle Inspections in accordance with NEM: AQA and ECA.	according to Maintenance Plan during Decommissioning Phase.
Final Rehabilitation	Air Quality	Operational Phase Decommissioning Phase	Local	a. Replacement of overburden and topsoil should be undertaken judiciously during windy days (winds speed greater than 5.4 m per second); b. Ensure the rehabilitated areas are vegetated to prevent erosion and surface exposure to winds;	a. Rehabilitation Plan in accordance with NEM: AQA	On-going and Monthly during: Operational Phase, Decommissioning Phase and Post-Closure.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				and c. Monitor the establishment of vegetation.		
	Topography and Visual Environment	Decommissioning Phase	Local	a. The open-pit must be backfilled as much as possible; b. The rehabilitated area must be contoured and profiled to create a free- draining topography emulating the pre-mining topography; and c. Topsoil must be backfilled over the rehabilitated area and vegetated.	a. Rehabilitation Plan; and b. Closure Plan in accordance with NEMA.	As required during Decommissioning Phase and Post-Closure.
	Soils	Decommissioning Phase	Very limited	a. All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated;	a. Emergency Response b. Vehicle Maintenance	As required during Life of Mine.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				b. Spillage control kits will be readily available on site to contain the mobilization of contaminants and clean up spills; c. All vehicles and machinery to be serviced in a hard park area or at an off-site location; d. Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); and e. Vehicles with leaks must have drip trays in place.	Plan in accordance with MPRDA Regulation 56 (1) to (8), Soil pollution and erosion control, and Hazardous Substances Act 1973.	
	Soils	Decommissioning Phase Post Closure	Very limited	a. Ensure that the topography of rehabilitated areas takes the pre-mining landscape into consideration and that the	a. Soil Rehabilitation Plan; b. Soil	On-going and prior to vegetation establishment during Operational

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				topography is free draining; b. Ensure that the soil layers are backfilled in reverse order of the stripping and the subsoil must underlie the topsoil; c. Ensure that the yellow and red soils are placed in upland landscape positions and wetland soils placed in the lower landscape positions; d. It is recommended that the soil cover should be at least 0.8 m in depth, consisting of 0.5 m of subsoil and 0.3 m of topsoil on top of the reconstructed profile to mimic the pre-mining land capability. However, the soil cover must be at least 0.3 m depth in order to sustain the	monitoring in accordance with MPRDA Regulation 56 (1) to (8), Soil pollution and erosion control.	Phase, Decommissioning Phase and Post-Closure.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				identified end land use of grazing; e. Investigate soil quality prior to establishment of vegetation on rehabilitated areas through representative sampling and laboratory analysis. Soil fertility and acidity must be corrected prior to vegetation establishment, if required; and f. Monitor vegetation establishment.		
	Fauna and Flora	Operational Phase Decommissioning Phase	Local	a. Vegetate disturbed and rehabilitated area with indigenous vegetation; b. Monitor vegetation establishment and implement erosion control measures, if required;	a. Rehabilitation Plan; and b. Alien Invasive Management Plan in	As required and On-going during Operational Phase, Decommissioning Phase and Post-

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				c. Alien invasive vegetation to be identified and removed throughout the LoM; and d. Establish and implement an Alien Invasive Management Programme.	accordance with NEM:BA and ECA.	Closure.
	Surface Water	Operational Phase Decommissioning Phase	Local	a. Rehabilitation activities must be monitored to ensure that the pre-mining drainage pattern is emulated, and that vegetation establishment is successful; b. The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies; c. Monitor surface water resources up and downstream of the Project area to identify potential	a. Rehabilitation Plan in accordance with NEMA.	Monthly during Operational Phase, Decommissioning Phase and ○ Post-Closure.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				contamination and residual impacts; and d. Where rehabilitation (grass seeding of topsoil cover) is not effective, the associated soil erosion must be mitigated by installing silt traps in affected areas.		
	Groundwater	Operational Phase Decommissioning Phase	Municipal	a. Ensure that the backfilled material is compacted where possible and the pre- mining drainage pattern is emulated; b. Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage. The monitoring programme will assist with the	a. Rehabilitation Plan; and o Groundwater Monitoring Programme in accordance with NWA.	Quarterly and as required during Operational Phase and Decommissioning Phase.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				identification of potential AMD occurring. All contaminated water must be contained in the PCD; c. The rehabilitated voids must be flooded as soon as possible to create anaerobic conditions to reduce the amount of time the potential acid producing material is exposed to oxygen. This will reduce the potential AMD risk and volumes; and d. The backfill material must be placed in such a manner to reduce the potential leaching impacts on the underlying aquifers. Material with a high neutralizing effect needs to be placed at the bottom followed by		

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				waste rock and slurry higher up. The top layers can again be material with a high neutralizing capacity. The top layer needs to ensure free draining of the rain water from the rehabilitated areas.		
	Noise	Operational Phase Decommissioning Phase	Project Area	a. Rehabilitation related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and b. Ensure equipment and machinery is switched off when not in use.	a. Regular Vehicle Inspections in accordance with NEM: AQA and ECA.	Daily and according to Maintenance Plan during Decommissioning Phase.
Post Closure Phase						

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Impacts on the Post-Mining Landscape	Air Quality	Post-Closure Phase	Local	a. Ensure vegetation is established across all disturbed and rehabilitated areas; and b. Monitor vegetation establishment.	a. Post Closure Monitoring and Maintenance Plan in accordance with NEM: AQA.	Monthly during Post-Closure.
	Topography and Visual Environment	Post-Closure Phase	Local	a. Should water pool on the surface, the drainage lines must be rehabilitated further and shaped to ensure a free-draining topography; and b. Monitor vegetation establishment and potential soil erosion. Should it be required, vegetation establishment and erosion control measures must be	Post rehabilitation monitoring plan in accordance with NEMA.	Monthly during Post-Closure.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				implemented.		
	Soils	Post-Closure Phase	Very Limited	a. Ensure that the topography of rehabilitated areas is free draining; b. Model post-mining landforms to establish post-mining landscape stability; c. Implement erosion prevention techniques, if required; d. Establish clear medium and long-term targets for the post-mining land capability and land use and e. Monitor vegetation establishment.	a. Post-rehabilitation monitoring plan in accordance with MPRDA Regulation 56 (1) to (8) and soil pollution and erosion control.	Annually during Post-Closure.
	Fauna and flora	Post-Closure Phase	Municipal	a. Monitor vegetation establishment and implement erosion control	a. Rehabilitation Plan; and	Monthly and as required during

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				measures, if required; b. Alien invasive vegetation to be identified and removed throughout the LoM; and c. Establish and implement an Alien Invasive Management Programme.	b. Alien Invasive Management Plan in accordance with NEM:BA and ECA.	Post-Closure.
	Wetlands and Aquatic Ecology	Post-Closure Phase	Municipal	a. Ensure a Storm Water Management Plan is implemented and direct all decant to a PCD; and b. Implement an Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions, should it be required.	a. Storm Water Management Plan b. Aquatic Monitoring Programme in accordance with NWA.	On-going and Biannually during Post-Closure.
	Groundwater	Post-Closure	Municipal	a. Groundwater monitoring of	a. Post-Closure	Quarterly during

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
		Phase		the water levels and quality must be implemented, as well as the decant point once decanting commences. Passive or active treatment options must be implemented where the water is an unacceptable quality for release into the environment.	Monitoring and Maintenance Plan; and b. Rehabilitation Plan in accordance with NWA.	Post-Closure.
	Surface water	Post-Closure Phase	Provincial	a. Water quality monitoring must continue post-closure to allow for the early detection of potential decant and to enable mitigation measures to be implemented. Passive or active treatment options must be implemented where the water is an unacceptable quality for release	a. Surface Water Monitoring Programme; and b. Rehabilitation Plan in accordance with NWA.	Quarterly during Post-Closure.

Activity	Aspect Affected	Phase	Size & scale of distribution	Mitigation Measure	Compliance with Standards	Time Period for Implementation
				into the environment.		
		Post-Closure Phase	Municipal	a. Rehabilitation activities must be monitored to ensure that the surface profile is free draining; and b. Where rehabilitation (grass seeding of topsoil cover) is not effective, the associated soil erosion must be mitigated by installing silt traps in affected areas.	Rehabilitation Plan in accordance with NWA.	Quarterly during Post-Closure.

18.6 Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph)

Table 13: Objectives and Outcomes of the EMP

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
All activities throughout the Life of Mine.	Dust generation	a. A minimum of eight (8) dust buckets should be installed, for each direction; b. Dust fallout levels must be monitored; c. It is recommended that PM10 fallout be	a. Environmental Manager; b. Environmental Control Officer; c. Air Quality Specialist	Dust buckets must be monitored every month, with a report compiled every quarter. Should the reports indicate that the NEM: AQA NDCR are exceeded, additional mitigation measures must be implemented.	Dust buckets must be monitored every month, with a report compiled every quarter. Should the reports indicate that the NEM: AQA NDCR are exceeded, additional mitigation measures must be implemented.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
		monitored.			
	Loss of soil recourses and land capability	a. Inspection of stripping depths and separation of topsoil and subsoil during stockpiling; b. Inspection of stockpiles to manage and prevent erosion; c. Inspection of rehabilitated areas to ensure that the surface is free-draining;	a. Environmental Manager; b. Environmental Control Officer; c. Soil Specialist.	Inspection of stripping depths must be on-going during site clearance activities and stockpiling to ensure that soils are stored separately. Stockpiles should be monitored monthly to manage potential soil erosion. The testing and analysis for macro nutrients and pH must be sampled on an annual basis and results kept planning for rehabilitation. The rehabilitation activities must be monitored, and	Inspection of stripping depths must be on-going during site clearance activities and stockpiling to ensure that soils are stored separately. Stockpiles should be monitored monthly to manage potential soil erosion. The testing and analysis for macro nutrients and pH must be sampled on an annual basis and results kept planning for

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
		d. Random inspections of soil thickness on rehabilitated areas; e. Fertility and acidic analysis and amelioration procedures prior to vegetation establishment.		random samples selected for to test for soil thickness. The land must be shaped and sampled, and remediation techniques implemented, if necessary, prior to vegetation establishment.	rehabilitation. The rehabilitation activities must be monitored, and random samples selected for to test for soil thickness. The land must be shaped and sampled, and remediation techniques implemented, if necessary, prior to vegetation establishment.
	Loss of biodiversity	a. Floral and faunal SSC must be rescued and	a. Environmental Manager; b. Environmental	Monitoring must take place at least in two years and especially during the wet season. Results of the	Monitoring must take place at least in two years and especially during the wet

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
		relocated, should they occur within the disturbed areas; b. Faunal and Floral SSC in the Project area, but not within the directly disturbed mine areas, should be monitored, particularly the Grass Owl, Serval, Hedgehog and Giant Bullfrog	Control Officer	monitoring must be recorded and compared to previous years' results to keep track of the populations of the faunal and floral species. Monthly monitoring for alien invasive vegetation must take place and managed according to the NEM: BA requirements.	season. Results of the monitoring must be recorded and compared to previous years' results to keep track of the populations of the faunal and floral species. Monthly monitoring for alien invasive vegetation must take place and managed according to the NEM: BA requirements.

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
		populations; c. Alien invasive vegetation must be controlled on a monthly basis.			
	Potential contamination and sedimentation of wetlands and aquatic ecosystems.	The following must be tested for: a. *In situ* water quality must be analyzed; b. Sediment and water column metal analysis; c. Toxicity testing; d. Habitat integrity; and	a. Environmental Manager; b. Environmental Control Officer	The Aquatic Ecology Monitoring Programme must be implemented from the onset of the Construction Phase and continue throughout the LoM. The monitoring must take place biannually, once during high flow and once during low flow. A report must be compiled annually and take cognisance of previous years' monitoring	The Aquatic Ecology Monitoring Programme must be implemented from the onset of the Construction Phase and continue throughout the LoM. The monitoring must take place biannually, once during high flow and once during low flow. A report must

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
		e. Aquatic macro-invertebrates.		results to track and identify potential impacts.	be compiled annually and take cognisance of previous years' monitoring results to track and identify potential impacts.
	Contamination to surface water resources	a. The following constituents must be tested for: b. Sodium, calcium, sulphate, chloride and potassium c. Manganese, magnesium and fluoride; d. Nitrate and	a. Environmental Manager; b. Environmental Control Officer	Surface water monitoring must take place from the onset of the Construction Phase, throughout the LoM and for a period of 3 years following closure. Sampling must be undertaken monthly during the Construction Phase, as well as during the initial stages of the Operational Phase. Should the water sampling indicate that there are no	Surface water monitoring must take place from the onset of the Construction Phase, throughout the LoM and for a period of 3 years following closure. Sampling must be undertaken monthly during the Construction Phase, as well as during the

Activity	Potential impact	Aspects affected	Phase	Mitigation type	Standard to be achieved
		ammonium; and e. pH, electrical conductivity and TDS.		impacts to the surface water quality, sampling can be reduced to a quarterly basis. All sampling results must be recorded to track potential quality changes or deterioration.	initial stages of the Operational Phase. Should the water sampling indicate that there are no impacts to the surface water quality, sampling can be reduced to a quarterly basis. All sampling results must be recorded to track potential quality changes or deterioration.

18.7 Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

Table 14: Impact Management Actions

Activity	Potential Impact	Mitigation
Construction Phase		
Site clearance for road construction, powerlines, water pipelines, Construction of infrastructure and the plant	Loss of vegetation and subsequent loss of habitat for fauna. The indigenous and natural vegetation will be impacted upon within the proposed open casted mining area as a result of clearance of vegetation due to mining. Noise generated by the mining and mining related activities may frighten animals which may lead to injuries, deaths as well as the animals migrating away from the site.	a. Removal of vegetation should be restricted to the relevant infrastructure footprints only; b. Topsoil should be stored separately to be used in rehabilitation and landscaping, c. Transformation of natural areas should exclude any areas designated as having high or very high sensitivities; d. Prevent all effluent from the mining activities from entering the wetland habitat e. Management of the topsoil stockpile to

Activity	Potential Impact	Mitigation
		preserve the seedbed; f. Fence development footprint area prior to commencement construction; g. No off-road driving into natural vegetation h. Implement alien invasive species eradication program.
Site clearance for road construction, powerlines, plant, ttrenches and foundations for surface infrastructure development, Topsoil stripping and Stockpiling	Loss of soil resource and land use	a. Limiting the area of impact to as small a footprint as possible, inclusive of waste management facilities, resource stockpiles and the length of servitudes, access and haulage ways and conveyancing systems wherever possible; b. Implement a soil utilization plan; c. Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction; and

Activity	Potential Impact	Mitigation
		d. Topsoil to be stripped and stockpiled separately.
Site clearance	Increased risk of erosion	a. Minimise the construction footprint within any wetland areas. Clearly demarcate the required construction servitude and maintain all activities within the demarcated area; b. Maintain flow connectivity in any valley bottom wetlands during the construction phase by temporarily diverting streams around the construction area; c. Install erosion prevention measures prior to the onset of construction activities;
Stripping, dumping activities and vehicular movements on dust roads	Increase in ambient dust levels	a. Regular watering of the site roads; b. Dressing off of tip faces, unused roads and disturbed areas; c. Minimising unnecessary disturbance of non-

Activity	Potential Impact	Mitigation
		operational areas; d. Use of chemical additives to control dust to be employed if necessary.
Trenching activities, Equipment use and vehicular activity	Increase in ambient noise levels. The noise from the mining machinery will be audible if opencast mining operations are undertaken during the night time, exceedances of all but the guidelines for industrial districts would be experienced and the noise levels at the nearest sensitive receptors would be objectionable;	a. Regular planned mobile plant maintenance, with special attention paid to the maintenance of engine efficiency and silencer effectiveness; b. Regular planned vehicle services.
Vehicles maintenance, fuel storage, servicing areas and construction equipment storage	Pollution of surface water resource including wetlands due to hydrocarbon spillages	a. Servicing of construction vehicles will take place only in dedicated areas that are equipped with drip trays; b. Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil; c. Spill-sorb or a similar product will be kept on

Activity	Potential Impact	Mitigation
		site, and used to clean up hydrocarbon spills if they should occur; d. Hazardous material will be placed in bunded areas; e. Spill kits to clean up hydrocarbon spills will be available; f. Clean upslope runoff will be diverted around construction areas. g. Prevent all effluent from the mining activities from entering the wetland habitat.
Site Clearance and Excavation of an open cast mine	Potential impact on heritage Resources	a. Conduct heritage impact assessment to identify heritage sites within the project area; b. If any heritage sites are identified, appropriate steps as per the Heritage Resources Act will be undertaken c. Education and training on heritage resources

Activity	Potential Impact	Mitigation
		will be given to mine employees
Vehicular movements	Increase in traffic volumes on existing traffic network	a. Traffic signage at site access point; b. Undertake traffic impact study; c. Traffic signage at site access points; d. Upgrade gravel roads to tarred roads.
Employment	Spontaneous settlement and increased pressure on social services	a. Develop a clear and concise employment and recruitment policy that prioritizes local recruitment; b. Identify and support community development programs that address challenges raised by population influx and spontaneous settlement; c. Support local government capacity for integrated development planning.
Operational Phase		

Activity	Potential Impact	Mitigation
Blasting, loading, hauling, stockpiling, backfilling and tailings storage and vehicle operations	Release of fugitive emissions in the form of N2O, CH4 and CO2 impact on air quality within and near the project area, particularly in the downwind direction	a. Efficiency will be applied to reduce wastage and unnecessary fuel consumption; b. Carbon offsets will be considered if required; c. Concurrent best practice rehabilitation and vegetation monitoring will be applied to allow for the restoration of some the carbon sink functionality within the mining right area.
Excavation for an open cast mine	Influx of groundwater into the pits, leading to a decrease in groundwater quality and yield	a. Detailed geological mapping to identify geological features; 21) Mining will take place according to design mine stability safety factors; 22) Mining will not take place in the weathered overlying strata; 23) Identify boreholes (undertake hydrocencus) within mining area and plug deep boreholes

Activity	Potential Impact	Mitigation
		to prevent inflow into the pit; b. Monitor groundwater levels and yields of external borehole users.
Excavation of an open cast mine	The formation of Acid Mine Drainage in groundwater resources.	a. Optimise storage of mine water to minimize exposure to oxygen; b. Develop a groundwater monitoring program to assess the groundwater quality; c. Should Acid Mine Drainage (AMD) be identified within the groundwater resources, the polluted water will be remediated accordingly.
Equipment, vehicle operations, leakages of oil and other industrial liquids from the trucks and machineries and stockpiling.	Contamination of soil	a. Spill leak detection plan should be implemented.
Vehicles maintenance, Fuel storage, servicing areas and construction, spilled construction materials such as cement, paint, fuel and oil.	Surface water and wetland resources due to hydrocarbon spills and carbonaceous material.	a. Implement storm water management plan; b. Divert clean storm water around construction

Activity	Potential Impact	Mitigation
		areas; c. Surface water management structures be constructed first as to ensure that runoff and dirty water spills are contained;
Loading, stockpiling, backfilling and Co-Disposal Facility storage.	Dust generated during the mining may cause a negative visual impact and altered visibility	a. Regular watering of the site roads; b. Dressing off tip faces, unused roads and disturbed areas; c. Minimizing unnecessary disturbance of non-operational areas; d. Use of chemical additives to control dust to be employed if necessary.
Blasting and vibrations	General increase in Blasting and vibrations	a. Blasting and other noise generating activities should be conducted during the day when surrounding noise levels is high.
Vehicular operation, hauling and transportation of material	General increase in ambient noise levels	a. Regular planned mobile plant maintenance, with special attention paid to the

Activity	Potential Impact	Mitigation
		maintenance of engine efficiency and silencer effectiveness; b. Regular planned vehicle services.
Waste disposal	Waste generation including Debris (slimes), waste rock, litter and other solid waste will be generated and deposited in and around the site. This could potentially attract nuisance and affect the natural scenery of the site.	a. The slimes and waste rock will be used to backfill the trenches. This will be undertaken in a concurrent rehabilitation manner.
Employment	Spontaneous settlement and Increase pressure on social services	a. Develop an employment and recruitment policy that prioritises local recruitment; b. Identify and support community development programmes; c. Support local government capacity for integrated development planning.
Employment	Benefits resulting from employment and income opportunities created by the mine	a. Positive impact that need to be enhanced.

Activity	Potential Impact	Mitigation
Decommissioning Phase		
Backfilling of the open cast mine	Compaction of soil and contamination of soil resources	a. Reinstatement of stored soils onto areas of disturbance where infrastructure has been demolished; 24) Contour and stabilize slopes to be free-draining; 25) Cultivation of growing medium, the planting of required vegetative cover and irrigation if required.
Backfilling of the open cast mine	Pollution of surface water resources	a. The storm water management infrastructure, including the PCD, will be decommissioned last to ensure adequate storm water management during the rehabilitation phase; b. Erosion protection measures will be implemented at steep areas; c. Spill kits will available and hydrocarbon spills

Activity	Potential Impact	Mitigation
		will be cleaned up immediately; d. All traces of hydrocarbons and residual waste will be removed before infrastructure is demolished.
Backfilling of the open cast mine	Increase in dust fallout	a. Regular watering of the site roads; b. Dressing off tip faces, unused roads and disturbed areas; c. Minimising unnecessary disturbance of non-operational areas; d. Use of chemical additives to control dust to be employed if necessary.
Hauling, Equipment and vehicular operations	General increase in ambient noise levels	a. Regular planned mobile plant maintenance, with special attention paid to the maintenance of engine efficiency and silencer effectiveness;

Activity	Potential Impact	Mitigation
		b. Regular planned vehicle services.
Loss of employment	Loss of employment and enterprise development opportunities	a. Develop and implement Labour and Human Resources Plan (LHRP) that address the impacts associated with retrenchment, job losses and reduced demand for local goods and services; b. Develop a closure plan which will aim to reinforce the objectives of the SLP by reducing the reliance on LoM for employment by promoting skills transfer to ensure alternative livelihoods portable skills.

19 FINANCIAL PROVISION

19.1 Determination of the amount of Financial Provision.

19.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.

The closure objectives have been formulated for Ikwezi Vanadium right application. The closure objectives for Ikwezi Vanadium mine are as follows:

a. Identify post-closure uses of land occupied by mine infrastructure in consultation with the surrounding land owners. Should a suitable use for any mine infrastructure not be found, it will be demolished and removed;
b. Rehabilitate all disturbed land to a condition that is suitable for its post-closure uses;
c. Rehabilitate all disturbed land to a condition that facilitates compliance with applicable environmental quality objectives, such as air and water quality objectives as an example;
d. Reduce the visual impact of the mine components through rehabilitation of all disturbed land and residue deposits;
e. Rehabilitate all disturbed land and residue deposits to a condition where post-closure management is minimised;
f. Develop a retrenchment programme in a timely manner;
g. Keep authorities informed of the progress of the activities during the Decommissioning Phase;
h. Submit monitoring results to the relevant authorities; and
i. Maintain the required pollution control facilities and the condition of the rehabilitated land following closure.

The decommissioning phase will entail the rehabilitation of the mining site. Upon cessation of the mining activities, the area will be fully rehabilitated. The perimeter walls of the opencast pit will either be sloped at 1:3 to the pit floor to prevent soil erosion or be stepped by creating benches of not more than 3 meters high. The applicant will comply with the minimum closure objectives as prescribed by DMR and detailed below.

19.1.1.1 Rehabilitation of the excavated area:

a. Rocks and coarse material removed from the excavation must be dumped into the excavation.
b. No waste will be permitted to be deposited in the excavations.
c. Once overburden, rocks and coarse natural materials has been added to the excavation and it was profiled with acceptable contours and erosion control measures, the topsoil previously stored shall be returned to its original depth over the area.
d. The area shall be fertilized if necessary, to allow vegetation to establishrapidly. The site shall be seeded with a local or adapted indigenous seed mix to propagate the locally or regionally occurring flora, should natural vegetation not re-establish within 6 months from closure of the site.
e. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

19.1.1.2 Rehabilitation of plant area:

a. The compacted areas shall be ripped, and the topsoil returned over the area.
b. Coarse natural material used for the construction of ramps shall be removed and dumped into the excavations.
c. Stockpiles shall be removed during the decommissioning phase, the area ripped, and the topsoil returned to its original depth to provide a growth medium.
d. On completion of operations, all structures or objects shall be dealt with inaccordance with Section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002):
    - Where sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
    - The site shall be seeded with a vegetation seed mix adapted to reflect the local indigenous flora if natural vegetation does not re-establish within 6 months of the closure of the site.

e. Photographs of the mining area and office sites, before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Regional Manager.
f. On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, shall be scarified to a depth of at least 300 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
g. Prior to replacing the top soil, the overburden material that was removed from these areas will be replaced in the same order as it originally occurred.
h. The area shall then be fertilized if necessary, to allow vegetation to establish rapidly. The site shall be seeded with a local, adapted indigenous seed mix if natural vegetation does not re-establish within 6 months after closure of the site.
i. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to his or her specification.

19.1.1.3 Final rehabilitation:

a. Rehabilitation of the surface area shall entail landscaping, levelling, top dressing, land preparation, seeding (if required) and maintenance, and weed / alien clearing.
b. All infrastructure, equipment, plant, temporary housing and other items used during the mining period will be removed from the site (section 44of the MPRDA).
c. Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site.
d. Weed/ Alien clearing will be done in a sporadic manner during the life of the mining activities.
e. Species regarded as Category 1 weeds according to CARA (Conservation of Agricultural Recourses Act, 1983- Act 43; Regulations15 & 16 (as amended in March 2001) need to be eradicated from the site.
f. Final rehabilitation shall be completed within a period specified by the Regional Manager.

19.1.2 Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

As part of the public participation process, the closure objectives and rehabilitation plan was presented and discussed in general with landowners and I&APs. All Interested and Affected Parties including the farm owners were told that a Rehabilitation Plan will be done for this project which will also be circulated for public review.

19.1.3 Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

A site-specific rehabilitation plan has not been finalised.

The site closure objective is to rehabilitate the site so it is as close to its natural state before any operations took place. Rehabilitation of the excavated area will continue as excavations progress and will consist of landscaping and reshaping the slope. Topsoil will be placed over the excavated area, as well as the access route to provide a source of seed and a seed bed to encourage the re-growth of plant species.

Upon closure of the mine all infrastructure will be removed. The compacted areas will be ripped and levelled upon which the topsoil will be replaced. The sides of the pit will be sloped to ensure safety and prevent erosion. No permanent structures will remain upon closure of the site.

The Independent ECO shall do a final site visit after rehabilitation was completed to ensure compliance with environmental standards.

19.1.4 Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

The rehabilitation plan has been compiled in support of the primary closure objective which is the remediation of the impact land to a post-mining land use capable of supporting grazing activities.

The decommissioning phase will entail the rehabilitation of the mining site. Upon cessation of the mining activities, the area will be fully rehabilitated. The perimeter walls of the opencast pit will be sloped at 1:3 to the pit floor to prevent soil erosion or stepped by creating benches of not more than 3 meters. The rehabilitation of the mine pit will comply with the minimum closure objectives as prescribed by DMR and detailed below, and therefore is deemed to be compatible:

19.1.4.1 Rehabilitation of the excavated area:

a. Rocks and coarse material removed from the excavation must be dumped into the excavation.
b. No waste will be permitted to be deposited in the excavations.
c. Once overburden, rocks and coarse natural materials has been added to the excavation and it was profiled with acceptable contours and erosion control measures, the topsoil previously stored shall be returned to its original depth over the area.
d. The area shall be fertilized if necessary, to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix to propagate the locally or regionally occurring flora, should natural vegetation not re-establish within 6 months from closure of the site.
e. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

19.1.4.2 Rehabilitation of plant area:

a. The compacted areas shall be ripped, and the topsoil returned over the area.
b. Coarse natural material used for the construction of ramps shall be removed and dumped into the excavations.

c. Stockpiles shall be removed during the decommissioning phase, the area ripped, and the topsoil returned to its original depth to provide a growth medium.
d. On completion of operations, all structures or objects shall be dealt with in accordance with Section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002):

    - Where sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
    - The site shall be seeded with a vegetation seed mix adapted to reflect the local indigenous flora if natural vegetation does not re-establish within 6 months of the closure of the site.

e. Photographs of the mining area and office sites, before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Regional Manager.
f. On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, shall be scarified to a depth of at least 300 mm and graded to an even surface condition and the previously stored topsoil will be returned to its original depth over the area.
g. Prior to replacing the topsoil, the overburden material that was removed from these areas will be replaced in the same order as it originally occurred.
h. The area shall then be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local, adapted indigenous seed mix if natural vegetation does not re-establish within 6 months after closure of the site.
i. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to his or her specification.

19.1.4.3 Final rehabilitation:

a. Rehabilitation of the surface area shall entail landscaping, levelling, top dressing, land preparation, seeding (if required) and maintenance, and weed / alien clearing.
b. All infrastructure, equipment, plant, temporary housing and other items used during the mining period will be removed from the site (section 44 of the MPRDA).

c. Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site.
d. Weed / Alien clearing will be done in a sporadic manner during the life of the mining activities.
e. Species regarded as Category 1 weeds according to CARA (Conservation of Agricultural Recourses Act, 1983– Act 43; Regulations 15 & 16 (as amended in March 2001) need to be eradicated from the site.
f. Final rehabilitation shall be completed within a period specified by the Regional Manager.

19.1.5 Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

The environmental closure liability for Ikwezi Vanadium (Pty) Ltd was calculated according to the DMR's "Guideline Document for the Evaluation of the Quantum of Closure-related Financial Provision Provided by a Mine".

The DMR Guideline format makes use of a set template for which defined rates and multiplication factors are utilised.

The 2005 DMR Master Rates were updated and published by the DMR in 2012 however, due to inflation, these are no longer accurate. During this assessment, the 2019 Master Rates, as published by the DMR, were increased by an average inflation rate of 5.7% (Statistics SA, 2013). An average rate of inflation of 5.9% (Statistics SA, 2014) was added to the 2018 Master Rates to reflect 2019 costs.

The DMR Guideline Document classifies a mine according to many factors which allows one to determine the appropriate weighting factors to be used during the quantum calculation. The following factors are considered:

a. The mineral mined;
b. The risk class of the mine;
c. Environmental sensitivity of the mining area;

d. Type of mining operation; and
e. Geographic location.

The calculation of the quantum for financial provision was according to Section B of the working manual.

Mine type and saleable mineral by-product

Commodity	Titanium, Vanadium, Iron Ore, Phosphate, Sand and Aggregate
Sealable mineral by-product	None

Risk ranking

Primary risk ranking	C (Low risk)
Revised risk ranking	N/A

Environmental sensitivity of the mine area

Environmental sensitivity of the mine area	Low

Level of information

Level of information available	Limited

19.1.6 Confirm that the financial provision will be provided as determined.

The applicant Ikwezi Vanadium (Pty) Ltd confirms that the financial provision will be provided for as determined is Section 13 Part B and Section 10 Part A of this report.

Herewith I, Thabelo Nelwamondo the person, whose name is stated below confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application. I herewith confirm that the company will provide the amount that will be determined by the Regional Manager in accordance with the prescribed guidelines.

20 MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON, INCLUDING

20.1 Monitoring of Impact Management Actions

20.1.1 Air Quality

a. Criteria pollutants:

Exceedances of the SA NAAQS at a nearby residential area (Mononono), were noted for simulated ground level concentrations of daily PM10 for Scenarios 1 and 2. No exceedances of the SA NAAQS for PM2.5 at the nearby residential areas or sensitive receptors were simulated for any of the scenarios. Simulated gaseous concentrations (SO2, NO2, and CO) were well below the SA NAAQS at all off-site locations including at all residential areas and sensitive receptor locations. Simulated VOC concentrations were below the referenced ECA guidelines for alkanes at all off-site locations.

b. Critical levels for Vegetation:

Simulated GLCs for NO_2 exceed the annual guidelines for vegetative protection when screened against the critical levels for vegetation as defined by the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Trans-Boundary Air Pollution Limits (CLRTAP, 2015). Simulated SO_2 concentrations were below the critical levels for vegetation outside the mine boundary.

c. Dustfall:

Simulated highest monthly dust fallout rates due to each of the scenarios assessed was well below the NDCR residential and non-residential limits at all off-site locations, including at residential areas and sensitive receptor locations.

d. Construction and closure:

Construction and closure phase emissions were not quantified since construction and closure schedules were not available (due to their temporary nature); and the likelihood that these activities will not occur concurrently at all portions of the site. For mining operations, construction activities are similar to operational phase activities and are generally less severe in magnitude.

e. Recommendations

In order to ensure the lowest possible impact on nearby AQSRs and the environment, it is recommended that the air quality management plan as set out in this report be adopted. To ensure that fugitive emissions are kept to a minimum, thus minimising adverse health effects to the receiving environment, additional mitigation is also recommended.

20.1.2 Soil Management

20.1.2.1 Soil management during the construction phase

From the perspective of conserving the soil properties that will aid rehabilitation during the closure phase, the key factors to consider during the preparation for the construction phase of the supporting infrastructure are to minimise the area affected by the development, minimise potential future contact of toxic or polluting materials with the soil environment and to maximize the recovery and effective storage of soil material that will be most useful during the rehabilitation process after operation of the opencast mine is completed. Some of these measures will minimise a combination of impacts simultaneously while other measures are specific to one impact.

a. **Minimise the footprint of the Ikwezi Vanadium Project**

The existing pre-construction mine layout and design is aiming to minimise the area to be occupied by mine infrastructure (workshops, administration, product stockpile, etc.) to as small as practically possible. All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase.

b. **Management and supervision of construction teams**

The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site. In addition, compliance to these instructions must be monitored.

c. **Prevention of soil contamination**

During the construction phase, chemical soil pollution should be minimised as follows:

i. Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained by using a drip tray with plastic sheeting filled with absorbent material;
ii. Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area;
iii. Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;
iv. Containing potentially contaminating fluids and other wastes; and
v. Cleaning up areas of spillage of potentially contaminating liquids and solids.

20.1.2.2 Soil management during the operational phase

Soil management should be an on-going strategy through the operational phase as soil disturbing activities will continue in areas where operation of the mine continues, and new areas are developed through operation activities.

It is recommended that concurrent rehabilitation techniques be followed to prevent topsoil from being stockpiled too long and losing its inherent fertility, but opportunities may be limited by the layout of the operation. Disturbed sites must be rehabilitated as soon as they have reached the end of their life. During operations, soil will continue to be removed from newly developed areas and stockpiled for later use. Topsoil stripping and stockpiling should follow the guidelines as stipulated under the construction phase above.

As new stockpiles are created, they should be re-vegetated immediately to prevent erosion and resulting soil losses from these stockpiles. It is recommended that vegetation removed during land clearance be composted during the operational phase and that this compost be used as a soil ameliorant for soil rehabilitation purposes.

All above soil management measures explained under the Construction Phase should be maintained for similar activities during the Operational Phase. In addition to this, the following Soil Management Measures are recommended:

i. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust).
ii. Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams.
iii. Routine monitoring will be required in and around the sites.

a. **Management of potential soil contamination during the operational phase**

The following management measures will either prevent or significantly reduce the impact of soil chemical pollution on site during the operation phase:

i. Stockpiles are managed so they do not become contaminated and then need additional handling or disposal;
ii. A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled;
iii. Processing areas should be contained, and systems designed to effectively manage and dispose of contained storm water, effluent and solids;
iv. Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater;
v. Equipment, and vehicle maintenance and washdown areas, are contained and appropriate means provided for treating and disposing of liquids and solids;

vi. Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems);
vii. Solids and slurries are disposed of in a manner consistent with the nature of the material and avoids contamination; and
viii. Effluent and processing drainage systems avoid leakage to ground.

20.1.2.3 Soil management during the decommissioning phase

At decommissioning any excavated areas will be backfilled and covered with a layer of topsoil. Some re-grading and re-contouring will be carried out. Soil management in the decommissioning phase will include the following:

a. Prevention of soil contamination;
b. During the decommissioning phase, chemical soil pollution should be minimized as follows: Losses of fuel and lubricants from the oil sumps of vehicles and equipment should be contained using a drip tray with plastic sheeting and filled with absorbent material;
   i. Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids and recovering contaminated soils and treating them off-site;
   ii. Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;
   iii. Containing potentially contaminating fluids and other wastes; and
   iv. Cleaning up areas of spillage of potentially contaminating liquids and solids.

c. **Soil management during the closure phase**

During the closure phase activities include the maintenance and aftercare of final rehabilitated land. In this regard, frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gullies have developed. In the event that vegetation has not re-established, and erosion gullies have developed, remedial action should be taken.

20.1.3 Fauna and Flora

20.1.3.1 Recommendations for Ensuring Application of Mitigation Measures

It is vital that mitigation measures are applied as recommended (based on practicality and cost effectiveness). This can be achieved with a series of plans assuring the process to be followed for monitoring and application of mitigation measures. Plans recommended for the proposed Ikwezi Vanadium development are as follows:

a. An alien invasive management plan;
b. A comprehensive assessment of all plant SSC within the footprint of the development and corresponding permit applications for removal of these species (removal includes both transplantation and destruction of these species);
c. A search and rescue plan for both plant and animal SSC to be applied before construction (plants) and during construction (animals);
d. A rehabilitation plan detailing the methods used for the rehabilitation of areas cleared for construction but not required for operation of the development; and
e. An offset plan should be developed should the proponent wish to demonstrate a net gain of biodiversity for the proposed Ikwezi Vanadium Project.

It is further recommended that all such plans be included in an overall Biodiversity Action Plan or BAP (optional) as is usually required for IFC projects to meet international best practice. Such a plan will allow for centralization of biodiversity-related mitigation actions with associated responsibility assignations and monitoring.

20.1.3.2 Monitoring Requirements

The main aims of compliance monitoring by the authorities are to:

a. Evaluate the adherence by the contractors and developer to the conditions attached to the letter of authorisation;
b. To check compliance with the Environmental Management Plan (EMP) and any other legal requirements referred to in the letter of authorisation;
c. To assess the contractor’s and applicant’s effectiveness in implementing the conditions of authorisation and the EMP; and

d. To recommend how and where improvements could be made to ensure compliance, enhance environmental performance and promote sustainability of the development.

The fauna and flora monitoring program should be initiated pre-construction and continue through construction thereafter conducted annually during the growing season as close to the same time of year as possible. If the monitoring results indicate the additional presence of red data species, or threatened species, this may require the need to undergo monitoring for that particular species more frequently, especially during the breeding season and birthing season for that species.

Monitoring will include sites in the undisturbed vegetation which will act as control plots, plots within the disturbed infrastructure areas which will have baseline data and then be monitored during the rehabilitation phase. These same plots will be monitored with each survey to ensure collected data is comparable and trends are identified. Where rehabilitation has been conducted, additional plots will be included to monitor the effectiveness of the re-vegetation.

Aspects that will be monitored in the annual surveys will include, species richness, vegetation composition i.e. proportion grasses, forbs and woody species, canopy height, cover percentage, presence of Red Data or protected species, and presence of alien invasive species.

20.1.4 Surface water

The identified watercourses associated with the project area have no freshwater priority areas designated to them. The A24E-00652 SQR (Phufane) is directly associated with the project area and spans 31 km of the Phufane River. The desktop Present Ecological State (PES) of the Phufane River is a class B (Largely natural), Ecological Sensitivity (ES) and Ecological Importance (EI) are rated as high.

Anthropogenic impacts identified within the sub-quaternary catchment included road crossings (causeways), irrigation for rural villages, subsistence farming, over-grazing which results in erosion and sediment deposition. There were nine (9) fish species that

were expected within the project area. None of the expected fish species were of conservation concern.

Three (3) aquatic sampling points were selected for the assessment namely IKW 01, IKW 02 and IKW 03. All the sampling point were along the Phufane River. IKW 01 and IKW 03 were beyond the Mining Right area to establish baseline data before the river enters the project area and after it has passed through. IKW 02 was along the Phufane River within the project area to establish baseline conditions of the river within the project area. Sampling points IKW 01 and IKW 02 were determined to be dry and could not be assessed. Sampling point IKW 03 to hold a low and disconnected flow that was largely isolated pools and could not be sampled as the watercourse did not meet the minimum requirements for an aquatic survey.

20.2 Monitoring and reporting frequency

Table 15: Monitoring and Management of Environmental ImpactsTable 15 discusses the monitoring and reporting frequency.

20.3 Responsible persons

Table 15 sets out roles and responsibilities with respecting to the monitoring programme.

20.4 Time period for implementing impact management actions

Table 15Table 13 captures the time period for implementing impact management actions.

20.5 Mechanism for monitoring compliance.

Table Table 15 sets out the method of monitoring the implementation of the impact management actions, the frequency of monitoring the implementation of the impact management actions, an indication of the persons who will be responsible for the implementation of the impact management actions, the time periods within which the impact management actions must be implemented and the mechanism for monitoring compliance with the identified impact management.

Table 15: Monitoring and Management of Environmental Impacts

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
All activities throughout the Life of Mine.	Dust generation	a. A minimum of eight (8) dust buckets should be installed, for each direction; b. Dust fallout levels must be monitored; c. It is recommended that PM10 fallout be monitored.	a. Environmental Manager; b. Environmental Control Officer c. Air Quality Specialist	Dust buckets must be monitored every month, with a report compiled every quarter. Should the reports indicate that the NEM: AQA NDCR are exceeded, additional mitigation measures must be implemented.
	Loss of soil recourses and land capability	a. Inspection of stripping depths and separation of topsoil and subsoil during stockpiling; b. Inspection of stockpiles to manage and prevent erosion;	a. Environmental Manager; b. Environmental Control Officer c. Soil Specialist.	Inspection of stripping depths must be on-going during site clearance activities and stockpiling to ensure that soils are stored

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
		c. Inspection of rehabilitated areas to ensure that the surface is free-draining; d. Random inspections of soil thickness on rehabilitated areas; e. Fertility and acidic analysis and amelioration procedures prior to vegetation establishment.		separately. Stockpiles should be monitored monthly to manage potential soil erosion. The testing and analysis for macro nutrients and pH must be sampled on an annual basis and results must be kept planning for rehabilitation. The rehabilitation activities must be monitored, and random samples selected for to test for soil thickness. The land must be shaped and sampled,

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
				and remediation techniques implemented, if necessary, prior to vegetation establishment.
	Loss of biodiversity	a. Floral and faunal SSC must be rescued and relocated, should they occur within the disturbed areas; b. Faunal and Floral SSC in the Project area, but not within the directly disturbed mine areas, should be monitored, particularly the Grass Owl, Serval, Hedgehog and Giant Bullfrog populations;	a. Environmental Manager; b. Environmental Control Officer	Monitoring must take place at least in two years and especially during the wet season. Results of the monitoring must be recorded and compared to previous years' results to keep track of the populations of the faunal and floral species. Monthly monitoring for alien invasive vegetation must

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
		c. Alien invasive vegetation must be controlled on a monthly basis.		take place and managed according to the NEM: BA requirements.
	Potential contamination and sedimentation of wetlands and aquatic ecosystems.	The following must be tested for: a. *In situ* water quality must be analyzed; b. Sediment and water column metal analysis; c. Toxicity testing; d. Habitat integrity; and e. Aquatic macro-invertebrates.	a. Environmental Manager; b. Environmental Control Officer	The Aquatic Ecology Monitoring Programme must be implemented from the onset of the Construction Phase and continue throughout the LoM. The monitoring must take place biannually, once during high flow and once during low flow. A report must be compiled annually and take cognisance of

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
				previous years' monitoring results to track and identify potential impacts.
	Contamination to surface water resources	The following constituents must be tested for: a. Aluminium and iron; b. Sodium, calcium, sulphate, chloride and potassium c. Manganese, magnesium and fluoride; d. Nitrate and ammonium; and e. pH, electrical conductivity and TDS.	a. Environmental Manager; b. Environmental Control Officer	Surface water monitoring must take place from the onset of the Construction Phase, throughout the LoM and for a period of 3 years following closure. Sampling must be undertaken monthly during the Construction Phase, as well as during the initial stages of the Operational Phase. Should the water sampling indicate

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
				that there are no impacts to the surface water quality, sampling can be reduced to a quarterly basis. All sampling results must be recorded to track potential quality changes or deterioration.

20.6 Indicate the frequency of the submission of the performance assessment report.

The performance assessment report will be submitted on an annual basis.

21 ENVIRONMENTAL AWARENESS PLAN

21.1 Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

An Environmental Awareness Plan was developed for Ikwezi Vanadium (Pty) Ltd and will be implemented for Ikwezi Vanadium Mine. The Environmental Awareness Plan describes the way the mine intends to inform its employees of any environmental risks that may result from their work and the way the risk must be dealt with to avoid pollution or degradation to the environment.

Environmental conditions are included in all operational contracts, thereby making contractors aware of the potential environmental risks associated with the project and the necessity to prevent accidental spillages by implementing good housekeeping practices.

The following principles will apply to the Environmental Awareness Plan (Safety, health and Environmental (SHE) Training) for Ikwezi Vanadium (Pty) Ltd.

f. All personnel will, as a minimum, undergo general SHE induction and awareness training;
g. An Environmental Control Officer (ECO) will be appointed;
h. The ECO will identify the SHE is training requirements for all Ikwezi Vanadium mine personnel and contractors.
i. The training requirements will be recorded in a training needs matrix indicating training that must be undertaken by the identified personnel and contractors. The training matrix will be administered by the ECO; and
j. Development of a training programme.

21.1.1 General Awareness Training

The ECO will be responsible for the development, or the facilitation of the development, of the required general SHE induction and awareness training. A general environmental awareness training module will be developed and integrated into the Ikwezi Vanadium mine induction programme. The general awareness training must include the following:

c. A review of the Environmental Policy;
d. A description of the EMPr and the importance of compliance to the EMPr requirements;
e. A review of the significant environmental aspects;
f. General responsibilities of personnel regarding the EMPr requirements; and
g. A review of the emergency and corrective action processes.

The ECO, or an appointee, must conduct the general awareness training. The training presenter will keep a record of the details of all personnel and contractors that attend the general awareness training and the attendance register will indicate the names of the attendants, their organizations, the date and the type of training received.

21.1.2 Specific Environmental Training

Specific environmental training will be in line with the requirements identified in the training matrix. Personnel whose work tasks may impact on the environment will be made aware of the requirements of appropriate procedures and work instructions. The ECO will communicate the training requirements to the responsible supervisors to ensure that personnel and contractors are trained accordingly.

21.1.3 Training Evaluation and Re-Training

The effectiveness of the environmental training will be reflected by the degree of conformance to the EMPr requirements, the results of internal audits and the general environmental performance achieved at Ikwezi Vanadium mine. Incidents and non-conformances raised against the EMPr will be assessed by the ECO to determine if the cause was due to a lack of awareness or training. Should it be evident that re-training is required; the ECO will inform the responsible supervisors and Heads of Departments of the need to take the appropriate actions. General Awareness Training will be repeated to all personnel every two years.

21.2 Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

An Emergency Response Plan is detailed in Section 21, Part B and is the approach used by Ikwezi Vanadium (Pty) Ltd to response to risks that may pollute or degrade the environment during the operational phase.

It should be noted that the Emergency Response Plan is in additional to the EMPr presented in Section 12.4 and Section 15.2, Part B.

21.3 Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually).

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by National Environmental Management Act, 1998, Act 107 of 1998), as amended, (NEMA) which provides in Section 24P that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision will be reviewed annually.

22 UNDERTAKING

The EAP herewith confirms

a. the correctness of the information provided in the reports ☒
b. the inclusion of comments and inputs from stakeholders and I&APs; ☒
c. the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and
d. the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

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APPENDIX A: DETAILS OF EAP

APPENDIX B: MAPS

APPENDIX C: PUBLIC PARTICIPATION REPORT

APPENDIX D: SPECIALIST STUDIES