



**mineral resources**

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

**DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT**  
**AND**  
**ENVIRONMENTAL MANAGEMENT PROGRAMME 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).

<b>NAME OF APPLICANT</b>	Tawana Hotazel Mining (Pty) Ltd
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<b>FILE REFERENCE NUMBER SAMRAD</b>	MR Ref No.: NC 30/5/1/2/2/10197MR EA Ref No.: NC 30/5/1/2/3/2/1/10197MR

**JANUARY 2022**

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## ACRONYMS AND ABBREVIATIONS

AEL	Atmospheric Emission Licence
BID	Background Information Document
CA	Competent Authority
CBA	Critical Biodiversity Area
CR	Critically Endangered
CRR	Comments and Response Report
DFFE	Department of Forestry, Fisheries and the Environment
DMR/ DMRE	Department of Mineral Resources/ Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
ESR	Environmental Screening Report
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
HMM	Hotazel Manganese Mine
HV	Heavy vehicle
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
JMLM	Joe Morolong Local Municipality
JTGDM	John Taolo Gaetsewe District Municipality
LED	Local Economic Development
LoM	Life of Mine
LDV	Light Delivery Vehicle
mamsl	Metres above mean sea level
mbgl	Metres below ground level
MEC	Member of the Executive Council
MPRDA	Minerals and Petroleum Resources Development Act (No. 28 of 2002)
MR	Mining Right
NBA	National Biodiversity Assessment (2018)
NCNCA	Northern Cape Nature Conservation Act (No. 9 of 2009)
NC DENC	Northern Cape Department of Environment and Nature Conservation
NAEIS	National Atmospheric Emissions Inventory System
NDCCR	National Dust Control Regulations
NEMA	National Environmental Management Act, No. 107 of 1998
NEMAQA	National Environmental Management Air Quality Act, No. 39 of 2004

NEMBA	National Environmental Management: Biodiversity Act, No. 10 of 2004
NEMPAA	National Environmental Management Protected Areas Amendment Act, No. 31 of 2004
NEMWA	National Environmental Management Waste Act, No. 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Areas (2011)
NHRA	National Heritage Resources Act, No. 25 of 1999
NPAES	National Protected Area Expansion Strategy (2011)
NWA	National Water Act, No. 36 of 1998
PES	Present Ecological State
PIA	Palaeontological Impact Assessment
RE	Remaining Extent
ROD	Record of Decision
RoM	Run of Mine
RSDF	Regional Spatial Development Framework
SAAQIS	South African Air Quality Information System
SAHRA	South African Heritage Resources Association
SAHRIS	South African Heritage Resources Information System
SANRAL	South African National Roads Agency SOC Ltd
SANS	South African National Standards
SCC	Species of Conservation Concern
Tawana	Tawana Hotazel Mining (Pty) Ltd
TDS	Total Dissolved Solids
THM	Tawana Hotazel Mine
TOPS	NEMBA Threatened or Protected Species
VU	Vulnerable
WMA	Water Management Area
WML	Waste Management Licence
WUL	Water Use Licence
WULA	Water Use Licence Application

## **1 IMPORTANT NOTICE**

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended) (MPRDA), the Minister of Mineral Resources 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 and an Environmental Authorisation is issued".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment (EIA) and an Environmental Management Programme report (EMPr) 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 NEMA EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the CA and in terms of section 17 (1) (c) the CA must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the CA 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 (EAP) 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.

## **2 OBJECTIVES 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—
    - a. can be reversed;
    - b. may cause irreplaceable loss of resources, and
    - c. 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 ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT  
REPORT**

**3 CONTACT PERSON AND CORRESPONDENCE ADDRESS**

**a) Details of**

**i) The EAP**

<b>Name of Environmental Assessment Practitioner (EAP)</b>	Prime Resources (Pty) Ltd
<b>Physical Address</b>	70 - 7th Avenue, Parktown North, Johannesburg
<b>Postal Address</b>	PO Box 2316, Parklands, 2121
<b>Telephone Number</b>	011 447 4888
<b>Fax Number</b>	086 604 2219
<b>Email</b>	prime@resources.co.za
<b>Professional Affiliations</b>	EAPASA; PrEng; PrSciNat; SAIMM; IAIAAsa

**ii) Expertise of the EAP**

*The qualifications of the EAP (With evidence refer to Appendix 1) and summary of the EAP's past experience (in carrying out the Environmental Impact Assessment Procedure)*

Prime Resources (Pty) Ltd is a specialist environmental consulting firm providing environmental, social, and related services, which was established in 2003. Prime Resources was founded by Peter Theron (PrEng, SAIMM), the Managing Director and Principal Environmental Consultant of the firm. Peter has a GDE Environmental Engineering from the University of Witwatersrand and over 30 years' experience in the field of environmental science and engineering.

Jonathan van de Wouw (BSc Hons) is a Principal Environmental Consultant and Registered EAP (EAPASA Reg No 2019/909) with thirteen years' experience managing projects in the mining and industrial sectors, including financial liability assessments associated with mine closure and rehabilitation, mine waste and water management planning, environmental impact assessments and management planning and environmental auditing. He also has a detailed knowledge of environmental law and precedents, both locally and internationally.

Louise Jones is a Senior Environmental Scientist with eight years' experience in the field of environmental science. Her expertise include environmental impact assessments and management planning, financial liability assessments associated with mine closure and rehabilitation as well as environmental compliance auditing.

Dr Bronwyn Grover, Senior Environmental Geochemist, has a PhD in Environmental Analytical Chemistry from the University of the Witwatersrand and four years' experience in the field of geochemistry and environmental science.

Key Prime Resources Personnel CVs are included as Appendix 1.

A copy of the Prime Resources Company Profile is attached as Appendix 2.

**b) Description of the property**

<b>Farm Name</b>	Farm York A 279 (Portion of Portion 1 (RE)) RE Farm Hotazel 280 (Portion of RE)
<b>Application area (Ha)</b>	The overall area applied for is 154 Ha Which includes: <ul style="list-style-type: none"><li>• Mining Right (MR) Application area: 145.1 Ha</li><li>• Access roads outside of MR Application area: 8.9 Ha</li></ul>
<b>Magisterial district</b>	Joe Morolong Local Municipality Magisterial District of John Taolo Gaetsewe Northern Cape Province
<b>Distance and direction from nearest town</b>	The area is located approximately 1km south-east of Hotazel
<b>21 digit Surveyor General Code for each farm portion</b>	C0410000000027900001 - Farm York A 279 (Portion of Portion 1 (RE)) C0410000000028000000 - RE Farm Hotazel 280 (Portion of RE)

c) Locality map (show nearest town, scale not smaller than 1:250000)

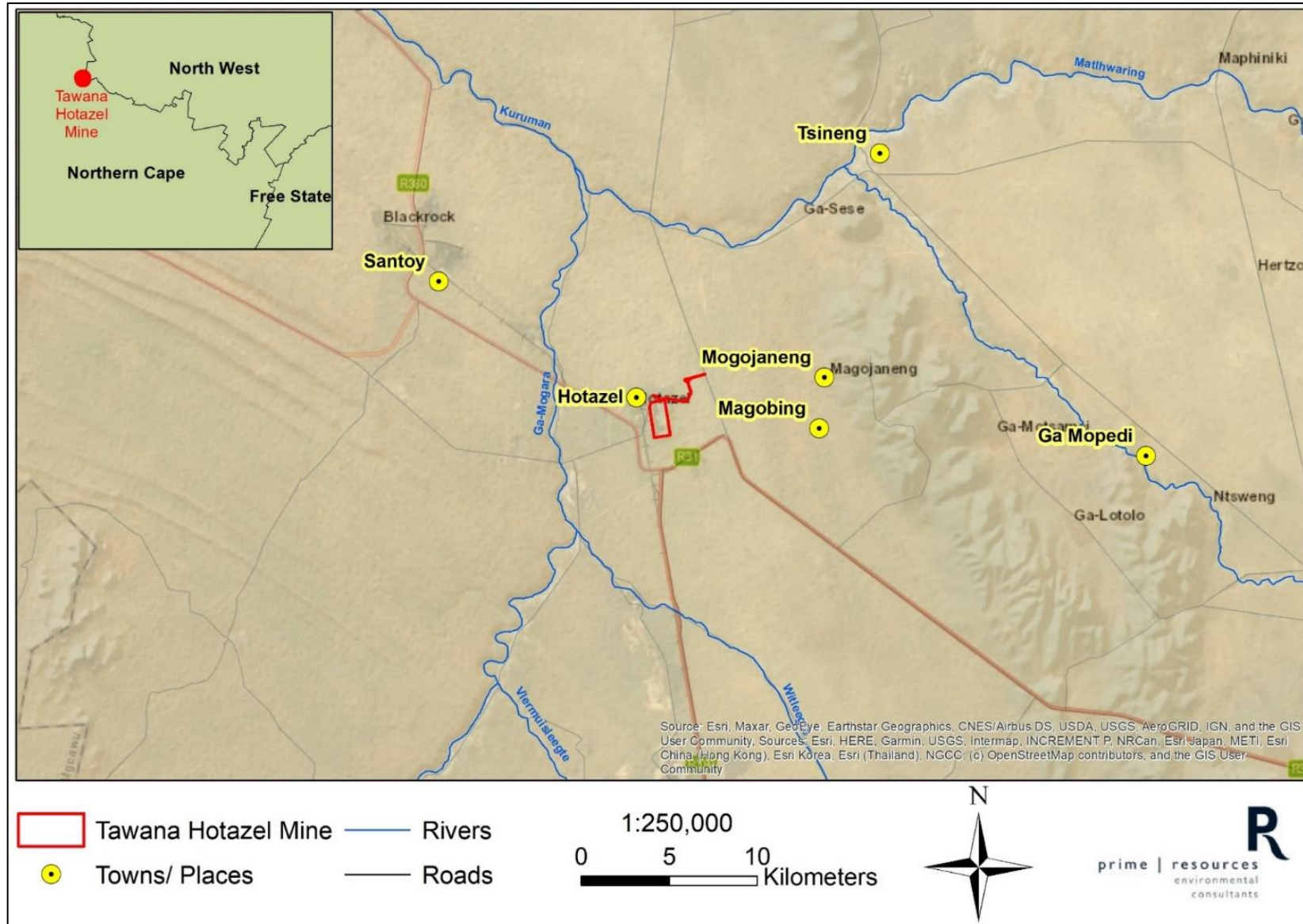


Figure 1: THM Locality map (1:250 000)

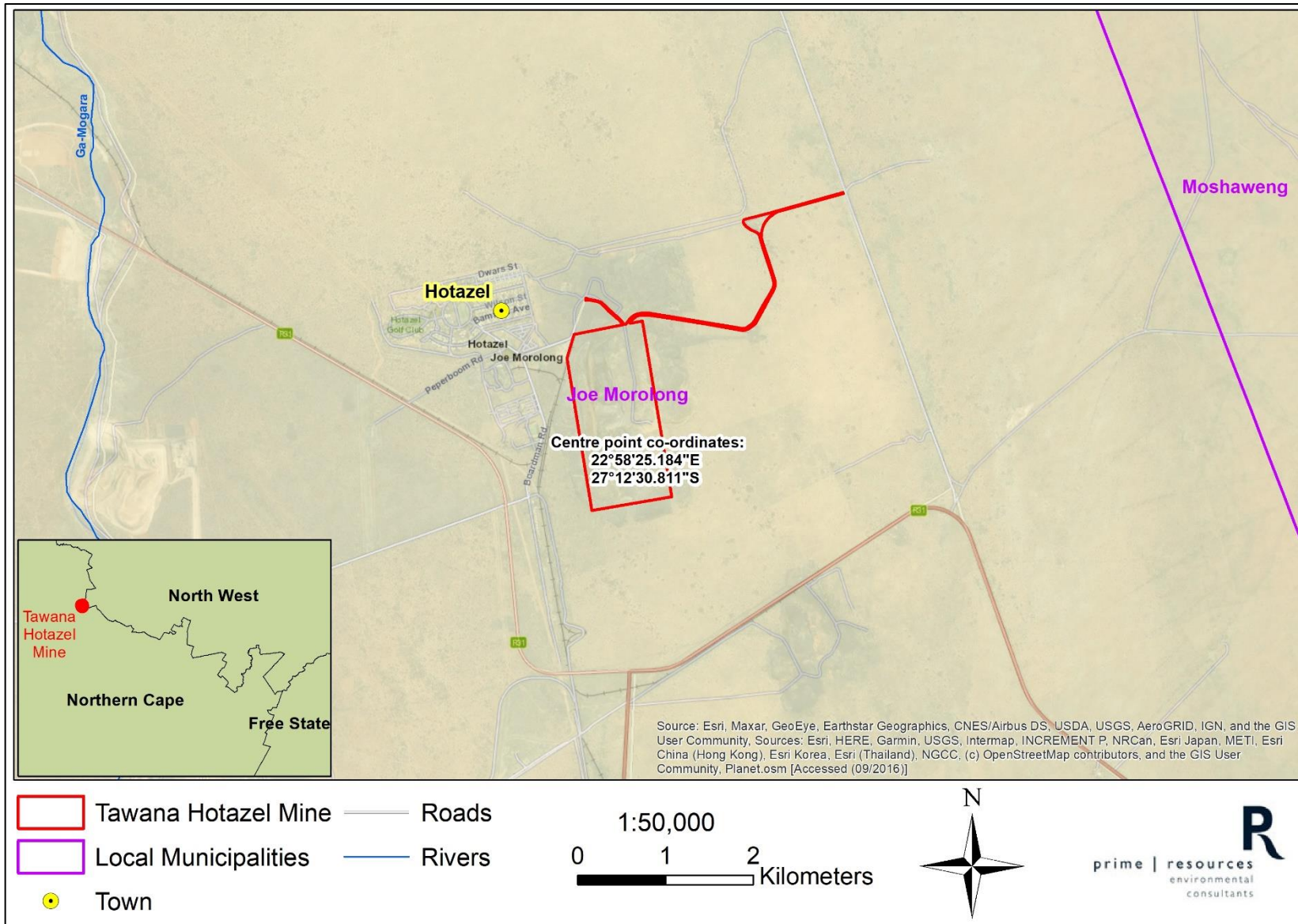


Figure 2: THM Locality map (1:50 000)



**d) 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). Refer to Figure 3, Figure 4 and Figure 5.

**i) Listed and specified activities**

<b>NAME OF ACTIVITY (All activities including activities not listed)</b> (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.)	<b>AERIAL EXTENT</b> <b>Ha or m<sup>2</sup></b>	<b>LISTED ACTIVITY</b> Mark with an X where applicable or affected.	<b>APPLICABLE LISTING NOTICE</b>
MR Application area	145.1 Ha		
Surface infrastructure that falls within the MR Application area as well as the access roads that are outside of the MR Application area.  Surface infrastructure will include the opencast pit (incorporating the historical HMM void and further expansion of the opencast footprint), in-pit waste rock dumps (residue material), surface residue handling / storage, vehicle yard, workshop, access and haul roads, offices, stores, processing plant, product stockpile area, run of mine pad, refuel station and water management infrastructure.	77 Ha	X	<b>Listing Notice 2 (GNR984 of 2014) (As amended) Activity 17</b> 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 No. 28 of 2002), as well as any other applicable activity as contained in this Listing Notice, in Listing Notice 1 of 2014 or Listing Notice 3 of 2014, required to exercise the mining right (as amended by GN517 of 2021).
<b><i>In accordance with the above, the following applicable listed activities are required to exercise the Mining Right</i></b>			
Vehicle yard, workshop, stores and refuel station	1.5 Ha	Applicable activities required to exercise the Mining Right	<b>Listing Notice 1 (GNR983 of 2014) (As amended) Activity 14</b> The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.
New on-site hauls roads	5.6 Ha		<b>Listing Notice 1 (GNR983 of 2014) (As amended) Activity 24</b> The development of a road— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—

<b>NAME OF ACTIVITY (All activities including activities not listed)</b> (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.)	<b>AERIAL EXTENT</b> <b>Ha or m<sup>2</sup></b>	<b>LISTED ACTIVITY</b> Mark with an X where applicable or affected.	<b>APPLICABLE LISTING NOTICE</b>
			(a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.
Areas to be cleared for surface infrastructure that falls within the MR Application area as well as the access roads that are outside of the MR Application area	77 Ha		<b>Listing Notice 1 (GNR983 of 2014) (As amended)</b> <b>Activity 27</b> The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except 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.
Widening of the existing access roads that fall outside of the MR Application area	8.9 Ha		<b>Listing Notice 1 (GNR983 of 2014) (As amended)</b> <b>Activity 56</b> The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.
Handling, storage and disposal of residue material to in-pit waste rock dumps, surface residue handling / storage and reclamation of residue material	54.7 Ha	X	<b>Listing Notice 1 (GNR983 of 2014) (As amended)</b> <b>Activity 21F</b> Any activity including the operation of that activity required for the reclamation of a residue stockpile or a residue deposit as well as any other applicable activity as contained in this Listing Notice or in Listing Notice 3 of 2014, required for the reclamation of a residue stockpile or a residue deposit.  <b>GNR921 of 2013, Category B of the National Environmental Management: Waste Act 2008 (No. 59 of 2008) (NEMWA)</b> <b>Activity 7 Disposal of waste on land</b> The disposal of any quantity of hazardous waste to land.  <b>Activity 10 Construction of facilities and associated structures and infrastructure</b> The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).  <b>Activity 11 Residue stockpiles or residue deposits</b> The establishment or reclamation of a residue stockpile or residue deposit resulting from activities 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).

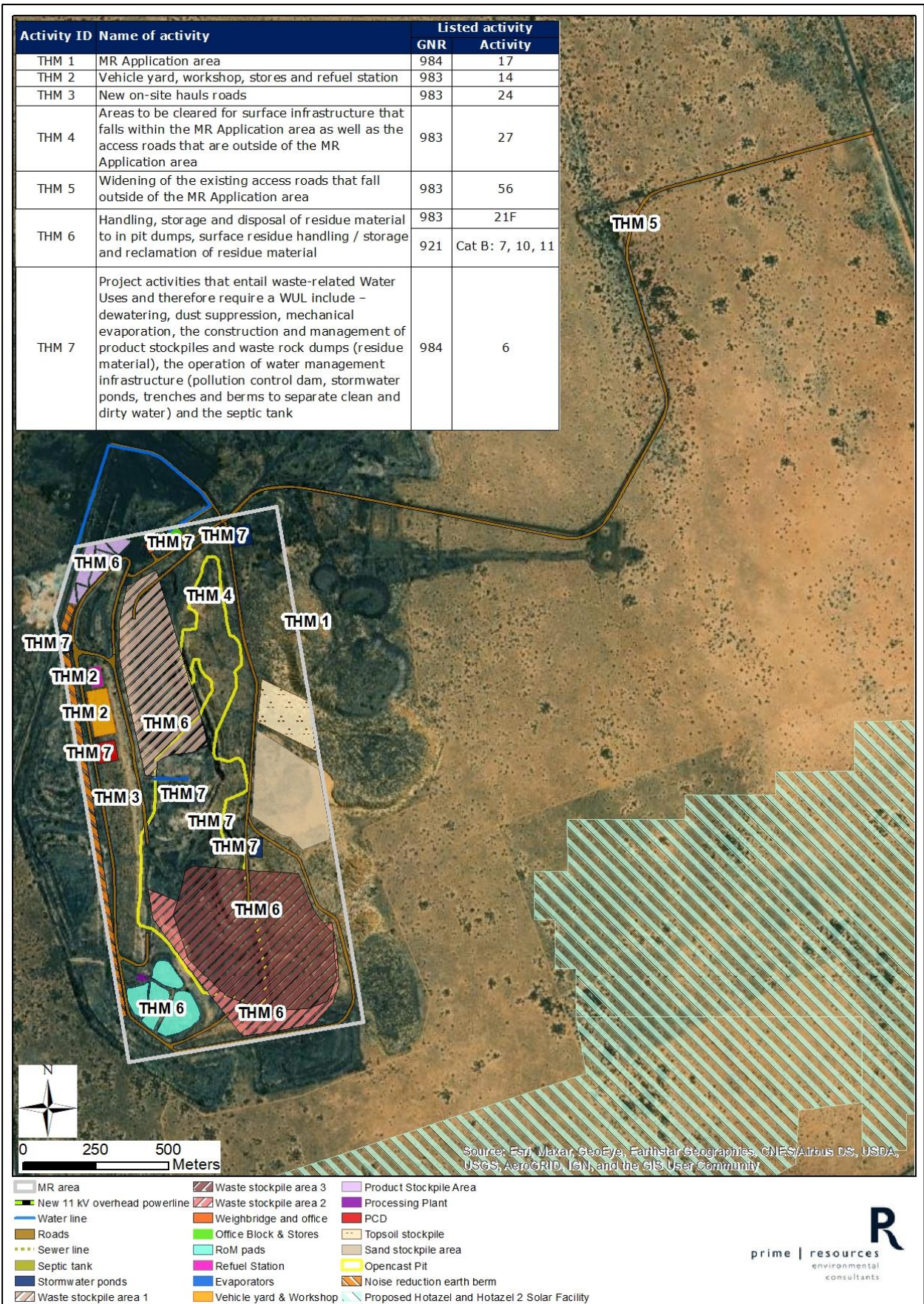
<b>NAME OF ACTIVITY (All activities including activities not listed)</b> (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.)	<b>AERIAL EXTENT</b> <b>Ha or m<sup>2</sup></b>	<b>LISTED ACTIVITY</b> Mark with an X where applicable or affected.	<b>APPLICABLE LISTING NOTICE</b>
Project activities that require a WUL include – dewatering, dust suppression, mechanical evaporation, construction and management of product stockpiles and waste rock dumps (residue material), the operation of water management infrastructure (pollution control dam, stormwater ponds, trenches and berms to separate clean and dirty water) and the septic tank.	77 Ha	X	<b>Listing Notice 2 (GNR984 of 2014) (As amended)</b> <b>Activity 6</b> The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding: (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.



**Figure 3: THM with associated farm portions and adjacent farms**



**Figure 4: Proposed THM mine layout**



**Figure 5: THM listed activities map**

## ii) Description of the activities to be undertaken

*(Describe the 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)*

The Department of Mineral Resources and Energy (DMRE) has accepted an application for Environmental Authorisation (ref No. NC 30/5/1/2/3/2/1/10197MR) in support of a Mining Right (MR) made by Tawana Hotazel Mining (Pty) Ltd (Tawana) in terms of Section 22 of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA). The types of minerals applied for are: all (Code UN); Iron and Iron bearing minerals including hematite, goethite, specularite and limonite (Code (Fe) Type (B)) and Manganese and manganese bearing minerals (Code (Mn) Type (B)).

The Tawana Hotazel Mine (THM) covers portions of two farms within the Joe Morolong Local Municipality (JMLM) in the Northern Cape Province; Hotazel 280 and York 279 and is located approximately 1 km south-east of the town of Hotazel. The THM largely incorporates the historical Hotazel Manganese Mine (HMM), and the MR area includes the residual opencast void and surface dumps of low-grade material. The mothballed processing plant and rail loadout facility fall outside the MR area (refer to Figure 30). HMM stopped production in 1989. The area was historically mined by both opencast and underground means and yielded high grade manganese ore. All current plans for the project specifically exclude underground mining.

The overall area applied for is approximately 154 Ha (inclusive of the MR application area and access roads). Surface infrastructure will include the opencast pit (incorporating the historical HMM void and further expansion of the opencast footprint), in-pit waste rock dumps (residue material), surface residue handling / storage, vehicle yard, workshop, access and haul roads, offices, stores, processing plant for the crushing and screening of mined ore, product stockpile area, run of mine pad, refuel station and water management infrastructure. Refer to Figure 4.

### **Mining**

- Opencast mining methods will be used to a maximum depth of 95 m.
- The orezone of the various seams is found at depths from 25 to 91 m below the surface and the manganese seam thicknesses varies from 3 to 27 m.
- The proposed mining process is as follows: drilling → blasting → load and haul → dry crushing and screening plant → product stockpiling → road truck loading.
- The annual Run of Mine (RoM) ore production is estimated at 500 000 tpa at steady state.
- The mining of the opencast pit will require as many as two active work areas in certain schedule overlap years.

### **Blasting**

- The blast designs will aim for productive blasting, whilst achieving the environmental controls that are needed for mining safely at the proposed THM.
- The blast designs (including timing and stemming requirements) will take the rock type descriptions, mining methods including planned bench height and hole diameter and the distribution of sensitive receptors surrounding the mine into account.
- The following limits will be applied:

- **Ground vibration:** Review of the type of structures that are found within the possible influence zone of the proposed mining area and the limitations that may be applicable, different limiting levels of ground vibration will be required. This is due to the typical structures and installations observed surrounding the site and location of the project area. Structure types and qualities vary greatly, and this calls for limits to be considered as follows: maximum peak particle velocity (PPV) of 6 mm/s, 12.5 mm/s levels and 25 mm/s.
- **Air blast:** Shall not exceed 134 dB at point of concern but 120 dB preferred.
- **Maximum fly rock range:** Fly rock will be limited to within a maximum risk range of 291 m.
- Heavy ANFO (Bulk Explosives) and detonators will be sourced from licensed explosive silo provided for use by the blasting contractor, the location of which will not be situated within the mining area or the adjacent residential areas.
- If cartridge explosives are required in the future, it will be delivered to site by truck. Cartridge explosives will not be stored on- or near to- site.

### **Loading and hauling**

- Due to the mixing requirements, where high-grade ore will be mixed with the lower grade material the lower benches within the pit, the loading and hauling equipment will be mobile. These will consist of a combination of excavators, wheel loaders, articulated and rigid haul trucks.
- The excavators will load the 40-50 t haulage units with three to four passes and will be supported by track dozers and motor graders to assist with oversize handling, ore crowding, road construction and loading area preparation.
- RoM ore will be trucked out of the open pit and tipped onto the RoM ore stockpile.
- In line with the mine plan's ore to waste stripping ratio and to permit further access to manganese ore, waste rock will be drilled, blasted and subsequently loaded and hauled with 50-60 t articulated and rigid haul trucks to the designated waste dumping sites.

### **Processing**

- From the RoM stockpile, front end loaders (FELs) or excavators will feed the ore into a semi mobile primary crusher (jaw crusher).
- The primary crusher will feed the screening plant. In the initial stages these will be semi mobile units.
- The semi mobile crushing and screening plant is currently planned to be located at the southern end of the open pit.
- The different size fractions will be sampled and stockpiled into separate stockpiles according to grade and size at the dedicated stockpile area.
- From these stockpiles, the product will be loaded onto road trucks using a FEL according to the customer's requirements in terms of size and grade (some blending may be required).
- Fines will be stockpiled for sale as and when the demand arises.
- Road transport loading, with suitable weighbridges, will take place via a dedicated loading facility. Road trucks will then transport product to Lohatla for train loading, after passing over the weighbridge.

### **Mine entrance and access roads**



- There are two main access roads to the mine, one intersects with Provincial Road D3463 from Kuruman to Severn and enters the mine at the north eastern corner, while the other road is from Hotazel town in the west and enters the mine from the north. The two roads intersect before entering the mining area.
- The main transport route to the north east will be for Heavy Vehicles (HVs) and the main entrance to the west (near Hotazel) will be for Light Delivery Vehicles (LDV's).
- In addition, on-site access roads will be required for use by the secondary support fleets and earthmoving haul trucks, with ramps that lead in and out of the pit and haul roads for the transportation of processed products and waste amongst others.
- In order to improve mobility around the mine and to potentially reduce road user costs, a ring road (haul road) around the mine pit has been proposed. This road will also intercept stormwater which will be channelled to the stormwater ponds.
- The minimum width of all the roads is 10 m (and up to 20 m) as they generally have to accommodate large trucks, with sufficient space for surface water flow.

### **Support Equipment**

- Four excavators (5 m<sup>3</sup> capacity) and three FELs (5 m<sup>3</sup> capacity) will be required for flexibility and management of the various stockpiles.
- Eight trucks (in the 40 t class with 320 kW engines) will be required in the initial production period with this increasing to sixteen once steady state RoM production has been achieved.
- Three primary blast hole drill rigs will be required.
- One road grader will maintain the roads on the property.
- One water truck for dust suppression on main haul routes.
- Two track dozers will be used for typical dozer functions including maintenance of dumps, drill site preparation, road building, ditching, bench repair, shovel clean-up and stockpile dozing.
- A rubber-tired dozer for lighter dozer work such as shovel excavator clean-up and road sweeping.
- Diesel LDVs will be supplied for the Mine Superintendent, Engineering Superintendent, Mining Supervisor, Blaster, Geologist, Surveyors, and the plant production crew. A total of eight units are provided for initially.
- Maintenance support vehicles and equipment will include flat deck trucks and fuel, water, and lube trucks for servicing the excavators.
- Miscellaneous units such as personnel carriers, cranes, portable toilets, lighting towers etc. will also be provided for the support of mine operations.

### **Electricity**

- The mine reticulation will be provided from the existing 11 kV Eskom overhead power supply line from a substation in the Hotazel railway substation area, which terminates close to the north-western corner of the mine, next to the existing railway line.
- A new mini-substation will be installed to connect to the Eskom substation near the South 32 Offices, from where the mine office and weighbridge will be connected by an overhead 11 kV power line.
- The expected full load power requirement is calculated as 3 326 kVA. An application for 4.0 mVA has been submitted to cover the power requirements for the proposed THM.
- The remaining facilities and plant (i.e., processing plant) will not be connected to the grid as they will use their own power. The entire processing plant will be diesel operated.

- Until such time as power infrastructure is installed on site a mix of solar and diesel generators will be used as an alternate supply source.

## **Water**

- All potable water will be supplied through the Vaal Gamagara water scheme via a bulk water meter, managed by Sedibeng Water. An application for a water connection has been submitted to Sedibeng Water.
- Sedibeng Water has therefore been engaged and has provisionally approved a connection point for water supply approximately 2 km south west of the mine. A design is required to be submitted to Sedibeng Water for approval.
- Water will be required for processing, mining, change houses, offices, and workshops. Each supply area will be individually metered to enhance control and minimize wastage.
- Water supply for other purposes (i.e. dust suppression and industrial use on site) will be sourced from either the stormwater ponds or the Pollution Control Dam (PCD).
- The PCD will be lined and 5 m deep with a minimum capacity of 20 000 m<sup>3</sup>.
- The site has been split into three main catchment areas, excluding the mining pit, resulting in a total of three planned stormwater ponds to store as much of the surface water as practically possible. The surface water will mainly be intercepted by the roads and channelled to the respective stormwater ponds. The capacity of the stormwater ponds is as follows: stormwater pond 1 (12 250 m<sup>3</sup>), stormwater pond 2 (6500 m<sup>3</sup>) and stormwater pond 3 (7313 m<sup>3</sup>). The ponds have been sized for a 1 in 50 year return flood.
- The estimated potable water consumption volume is 4800 – 6480 litres per day plus 10% for wastage/ losses.
- The remainder of the water to be used for general purposes (i.e. dust suppression and process water purposes) will be sourced from the PCD and the stormwater ponds.
- Precipitation has collected in the open void and underground workings since the mine stopped production in 1989. Thus this water will need to be fully removed before mining work can commence. A forced-evaporation system to remove water from the initial void may be implemented during the pre-operational phase for water management purposes.
- Mine dewatering will be carried out using diesel powered submersible pumps installed in sumps at the bottom of the pit.

## **Waste**

- The mining project will generate general (domestic) waste and mining waste.
- Sanitation from the mine will be piped to a septic tank which will be located on the eastern side of the offices. This septic tank will have a capacity of a minimum two weeks before it is filled-up. Design drawings are to be submitted to the municipality for approval prior to start of construction. Similar to the water supply, sanitation infrastructure will only be connected to the office block.
- Non-hazardous domestic and industrial waste will be stored temporarily within a hard-standing area for covered bins / skips.
- All recyclable waste will be collected by a contractor where it will be recycled off-site. Only materials which cannot be reused, recycled or recovered will be disposed of at an appropriately licensed facility by a licensed contractor.

- An estimated stripping ratio is calculated at 2.98 t of waste per tonne of ore. Residue material (overburden and waste rock) arising from the development and ongoing operation of the opencast mine pit will be disposed back into the existing historical opencast void and the trailing mined out opencast void through backfilling. There will be 3 waste rock dumps with the following capacities and maximum heights:
  - Waste dump no.1 (3 859 493 m<sup>3</sup>) – 15 m above current surface
  - Waste dump no.2 (3 487 682 m<sup>3</sup>) – level with current surface
  - Waste dump no.3 (5 783 722 m<sup>3</sup>) – 30 m above current surface and to be developed on top of waste dump 2 once that dump reaches surface level
- There will also be a topsoil stockpile with a capacity of 210 000 m<sup>3</sup> and estimated height of 10 m and a sand stockpile with a capacity of 1 185 000 m<sup>3</sup> and estimated height of 20 m.

### **Other infrastructure**

- A new weighbridge facility, which will comprise of a weighbridge and an office, is planned to be constructed between the offices and the product stockpile area, close to the northern boundary of the of the mine. This facility will be manned as per the operational requirements of the mine. In order to cater for trucks that may be overload or underloaded, a turning loop will be constructed next to the weighbridge facility to allow for easy access back to the product stockpile area.
- The new offices and parking will be located along the northern boundary of the mine. The offices will be accessible via the new access road that ties-in with the main access road from the north, used by LDVs.
- A plant yard/ workshop will be located on the western side of the pit, between the mine pit and a haul road that links the processing plant and the product stockpile area. This facility will mainly be used for repairs, servicing and washing of vehicles/plant. The surface will be a concrete slab with a slope towards various sumps to contain oil and contaminated water.
- A refuel station will be located on the western side of the pit. This facility is anticipated to have at least two 35 000 l refuelling tanks, and will have a concrete slab with sumps to contain oil and contaminated water.

### **Operating hours and staff**

- The mine and plant will operate on a continuous basis with 330 working days per annum.
- Approximately 73 construction-related job opportunities will be created and approximately 177 people (inclusive of outsourced service providers) will be employed during operations.

### **Timeframes and scheduling of phases**

- 2 years have been allowed for pre-stripping and mining infrastructure construction.
- The Life of mine (LoM) indicated by the conversion of the Mineral Resource to Mineral Reserves is 30 years for the open pit operation.
- Backfilling/rehabilitation will commence immediately after the commencement of the mining operation and its advance will match the depletion rate of the open pit.
- A period of 3 years is expected for final rehabilitation after closure.

## e) Policy and legislative context

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p><b>The Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)</b> is the key legislation governing mining activities within South Africa. It details the requirements and processes which need to be followed and adhered to by mining companies. The Department of Mineral Resources and Energy (DMRE) is the competent authority that deals with all mining related applications.</p> <p>Section 22(4)(a) of the MPRDA requires that the Applicant addresses the requires of Chapter 5 of NEMA following the acceptance of its application by the Regional Manager.</p>	<p>An integrated application in terms of the MPRDA and NEMA is being undertaken. The requirements of Chapter 5 of NEMA are addressed throughout this report. See below for further information.</p>	<p>An application for a MR was submitted to the DMRE on 11 June 2021 (DMRE Reference NC 30/5/1/2/2/10197MR) and accepted on 29 July 2021.</p> <p>Any activity including the operation of that activity which requires a MR in terms of Section 22 of the MPRDA is a listed activity in terms of Section 24 of NEMA which therefore requires that an Environmental Authorisation process, entailing a Scoping and EIA process and public consultation as specified in the EIA Regulations of 2014, promulgated under NEMA, is undertaken. The purpose of this EIAR / EMPr is to fulfil these requirements.</p>
<p><b>The National Environmental Management Act, No. 107 of 1998 (NEMA)</b> is enabling legislation intended to provide a framework for integrating environmental management into all developmental activities to promote co-operative environmental governance with regard to decision making by state organs on matters affecting the environment.</p> <p>The Environmental Impact Assessment (EIA) Regulations of GNR982, December 2014 <i>as amended in 2021</i> serve to regulate the procedure and criteria for submitting, processing and considering decisions for applications for Environmental Authorisation. These Regulations provide details on the process to be followed for the consultation of stakeholders and Interested an Affected Parties (IAPs), the identification of the Competent Authority, and the various timeframes and application requirements for Environmental Authorisation. A further three Regulations, GNR983, GNR984, and GNR985 (all of 2014 <i>as amended in 2021</i>), provide lists of activities for which Environmental Authorisation, either in the form of a Basic Assessment or Scoping and Environmental Impact Assessment Report (EIAR) / Environmental Management Programme (EMPr), is required before the activity can commence.</p> <p>Since the enactment of the “One Environmental System” on 8 December 2014, the Environmental Authorisation process in terms of the NEMA must be followed for any mining activities requiring a right or permit in terms of the MPRDA to fulfil the requirements of Section 5A(a) of the Act. In</p>	<p>This EIA and EMPr have been prepared to meet the requirements of the EIA Regulations (GNR982 of 2014 <i>as amended</i>).</p> <p>Refer to Section 3.d)i) above for the listed activities applicable to the proposed project.</p>	<p>An application for Environmental Authorisation in terms of NEMA was submitted together with the MR application to the DMRE for the NEMA listed activities triggered by the proposed project. The DMRE acknowledged receipt of the application per letter stamped 25 June 2021.</p> <p>According to the EIA Regulations the following are to be submitted in support of the application for Environmental Authorisation, to the DMRE:</p> <ul style="list-style-type: none"> <li>• Scoping Report (submitted on 13 September 2021 and accepted 5 October 2021) together with the results of consultation with IAPs and State Departments, within 44 days of submission of the application; and</li> <li>• The EIAR and EMPr (this document) together with the results of consultation</li> </ul>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
instances where Environmental Authorisation is required for a mining project, the DMRE is identified as the Competent Authority.		with IAPs and State Departments within 106 days of acceptance of the Scoping Report (11 February 2022).
<p><b>The National Screening Tool</b> is a geographically-based web-enabled application that allows the proponent seeking environmental authorization, in terms of EIA Regulations 2014, to screen their proposed site for any environmental sensitivity. The tool also provides site-specific EIA process and review information, and identifies related exclusions and/or specific requirements, including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site.</p> <p>As per GN960 of 2019, read with Section 24(5)(a) of the NEMA, an Environmental Screening Report (ESR) must be generated for the Environmental Authorisation application using the National Web-based Screening Tool. As per the requirement of GN320 and GN1150, prior to commencing with a specialist assessment, the current use of the land and the environmental sensitivity of the site under consideration identified by the national web based environmental screening tool (screening tool), where determined, must be confirmed by undertaking a site sensitivity verification.</p> <p>The application classification for this report is: Mining =&gt; Mining Right =&gt; Mining – Mining Right.</p> <p>GN320 and GN1150 prescribes the following for the site sensitivity verification:</p> <ol style="list-style-type: none"> <li>1. The Site Sensitivity Verification must be undertaken by an environmental assessment practitioner or a specialist.</li> <li>2. The Site Sensitivity Verification must be undertaken through the use of <ol style="list-style-type: none"> <li>a. a desktop analysis, using satellite imagery;</li> <li>b. a preliminary on-site inspection; and</li> <li>c. any other available information.</li> </ol> </li> <li>3. The outcome of the Site Sensitivity Verification must be recorded in the form of a report that: <ol style="list-style-type: none"> <li>a. confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;</li> <li>b. contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and</li> <li>c. is submitted together with the relevant reports prepared in accordance with the requirements of the NEMA EIA Regulations (2014).</li> </ol> </li> </ol>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>• Section 3. G) iv) where the baseline conditions are described</li> <li>• Section 3. G) v) and Table 20 where the impacts of the proposed activities on all aspects of the physical and socio-economic environment are assessed.</li> <li>• ESR in Appendix 3</li> <li>• Site Sensitivity Verification Report in Appendix 4</li> </ul>	<p>The ESR (refer to Appendix 3) indicates that there are 4 solar PV developments with an approved Environmental Authorisation or applications under consideration within 30 km of the proposed area. No intersections with EMF areas were found and no intersection with any development zones were found.</p> <p>The following environmental sensitivities were predicted by the ESR and a Site Sensitivity Verification Report (refer to Appendix 4) was compiled to adjust/ verify the sensitivity of the environmental themes raised in the ESR:</p> <ul style="list-style-type: none"> <li>• Agriculture Theme – ESR medium sensitivity (low verified sensitivity)</li> <li>• Animal Species Theme – ESR low sensitivity (medium adjusted sensitivity)</li> <li>• Aquatic Biodiversity Theme – ESR low sensitivity (low verified sensitivity)</li> <li>• Archaeological and Cultural Heritage Theme – ESR low sensitivity (low verified sensitivity)</li> <li>• Civil Aviation Theme – ESR high sensitivity (high verified sensitivity)</li> <li>• Defence Theme – ESR low sensitivity (low verified sensitivity)</li> <li>• Palaeontology Theme – ESR medium sensitivity (low adjusted sensitivity)</li> <li>• Plant species Theme – ESR low sensitivity (low verified sensitivity)</li> <li>• Terrestrial Biodiversity Theme – ESR low sensitivity (low verified sensitivity)</li> </ul>
<b>The National Environmental Management Air Quality Act, No. 39 of 2004 (NEMAQA)</b> has placed the responsibility for air quality management on local authorities that will be tasked with	Refer to:	The proposed project does not trigger any listed activities in terms of GN893. Therefore, an

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and emissions reduction strategies. GN893 of 2013 provides the list of activities in terms of Section 21(1)(a) for which for which licensing is required in terms of Chapter 5 of the Act. This notice further establishes minimum emission standards for the listed activities.</p> <p>The National Ambient Air Quality Standards (NAAQS) (GN1210 of 2009) were determined based on international best practice for PM<sub>10</sub> (particulates with an aerodynamic diameter of 10 micron), dust-fall, sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), carbon monoxide (CO), lead (Pb), benzene and recently PM<sub>2.5</sub>. The PM<sub>2.5</sub> standards were published in GN486 of 2012. Section 32 of NEMAQA allows for the promulgation of measures to control and monitor dust. The National Dust Control Regulations (NDCR) (GNR827 of 2013) prescribe general measures for the control of dust in all areas, including residential and light commercial areas.</p> <p>The National Atmospheric Emission Reporting Regulations were published in 2015 and aims to standardise the reporting of data and information from an identified point, non-point and mobile sources of atmospheric emissions to an internet-based National Atmospheric Emissions Inventory System (NAEIS), towards the compilation of atmospheric emission inventories. The NAEIS is a component of the South African Air Quality Information System (SAAQIS). Regulations pertaining to Greenhouse Gas reporting using the NAEIS were published in 2017 (as amended by GNR994 of 2020) with the objective to provide all stakeholders with relevant, up to date and accurate information on South Africa's emissions profile. The South African mandatory reporting guidelines focus on the reporting of Scope 1 emissions only. The three broad scopes for estimating GHG are:</p> <ul style="list-style-type: none"> <li>• Scope 1: All direct GHG emissions.</li> <li>• Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.</li> <li>• Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Section 3. G) iv) for a description of the ambient air quality within the project area.</li> <li>• Section 3. G) v) and Table 20 for the potential impacts on ambient air and potential mitigation.</li> <li>• Appendix 7 for the air quality study and Appendix 21 for the impact assessment.</li> </ul>	<p>Atmospheric Emission Licence (AEL) is not required.</p> <p>Provision for rehabilitation has been made in the Closure Plan (Appendix 22).</p> <p>Air quality monitoring and management measures have been stipulated in the EMPr, to ensure that Tawana complies with the legislative requirements.</p>
<p><b>The National Heritage Resources Act, No. 25 of 1999 (NHRA)</b> serves to protect and manage South African heritage and cultural resources, which include places, buildings, structures and equipment of cultural significance, historical settlements and townscapes, archaeological and paleontological sites, graves and burial grounds. The Act protects any heritage resources from damage by developments by stipulating in Section 38 that any person intending on undertaking any form of development which involves the activities listed below must, at the earliest stage of initiation,</p>	<p>Refer to Section 3. G) iv) for a description of the cultural and heritage resources within the proposed THM.</p>	<p>A Palaeontological Impact Assessment and a Heritage Impact Assessment were carried out (refer to Appendix 9 and 10).</p> <p>The potential impact to fossil heritage resources is extremely low. Due to the disturbed nature of the proposed THM, the existence of any graves within the proposed THM is very unlikely.</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>notify the South African Heritage Resources Association (SAHRA) specifically the Northern Cape Heritage Resources Authority:</p> <ul style="list-style-type: none"> <li>A. the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;</li> <li>B. the construction of a bridge or similar structure exceeding 50 m in length;</li> <li>C. any development or other activity <b>which will change the character of a site</b>— <ul style="list-style-type: none"> <li>i. exceeding 5 000 m<sup>2</sup> in extent; or</li> <li>ii. involving three or more existing erven or subdivisions thereof; or</li> <li>iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or</li> <li>iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;</li> </ul> </li> <li>D. the re-zoning of a site exceeding 10 000 m<sup>2</sup> in extent; or</li> <li>E. Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.</li> </ul> <p>Section 38(8) of the Act states that if heritage considerations are taken into account as part of an application process undertaken in terms of NEMA and the EIA process, there is no need to undertake a separate application in terms of the NHRA. Heritage considerations will form part of this environmental process.</p>		<p>Mitigation measures for potential chance finds are included in the EMPr.</p>
<p><b>The National Water Act, No. 36 of 1998 (NWA)</b> regulates all matters relating to inland water resources. It thus operates as a management instrument with the lead authority being the Department of Water and Sanitation (DWS). This Act provides mechanisms for the prevention of the pollution of water resources to support the management of water as a renewable resource. Section 21 of the NWA lists water uses for which authorisation is required from the DWS.</p> <p>Regulation GN704 of 1999 provides regulations for the use of water for mining and related activities and is aimed to further protect water resources. These regulations describe how mining activities should be managed to protect water resources. The Act thus plays a crucial role in the mining process as many mining-related activities use water as listed in Section 21, thereby requiring approval from DWS.</p> <p>Regulation GN267 of 2017 describes the procedural requirements for WUL applications and appeals.</p>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>• Section 3. G) iv) for a detailed description of the groundwater and surface water resources within the project area.</li> <li>• Section 3. G) v) and Table 20 for the potential impacts on water resources and potential mitigation.</li> </ul>	<p>The process of applying for a Water Use Licence (WUL) from DWS for the full set of water uses associated with the mine (as described elsewhere) has commenced through the submission of a pre-application enquiry via the eWULAAS portal. The application has been assigned reference no. WU21348 (Appendix 5). A pre-application consultation meeting was held with the DWS on 9 September 2021 and minutes of that meeting form part of the consultation record in this EIAR (Appendix 6.7).</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p><b>The National Environmental Management Waste Act, No. 59 of 2008 (NEMWA)</b> regulates waste management in order to protect public and environmental health by providing various waste management measures for the prevention of pollution and ecological degradation and to provide defining requirements for the licensing and control of waste management activities. It also describes measures related to the management of contaminated land, waste handling and transport, describes the general duty of care regarding waste management activities, establishes powers for compliance and enforcement and lays the foundation for waste information systems. GN921 of 2013 provides definitions for activities which require a Waste Management Licence (WML) and identifies the relevant EA's which are further required for said activities.</p> <p>The Waste Classification and Management Regulations (GN634 of 2013) and the related National Norms and Standards (GN635- and GN636 of 2013) provide the requirements by which waste is to be classified, labelled and the requirements related to the disposal thereof depending on the classification.</p> <p>The storage of waste above the specific thresholds (in excess of 100 m<sup>3</sup> of general waste or 80 m<sup>3</sup> of hazardous waste) for a period of more than 90 days triggers a Category C activity which requires compliance with the National Norms and Standards for the Storage of Waste (GN926 of 2013). Similar National Norms and Standards have been published for the Sorting, Shredding, Grinding, Crushing, Screening and Baling of General Waste (GN1093 of 2017).</p> <p>Mine residue stockpiles were included in the list of NEMWA activities as Activity 11, Category B in 2015. The existing residue stockpiles at the THM were established before the coming into effect of the above and therefore the Transitional Provisions of GN921 apply which state that "A person who lawfully conducts a waste management activity listed in this Schedule on the date of the coming into effect of this Notice may continue with the waste management activity until such time that the Minister by notice in a Gazette calls upon such a person to apply for a WML." Furthermore, Section 43(a)(1) of NEMWA states that residue stockpiles and residue deposits must be managed at the location described for that purposes in the manner prescribed in the approved EMPr.</p> <p>GN632 of 2015 provides regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation. These regulations advocate a risk-based approach regarding the planning, management and reporting of residue stockpiles and deposits. The transitional arrangements described in GN632 are noted as follows as they pertain to the THM:</p> <p>13. (1) Anything done in terms of regulation 73 of the Mineral and Petroleum Resources Development Regulations, 2004 relating to the management of residue stockpiles and residues</p>	<p>This is an integrated EA application for activities considered both in terms of NEMA and NEMWA.</p> <p>Refer to Section i) above for the applicable listed activities.</p> <p>Waste management relevant to this project has been addressed in the EMPr Part B of this document.</p>	<p>WML activities have been applied for in conjunction with the NEMA listed activities.</p> <p>A commitment to abide by the Norms and Standards is included in the EMPr, should waste be stored in excess of threshold values and for longer than 90 days.</p>



Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>deposits which can be done in terms of a provision of these Regulations must be regarded as having been done in terms of the provision of these Regulations.</p> <p>(2) Management measures of residue stockpiles and residue deposits approved in terms of the Mineral and Petroleum Resources Development Regulations, 2004, at the time of the coming into operation of these Regulations, must be regarded as having been approved in terms of these Regulations.</p> <p>(3) A holder of a right or permit in terms of the Mineral and Petroleum Resources Development Act, 2002 must continue the management of the residue stockpiles and residue deposits in accordance with the approved management measures.</p>		
<p><b>The Hazardous Substances Act, No. 15 of 1973</b> aims to control substances that may cause injury, ill-health, or death through their toxic, corrosive, irritant, strongly sensitising or flammable nature, or by the generation of pressure. The Act provides for the division of such substances or products into groups in relation to the degree of danger as well as the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products. Hazardous materials such as explosives and hydrocarbons will be handled on site. The Applicant will ensure that any hazardous materials on site are handled in a manner in line with that described in the Act.</p>	<p>A commitment to abide by the Act has been included in the EMPr Part B of this document.</p>	<p>Management measures for the handling of hazardous substances are incorporated into the EMPr.</p>
<p><b>The Mine Health and Safety Act, No. 29 of 1996 (MHSA)</b> and Regulations provide for protection of the health and safety of staff and other persons at mines and, for that purpose to promote a culture of health and safety; to provide for the enforcement of health and safety measures; to provide for appropriate systems of employee, employer and State participation in health and safety matters; to establish representative tripartite institutions to review legislation, promote health and enhance properly targeted research; to provide for effective monitoring systems and inspections, investigations and inquiries to improve health and safety; to promote training and human resources development; to regulate employers' and staff' duties to identify hazards and eliminate, control and minimise the risk to health and safety; to entrench the right to refuse to work in dangerous conditions; and to give effect to the public international law obligations relating to mining health and safety.</p>	<p>A commitment to abide by the Act has been included in the EMPr Part B of this document.</p>	<p>Tawana will ensure that operations are in line with the requirements of the Act and Regulations.</p>
<p>The purpose of the <b>National Environmental Management: Biodiversity Act, No. 10 of 2004 (NEMBA)</b> is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. This includes, among others, the protection of species and ecosystems.</p>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>• Terrestrial ecology baseline in Section 3. G) iv)</li> </ul>	<p>A Terrestrial Biodiversity Assessment was undertaken.</p> <p>A limited portion, along the existing haul roads and access roads, is located within remaining</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>Section 52 of the Act provides for listing of threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected. The main purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction and includes the prevention of further degradation and loss of structure, function and composition of threatened ecosystems. Threatened terrestrial ecosystems have been delineated based on the South African Vegetation Map, national forest types and priority areas identified in a provincial systematic biodiversity plan.</p> <p>Section 53 of the Act goes on to provide the Minister with power to publish a list of threatening activities within a Section 52 listed ecosystem for which EA is required and this activity becomes triggered. While the Minister has published a list of ecosystems in need of protection, to my knowledge, no list of threatening activities has been published to-date.</p> <p>Chapter 4, Part 2 of the Act provides for listing of species as threatened or protected. If a species is listed as threatened, it should be further classified as critically endangered, endangered or vulnerable (GNR151 of 2007). The Act also defines restricted activities in relation to a specimen of a listed threatened or protected species (GNR152 of 2007).</p>	<ul style="list-style-type: none"> <li>• Section 3. G) v) and Table 20 for the potential impacts on biodiversity</li> <li>• Biodiversity management has been addressed in the EMPr (Part B of this document)</li> <li>• Appendix 14 for the terrestrial biodiversity study</li> </ul>	<p>extent of Kathu Bushveld [Threat Status: Least Concern (LC); Protection Level: Poorly Protected] in terms of the National Biodiversity Assessment (NBA): Terrestrial Remnant Vegetation (2018).</p> <p>One faunal Species of Conservation Concern (SCC), namely Verreaux's eagle (<i>Aquila verreauxii</i>), utilises the proposed THM area for nesting, breeding and foraging purposes. One Threatened or Protected Species- listed floral species, namely <i>Harpagophytum procumbens</i> was recorded. Two nationally protected tree species in terms of the National Forests Act (Act No. 84 of 1998) occur, namely <i>Vachellia erioloba</i> in relatively low abundance and <i>V. haematoxylon</i> in high abundance. One provincially protected floral species in terms of Schedule 1 of the NCNCA, namely <i>H. procumbens</i>, and several floral species listed under Schedule 2 of this Act, namely <i>Plinthus sericeus</i>, <i>Ammocharis coranica</i>, <i>Boophone disticha</i>, <i>Crinum sp.</i>, <i>Orphanthera jasminiflora</i>, <i>Albuca seineri</i> (= <i>Ornithogalum seineri</i>), <i>Albuca setosa</i> (= <i>Ornithogalum setosum</i>) were recorded.</p>
<p><b>The National Environmental Management: Protected Areas Act (No. 57 of 2003) (NEMPAA)</b> was promulgated in order to provide for (among other things) the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national Register of Protected Areas, and for the management of those areas in accordance with national norms and standards.</p> <p><b>The South African Protected Areas Database (SAPAD, 2020) and South African Conservation Areas Database (SACAD, 2020)</b> are Geographic Information System (GIS) inventories of all Protected and Conservation areas in South Africa.</p> <p><b>The National Protected Areas Expansion Strategy (NPAES; 2010)</b> are focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large</p>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>• Section 3. G) iv) where the current biodiversity in the proposed THM is characterised.</li> </ul>	<p>According to the most recently published SAPAD (2020) and SACAD (2020) databases, the proposed THM is not located within- or within 10km of- any formally protected areas such as nature reserves or other conservation areas.</p> <p>The closest protected areas are located further than 40km from the proposed THM.</p> <p>The closest NPAES Focus Area (the Eastern Kalahari NPAES Focus Area) is located approximately 18 km to the northwest and west of the proposed THM.</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy (NPAES, 2008). According to the NPAES database (2010), the project area is not located within an NPAES Focus Area.		Although not formally protected, the Hotazel Game Park is located next to the guest house in town.
<p><b>The Conservation of Agricultural Resources Act, No. 43 of 1983 (CARA)</b> provides for the conservation of the natural agricultural resources through the maintenance of the production potential of land, through combating and prevention of erosion and weakening or destruction of the water sources, and through the protection of the vegetation and the combating of weeds and invader plants.</p> <p>Amendments to regulations under the CARA (Act No. 43 of 1983) provide for the declaration of weeds and invader plants, with weeds regarded as alien plants with no known useful economic purpose, while invader plants may serve useful purposes as ornamentals, as sources of timber and may provide many other benefits, despite their aggressive nature. Declared weeds are described as Category 1 plants, while declared invader plants with a commercial or utility value are described as Category 2 plants and ornamental species as Category 3 plants. CARA indicates that Category 1 weeds are prohibited, and that Category 2 and 3 plants must be controlled.</p>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>Section 3. G) iv) where the current biodiversity, agricultural potential, soil and land-use in the proposed THM is characterised.</li> </ul>	<p>A Terrestrial Biodiversity Assessment was undertaken and a list of alien floral species recorded in the proposed THM, including an indication of the weeds and invader species categories in terms of CARA was compiled.</p> <p>The region is characterised by red aeolian sand and surface calcrete, and deep sandy soils of Hutton and Clovelly soil forms. Land types are mainly Ah and Ae, with some Ag. The deep aeolian Kalahari sands are underlain by hardpan calcretes of the Mokalanen Formation (Kalahari Group). The deep sand reaches high temperatures during the summer months and has poor water retention. Soils generally have a high base status with a clay composition usually &lt;15%. The soils are therefore shallow and of low agricultural potential and have rock, calcrete or weathered rock underlying material. As the proposed THM is situated within a historically mined area, grazing is also not a compatible land use as animals are likely to be injured and the area is not considered to be feasible or compatible with agriculture.</p> <p>The EMPr commits THM to appropriate topsoil/soil conservation and regular control of weeds and invader species.</p>
The <b>National Forests Act (No. 84 of 1998)</b> is enabling legislation providing for sustainable forest use and management and provides special measures to protect trees and forests by prohibiting the destruction of natural forests, protecting areas and individual tree species and further providing measures to control and remedy deforestation. The Department of Forestry, Fisheries and the	<p>Refer to:</p> <ul style="list-style-type: none"> <li>Section 3. G) iv) where the current biodiversity</li> </ul>	A Terrestrial Biodiversity Assessment was conducted and no indigenous forests occur in the proposed THM. Protected tree species in terms of the National Forests Act (Act No. 84 of 1998) that

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<p>Environment (DFFE) are the custodians of the National Forests Act. No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister of the DFFE to an applicant and subject to such period and conditions as may be stipulated.</p> <p>An updated list of protected tree species was published under section 12(1) (d) of the National Forests Act (Act No. 84 of 1998) on 6 December 2019.</p>	<p>in the proposed THM is characterised.</p> <ul style="list-style-type: none"> <li>• Commitments in the EMPr (Part B of this document)</li> </ul>	<p>have been recorded with the proposed THM during the field assessment are <i>Vachellia erioloba</i> (Camel thorn) and <i>V. haematoxylon</i> (Grey camel thorn). <i>Boscia albitrunca</i> (Shepherd's tree), although known from the region, was not recorded; this does not however exclude its presence from the proposed THM.</p>
<p><b>The Northern Cape Nature Conservation Act (No. 9 of 2009) (NCNCA)</b> provides for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province.</p> <p>The Act also lists invasive species in Schedule 6, Especially Protected plant and animal species in Schedule 1, Protected plant and animal species in Schedule 2 and common plant and animal species in Schedule 3. A permit is required to undertake restricted activities involving species listed in Schedule 1 and 2 which include hunting, importing, exporting, transporting, keeping, possessing (unless occurring naturally), breeding or trading in with respect to animal species listed and picking, importing, exporting, transporting, possessing (unless occurring naturally), cultivating and trading in with respect to plant species listed. A permit would therefore be required from the Northern Cape Department of Environmental Affairs and Nature Conservation (NC DENC) to destroy, remove or relocate any provincially listed Specially Protected or Protected species from the site.</p>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>• Section 3. G) iv) where the baseline conditions are described</li> <li>• Terrestrial Biodiversity Impact Assessment Report in Appendix 14</li> <li>• Commitments in the EMPr</li> </ul>	<p>A Terrestrial Biodiversity Assessment was undertaken. Provincially protected floral species in terms of the NCNCA recorded within the proposed THM are the Schedule 1 species <i>Harpagophytum procumbens</i>, and the Schedule 2 species <i>Plinthus sericeus</i>, <i>Ammocharis coranica</i>, <i>Boophone disticha</i>, <i>Crinum</i> sp., <i>Orphanthera jasmiflora</i>, <i>Albuca seineri</i> (= <i>Ornithogalum seineri</i>), <i>Albuca setosa</i> (= <i>Ornithogalum setosum</i>).</p>
<p><b>The Northern Cape Conservation Plan (C-Plan; 2016)</b> identifies biodiversity priority areas, namely Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of a landscape as a whole.</p> <p>CBAs are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan, while ESAs are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBAs and/or in delivering ecosystem services. The primary purpose of a map of CBA and ESAs maps is to guide decision-making about where best to locate development and to encourage appropriate land uses that are compatible with the desired state of CBAs and ESAs. It should inform land-use planning, environmental assessment and authorisations, and natural resource management, by a</p>		<p>The proposed THM is not associated with CBA or ESA sites, and is mostly located within previously modified areas. Limited portions of natural habitat are indicated to remain along existing haul roads within the opencast void and along the access road in the east, with these areas designated as Other Natural Area (ONAs). ONAs are defined as natural or semi-natural areas that are not required to meet biodiversity targets or support natural ecological processes. The desired state of ONAs is best determined through multi-sectoral planning processes and from a</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes.		biodiversity perspective, these areas can be used for a range of intensive land uses.
<p><b>The Northern Cape Province 2018 Spatial Development Framework (PSDF) Review</b> was commissioned by the Office of the Premier, Northern Cape Province. Key requirements of the PSDF review included:</p> <ul style="list-style-type: none"> <li>• consistency with the PGDP, NDP and National Spatial Development Framework (NSDF) (representation of key national and provincial strategies, policies and plans);</li> <li>• application of the Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) principles;</li> <li>• review and update of the Northern Cape Socio Economic Potential of Towns Study completed in 2011 towards the development of the 2012 PSDF document;</li> <li>• promotion of Sectoral involvement in the development of the reviewed PSDF;</li> <li>• update and review of the Implementation Framework, as proposed in the 2012 PSDF;</li> <li>• evaluation of the current PSDF, looking at core challenges and recommendations;</li> <li>• coordination of Municipal Spatial Development Frameworks;</li> <li>• update, review and improve data (spatial and non-spatial) used for the 2012 PSDF;</li> <li>• verify or update desired and undesired land use patterns;</li> <li>• assess and update current strategy(ies) of the 2012 PSDF;</li> <li>• identify and/or update issues deemed to be of provincial, regional and national interest together with strategic interventions; and</li> <li>• addressing the issue of spatial governance.</li> </ul> <p>The THM falls within the Joe Morolong Local Municipality and the Magisterial District of John Taolo Gaetsewe. Kuruman is the administrative capital of the John Taolo Gaetsewe District Municipality and this area is referred to as the Kalahari 'macro-region'. The Gamagara corridor comprises the mining belt of the John Taolo Gaetsewe and Siyanda districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron ore and manganese.</p>	This has been taken into consideration in determining the need and desirability of the project, refer to Section 3. f).	<p>From the PSDF Composite Spatial Vision, the THM falls within an area classified as the Gamagara corridor, a mining belt focussing on the mining of manganese and iron.</p> <p>Based on GIS data, the land use and land cover of the proposed THM is mining or mining related infrastructure including mines and mining buildings over majority of the land. Other pockets comprise of bare non-vegetated land, grassland, low shrubland and thickets/bush.</p>
<p><b>The Integrated Development Plan (IDP) of the John Taolo Gaetsewe District Municipality (JTGD) (2019/2020) and the draft IDP of the Joe Morolong Local Municipality (JMLM) (2020/2021)</b></p> <p>JTGD development priorities are 1. Water &amp; Sanitation 2. Roads &amp; Transport 3. Local economic development 4. Land development and reform 5. Integrated human settlements 6. Sustainable</p>	<p>Refer to:</p> <ul style="list-style-type: none"> <li>• Social baseline in Section 3. G) iv).</li> <li>• This has also been taken into consideration in</li> </ul>	The IDPs have been taken into account in determining the need and desirability of the project and in the formulation of the SLP.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>Development Orientated Municipality 7. Environmental management and conservation and climate change management 8. Promotion of health in the District and 9. Disaster management.</p> <p>The JMLM IDP includes Key Performance Areas (KPAs) for the wards and for the municipality which cover 1) Basic Service Delivery and Infrastructure Development, 2) Good Governance and Public participation, 3) Municipal Transformation and Organizational Development, 4) Local Economic Development (LED), and 5) Municipal Finances and Financial Viability. The IDP identifies the following issues as significant challenges for the JMLM:</p> <ul style="list-style-type: none"> <li>• Service delivery backlog challenges</li> <li>• Maintenance of aging infrastructure</li> <li>• Poverty</li> <li>• Unemployment and low economic growth</li> <li>• Rural Development and support to vulnerable groups</li> </ul>	<p>determining of the need and desirability of the project, refer to Section 3. f)</p>	

## **f) 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)*

This Section has been prepared in accordance with the 2017 DFFE Integrated Environmental Management Guideline on Need and Desirability.

South Africa's Constitution guarantees all its citizens the right to an environment that is not harmful to their health and/or wellbeing; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation. The Constitutional obligations of the State to protect the environment with respect to new developments can only be met through the implementation, enforcement and monitoring of effective legislation. In order to protect the environment and ensure that the proposed project is undertaken in an environmentally responsible manner, the relevant national and local legislation, policies and guidelines were reviewed and incorporated into the Scoping Report and EIAR.

In terms of securing ecological sustainable development and use of natural resources the impact of the proposed project on the biophysical and social environment has been considered in this EIAR. The current biodiversity and cultural heritage of the proposed THM is characterised in Section 3 g) iv) and includes a description of the Habitat Units and Environmental Sensitivity, SCC, Protected and NEMBA Threatened or Protected Species and Endemic Species, Alien and Invasive Floral Species and Ecological Drivers and Processes. Table 20 details the potential impacts that have been identified and the proposed mitigation measures.

The aim of the THM is to extract remaining resources which were not previously exploited at the historic HMM, thereby extracting minerals whilst limiting the creation of potential new impacts. Prospecting activities have also confirmed suitable mineralisation including a mix of high-grade ore and lower grades which can be economically and feasibly mined. The project has a long life (~30 years).

The proposed THM is located in an area where there is limited natural vegetation due to the historical mining activities that were undertaken. The proposed THM contains mining and mining related infrastructure over the majority of the area. The surrounding area is characterized by mining. Mining is not considered an environmentally sustainable land development practice, however the footprint of the THM is also limited to the footprint of the MR area and as far as possible the surface infrastructure will be placed on the already disturbed areas and away from the orezone, so as not to sterilise the resource. The proposed THM is not located within or within 10 km of any formally protected areas such as nature reserves, Ramsar Sites or other conservation areas. The closest protected areas are located further than 40 km from the proposed THM. The closest NPAES Focus Area (the Eastern Kalahari NPAES Focus Area) is located approximately 18 km to the northwest and west of the proposed THM. The proposed THM is not associated with CBA or ESA sites, and is mostly located within previously modified areas. Other pockets comprise of bare non-vegetated land, grassland, low shrubland and thickets/ bush. From the Northern Cape PSDF, the THM falls within an area defined as the Gamagara Corridor, an area comprising the mining belt of the John Taolo Gaetsewe and the Siyanda districts. It runs from Lime Acres and Danielskuil to Hotazel in the north and focuses on the mining of iron and manganese. According to the industrial areas spatial vision, proposed THM is located within industrial areas and in close proximity to mining focus areas. Access to the area is good, consisting

of paved main roads and secondary gravel roads. The proposed THM boundaries are within previously disturbed (mined) land and do not coincide with-, nor are within close proximity to any sensitive environmental features, therefore, limiting the potential for negative environmental impacts. Mining in the area will assist in alleviating unemployment. Poverty alleviation in the area is needed as the official unemployment rate of the District Municipality is 29.7%, and the youth unemployment rate is 37.2%. Mining activities would further allow for the proper and beneficial rehabilitation of areas previously affected by mining activities which have not been rehabilitated to reflect the surrounding land-use or a suitable alternative. Alternatives considered are described in detail in Section 3 g) i).

Currently there are no other developments planned for within the proposed THM area. The existing Hotazel waste site (G:S:B- , Permit No.: B33/2/441/20/P156, licence date 20 February 1995) is located within the proposed THM. The waste site is owned by South 32 – HMM and operated by the municipality. The waste site is nearing its end-of-life usage, thus at this stage, only the general waste from Hotazel Town and from South 32 – HMM is permitted for disposal. Apart from the town of Hotazel, the area immediately surrounding the proposed THM is unpopulated and undeveloped. There is a proposed solar farm located adjacent to the THM, called the Hotazel and Hotazel 2 Solar facility, to be located on the remaining extent (Portion 0) of the farm York A 279, and associated infrastructure on Portion 11 of farm York A 279, Remaining extent of Portion 3 of the farm York 279 and the Remaining extent (Portion 0) of the farm Hotazel 280.

Non-renewable resources which will be utilised for the project include water and electricity. All potable water will be supplied through the Vaal Gamagara water scheme via a bulk water meter, managed by Sedibeng Water. The mine will use electricity sourced from Eskom, diesel operated equipment and solar and diesel generators as an alternate supply source. Service water will be pumped from the pit water. Mitigation measures will be put in place to minimise water contamination. Soil is also considered a non-renewable resource. The soils in the area are shallow, limited natural soil resources remain on-site and the overall soil quality is considered poor and of low agricultural potential. However where topsoil is present it will be stockpiled during construction and will be utilised during the rehabilitation process.

Independent specialists were appointed to identify and assess potential positive and negative impacts, including cumulative impacts, of the project. In terms of the gaps, uncertainties and assumptions, these are addressed to some extent in the specialist studies conducted (refer to various appendices and Section 3 o)) *Description of any assumptions, uncertainties and gaps in knowledge*). The level of risk associated with the limits of current knowledge include that the quantification of potential impacts in terms of air quality, groundwater, blasting and noise have been determined by modelling the impacts. Due to palaeontological and archaeological sites being subterranean in essence, it is possible that all sites may not have been identified. Blasting impacts and levels of influence are calculated using standard accepted methodology according to international and local regulations, however due to the locality of the mine's opencast pit, careful management and control of blast preparation and blasting is necessary to mitigate any risks. The negative environmental impacts will be contained as far as possible to within the surface infrastructure footprint. The project will generate nuisance noise, fine particulates (dust), traffic impacts, and will potentially impact on groundwater resources – all outside of the infrastructure footprint. Mitigation measures to address the impacts are included in the EMP.

It is anticipated that the project may result in an improved environmental condition at closure if the recommended rehabilitation measures be implemented, as the proposed THM is currently considered



significantly impacted by historical mining activities with vegetation not being representative of the natural indigenous vegetation. If the mine were to improve the environment through rehabilitation measures and the removal of invasive species it could potentially improve the functioning of the ecosystems and reinstate indigenous and healthy environments that would be of benefit to the surrounding communities from an ecosystem services and beneficial / suitable end land-use perspective. The rehabilitation of the currently disturbed area would also improve the safety of the area, for both livestock and people. Section 28 of NEMA relates to the duty of care and remediation of environmental damage and states that anyone who causes, has caused or may cause significant pollution or degradation of the environment is strictly liable and must take reasonable measures to prevent the pollution or degradation from occurring, continuing or recurring. As per the NEMA Regulations on Financial Provisioning (GN1147 of 2015) the sum of the financial provision has been calculated and included in this EIAR/ EMPr. The financial provision for the **final rehabilitation, decommissioning and closure** of the THM has been calculated to be **R 35 947 195** (incl. P&Gs + contingencies). The financial provision for the residual environmental impacts is calculated as **R 5 959 845** (incl. P&Gs + contingencies). The total financial provision for the THM, is therefore **R 48 193 096** (incl. VAT, value as per date of assessment – 2021) (refer to Appendix 22 for the Closure Plan).

In terms of promoting justifiable economic and social development the current socio-economic context of the proposed THM is characterised in Section 3 g) iv) and includes a description of the provincial, regional and local context and the receiving socio-economic environment. The latest IDP of the JTGD and the JMLM and associated LED strategies were also consulted in characterising the socio-economic context of the area. No Environmental Management Frameworks relevant to the area were found. The public participation process followed meets the requirements of Chapter 6 of the NEMA EIA Regulations, (GNR982 of 2014 as amended in 2017) as described in Section 3 g) ii).

THM is committed to making changes that contribute positively to social and economic development, poverty eradication and community upliftment in surrounding communities. The overall aim of the SLP and LED projects is to provide provision for skills development and infrastructure improvement for community members.

The THM SLP makes provision for the following proposed LED initiatives:

- Enterprise Development
- Refurbishment of Rural Village Infrastructure
- Water Infrastructure Development

As per the SLP, the focus of the Tawana will be on local recruitment of the workforce within the local labour sending areas and that employees should have the opportunity to live with their families in a sustainable social environment and have the opportunity to participate in wealth accumulation through ownership of property. Tawana will employ approximately 73 people during construction and approximately 177 people (inclusive of outsourced service providers) will be employed during operations. The bulk of these positions will consist of semi-skilled labour. Once the mine is operational, the employment of a local workforce will translate into more individuals being impacted through direct and indirect income. Tawana will therefore promote the importance and benefits of home ownership by educating employees regarding living budgets, housing options, accessing government housing loans and subsidies; and will review current financial status of employees interested in home ownership and assess, together with the employee, what steps could be taken in order for the employee to be able to participate in the home ownership arena.

Globally, Asia is the largest market for Manganese Lumpy and Fines Ore and South African Manganese producers, such as Tawana Hotazel Mining are well placed as suppliers to this market. The principal end-use for manganese ore, after conversion to either silico-manganese or ferro-manganese alloys, is a critical input to the global steel manufacturing industry, which produced approximately 1.7 billion tonnes (Bt) of raw steel in 2019, up by 3.4% compared to 2018 (World Steel Association, 2020). China (996Mt), India (111Mt), Japan (99Mt), and the United States (88Mt) represent the top four steel producing countries in 2019, contributing some 76% to current global steel production, (World Steel Association, 2020). It is noteworthy that this level of steel production represents only 80% utilisation of the installed 2.4Bt of global steel production capacity, arising from the last two decades of unprecedented steel production capacity expansion in Asia.

While the bulk of the world's manganese alloy is produced in China and India, in support of their domestic steel production capacity, China's diminishing primary manganese ore supply is typically of low grade and is insufficient to meet domestic demand, while India relies on imported manganese ore feedstock to augment constrained domestic ore sources. Japan and the United States have no domestic manganese ore sources. Subordinate applications for manganese include use in speciality alloys, batteries and chemicals.

Manganese ore is not exchange traded, and prices are largely determined by supply and demand dynamics linked to the global steel industry production levels. Manganese ore is priced in US\$/ Dry Metric Tonne Unit (dmtu), and consequently ore grade is directly reflected in the price per tonne of ore.

**g) 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)*

The THM is located in an area where there is limited natural vegetation due to the historical mining activities that were undertaken. The footprint of the THM is also limited to the footprint of the MR area and as far as possible the location of surface infrastructure was elected so as to be placed on already disturbed areas and away from the orezone, so as not to sterilise the resource. Other factors include the location of existing infrastructure such as the access roads and the municipal waste dump, proximity to surrounding sensitive receptors including the town of Hotazel and adjacent mining and solar activities, the remnants of historical infrastructure which may be utilised in future and the position of residual material dumps located within the MR area.

**i) Details of the development footprint alternatives considered**

*(With reference to the site plan 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/ the operational aspects of the activity; and*
- e) the option of not implementing the activity.)*

### a. Property/ Location

No alternative sites were assessed as the proposed location was selected based on the location of the MR area, surface access rights, as well as the location of the orezone within the property determined from the exploration results.

### b. Type of activity

The mining activity will comprise of opencast mining operations in the historical void and associated activities, including, blasting, loading, hauling and processing to extract the ore. Supporting surface infrastructure will be developed on site.

Underground mining methods were used in the past, however such methods of mining the ore body would no longer be economical and thus the opencast option is preferred.

### c. Design or layout

The design and layout prioritises compatible land-use, namely the existing void, which correlates with the location of the orezone within the property, the boundary of the MR area and the existing infrastructure on surface.

The chosen layout is also the most suitable in terms of fitting the required infrastructure within the boundary of the MR area while taking cognisance of surrounding sensitive receptors.

### d. Technology to be used in the activity / operational aspects

The proposed operation involves the use of existing infrastructure, mobile loading equipment and a mobile crushing and screening plant as far as possible in order to limit capital expenditure. Trade-off studies were undertaken for the following technological and operational aspects of the project:

Item	Alternative / Trade-off	Preferred option
<b>Electricity</b>	<ul style="list-style-type: none"> <li>Electrical power and/or diesel power for the plant and mine.</li> <li>Renewable energy solutions.</li> </ul>	<ul style="list-style-type: none"> <li>The plant and office infrastructure will be powered using electricity produced by Eskom.</li> <li>The mine currently plans to also operate with diesel powered equipment.</li> <li>Until such time as power infrastructure is installed on-site a mix of solar and diesel generators will be used as an alternate supply source.</li> </ul>
<b>Operation</b>	Owner-operated versus contractor-operated plant and mine	<p>The mine will be owner-operated aside from the following statutory key areas that will be outsourced:</p> <ul style="list-style-type: none"> <li>Occupational Health and Emergency Medical services</li> <li>Occupational Hygiene services</li> <li>Part time Rock Engineering and Geotechnical services</li> <li>Mine surveyor</li> <li>Blasting services</li> <li>Sampling</li> <li>Security</li> <li>Logistics</li> </ul>
<b>Bulk water supply and management of pit water</b>	<p>Solutions for impounded water within the historical mine void include:</p> <ul style="list-style-type: none"> <li>Re-use of water for service needs and dust suppression (high-cost of treatment for potable use vs Vaal Gamagara Regional Water Supply Scheme)</li> </ul>	<ul style="list-style-type: none"> <li>A forced-evaporation system will be used to remove water from the initial void during the pre-operational phase.</li> <li>Current plans are for impounded water in the historical void to be pumped to a lined PCD, to be used for dust suppression and service use on site.</li> <li>All potable water will be supplied through the Vaal Gamagara water scheme via a bulk water meter, managed by Sedibeng Water.</li> </ul>

Item	Alternative / Trade-off	Preferred option
	<ul style="list-style-type: none"> <li>Pumping full volume to service impoundment (limitations on space for impounding full volume, prohibitive cost of liner system)</li> <li>Options for water storage including use of stored water, or evaporation opportunities to minimise the size of the PCD required</li> </ul>	
<b>Sewage</b>	The option to access the nearby sewerage works from HMM for human waste generated on site versus installing a septic tank on site.	Sanitation from the mine will be piped to a septic tank which will be located on the eastern side of the offices. This septic tank will have a capacity of a minimum two weeks before it is filled-up. Design drawings are to be submitted to the municipality for approval prior to start of construction. Similar to the water supply, sanitation infrastructure will only be connected to the office block.
<b>Blasting</b>	Alternative blasting parameters (fragmentation optimisation, noise, vibration etc influencing hole size, explosive types and drilling equipment).	<ul style="list-style-type: none"> <li>The blast designs selected aim to achieve productive blasting while achieving the environmental controls that are needed for mining safely at the proposed THM.</li> <li>The blast designs (including timing and stemming requirements) will take the rock type descriptions, mining methods including planned bench height and hole diameter and the distribution of sensitive receptors surrounding the mine into account.</li> <li>The following limits will be applied: <ul style="list-style-type: none"> <li><b>Ground vibration:</b> Review of the type of structures that are found within the possible influence zone of the proposed mining area and the limitations that may be applicable, different limiting levels of ground vibration will be required. This is due to the typical structures and installations observed surrounding the site and location of the project area. Structure types and qualities vary greatly, and this calls for limits to be considered as follows: maximum peak particle velocity (PPV) of 6 mm/s, 12.5 mm/s levels and 25 mm/s.</li> <li><b>Air blast:</b> Shall not exceed 134 dB at point of concern but 120 dB preferred.</li> <li><b>Maximum fly rock range:</b> Limiting fly rock to within a maximum risk range of 291 m.</li> </ul> </li> </ul>
<b>Ore and processing</b>	Wet versus dry processing plant / beneficiation process.	Due to the scarcity of water in the area, a dry processing plant was selected as the preferred option.
	Grade and size optimisation versus value	The product split will be: <ul style="list-style-type: none"> <li>Lumpy (-75+6mm) – 80%</li> <li>Fines (-6 mm) – 17%</li> <li>Other - 3%</li> </ul>
	Permanent/ fixed location crushing and screening plant versus mobile crushing and screening plant and mobile loading equipment.	<ul style="list-style-type: none"> <li>The capital expenditure required for a mobile plant was found to be less.</li> <li>Due to the need to mine high-grade ore in the pit and mix with the lower grade material from the lower benches of the pit, the loading equipment needs to be mobile.</li> </ul>
<b>Transportation of ore off site</b>	Road trucks versus rail.	<ul style="list-style-type: none"> <li>Transportation of ore by road was elected because the rail capacity is currently constrained. Transnet will only be in a position to place trains at Hotazel from April 2023.</li> </ul>
<b>Municipal waste dump</b>	Moving of the municipal waste dump, versus alternative	<ul style="list-style-type: none"> <li>The municipal waste dump is owned by South 32 and operated by the municipality</li> </ul>

Item	Alternative / Trade-off	Preferred option
	entrance versus replacement with a waste-to-energy plant versus.	<ul style="list-style-type: none"> <li>• The dump is nearing its end of life usage and currently only accepts general waste from Hotazel Town and from South 32. Informal discussions are underway to look at other alternatives/ options to deal with waste.</li> <li>• Surrounding mines are sending general waste to Kuruman.</li> </ul> <p>The municipal waste dump will remain in place until its end of life due to factors regarding closure- and rehabilitation of the existing site, identifying a suitable alternative location and cost / permitting aspects entailed in closure and rehabilitation of both old- and new sites.</p>

#### e. The “No-Go” Option

Should the proposed development of the THM not proceed, the associated positive socio-economic and environmental benefits identified will not be realised (i.e. those related to partaking within the regional developmental goals, upliftment within labour-sending areas, contribution of royalties and taxes, opportunities for the rehabilitation of historical workings), while the potential negative impacts (described elsewhere in this EIAR) will be avoided.

#### ii) Details of the Public Participation Process followed

*(Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land)*

The public participation process has been developed in accordance with the requirements of Chapter 6 of the NEMA EIA Regulations, GNR982 of 2014 (*as amended*) read with the requirements of Regulation 3(3) of GN527, 2004 (MPRDA Regulations) to conduct meaningful consultation with landowners, lawful occupiers, owners and occupiers of adjacent land, municipal councillor of the ward, organisation of ratepayers that represent the community in the area, municipality, organ of state having jurisdiction in respect of any aspect of the activity and other Interested and Affected Parties (IAPs).

Refer to the detailed Public Participation Plan attached as Appendix 6.1.

#### **Scoping phase public participation process**

The Scoping phase public commenting period ran from **10 August 2021 to 9 September 2021**.

#### **Registration of IAPs**

An IAP register was opened and representatives from the organs of state which have jurisdiction applicable to the THM were included. Any IAPs who submitted written comments or requested to register pursuant to the project announcement phase (see means described below), were added to the database (the complete IAP register will be included in the Final EIAR/EMPr submitted to the DMRE).

The IAP register will be maintained throughout the authorisation process.

#### **Written notification and consent**

Written notice, as required by NEMA Regulations Section 41(2)(b), was provided to the following recipients:

- Lawful occupant / landowner on the site over which the application has been submitted.
- Land owners, lawful occupiers and persons in control of land adjacent to the site.
- The municipality and municipal councillor of the ward in which the site is situated.
- Organs of state having jurisdiction in respect of any aspect of the activity.
- Any other parties identified by the Competent Authority as requiring notification.

In terms of Section 41(2)(b) of the NEMA Regulations, notices were provided to the above-mentioned parties via email and, where applicable by registered mail and / or by hand.

The current landowner of the farm portions subject to the MRA was provided with written notification of the project on 30 July 2021.

### **Media notice**

Media notices (in English) were published in the Noordkaap Bulletin on 5 August 2021 and the Kathu Gazette on 7 August 2021. The media notice was prepared in accordance with Section 41(2)(c) of the NEMA EIA Regulations for the purposes of announcing the project, identifying IAPs and inviting IAPs to register on the database of IAPs, during the Scoping phase of the process. The notice announced the project and indicated that Scoping and Environmental Impact Reporting processes are being undertaken in terms of NEMA, and indicated: the nature and location of the activity to which the application relates, the process to be followed to register as an IAP and otherwise make representations regarding the proposed application, locations where the Scoping Report was available for review, and contact details of the EAP from whom more information can be obtained. The timeframe for the public commenting periods and deadlines for submission of comments was clearly indicated (refer to Appendix 6.2).

### **Site notices**

Site notices were displayed on-site and at conspicuous locations within the surrounding communities during the Scoping phase of the project. The site notice was prepared in accordance with Section 41(3) of the NEMA EIA Regulations and provided a brief project description, that Scoping and Environmental Impact Reporting processes are being undertaken in terms of NEMA (and other applicable legislative requirements), the nature and location of the activity to which the application relates, the process to be followed to register as an IAP and otherwise make representations regarding the proposed application, locations where the Scoping Report was available for review, and contact details of the EAP from whom more information can be obtained. The timeframes for the public commenting periods and deadlines for submission of comments was clearly indicated (refer to Appendix 6.3).

### **Background Information Document (BID)**

The BID is a non-technical document which provides a brief description of the project, the nature and location thereof, potential impacts being investigated, the legislated environmental process, availability of the reports for review, the process to follow to register as an IAP, and contact details for queries and to whom representations can be made.

The BID was provided to State Departments and IAPs via email on 10 August 2021, and to surrounding residents in Hotazel by hand on 10 August 2021 (refer to Appendix 6.4).

### **Provision of reports and documents**

The Scoping Report and any other relevant document ("information containing all relevant facts in respect of the application") for review and comment by IAPs, stakeholders and the relevant State Departments was provided digitally, where possible, directly via email or, via an email containing a link to a download platform (on the Prime Resources website: [www.resources.co.za](http://www.resources.co.za)) during the 30-day commenting period. A hard copy of the Scoping Report was placed at the Hotazel Public Library. Refer to Appendix 6.5 for proof of distribution of the draft Scoping Report and Appendix 6.6 for copies of the comments received and responded to during the Scoping Phase public participation.

### **Meetings**

A pre-application consultation meeting was held with the DWS on 9 September 2021 as part of the WULA process (refer to Appendix 6.7 for minutes of the meeting).

### **EIA phase public participation process**

The EIA phase public commenting period will run from **10 January 2022 – 9 February 2022**.

### **Availability of draft EIAR and EMPr**

The EIAR and EMPr and any other relevant document ("information containing all relevant facts in respect of the application") for review and comment by **registered** IAPs, stakeholders and the relevant State Departments was provided digitally, where possible, directly via email or, via an email containing a link to a download platform (on the Prime Resources website: [www.resources.co.za](http://www.resources.co.za)) during the 30-day commenting period.

### **Feedback BID**

The BID was updated to summarise the questions and comments raised during the Scoping Phase, and to provide feedback on potential impacts and recommended mitigation measures, as per the EIAR / EMPr. The BID was made available to **registered** State Departments and IAPs via email on 10 January 2022, and was provided to any registered IAPs on request. Refer to Appendix 6.8.

### **Comments and Responses Report**

A Comments and Responses Report (CRR) table was prepared, containing all comments received and responded to and any other representations made to date (refer to Section 3.g) iii), Table 1 below). The CRR will be updated following the 30-day EIA phase commenting period, incorporating all comments received (and responses thereto) which will be included in the Final EIAR to be submitted to the DMRE. The Final EIAR and EMPr will be submitted to the DMRE by **11 February 2022**.

The CRR and IAP database may only be disclosed to the Competent Authority in accordance with the Protection of Personal Information Act, No. of 2013 (POPI Act). In order to fulfil the requirements for meaningful public consultation in terms of the MPRDA, NEMA and the EIA Regulations, Prime Resources is required to process the personal information (as defined in the POPI Act) of IAPs and relevant stakeholders. Such personal information may include full names, addresses, designations and any comments or representations. This data will be captured either through wilful disclosure by IAPs and stakeholder, or, where necessary, from data published on the internet (for example on Departmental Websites). This data will be retained on the IAP database for the duration of the Environmental Authorisation application process- and, if awarded, the duration of any Environmental Authorisation awarded, after which it will be destroyed.

In order to uphold the interests of IAPs and stakeholders, certain elements of the data processed will be disclosed in the reports produced by the EAP, however, full names, designations and contact information will only be disclosed to the Competent Authority.



**iii) Summary of issues raised by IAPs**

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

The table below contains all comments raised by IAPs to date, including those raised during the Scoping phase. The table will be updated with comments received during the EIA phase consultation process.

**Table 1: Comments and Responses Report (CRR)**

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS						
<b>Landowner/s and lawful occupier/s of the land where the activity will take place</b>											
South 32 (Hotazel Manganese Mines Pty Ltd)	Notified by email (10 August 2021)	12 August 2021 (Email)	We acknowledge receipt of the email below and attached regarding the subject matter. It has been circulated to internal stakeholders as requested in the email below. I will also peruse the attached documents and tender my comments before the due date.	(PR responded on 13 August 2021). Thank you for your responses and for circulating the documents to the relevant internal stakeholders. We have updated our IAP database to remove Dennis and have included the various additional stakeholders as per your emails. We await the comments from your team.							
		9 September 2021 (Email)	Please receive our comments on your scoping report, as stated below. Spreadsheet document has all comments but I included your report where comments were made for clarity.	(PR responded on 9 September 2021). Thank you for your email, we hereby acknowledge receipt of your comments. Your comments and concerns raised will be incorporated into the final Scoping Report to be submitted to the DMRE and will also be addressed within the	Specific requests, comment and concerns from South 32 (Hotazel Manganese Mines Pty Ltd) have been addressed in this EIAR/EMPr as described below.  Refer to Figure 30 for the location of the proposed and historical mine infrastructure in relation to the MR area.						
		<table border="1"> <thead> <tr> <th>Theme</th> <th>Issue</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Old mine infrastructure</td> <td>Surface dumps of low-grade material</td> <td>What exactly is within their MR? identify exact coordinates</td> </tr> <tr> <td></td> <td>Mothballed processing plant</td> <td>Where is it located exactly within their MR?</td> </tr> </tbody> </table>	Theme	Issue	Comments	Old mine infrastructure	Surface dumps of low-grade material	What exactly is within their MR? identify exact coordinates		Mothballed processing plant	Where is it located exactly within their MR?
Theme	Issue	Comments									
Old mine infrastructure	Surface dumps of low-grade material	What exactly is within their MR? identify exact coordinates									
	Mothballed processing plant	Where is it located exactly within their MR?									

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED		(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
			Proposed Mine layout infrastructure	Weighbridge is not a listed activity but it will be nice to see its position as it is excluded from the mine layout plan provided Infrastructure seem to be proposed on top existing topsoil dump, is Tawana planning to relocate the dump and to where?	EIA, to be made available at a later stage for your further review.	Refer to Figure 4 for the proposed mine layout including the location of the weighbridge.  The existing topsoil dump will not be relocated and will form part of the soil stockpile.
		Access roads and Traffic	1. Heavy vehicles route connection to DR3463 closed with the sand heap 2. Upgrade and expansion of the farm gravel road 3. R31 and DR3463	Removal of vegetation and trees for widening of access road- is there an offsetting strategy for protected species  Intersection is curving and poses high vehicles accidents in particular to road trucks that will be coming from mine site for the transportation of ore to Lohatla. Is Tawana looking into impact of traffic on big intersection?		Refer to Table 27 where the Environmental Management Programme for Biodiversity is described including the management of protected species.  Refer to Table 20 and Appendix 19 for the access roads and traffic impacts and Traffic Impact Assessment specialist study.
			Light vehicles R31 intersection to Boardman road Hotazel	Currently high vehicle accident area and increase of vehicles intersecting during peak hours. Traffic impact?		
			Noise	Project will generate nuisance noise (Blasting and mobile crushing and		Hotazel town is fully occupied by mine workers and others working

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED			(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
				screening, Operational traffic, Product loading / hauling). mine and plant will operate on a continuous basis, with 330 working days per annum.	shifts and the noise from mining activities will have an impact on their sleeping patterns and fatigue recovery.		<p>result in disturbance or complaints. However, due to low baseline night-time noise levels, night-time activities at THM could have a significant impact on environmental noise levels at Hotazel town during the night (22:00 to 06:00). The increase in noise levels in a large portion of Hotazel town may exceed the 3-dBA limit and complaints are expected. The increase in noise levels at receptors outside Hotazel town will be slight or mostly undetectable and complaints are not expected.</p> <p>Refer to Table 20 and Appendix 11 for the noise impacts and Noise Impact Assessment specialist study.</p>
			Blasting	<p>Blasting damage from ground vibration, air blast and fly rock. Committed blasting limitations</p> <p>ground vibration- max of peak particulate velocity of 6mm/s to the closest house</p> <p>Fly rock range- within a range of 300m radius</p> <p>Lesser sensitive or medium sensitivity is the 500 m to 1500 m reference area. The 1500m radius is considered as a range where influence</p>	<p>Compensation strategy for possible building damages and injuries from fly rock</p> <p>How far is the closest house from a closest blasting block?</p> <p>How will it be monitored?</p> <p>What will be a blasting impact on Provest plant close to mine workings?</p>		<p>Refer to Table 20 and Appendix 17 for the blasting impacts and Blasting Impact Assessment specialist study.</p> <p>The nearest house to the pit area is 658 m. Recommendations are made for ground vibration, air blast and video monitoring using seismographs and video camera. The use of drone footage may also be considered.</p> <p>The drill and blast parameters set to be used do show expected vibrations of 6.6 mm/s at closest structure at 417 m.</p>

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED			(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
				may be less but still requires active monitoring.			
			Ore and processing	Due to the scarcity of water in the area, a dry processing plant was selected as the preferred option.	Will it not create more dust to nearby community?		<p>The emissions from these sources as well as other sources were quantified. The dispersion model setup included all sources with and without design mitigation applied. Both source group and all operations were outputs of the model to determine the sources that required additional mitigation. The unpaved haul roads, especially in-pit and the waste stockpile roads had an overwhelming contribution to exceedances of the NAAQS, excluding the other sources the exceedance areas for the roads were similar to those for all sources.</p> <p>Mitigation measures will include watering on in-pit and waste stockpiles unpaved roads, water sprays with chemicals on haul roads and access roads and water sprays at the crusher and screen.</p> <p>Indoor air quality sampling/monitoring has not been undertaken but two short fine particulate matter sampling campaigns were undertaken at two areas in Hotazel town using passive particulate matter samplers which is a very cost-effective method of sampling multiple size fractions of fine particulate matter as well as for</p>
			Dust	Dust generation from the following activities: 1. blasting 2. hauling roads 3. crushing and screening 4. Fines and stockpile area	What other controls are being considered other than suppression on hauling roads?  Positioning location of product stockpiles and fines vs community houses direction?  Dust exposure surveys within households to understand level of exposure and establishment of dust monitoring station to monitor PM10 due to sensitive receptors?		

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED			(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
							<p>source apportionment. Four months of dustfall sampling was also undertaken at four sites with two sites being in Hotazel town.</p> <p>Refer to Table 20 and Appendix 7 for the air quality impacts and Air Quality Impact Assessment specialist study.</p> <p>Refer to the Monitoring Programmes, EMPr Part B 1 i).</p> <p>South 32 will have to cease using the landfill when its end of life is reached.</p> <p>Refer to Table 27 where the Environmental Management Programme for Biodiversity is described including the following  - A pre-construction inspection must be conducted prior to the removal of the water within the open void and the construction of the mine to confirm the Verreaux's Eagle nest status. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds</p>
			Landfill area	Further expansion of pit			
				The municipal waste dump will remain in place due to factors regarding closure- and rehabilitation of the existing site, identifying a suitable alternative location and cost / permitting aspects entailed in closure and rehabilitation of both old- and new sites	When will S32 have to cease using landfill?		
			Avifauna	It is likely the disturbance associated with the noise of the drilling equipment and the vehicle and pedestrian traffic at the prospecting site, may have temporarily displaced the eagles from the nest and the immediate area.	If it happens that during project execution phase an eagle is seen, how will it be captured and relocated?		

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							<p>of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick and/or eggs.</p> <p>Refer to the Appendix 15 for the Avifaunal Impact Assessment specialist study.</p>
			Electricity Supply	Mine reticulation will be provided at 11 kV from the Hotazel substation.	Capacity? Impact on Hotazel town? What are the time lines for the application approval and infrastructure installation with Eskom		Eskom has indicated that they have capacity and an application for 4.0 mVA has been submitted. The entire processing plant will be diesel operated. Until such time as power infrastructure is installed on site a mix of solar and diesel generators will be used as an alternate supply source.
			Water	Potable water will be supplied through the Vaal Gamagara water scheme via a bulk water meter, managed by Sedibeng Water; 370 m <sup>3</sup> per day. Potable water to be used for processing plant and dust suppression Forced- water evaporation system to manage excess water	Potable water demand and supply impact on Hotazel operations and communities? It would be nice to see where the water pipeline from Gamagara will be joined, especially since there is infrastructure (Hotazel community) between open pit and pipeline.  Where will evaporators be positioned and how big are they?		<p>Refer to Table 20 and Appendix 12 for the surface water impacts and Surface Water Impact Assessment specialist study.</p> <p>Refer to Figure 4 for the proposed mine layout including the location of the water pipeline and evaporators.</p> <p>Sedibeng Water are responsible for the allocation of their water resources. It is assumed that if Sedibeng water approves the off-take agreement then they have done a capacity assessment with approvals accordingly. Sedibeng water should have supply agreements with their existing customers and should not allocate additional water to new customers that they cannot deliver.</p>

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					<p>Is any chance for them adding to noise?</p> <p>Excess water management through evaporation system- is it the best practical practice while there is water scarcity in the country and in the region?</p>		<p>Evaporator fans will be located below the pit perimeter. Forced evaporation will be limited to dewatering the existing water body in the pit and will not be used for operational pit water management. The noise levels expected from the pit dewatering, including the operation of the evaporators was modelled and the simulations indicate no exceedance of the IFC NLG at the noise receptors during the day. There may be exceedances of the IFC NLG at the noise receptors during the night.</p>
			Sewage treatment plant	Access to the nearby sewerage works will be sought from HMM for human waste generated on site.	What happens if capacity of current sewage does not allow? Any discussion with S32 with regards to possible sewage accessing?		<p>The option to access the nearby sewerage works from HMM for human waste generated on site was initially investigated, however sanitation from the mine will now be piped to a septic tank which will be located on the eastern side of the offices.</p>
			Impacts Identified	Potential impact - Blasting damage from ground vibration, air blast and fly rock.	<p>Vibration travels faster than noise and there is community next to the pit, why would its impact be minimal?</p> <p>Is there no chance of cracking sewage facility?</p>		<p>The nearest houses are 658 m from the pit. Expected levels of ground vibration is 3.1 mm/s. This is well within the general accepted safe limit of 12.5 mm/s applied.</p> <p>The sewage plant is located 728 m from the pit area. Expected vibration is 2.6 mm/s. It is well below reason concern of damage to the plant.</p>
				Tawana Hotazel Mine Groundwater Study Baseline Report	Can we have copy?		<p>The Groundwater Impact Assessment is attached as Appendix 13.</p>

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				compiled by Future Flow Groundwater and Project Management (February 2021)			
			Employment opportunities	Mine will employ approximately 177 people (inclusive of outsourced service providers).	Hotazel/Magobing/Magojaneng residents are the closest local community, how will they ensure local employment?		THM is to make use of local labour as far as possible in all stages and for all aspects of the project. This applies to all contractors during construction (added as a commitment in the EMP, refer to Table 36).
			Airstrip	Proposed THM is located within 8 km of the Hotazel Airstrip desktop analysis identified several existing structures within the 8 km of the aerodrome reference point which may be considered obstacles restricting the overhead movement of air traffic (including the processing plant, power lines, telecommunication tower, rail loadout facility railway structures)	What is mining impact? (blasting)?		The airstrip is located 2313 m from the pit area. There is no concern with regards to ground vibration, air blast or fly rock. Communication with the Hotazel airstrip must be established in terms of blasting and air traffic clearance.
			SLP	The THM SLP makes provision for the following proposed LED initiatives: <ul style="list-style-type: none"> <li>• Enterprise Development</li> <li>• Refurbishment of Rural Village</li> </ul>	Any opportunities for collaboration to be more impactful? Can we see plan and projects?		This can be discussed with THM and IAPs going forward.



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				Infrastructure • Water Infrastructure Development												
<b>Landowners or lawful occupiers on adjacent properties</b>																
ABO Wind Hotazel PV (Pty) Ltd Hotazel Solar Facility 2 (Pty) Ltd	Notified by email (10 August 2021)	10 August 2021 (Email)	I confirm receipt of the notification.		No response required.	Specific requests, comment and concerns from ABO Wind Hotazel PV (Pty) Ltd/ Hotazel Solar Facility 2 (Pty) Ltd are addressed in this EIAR/EMPr as described below.										
		9 September 2021 (Email)	Thank you for the notification regarding the availability of the Draft Scoping Report (DSR) for comment. This comment pertains to the potential adverse impacts that the abovementioned proposed mine could have on the Hotazel Solar PV facilities to the south/south-east of the site, for which two cadastral boundaries are shared. Kindly acknowledge receipt of this mail.  The proposed mine is indicated to be located a minimum of approximately 535m from the Hotazel Solar PV facilities, with the key mine components located nearby being the open-cast mining pits, in-pit dumps and the RoM pads. Activities at these areas could pose the following risks to the Hotazel Solar PV facilities: <ul style="list-style-type: none"> <li>• Damage to infrastructure as a result of vibrations, fly rock impact and/ explosions and fire; and</li> </ul>		(PR responded on 10 September 2021). Thank you for your email, we hereby acknowledge receipt of your comments.  Your comments and concerns raised will be incorporated into the final Scoping Report to be submitted to the DMRE and will also be addressed within the EIA, to be made available at a later stage for your further review.	There are no specific limits for solar installations. A conservative 25 mm/s vibration and air blast 134 dB as applied. These are similar for normal well build houses where people will reside. The nearest point between the pit area and the two solar farms are 758 m and 946 m. The expected levels of ground vibration and air blast expected are as follows: <table border="1"> <thead> <tr> <th>Facility</th> <th>Distance (m)</th> <th>PPV (mm/s)</th> <th>Air blast (dB)</th> </tr> </thead> <tbody> <tr> <td>Hotazel Solar Facility</td> <td>578</td> <td>3.8</td> <td>129.8</td> </tr> <tr> <td>Hotazel 2 Solar Facility</td> <td>946</td> <td>1.7</td> <td>126.7</td> </tr> </tbody> </table> These levels are well within accepted norms for safe blasting.	Facility	Distance (m)	PPV (mm/s)	Air blast (dB)	Hotazel Solar Facility	578	3.8	129.8	Hotazel 2 Solar Facility	946
Facility	Distance (m)	PPV (mm/s)	Air blast (dB)													
Hotazel Solar Facility	578	3.8	129.8													
Hotazel 2 Solar Facility	946	1.7	126.7													

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					Fly rock unsafe zone was calculated to 291 m. The solar facilities are located outside of this zone. However a general clearance zone of 500 m is normally applied by mines. It will however still be required by the blasting team to ensure that all is done not to create fly rock.
			<ul style="list-style-type: none"> <li>• Loss of/reduced power output by the PV panels as a result of dust and possible shading.</li> </ul>		<p>Larger particulate matter particles contributing to dustfall are deposited close to the source due to the higher mass limiting the time these particles remain suspended in the air (i.e., the deposition velocity for these particles is high).</p> <p>Dustfall rates/dust deposition at the solar facility would largely be from sources in the immediate vicinity of the mine such as windblown dust from open areas at and around the site.</p> <p>There is currently no legislation regarding maximum allowable dustfall rates from other industrial operations for solar facilities.</p> <p>There is limited literature on the impact of dustfall rates on the reduction in efficiency/power output reduction. It is known that settled dust on PV panels does reduce the efficiency due to soiling and the movement of large dust particles over panels could damage the panels also leading to a reduction in</p>

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					<p>efficiencies. There are currently no research findings determining exact percentage reductions per mg deposited on the panels and the dust deposition rates, although with the increase in use of PV panels for power generation on a commercial scale other facilities engineers have obliged to undertake research, but they are not obligated to conduct such investigations and thus these studies may not be undertaken. The potential of damage to panels also cannot be determined as the amount of windblown dust from the landscape in the immediate vicinity of the solar facility is extremely variable as the erosion potential (and dust quantity) is dependent on the wind speed, the amount of fine loose surface material that can be lifted by the wind, surface crusting, vegetation cover and features that could act as wind-breaks. Support vehicles associated with the solar facility travelling on-site and near site as well as the use of public roads especially those that are unpaved as well as the R31 would also have a significant impact on the solar facility.</p> <p>Dustfall sampling was undertaken as part of this project at the proposed location of the solar facility (D4) and the highest sampled pre-development dustfall rate at this site was 673 mg/m<sup>2</sup>-day. With the highest simulated</p>

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					dustfall rate of almost 95 mg/m <sup>2</sup> -day for unmitigated operations (49.9 mg/m <sup>2</sup> -day for mitigated operations) added to the highest sampled dustfall rate, the dustfall rate at the solar facility could be 768 mg/m <sup>2</sup> -day. Over time, the dustfall rates at the Solar Facility would continue to increase with increased use of public roads and the initiation/ramp-up of on-site (solar facility) support operations as the Solar Facility operations commence/expand.
			Therefore, the relevant aspects of the proposed mining activities can be divided into the following: <ul style="list-style-type: none"> <li>• Vibration;</li> <li>• Dust;</li> <li>• Shading;</li> <li>• Other Risks; and</li> <li>• Future Risks.</li> </ul>		See below.
			In terms of <b>vibration</b> , given that the Hotazel Solar PV facilities are within the 1500m "medium sensitivity" zone, please clarify the expected vibration anticipated at the property/ cadastral boundaries shared by the proposed mine and Hotazel Solar PV facilities. Furthermore, the vibration assessment must please explicitly confirm the risk of damage to the Hotazel solar facilities infrastructure as a result of vibrations caused by the proposed mine. Please also include the following specification in the Operational Environmental Management Programme (EMPr): Vibration monitoring must be done at various points (the siting of the points to be recommended by the relevant specialist) along the shared cadastral boundaries and the results of the monitoring are to be regularly provided to a representative of ABO Wind Hotazel PV (Pty) Ltd and/or Hotazel Solar Facility 2 (Pty) Ltd, or whichever entity is operating the Hotazel solar facilities (as per whatever is relevant at the time).		Part of the monitoring programme recommended includes two locations at closest point between the pit and the solar facilities. These points are intended to act as governing the ground vibration and air blast yielded by blasting. The monitoring positions are located such that it should be best location for strictest control. Any distance further will indicate lower levels.
			In terms of <b>dust</b> , please confirm the anticipated maximum height of stockpiles in RoM and in-pit waste dumps, as well as the maximum height of all structures on site (this would also		There will be 3 waste rock dumps with the following maximum heights:

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			<p>assist in providing relevant information in order to consider the potential for shading on the Hotazel Solar PV facilities). The air quality impact must please address the impact of dust on the Hotazel solar facilities, particularly detailing the anticipated average volumes of dust that would reach the facilities during each season with and without the application of mitigation measures by the mine. It is important that the specialist confirms any monthly or seasonal variation in anticipated dust volumes (noting that the specialist would need to consider <i>inter alia</i>, seasonal variation in wind, humidity, rain and mining operations).</p> <p>Please also include the following specification in the Operational Environmental Management Programme:</p> <ul style="list-style-type: none"> <li>Dust/air quality monitoring (specifically for dust) must be done at various points along the shared cadastral boundaries (the siting of the points to be recommended by the relevant specialist) and the results of the monitoring are to be regularly provided to a representative of ABO Wind Hotazel PV (Pty) Ltd and/or Hotazel Solar Facility 2 (Pty) Ltd, or whichever entity is operating the Hotazel solar facilities (as per whatever is relevant at the time).</li> </ul>		<ul style="list-style-type: none"> <li>Waste dump no.1 – 15 m above current surface</li> <li>Waste dump no.2 – level with current surface</li> <li>Waste dump no.3 – 30 m above current surface and to be developed on top of waste dump 2 once that dump reaches surface level</li> </ul> <p>There will also be a topsoil stockpile with an estimated height of 10 m and a sand stockpile with an estimated height of 20 m.</p> <p>Although there will be monthly and seasonal variability the highest (worst-case) predicted dustfall rates from a three-year simulation period from the THM operations have been discussed in the Air Quality Impact Assessment specialist study. If the solar facility has a ratio for efficiency reduction to dustfall rate that can be applied; then it is recommended that the simulated worst case dustfall rate for the THM (94.6 mg/m<sup>2</sup>-day, unmitigated operations) is applied to the entire area that the PV panels cover for all months of the year. The operators of the Solar Facility/Technical staff should remain cognisant that the effects (and uncertainty in the extent) of climate change makes a high level of detail regarding the future monthly and seasonal variations in the meteorological</p>

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					<p>conditions (including solar radiation and sunshine hours) for the area difficult to predict; as well as the future impacts and efficiency reductions from the nearby sources (especially windblown dust from open areas, vehicles travelling on public roads near the solar facility and internal service roads). As stated above, the sources that would have the greatest impact on the facility will be on-site or just beyond the facility boundary. The simulated dustfall rate for the second highest month at the solar facility location is 84.5 mg/m<sup>2</sup>-day (unmitigated operations) and 44.3 mg/m<sup>2</sup>-day when design mitigated measures are applied to the operations.</p> <p>A dustfall rates sampling network will be set up and it has been recommended that two units be located on the border of the solar facility. Progress reports will be reported to all IAPs affected by pollution and stakeholder forum/feedback meetings are to be scheduled and held at least on a bi-annual basis. A complaints register must be kept at all times. Regular (maximum of 5 years) review of the mitigation, management and monitoring procedures should take place.</p> <p>Refer to Table 20 and Appendix 7 for the air quality impacts and Air</p>

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					Quality Impact Assessment specialist study.
			The specifications in the Construction Environmental Management Programme must also include mitigation measures for dust, as well as the requirement that the contractor communicate (ahead of time) with ABO Wind Hotazel PV (Pty) Ltd and/or Hotazel Solar Facility 2 (Pty) Ltd / the Hotazel solar facilities operator (whichever is applicable at the time) when activities that would produce a lot of dust (e.g., excavations, blasting, etc.) are programmed to occur. These specifications must also require that stockpiles must be located as far from the property boundary of the Hotazel solar facilities as possible (the north-east corner of the site appears to have the fewest surrounding receptors, so that would be an adequate location).		Dust from blasting may be expected. The blast designs are however such that the type of blasting to be done is well restricted. It is believed that this will also contribute to control on dust emissions directly from the blast. Considerations can be given to wind directions at time of blast not to exacerbate the effect.
			Regarding <b>other risks</b> , the DSR does not describe much in the way of potential risks of fire and explosion (beyond vibrations and blasting), therefore, it is requested that the next report please provide a more detailed explanation of potential risks in this regard, preferably by providing a map/plan indicating the location within the proposed mine that these risk events are most likely to occur and what the risk zones associated with these components are. Ideally, a Major Hazard Installation (MHI) specialist would provide comment in this regard.		Air Quality mitigation measures have been recommended which include water bowsers on unpaved roads, water sprays at stockpiles and handling points, and limiting construction (including mobile equipment) activities to take place during day-light hours. It is recommended that dustfall sampling be initiated prior to construction, continue throughout the construction phase, operational phase and decommissioning phase.
					Refer to the Project Description under Section 3 d).  In terms of explosion and future risks relating to the planned ammonium nitrate prill and emulsion silos, silos are no longer required. If cartridge explosives are required in the future, it will be delivered to site by truck.

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			<p>Lastly, as far as future risks are concerned, the Operational EMPr must include a specification whereby the mine operator is required to notify ABO Wind Hotazel PV (Pty) Ltd and/or Hotazel Solar Facility 2 (Pty) Ltd / the Hotazel solar facilities operator when potentially hazardous or risk components are added to the scope (for example, in an instance where the Applicant wishes to include ammonium nitrate prill and emulsion silos in future).</p> <p>It is understood that there is more detail, supported by specialist impact assessment reports, forthcoming through the full Scoping and Environmental Impact Assessment (S&amp;EIA) process, so it must be noted that we reserve our right to amend our comment as further information comes to light.</p> <p>Thank you for the opportunity to comment and we look forward to seeing the issues raised addressed in the Environmental Impact Assessment Report (and relevant specialist reports).</p>		Cartridge explosives will not be stored on- or near to- site.
Assmang Ltd - Black Rock Mine	Notified by email (10 August 2021)	Delivery receipt of email received	No comments received to date		
Transnet	Notified by email (10 August 2021)	Delivery receipt of email received			
Jacobus Fredrick Eduard and Dawie Fourie	Notified by email (10 August 2021)	Delivery receipt of email received			
<b>Municipal ward councillor</b>					
Julia Katong Ward Councillor Ward 4	Notified by email (10 August 2021)	Delivery receipt of email received	No comments received to date		
Above person no longer the ward councillor, new councillor still to be confirmed.					
<b>Municipality</b>					



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Joe Morolong Local Municipality	Notified by email (10 August 2021)	Delivery receipt of email received	No comments received to date		
John Taolo Gaetsewe District Municipality	Notified by email (10 August 2021)	Delivery receipt of email received			
<b>Organs of state (responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWS etc.)</b>					
Eskom	Notified by email (10 August 2021)	10 August 2021 (Email)	Please send me a KMZ file of the proposed mining area. Please find attached Eskom requirements for works at or near Eskom infrastructure and servitudes. Eskom is planning major network expansion in the Hotazel area for the future and would like to check how this may impact on such development. Eskom has previously received authorisation for route corridors in the area.	(PR responded on 10 August 2021). Thank you for your response, the content of which is noted.  As requested, please find attached a KMZ showing the proposed footprint of the mine.	No incorporation into Scoping Report required. Finalised during public participation.
South African Civil Aviation Authority (SACAA)	Notified by email (10 August 2021)	10 August 2020 (Email)	Please find an extract to the SACAA Regulations to Obstructions (obstacles) towards Aviation operations, find some guidance documentation for your information.  Please follow the Obstacle application procedure as Part 139.01.30 extract Regulation, guide and the said Mine falls within the criteria ad structures proposed requires approval.	(PR responded on 12 August 2021). Thank you for your response. The information will be shared with Tawana Hotazel Mining (Pty) Ltd. We will be in contact should we require further assistance.	Specific requests from the SACAA have been addressed in this EIAR/EMPr – none of the proposed structures forming part of the proposed THM are expected to exceed 45 m above ground level or 150 m above the mean ground level.
SANRAL	Notified by email (10 August 2021)	Delivery receipt of email received	No comments received to date		
Gamagara Water	Notified by email (10 August 2021)	Delivery receipt of email received			
<b>Department Land Affairs</b>					
Department of Agriculture, Land Reform	Notified by email (10 August 2021)	Delivery receipt of	No comments received to date		

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and Rural Development		email received			
Northern Cape Province Department: Agriculture, Environmental Affairs, Land Reform and Rural Development	Notified by email (10 August 2021)	16 August 2021 (Email) Air Quality & Climate Change Unit	<p>Greetings; Please find comments on the Tawana development in the Hotazel area.</p> <p>A full air quality impact assessment specialist study must be undertaken (is required), the said area is already plagued by high levels of dust and particulates, and also based on the close proximity to receptor communities. The study should highlight assessment of potential health impact.</p> <p>Air quality must be assessed not only for Tawana's individual contribution, but in terms of its additive contribution to baseline ambient air quality i.e. cumulative effects must be considered.</p> <p>A comprehensive dust management plan (as per the NDCR 2013) must be developed and submitted to the department for approval, the plan should include all the phases of development from road construction to total ROM.</p> <p>A dustfall monitoring programme must be clearly outlined as per section 4 &amp; 5 of the NDCR 2013; and a reporting regime established.</p>	(PR responded on 16 August 2021). Thank you for your email and the comments from the Department Environment & Nature Conservation, Air Quality & Climate Change Unit. These will be incorporated into the Final Scoping Report to be submitted to the DMRE and will also be addressed in the Phase 2 EIA Air Quality study.	<p>Specific requests from the Air Quality &amp; Climate Change Unit were addressed in this EIAR/EMPr as described below.</p> <p>Refer to Appendix 12 for the Air Quality Impact Assessment specialist study.</p> <p>A thorough quantitative assessment would require either a year or more of monitoring data which was not available; or the operational data from all mines, farmers and residences. For dispersion modelling the input from the other mines, farmers and the Provincial, District and Local government "census" data including fuel use per household, number of households, population per km<sup>2</sup>, and traffic counts for all roads within the local municipality would be required.</p> <p>Refer to Table 32 where the Environmental Management Programme for Air Quality is described including the following commitment -</p> <p>A comprehensive dust management plan (as per the NDCR 2013) must be developed and submitted to the department for approval, the plan should include all the phases of development from road construction to total ROM.</p> <p>Refer to the Monitoring Programmes, EMPr Part B 1 i).</p>

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			<p>NAEIS registration and reporting must be established and undertaken.</p> <p>Thanking you in advance</p>		<p>Refer to Table 32 where the Environmental Management Programme for Air Quality is described including the following commitment - NAEIS registration and reporting must be established and undertaken.</p> <p>The assigned accounting officer (ACO) for the facility will need to register on the NAEIS system and request the addition of the facility to the system and linking of the facility to their profile by submitting the required facility information and ACO details to NAEIS admin. Tawana will need to undertake the registration application with DFFE after acquiring EA and the reporting will need to be undertaken after the commencement of the operations. NAEIS reporting submissions will need to be completed annually for the previous calendar year operations by 31 March.</p>
<b>Traditional Leaders</b>					
Bathlaro Ba Ga Motlhwane	Notified by email (23 August 2021)	Delivery receipt of email received	No comments received to date		
B.G.Mokgwabone		5 August 2021 (WhatsApp Message)	Affected Party – Name, cell number and email address provided.	(PR responded on 24 August 2021). Thank you for your WhatsApp message. Your details have been added to the proposed Tawana Hotazel Mine IAP database. Please find a	<p>Dispute letter and response are attached as Appendix 6.6.</p> <p>No incorporation into Scoping Report required. Finalised during public participation.</p>

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
				<p>brief Background Information Document attached. The Scoping Report and appendices can be accessed at the Prime Resources website (<a href="http://www.resources.co.za/downloads">www.resources.co.za/downloads</a>), or via email upon request.</p> <p>The Scoping Phase public participation period will take place from 10 August to 9 September 2021. Kindly furnish all comments or queries to prime Resources (<a href="mailto:prime@resources.co.za">prime@resources.co.za</a>) by 9 September 2021.</p>	
		23 August 2021 (Email)	<p>Please find attached letter with corrected date</p> <p>I hope you find this in order.</p> <p>Lodging a dispute against mining on the farms claimed by Tsineng Community Letter stated:  <i>Tsineng Communal Property Association (CPA), Tsineng Community together with Tsineng Chieftainship under Kgosi T.Shuping is lodging a dispute regarding mining on the following farms: Hotazel 280 and York 279 by Tawana Hotazel Mining (Pty) Ltd. The above farms have already been claimed by CPA Chairperson Mr Kenyaditse Looseboy Tshwenyane on behalf of Tsineng Community on 14 December 1998. The Tsineng CPA, Tsineng Community and Chieftainship is requesting meeting with Tawana Hotazel Mining (Pty) Ltd.</i></p>	<p>(PR responded on 23 August 2021). We hereby acknowledge receipt of your email and confirm that you have been added to the Interested and Affected Party (IAP) database for the Tawana Hotazel Mining Project.</p> <p>Your dispute letter will be sent to Tawana Hotazel Mining (Pty) Ltd for their consideration.</p>	
				<p>(PR responded on 1 September 2021). We kindly draw your attention to the attached response from the Applicant, Tawana, in response to matters</p>	

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
				raised in your below correspondence.	
<b>Department Environmental Affairs</b>					
Department of Forestry, Fisheries and the Environment	Notified by email (10 August 2021)	18 August 2021 (Email)	DFFE Directorate: Biodiversity Conservation hereby acknowledge receipt of the invitation to review and comment on the Scoping Report for the proposed Tawana Hotazel Mine. Kindly note that the project has been allocated to Ms Makitla and Ms Maifo (both copied on this email). Please note: All Public Participation Process documents related to Biodiversity EIA review and any other Biodiversity EIA queries will be submitted to the Directorate: Biodiversity Conservation at Email: BCAdmin@environment.gov.za for the attention of Mr Seoka Lekota.	No response required.	
		15 September 2021 (Email)	Kindly find the attached comments for consideration. Comments:  The Directorate: Biodiversity Conservation has reviewed and evaluated the aforementioned report. According to the information provided in the Draft Scoping Report (DSR), the proposed development site falls within the Savanna Biome, in the Eastern Kalahari Bushveld Bioregion and the Kathu Bushveld vegetation type, which is considered to have a conservation status of Least Threatened. The site is also located in an area where there is limited natural vegetation due to the historical mining activities that were undertaken and it is not associated with Critical Biodiversity Areas or Ecological Support Areas. Notwithstanding the above, the final Scoping Report must include the following as guidelines considered and ensure that the proposed project is in compliance with their requirements:	(PR responded on 16 September 2021). Thank you for your email, we hereby acknowledge receipt of your comments.  Your comments will be incorporated into and addressed in the EIA which will be made available at a later stage for your further review.	Specific requests from the DFFE were addressed in this EIAR/EMPr as described below.
			<ul style="list-style-type: none"> <li>All relevant provincial biodiversity plans;</li> <li>Permits from relevant authorities must be applied for and obtained, for the removal and translocation of the nationally or provincially protected species;</li> </ul>		Refer to Section 3 e) Refer to Table 27 where the Environmental Management Programme for Biodiversity is described including the following commitment – Where any protected or TOPS-listed species are to be rescued and relocated, this process should

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
			<ul style="list-style-type: none"> <li>• Search and rescue plan for the identified Species of Conservation Concern (SCC) must be developed and submitted for approval;</li> <li>• Erosion management plan and rehabilitation plan of natural vegetation must be developed to mitigate on habitat degradation and consider all phases of the development;</li> <li>• Rehabilitation plan must include the ongoing monitoring and maintenance of the surrounding natural vegetation; and</li> <li>• Alien Invasive Plant (AIP) species Management and Control Plan must be designed and implemented to prevent further loss of floral habitat and diversity as AIPs displace native species.</li> </ul>		<p>be overseen by a suitably qualified botanist or horticulturalist. Permits for the destruction or relocation of nationally and provincially protected tree, shrub and forbs species must be applied for and obtained from the relevant authorities.</p> <p>Refer to Table 27 where the Environmental Management Programme for Biodiversity is described including the following commitment – A search and rescue plan for the identified SCC must be developed and submitted for approval.</p> <p>Refer to Appendix 22 for the Closure Plan.</p> <p>Refer to the Monitoring Programmes, EMPr Part B 1 i).</p>
<b>Other Competent Authorities affected</b>					
DMRE Northern Cape Region	Notified by email (11 August 2021)	5 October 2021 (SR Acceptance Letter)	<p>The Final Scoping Report (FSR) and Plan of Study for Environmental Impact Assessment dated 20 September 2021 and is satisfied that the documents comply with the minimum requirements of Appendix 2(2) of NEMA EIA Regulations. The SR is hereby accepted by the Department in terms of Regulation 22(a) of the NEMA EIA Regulations, 2014. You may proceed with the environmental impact assessment process in accordance with the tasks contemplated in the Plan of Study for EIA Regulations, 2014.</p> <p>Please ensure that surrounding communities are given the opportunity to participate on the public participation process</p>	No response required.	<p>Refer to Section 3 g) ii) for the details of the Public Participation</p>

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
			and the Draft EIAR and is provided to the community representative for commenting purpose.		Process followed and the Public Participation Plan (Appendix 6.1).
			Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAR. This included but not limited to the Provincial Heritage Resources Authority and/ or SAHRA, Provincial Environmental Department, Department of Agriculture, Forestry and Fisheries, DWS, the local municipality, local community structures (e.g. Traditional Leaders, Ward Councillors, SANCO, CPAO. Proof of correspondence with the various stakeholders must be included in the EIAR. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department.		An IAP register has been opened and representatives from the organs of state which have jurisdiction applicable to the THM have been included. Any IAPs who submit written comments, attend meetings or request to register pursuant to the project announcement phase, are added to the database (the IAP register will be included in the Final EIAR/EMPr submitted to the DMRE).  All comments received and responded to and any other representations made will be included in the Final EIAR to be submitted to the DMRE.
			The applicant is hereby reminded to comply with the requirements of regulation 3 of the NEMA EIA Regulations, 2014 with regards to the period allowed for complying with the requirements of the Regulations.		According to the EIA Regulations the following are to be submitted in support of the application for Environmental Authorisation, to the DMRE: <ul style="list-style-type: none"> <li>• Scoping Report (submitted on 13 September 2021 and accepted 5 October 2021) together with the results of consultation with IAPs and State Departments, within 44 days of submission of the application; and</li> <li>• The EIAR and EMPr (this document) together with the results of consultation with IAPs and State Departments within 106 days of acceptance of the</li> </ul>

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
					Scoping Report (11 February 2022).
			Please ensure that the EIAR includes the A3 size locality maps of the area and illustrates the exact location of the proposed development. The maps must be of acceptable quality and as a minimum, have the following attributes: maps relatable to one another; the flood lines must be delineated on the topographical map; co-ordinates; legible legends scale of 1:50000.		A3 maps will be included in the Final EIAR to be submitted to the DMRE.
			Further it must be reiterated that should an application for Environmental Authorisation be subjected to any permits or authorisations in terms of the provisions of any Specific Environmental Management Acts (SEMAs), proof of such application will be required.		Noted.
			You are hereby requested to submit, three(3) copies manually and one(1) electronic copy through SAMRAD, of an EIAR and EMPr, inclusive of any specialist reports which have been subjected to the public participation process of at least 30 days incorporating the comments received, including all comments from the competent authority. Kindly refer to section 24N(2) of NEMA as amended and Appendix 2, 4 and 6 of the EIA Regulations for the minimum requirements set for the aforementioned reports. The public participation process should be conducted as stipulated in chapter 6 of the EIA Regulations and taking into considerations any guideline applicable for public participation.		Refer to Section 3 g) ii) for the details of the Public Participation Process followed and the Public Participation Plan (Appendix 6.1).  All comments received and responded to and any other representations made will be included in the Final EIAR to be submitted to the DMRE.
			Kindly note that acceptance of your scoping report application does not grant you a right to commence with the listed activities applied for. Acceptance simply confirms that your application will be processed further and a recommendation on granting or refusal of an environmental authorisation will be forwarded to the Minister or his delegate for consideration, and the decision will be communicated as stipulated in regulation 4(1) f the EIA Regulations.		Noted.
			You should also note that commencement with a listed activity without an environmental authorisation contravenes the provisions of section 24F(1) of NEMA, as amended and constitutes an offence in terms of section 49A(1)(a) of NEMA.		



INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
			<p>Further note that in terms of regulation 45 of the EIA Regulations, your failure to submit the documents or meet any timeframes prescribed in terms of the said Regulations will result in your application deemed to have lapsed.</p> <p>Your attention is brought to Section 24F of the NEMA which stipulates "that no activity may commence prior to an environmental authorisation being granted by the competent authority".</p>		
DWS	Notified by email (10 August 2021)	Delivery receipt of email received	No comments received.		A pre-application consultation meeting was held with the DWS on 9 September 2021 (refer to Appendix 6.7 for minutes of the meeting).
Northern Cape Province Department: Roads and Public Works	Notified by email (10 August 2021)	Delivery receipt of email received	Discussions around the DR3463 road.	<p>5 October (Email sent by ReaAgi Consulting Engineers) Our telephone discussion last week regarding road DR3463 refers.</p> <p>Tawana Investment Holdings is in the process of applying for a mining right for a mine in Hotazel and plans to use DR3463 as an access road for trucks to the mine. Refer to the attached layout.</p> <p>As confirmed during our discussion, road DR3463 is a provincial road, thus any proposed access to and from this road needs to be approved by the Provincial Department.</p> <p>We will therefore undertake the designs for this access road in</p>	DR3463 is a provincial road, thus any proposed access to and from this road needs to be approved by the Provincial Department. This has been addressed in this EIAR/EMPr – Refer to Table 26

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
				<p>line with the Provincial requirements, and submit for approval.</p> <p>We will confirm the timeframes in due course.</p>	
<p>SAHRA and Provincial Heritage Resources Authority of the Northern Cape Province (Ngwao-Boswa Jwa Kapa Bokone)</p>	<p>Notified by email (10 August 2021)</p>	<p>3 September 2021 (Interim Comment received via SAHRIS)</p>	<p>The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes submitted HIA, however requested clarity on the age and significance of the "historical Hotazel Manganese Mine (HMM)" and any associated historical mining structures within the proposed development area. If the historical HMM proves to be defined as a heritage resource, a revised HIA inclusive of field-survey must be conducted as part of the DEIA phase of the EA application process.</p> <p>The conducted PIA must be submitted to SAHRA for review and comment. Further comments will be issued upon receipt of the above requested reports and the draft EIA inclusive of appendices. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.</p>	<p>(PR responded on 7 September 2021 via SAHRIS). Thank you for your Interim Comment, the content of which is noted.</p> <p>As requested, please note that the PIA report has been uploaded to SAHRIS, together with the Phase 1 HIA report for review and comment.</p> <p>In terms of the age and significance of the "historical Hotazel Manganese Mine (HMM)" and associated historical mining structures within the proposed development area, further detail is provided in the Phase 1 HIA report, which included a field-survey.</p> <p>We also note that further comments will be issued by SAHRA upon receipt of the above reports and the draft EIA inclusive of appendices. We will upload the draft EIA and</p>	<p>Specific requests from the SAHRA must be addressed in the EIA phase – including clarity on the age and significance of the "historical Hotazel Manganese Mine (HMM)" and any associated historical mining structures within the proposed development area to determine if they are heritage resources.</p>

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
		7 September 2021 (Message received via SAHRIS)	I take note of the above. I will change the status of the case to Studies Pending. Once the draft EIA and appendices have been uploaded, please change the status of the case to SUBMITTED or Studies Submitted. Further comments will be issued when this is completed.	appendices to SAHRIS at the start of the second public participation period. (PR responded on 7 September 2021 via SAHRIS). Thank you and noted, we will do so. The draft EIA will likely be made available in January/ February 2022.	
<b>Organisations</b>					
Agri Kuruman	Notified by email (10 August 2021)	Delivery receipt of email received	No comments received to date		
Kalagadi Water Verbruikers Forum	Notified by email (10 August 2021)	Delivery receipt of email received			
KLK	Notified by email (10 August 2021)	Delivery receipt of email received			
WESSA NC	Notified by email (10 August 2021)	Delivery receipt of email received			
Birdlife	Notified by email (10 August 2021)	Delivery receipt of email received			
<b>Surrounding communities and Interested Parties</b>					
Site notices were displayed on-site and at conspicuous locations within the surrounding communities during the Scoping phase of the project. Media notices (in English) were published in the Noordkaap		An IAP database was maintained during public participation and comments from the community are included in this table under the "Surrounding communities and Interested Parties" section.			

INTERESTED AND AFFECTED PARTIES	DATE & METHOD NOTIFIED	DATE COMMENTS RECEIVED (METHOD)	ISSUES RAISED	(DATE & METHOD OF RESPONSE) EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS
Bulletin on 05 August 2021 and the Kathu Gazette on 07 August 2021.					
Unknown		5 August 2021 (WhatsApp Message)	Registered as an IAP via WhatsApp with contact number	(PR responded on 11 August 2021). Thank you for your WhatsApp message. Your details have been added to the proposed Tawana Hotazel Mine IAP database. Please find a brief Background Information Document attached. The Scoping Report and appendices can be accessed at the Prime Resources website ( <a href="http://www.resources.co.za/downloads">www.resources.co.za/downloads</a> ), or via email upon request.	No incorporation into Scoping Report required. Finalised during public participation.
Tlhalefo				The Scoping Phase public participation period will take place from 10 August to 9 September 2021. Kindly furnish all comments or queries to prime Resources ( <a href="mailto:prime@resources.co.za">prime@resources.co.za</a> ) by 9 September 2021.	

**iv) The environmental attributes associated with the development footprint alternatives - Baseline Environment**

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

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

**(a) Meteorological conditions and air quality**

The information presented in this section was obtained from following reports:

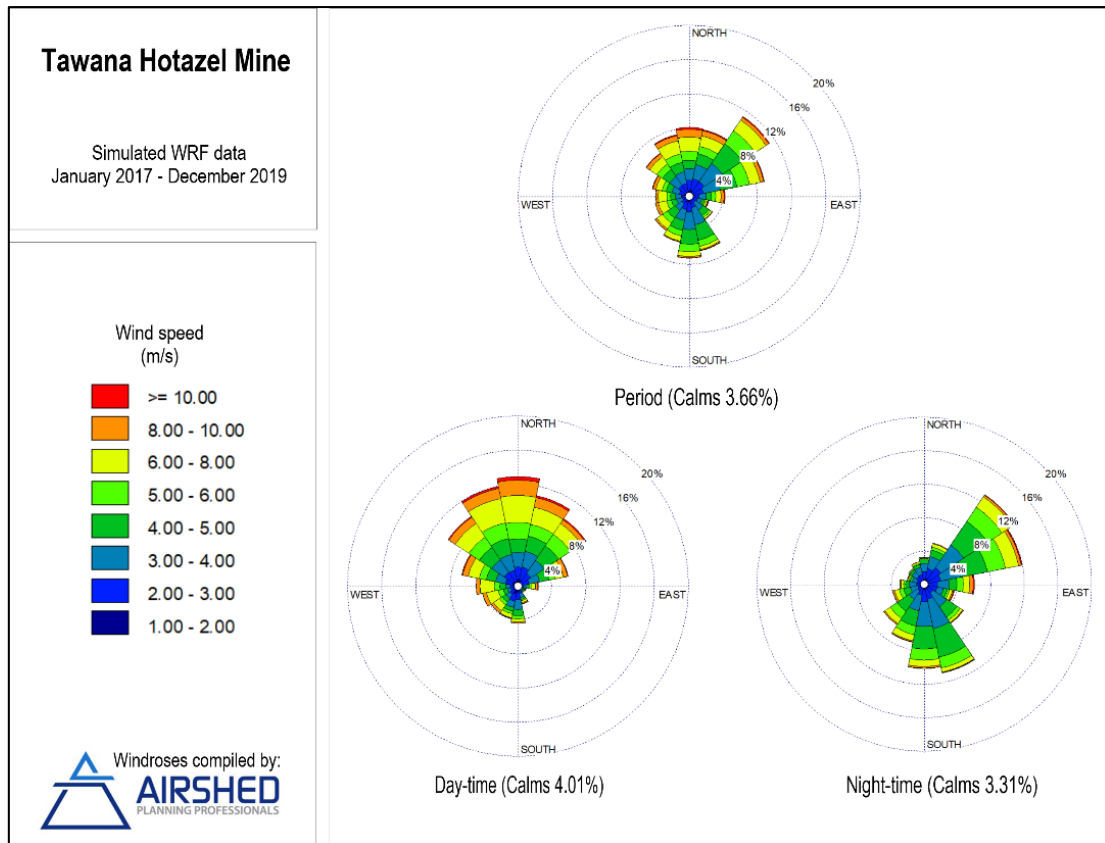
- Air Quality Impact Assessment Report for the Proposed Tawana Hotazel Mine in Northern Cape Province compiled by Airshed Planning Professionals (Pty) Ltd (January 2022) (refer to Appendix 7)
- Air Quality Management Plan (AQMP) for the Northern Cape: Air Quality Baseline Assessment Report developed by uMoya-NILU (December 2017)

The Northern Cape is generally hot and dry. Maximum summer temperatures often exceed 40°C. During winter, the average daytime temperatures are mild and night time temperatures may drop below 0°C. There are four climatic zones in the Northern Cape: hot desert, cold semi-arid, cold desert and hot semi-arid. Hotazel (the closest town, situated adjacent to the proposed THM) is classed as a cold semi-arid area. Monthly mean, maximum and minimum temperatures are shown in Table 2 below.

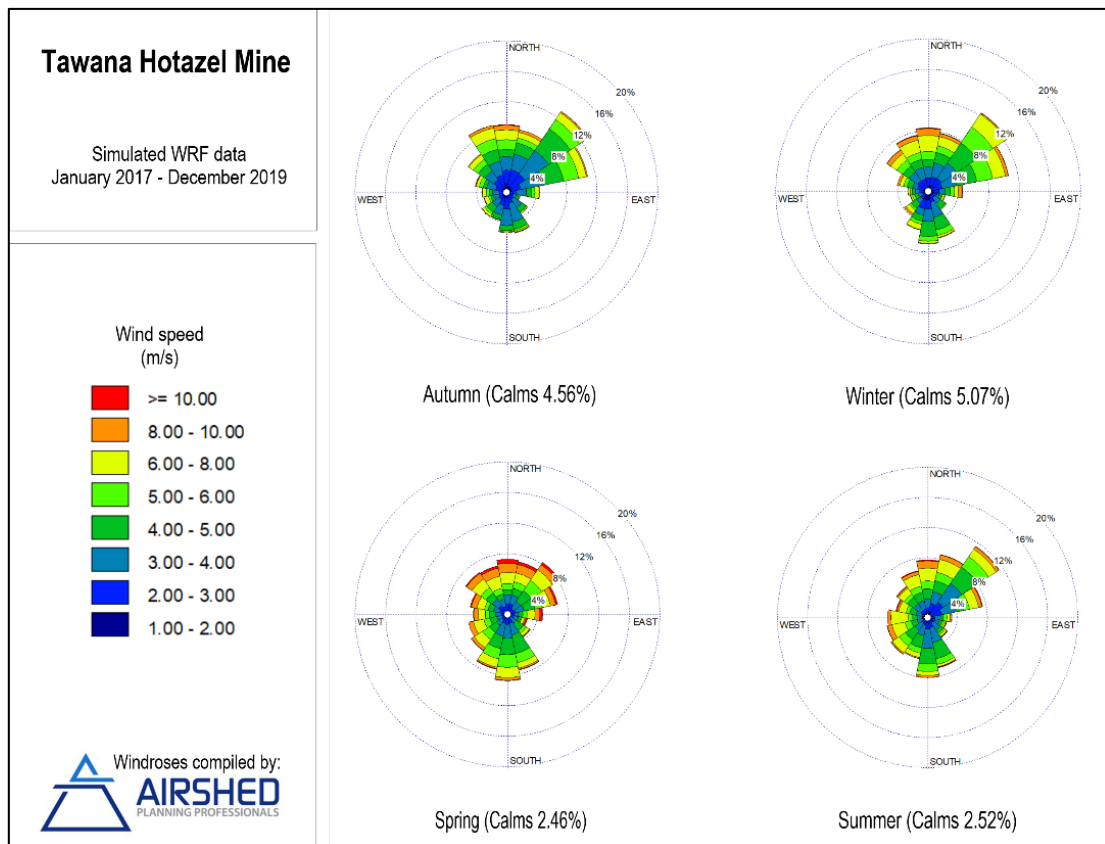
**Table 2: Temperature (°C) summary (AERMET processed Weather Research and Forecasting data, January 2017 to December 2019)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hourly Minimum	12	12	9	5	0	-3	-5	-4	-4	-1	6	11
Monthly Average	28	27	25	22	17	13	12	14	19	22	25	27
Hourly Maximum	39	37	37	34	30	26	27	30	35	36	38	39

The wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds between 6 and 8 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated. The period wind field and diurnal variability in the wind field are shown in Figure 6, while the seasonal variations are shown in Figure 7. The wind field is dominated by winds from the north-easterly sector. The strongest winds (>6 m/s) occurred mostly from the northerly sectors. Calm conditions occurred 3.66% of the time, with the average wind speed over the period of 4.36 m/s. Wind speeds are stronger during the day but with a higher frequency of calm conditions (4.01% during the day) than during the night (3.31% during the night). Night-time shows dominant north-easterly, east-north-easterly, south-south-easterly and southerly components to the wind field and during the day these winds decrease, and the northerly winds dominate. Strong winds exceeding 6 m/s occurred most frequently during summer and spring, followed by winter. Calm conditions occurred most frequently during the autumn and winter months.

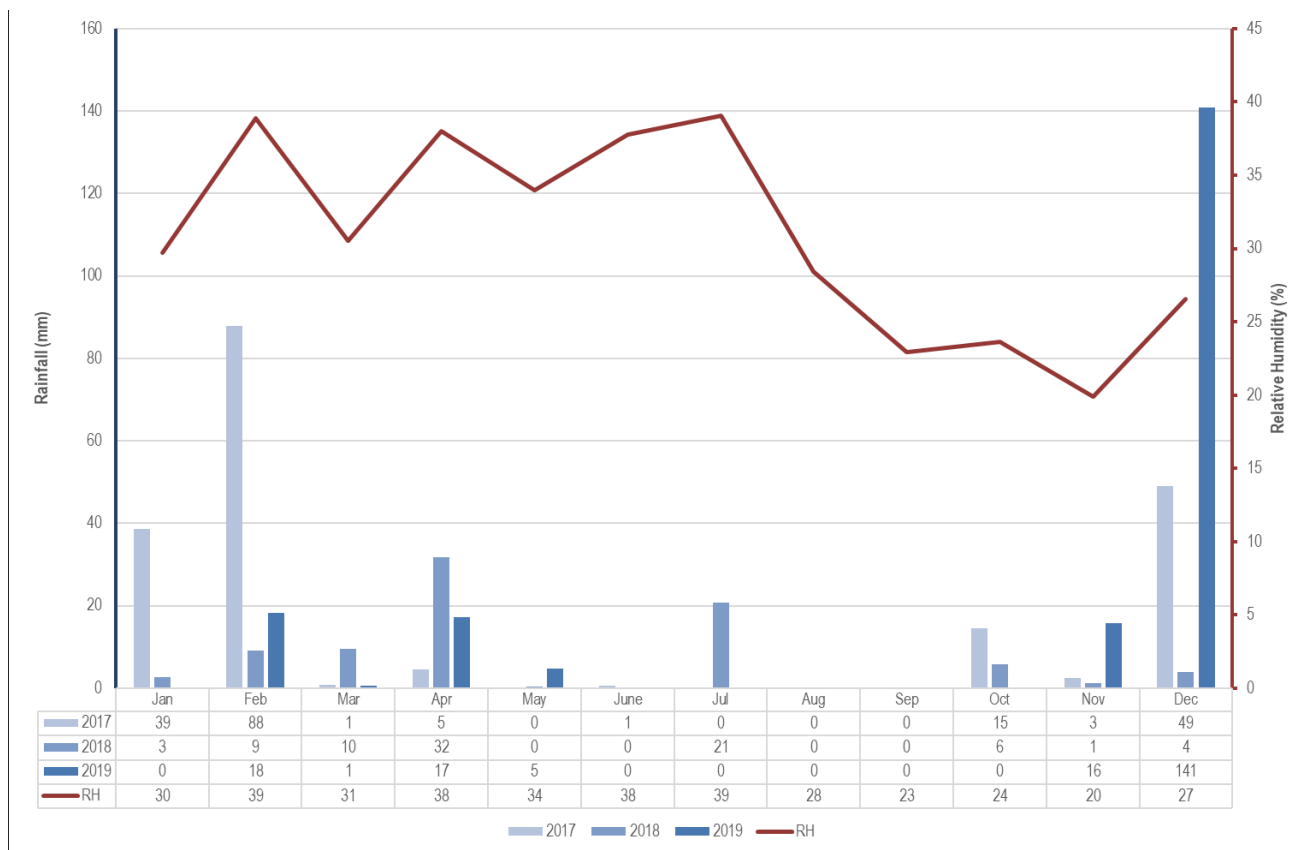


**Figure 6: Period, day- and night-time wind roses (AERMET processed WRF data, January 2017 to December 2019)**



**Figure 7: Seasonal wind roses (AERMET processed WRF data, January 2017 to December 2019)**

The proposed THM falls within the summer rainfall region of South Africa, in which more than 80 % of the annual rainfall occurs from October to April, during the summer months although it also rains during spring and autumn while the winter months are dry even through the relative humidity is greater during the winter period than other seasons. Colder air can hold less moisture than warmer air and thus the percentage saturation is higher at a lower moisture quantity resulting in higher relative humidity during colder periods than warmer periods. Monthly rainfall and relative humidity data obtained from the Weather Research and Forecasting data is presented in Figure 8 below. Total average annual rainfall from January 2017 to December 2019 is 161 mm. The rainfall for 2017, 2018 and 2019 was 199 mm, 86 mm, and 198 mm, respectively.



**Figure 8: Monthly rainfall and relative humidity (AERMET processed WRF data, January 2017 to December 2019)**

The main sources of air pollution in the Northern Cape are biomass burning and mining, followed by industry and motor vehicles. Biomass burning is a major contributor of carbon monoxide (CO) whereas mining contributes particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>) and total suspended particles (TSP). Motor vehicles are the largest source of Oxides of nitrogen (NO<sub>x</sub>) and Volatile organic compounds (VOC) emissions, although these are relatively small and it is likely that these emissions have been underestimated. Long range atmospheric transport of air pollutants from the industrialised Highveld and biomass burning in southern and central Africa may influence ambient air quality over parts of the Northern Cape. Emissions within the Northern Cape in 2015 are summarised in Table 3.

**Table 3: Estimated emissions (tons/annum) during 2015 in the Northern Cape (uMoya-NILU, 2017)**

Source	PM <sub>10</sub>	PM <sub>2.5</sub>	TSP	SO <sub>2</sub>	NO <sub>x</sub>	CO	VOC
Industrial sources	1452		133	289	333	79	24
Mining	32248	22315	61453				
Residential fuels	42			2	6	315	
Biomass burning			15978	695	3917	115525	
Motor vehicles	517			253	6574	15433	3067
Airports				3	11	9988	158
<b>Total</b>	<b>34259</b>	<b>22315</b>	<b>77564</b>	<b>1242</b>	<b>10841</b>	<b>141340</b>	<b>3249</b>

### Existing Air Quality

The current air quality in the study area is mostly influenced by mining and processing activities at other surrounding operations, as well as farming activities, domestic fires, vehicle exhaust emissions and dust entrained by vehicles. These emission sources vary from activities that generate relatively coarse airborne particulates (such as dust from paved and unpaved roads, and the mine sites) to fine PM such as that emitted by vehicle exhausts, diesel power generators and processing operations.

Emissions from unpaved roads constitute a major source of emissions to the atmosphere in South Africa. When a vehicle travels on an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads are a function of vehicle traffic and the silt loading on the roads. Emissions from paved roads are significantly less than those originating from unpaved roads, however they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the re-suspension of loose material on the road surface. Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. When a surface is disturbed e.g. by mining, agriculture and/or grazing activities, its erosion potential is restored.

### Air Quality Sensitive Receptors (AQSRs)

AQSRs primarily refer to places where people reside; however, it may also refer to other sensitive environments that may adversely be affected by air pollutants. Ambient air quality guidelines and standards, as discussed under Section 4, have been developed to protect human health. Ambient air quality, in contrast to occupation exposure, pertains to areas outside of an industrial site/mine boundary where the public has access to and according to the NEM:AQA excludes areas regulated under the Occupational Health and Safety Act (No 85 of 1993).

Receptors near the THM include the residential areas of Hotazel, Blackrock, Mogojaneng, and Magobing which are made up of individual residences, schools, medical facilities as well as contractors and leisure accommodation. There are also isolated farmsteads, contractors and leisure accommodation and mining villages near the THM that would also be classified as sensitive receptors. Receptors located within 10 km of the THM are shown in Figure 10.

### Dustfall Sampling Rates

A site visit was undertaken from 30 November 2020 to 4 December 2020 where dustfall units were installed to undertake four months of dustfall sampling. The dustfall sampling network included four locations: three Tawana Hotazel Mining (Pty) Ltd  
Tawana Hotazel Mine  
Environmental Impact Assessment Report and Environmental Management Programme  
January 2022



classified as non-residential sites and one as a residential site according to the NDCR (Figure 11). The dust fallout sampling was undertaken in accordance with ASTM D1739 (2017) as the draft NDCR recommends the most recent version of ASTM D1739. Site D4 was located at the proposed Solar Facility, where the dustfall rates as a result of the THM proposed operations were expected to be the highest.

The samples for the first month contained a large amount of rainwater and during courier to the laboratory the samples leaked water which could have resulted in some of the dust being leaking out of the buckets with the rainwater. The fourth month samples appeared to have a large quantity of organic material (insects) and the laboratory undertook weighing and ashing of the samples to determine the percentage that organic matter contributes to the sample weight.

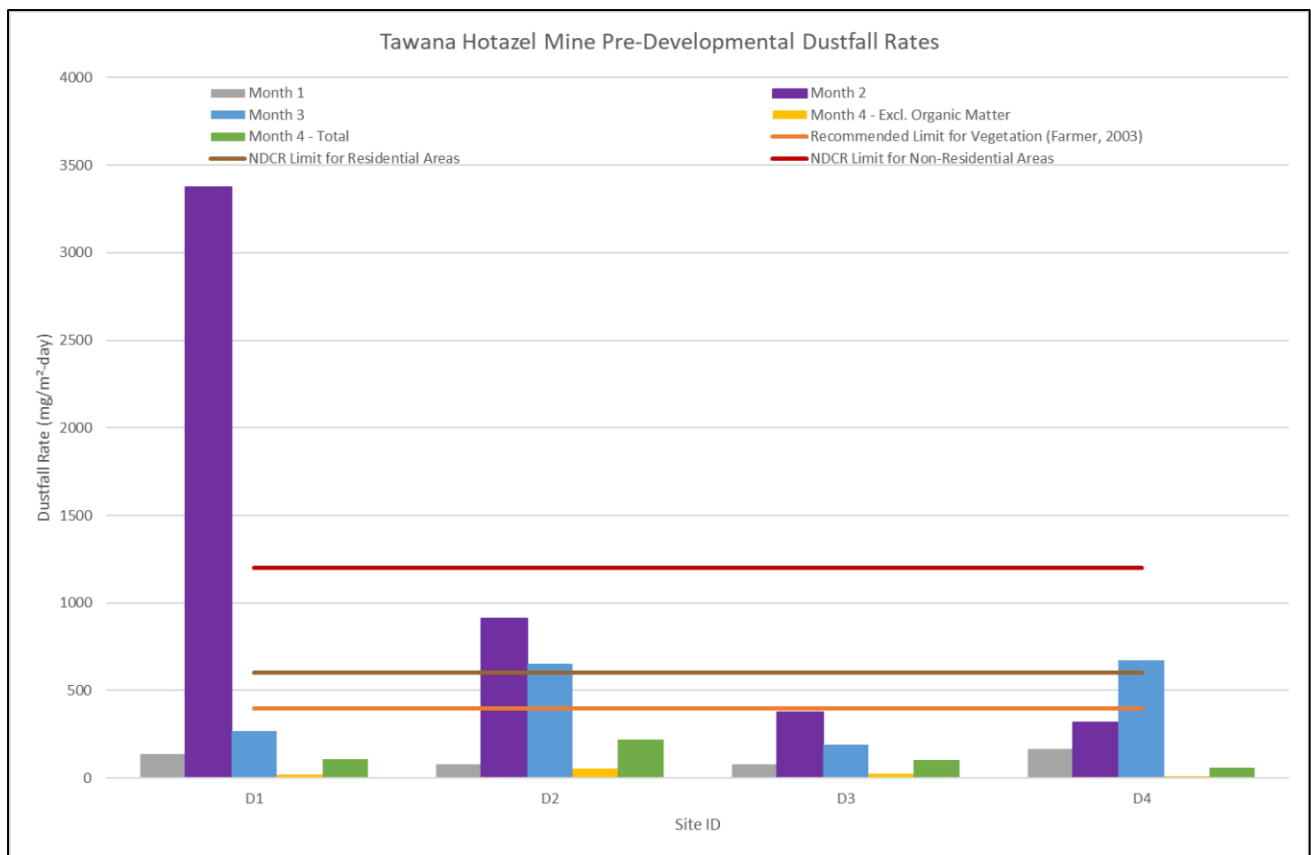
Dustfall rates at the sampling sites from 4 December 2020 to 6 April 2021 are summarised in Table 4 and Figure 9. There was one exceedance of the NDCR limit for non-residential areas at D1 in Month 2 (value in red bold); determination of the organic matter content of this filter may be requested in the future. The dustfall rates at the unit on the boundary of Hotazel is below the NDCR limit for residential areas for all four months. The sampled dustfall rates are compliant with the NDCR based as the four months results do not have more than two exceedances of the applicable limit in the sampling period or for consecutive months at all sites. As only four months of sampling was undertaken and there was high rainfall in the area during the first month the sampling period there is still the potential that the dustfall rates in the area may be non-compliant with the NDCR.

**Table 4: Dustfall rates summary**

<i>NDCR Limit for Residential Areas = 600 mg/m<sup>2</sup>-day</i>							
<i>NDCR Limit for Non-Residential Areas = 1 200 mg/m<sup>2</sup>-day</i>							
<b>Map ID</b>	<b>Location</b>	<b>Applicable NDCR Limit</b>	<b>Month 1<sup>(a)</sup></b>	<b>Month 2<sup>(b)</sup></b>	<b>Month 3<sup>(c)</sup></b>	<b>Month 4<sup>(d)(e)</sup></b>	<b>Month 4<sup>(d)(f)</sup></b>
D1	East of the proposed THM	Non-Residential	137	<b>3376</b>	266	23.0	110
D2	North of the proposed THM	Non-Residential	77	911	655	53.7	218
D3	East of Hotazel near Dwarsstraat, West of the proposed THM	Residential	79	375	190	23.5	103
D4	South of the proposed THM	Non-Residential	165	320	673	12.9	61.5

*Notes:*

- (a) Sampling period from 4 December 2020 to 5 January 2021 = 32 days exposure*
- (b) Sampling period from 5 January 2021 to 5 February 2021 = 31 days exposure*
- (c) Sampling period from 5 February 2021 to 5 March 2021 = 28 days exposure*
- (d) Sampling period from 5 March 2021 to 6 April 2021 = 32 days exposure*
- (e) Dustfall rate excluding organic matter contribution*
- (f) Dustfall rate including organic matter contribution*



**Figure 9: Sampled dustfall rates from 4 December 2020 to 6 April 2021**

### Fine Particulate Matter Concentrations

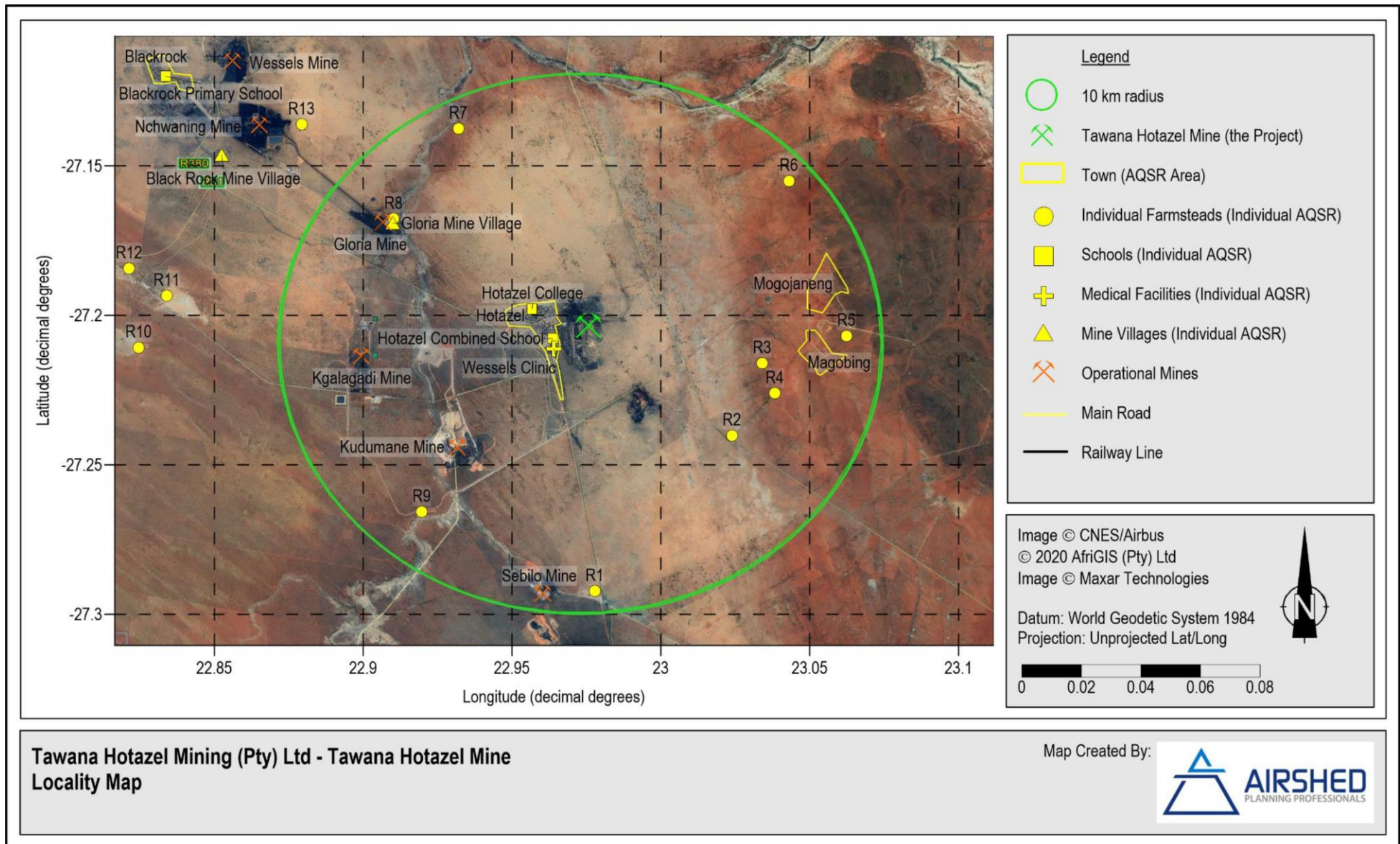
Fine particulate matter sampling was undertaken using passive particulate matter samplers from 7 September 2021 to 21 September 2021. The passive PM sampling comprised of two sampling campaigns at two locations in Hotazel town (Figure 11). Site 1 (Hotazel Guesthouse) extrapolated 24-hour concentration for the first 7-day sampling period indicated that the 24-hour average PM<sub>10</sub> concentration could exceed the 24-hour NAAQ limit.

Table 5 shows the determined 7-day PM<sub>10</sub> and PM<sub>2.5</sub> concentrations using Scanning Electron Microscope (SEM) to examine the passive samplers substrate and the extrapolated annual and 24-hour average concentrations screened against NAAQS and NAAQ limits. All samples extrapolated concentrations indicated that the annual average PM<sub>10</sub> and PM<sub>2.5</sub> concentration are not likely to exceed the annual (1-year) NAAQS. Concentration values in red bold (Table 5) indicate that the extrapolated concentration exceeds the NAAQ limit for that pollutant. Site 1 extrapolated 24-hour concentration for the first 7-day sampling period indicated that the 24-hour average PM<sub>10</sub> concentration could exceed the 24-hour NAAQ limit. If the relevant 24-hour NAAQ limits are exceeded more than 4 days in a calendar year, then that pollutant would not be in compliance with the NAAQS.

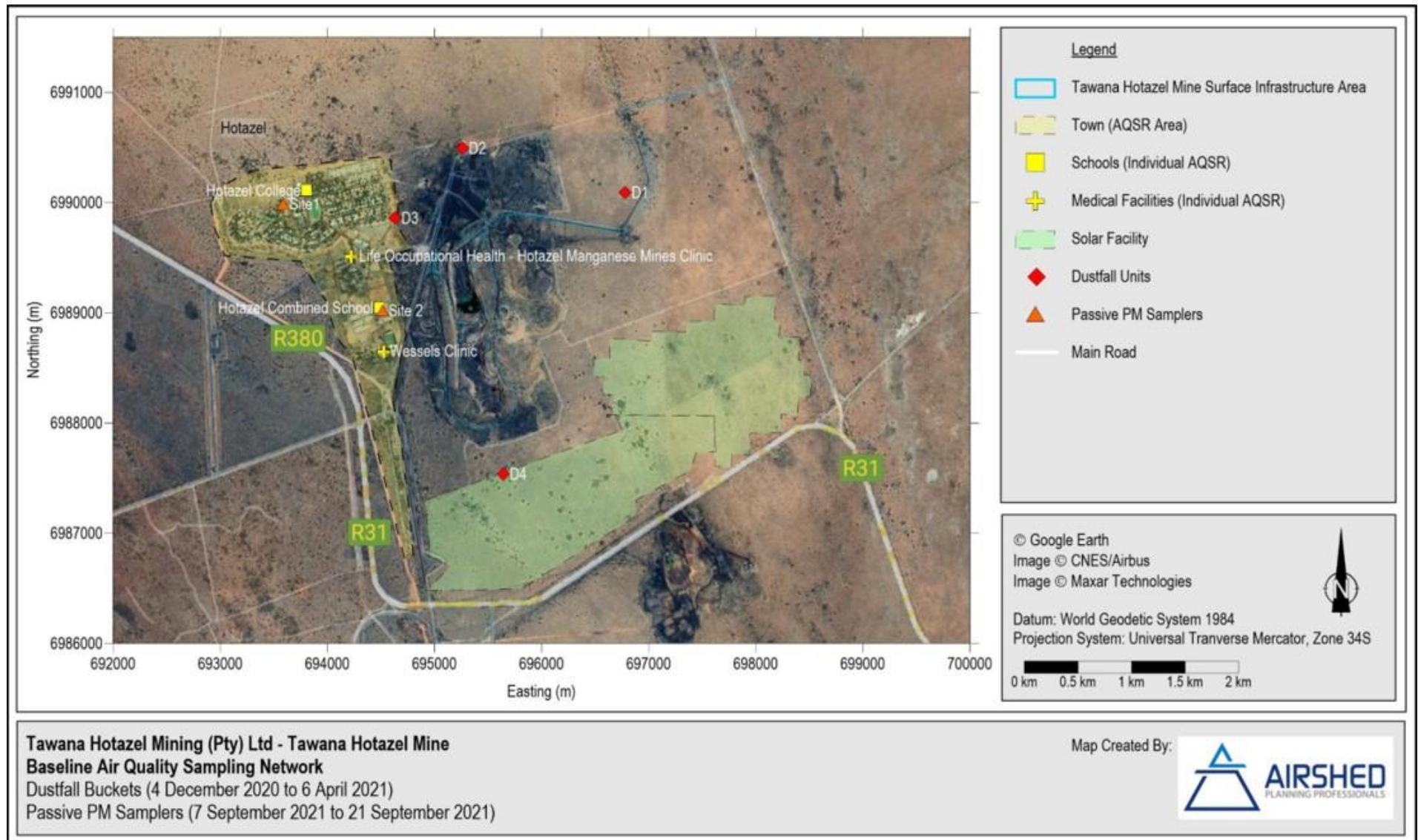
**Table 5: PM<sub>10</sub> and PM<sub>2.5</sub> results for each of the samples analysed**

Sample ID/Site	1/ Site 1	2/ Site 2	3/ Site 1	4/ Site 2
<b>PM<sub>10</sub> concentration (µg/m<sup>3</sup>)</b>	29.26	8.16	6.97	7.04
<b>PM<sub>2.5</sub> concentration (µg/m<sup>3</sup>)</b>	4.54	6.59	3.84	4.32

Sample ID/Site	1/ Site 1	2/ Site 2	3/ Site 1	4/ Site 2
<b>Sampling period</b>	07/09/2021 09:15 - 14/09/2021 12:09	07/09/2021 09:28 - 14/09/2021 11:53	14/09/2021 11:55 - 21/09/2021 13:00	14/09/2021 12:12 - 21/09/2021 13:13
<b>Calculated Annual PM<sub>10</sub> concentration (µg/m<sup>3</sup>)</b>	3.60	1.00	0.857	0.866
<b>Calculated 24-hr PM<sub>10</sub> concentration (µg/m<sup>3</sup>)</b>	<b>82.1</b>	22.9	19.5	19.7
<b>Calculated Annual PM<sub>2.5</sub> concentration (µg/m<sup>3</sup>)</b>	0.558	0.811	0.472	0.531
<b>Calculated 24-hr PM<sub>2.5</sub> concentration (µg/m<sup>3</sup>)</b>	12.7	18.5	10.8	12.1



**Figure 10: Air Quality Sensitive Receptors within a 10 km radius of the proposed THM**



**Figure 11: Baseline Air Quality Sampling Network**

## **(b) Greenhouse Gas Emissions and Climate Change**

The information presented in this section was obtained from following report:

- Air Quality Impact Assessment Report for the Proposed Tawana Hotazel Mine in Northern Cape Province compiled by Airshed Planning Professionals (Pty) Ltd (January 2022) (refer to Appendix 7)

Greenhouse gases (GHG) are "those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and ozone (O<sub>3</sub>) are the primary greenhouse gases in the Earth's atmosphere.

Moreover, there are a number of entirely human-made GHGs in the atmosphere, such as the halocarbons and other chlorine and bromine containing substances, dealt with under the Montreal Protocol. Beside CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>, the Kyoto Protocol deals with the greenhouse gases sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (IPCC, 2007). Human activities since the beginning of the Industrial Revolution (taken as the year 1750) have produced a 40% increase in the atmospheric concentration of carbon dioxide, from 280 ppm in 1750 to 406 ppm in early 2017 (NOAA, 2017). This increase has occurred despite the uptake of a large portion of the emissions by various natural "sinks" involved in the carbon cycle (NOAA, 2017). Anthropogenic CO<sub>2</sub> emissions (i.e., emissions produced by human activities) come from combustion of fossil fuels, principally coal, oil, and natural gas, along with deforestation, soil erosion and animal agriculture (IPCC, 2007).

South Africa ratified the United Nations Framework Convention on Climate Change (a framework for international cooperation to combat climate change by limiting average global temperature increases and the resulting climate change, and coping with impacts) in August 1997 and acceded to the Kyoto protocol in 2002, with effect from 2005. However, since South Africa is an Annex 1 country it implies no binding commitment to cap or reduce GHG emissions. The National Climate Change Response White Paper stated that in responding to climate change, South Africa has two objectives:

- to manage the inevitable climate change impacts and
- to contribute to the global effort in stabilising GHG emissions at a level that avoids dangerous anthropogenic interference with the climate system.

The White Paper proposes mitigation actions, especially a departure from coal-intensive electricity generation, be implemented in the short- and medium-term to match the GHG trajectory range. Peak GHG emissions are expected between 2020 and 2025 before a decade long plateau period and subsequent reductions in GHG emissions. The White Paper also highlighted the co-benefit of reducing GHG emissions by improving air quality and reducing respiratory diseases by reducing ambient particulate matter, ozone and SO<sub>2</sub> concentrations to levels in compliance with National Ambient Air Quality Standards by 2020. In order to achieve these objectives, the DFFE appointed a service provider to establish a national GHG emissions inventory, which will report through the SAAQIS.

The three broad scopes for estimating GHG are:

- Scope 1: All direct GHG emissions.

- Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
- Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.

This study considered Scope 1 emissions, which are the emissions directly attributable to the project, as well as Scope 2 emissions, which are the emissions associated with bought-in electricity. Scope 3 emissions which consider the “embedded” carbon in bought-in materials and transport as well as the use of exported materials, were not estimated. Only scope 1 emissions need to be quantified to be in line with the DFFE guidelines; the addition of scope 2 would put it in line with the guidelines provided by the International Finance Corporation (IFC, 2012). The Scope 1 CO<sub>2</sub>-e emissions for construction and operations will be approximately 19 964 t/a and 25 686 t/a, respectively. The combined Scope 1 and Scope 2 CO<sub>2</sub>-e emissions for operations will be approximately 49 461 t/a.

### **(c) Topography**

Site specific topographical elevations ranges between 1 063 and 1 070 m above mean sea level (mamsl). The topography within the proposed mining area is best described as gently sloping from the east (at approximately 1 071 mamsl) towards the Gamagara River west of the proposed mining area (at approximately 1 063 mamsl). The topographical gradient ranges around 1:280.

The only distinct topographic features in the greater area are a small inselberg at Black Rock mine, the north-south trending Kuruman Hills toward the east and the Korannaberge to the west. With the exception of the existing opencast void and surface dumps in the south and east of the proposed THM, no significant landforms such as hills, valleys or outcrops could be discerned from available elevation and relief data, although surface mine dumps are present within the east and south of the proposed THM.

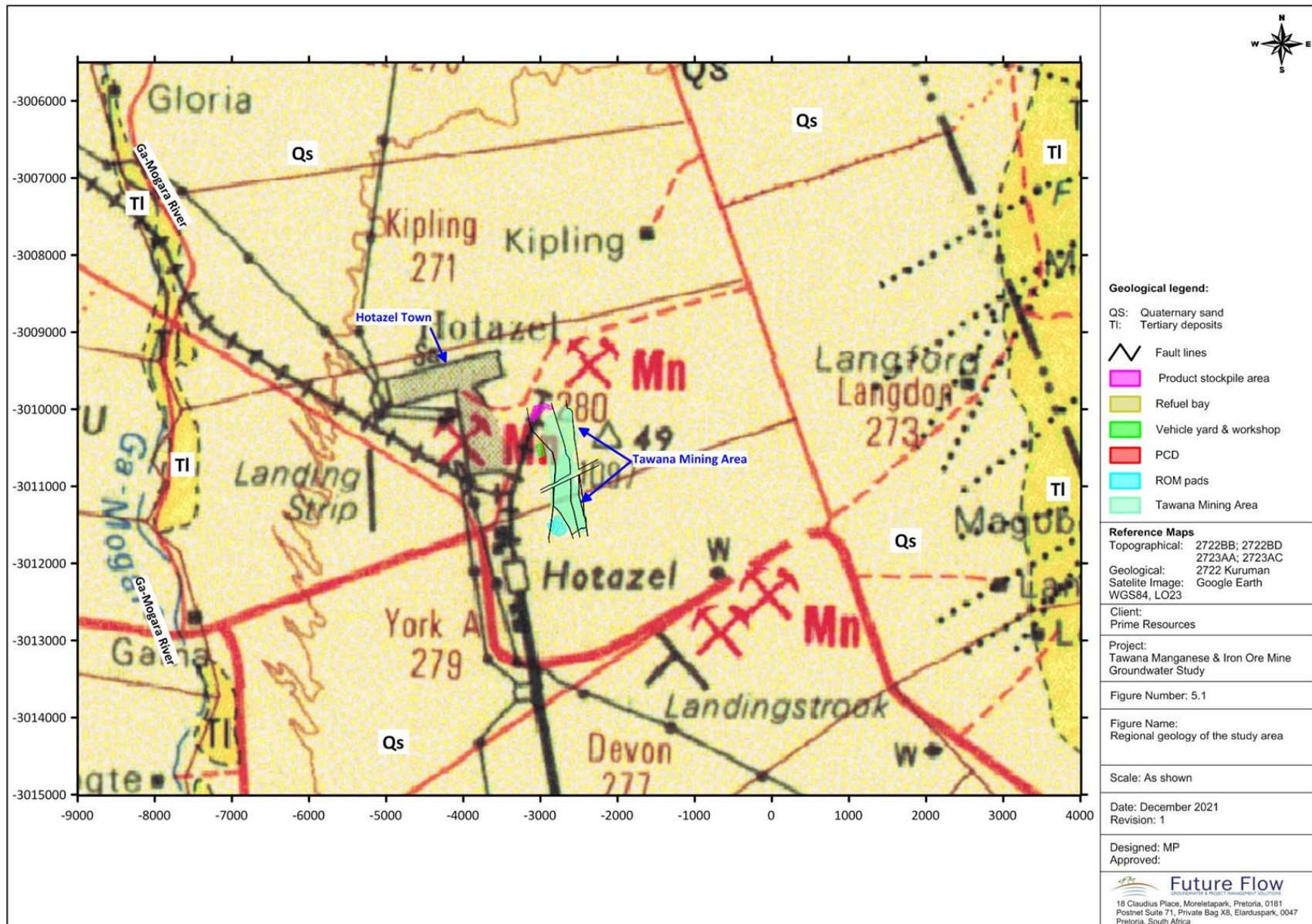
### **(d) Geology**

On a regional scale, the proposed THM is located on the relatively young Kalahari Group. The Kalahari Manganese Basin is situated within the Kuruman district of the Northern Cape Province and lies at approximately 1000 mamsl. The property is in the northern portion of the Kalahari Manganese Field (KMF). The KMF is an erosional basin spanning approximately 40 km in the north-south dimension and 15 km in the east-west dimension. The regional strike in the study area is 330 degrees with a westward dip of around 7 degrees.

The lithologies in the study area belong to the Griqualand West sequence of the Transvaal Supergroup. The base of the study area is formed by the Ongeluk Lava consisting of an amygdaloidal Andesite. The Hotazel formation overlies the lava and consists of a 40 – 100 m thick Banded Iron Formation (BIF). Intercalated in the BIF a total of 3 Manganese seams can be found. The lowermost of these seams (LMO) is followed by the Manganese Marker seam (MMO) about 2 to 4 m above it. The upper Manganese seam (UMO) normally occurs about 20 m above the No 1 seam. The LMO has been extensively exploited in the past. The Hotazel formation is overlain by a sequence of Shales and Quartzites of the Mapedi Formation. Glacial sediments of the Dwyka Formation were observed and is thought to occupy NE – SW trending glacial valleys. The Mapedi Formation is followed by the recent Kalahari Formation consisting of a series of Aeolian sands, clays, and gravels.

The THM area can be described as an erosional relict approximately 2 km to the east of the main KMF basin. The manganese ore seams have been preserved in a north-south orientated fault-bounded graben structure. The UMO is on average 7.61 m thick and is overlain by a BIF which is on average 10.73 m thick. The LMO is separated from the UMO by a BIF layer on average 17.3 m thick. The LMO varies in thickness from a maximum of 27.92 m to a minimum of 3.35 m (average 16.72 m). The Hotazel Formation overlies a pillow lava basement of the Ongeluk Formation. The lavas occur on average 12.43 m below the LMO. A prominent vertical Bostonite dyke, 50 m wide, bisect the MR area along an east-northeast to east-southeast line. Exploration drilling at THM intersected, from top to bottom, the Kalahari Group, Hotazel and Ongeluk Formations. The Kalahari Group is an up to 23 m thick package consisting of a sequence of sand, calcrete, red clay and gravel units. The sand is on average 13.91 m thick and the calcrete is on average 8.33 m thick. The major rock types that occur in the study area include dolomite, limestone and chert of the Ghaap Group, BIF within the Griquatown West Sequence and shales and schists of the Ecca Group of the Karoo Supergroup. In general terms the mines in the KMF normally have one of the two types of manganese mineralization present i.e. the higher-grade oxide ore or the lower grade carbonaceous ore. In the case of THM it appears that both a thinner seam of high-grade oxide ore and a thicker seam of lower grade carbonaceous ore seems to be present. The thicker low-grade seam appears to be better developed in the area south of the dyke. Refer to Figure 12 below showing a map of the regional geology and fault lines within the THM.





**Figure 12: 1:250 000 geological survey map**

### **(e) Soil, Land Capability and Agricultural Potential**

Information for this section has been sourced from:

- The Department of Agriculture, Forestry and Fisheries (now called the Department of Agriculture, Land Reform and Rural Development (DALRRD)) Generalized soil patterns: A simplified baseline of the soils of the country, 2004
- The Department of Agriculture, Forestry and Fisheries (now called the Department of Agriculture, Land Reform and Rural Development (DALRRD)) National land capability evaluation: Long term grazing capacity map for South Africa, 2016
- The Institute for Soil, Climate and Water (ISCW) of the Agricultural Research Council (ARC) Land Type and Land Capability database of South Africa
- Southern African Agricultural Geo-referenced Information System (AGIS) data
- Agricultural Compliance Statement for the Proposed Tawana Hotazel Mine compiled by Digital Soils Africa (Pty) LTD (DSA) (July 2021) (refer to Appendix 8).

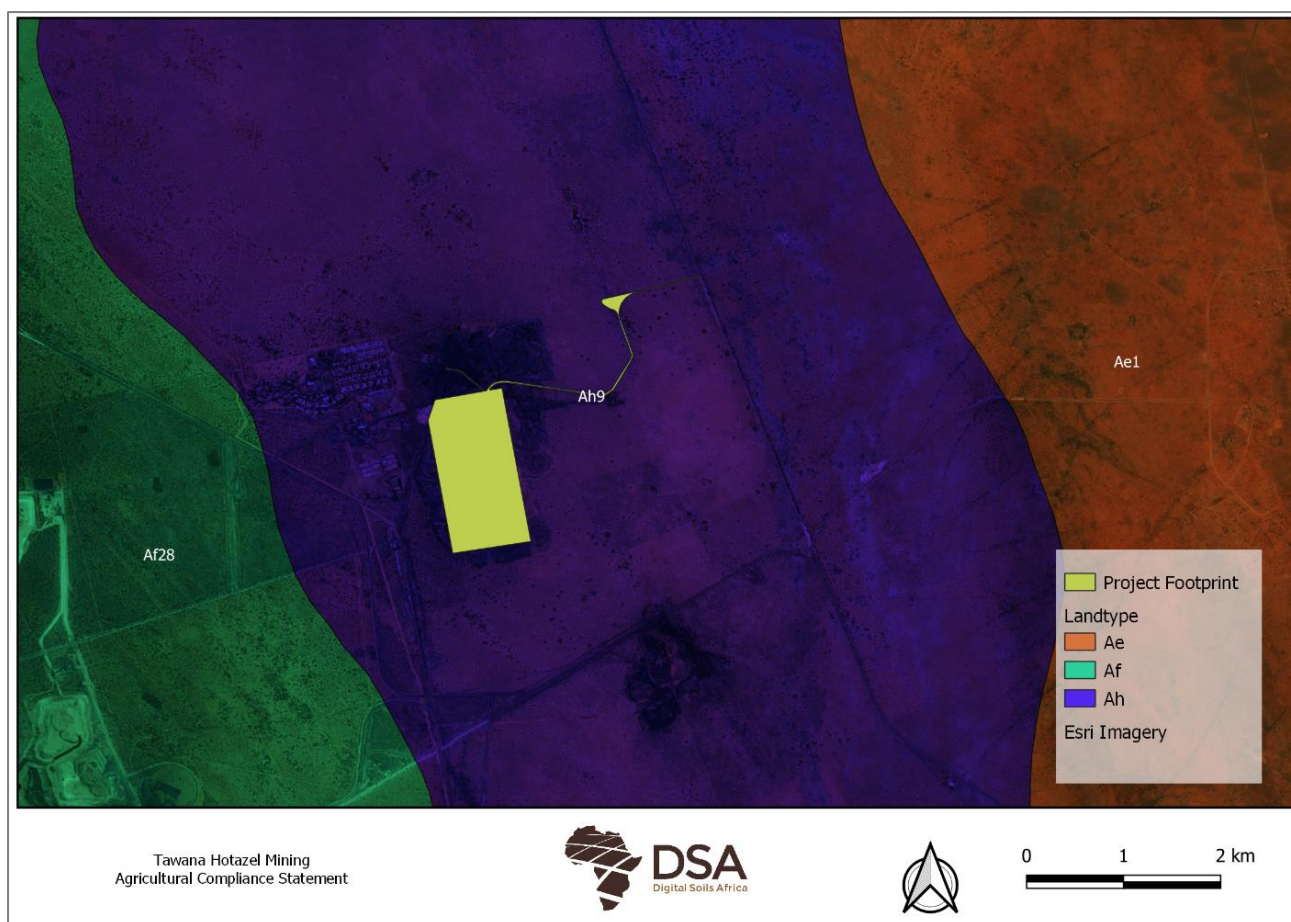
The Compliance Statement was compiled according to the protocol for the specialist assessment and minimum report content requirements for the environmental impacts on agricultural resources (GN320 of 2020).

The National Land Capability Classification was undertaken at a national scale, using the land type data on a scale of 1:250 000 (DAFF National land capability evaluation raster data layer, 2017). The National Land Capability has fifteen classes, as opposed to the eight classes described by Schoeman et al. (2002). Classes 1 to 7 are of low land capability and only suitable for wilderness or grazing. Classes 8 to 15 are considered to have arable land capability with the potential for high yields increasing with the land capability class number. The feature which increases the low Agricultural sensitivity to medium sensitivity are Land capability values of between 6 and 8, which are considered moderately arable soils.

The mean annual rainfall distribution is between 200 and 400 mm and the site falls within the arid climate category. The current land use is dominated by historic open cast mining and mining infrastructure. The access road intersects natural grasses.

There is only one land type occurring in the study area, namely Ah9 (Figure 13). Ah9 is dominated by freely drained and structureless soils (93%). Most of the soils are deeper than 1200 mm (96%) and have less than 6% clay. Soils in the area have limited pedological development and the texture of soil in this land type is dominated by sand with the clay fraction estimated as less than 10%. Deep Hutton and Clovelly soil forms (>1.2m) constitutes the largest portion of this land type. The land types of the area predict deep red sandy soils. These soils will have a low water holding capacity which will limit crop production in the arid climate. Therefore, the soil capability is considered low, and therefore a low Land Capability of less than 5. Most of the site footprint is dominated by historic mining activities and therefore minimal soil is present.

The site falls in an area with a low grazing capacity of 13 hectares per large stock unit (ha/LSU). Most of the site is sparsely vegetated mine site; therefore, the grazing potential would be very limited as most the area is bare mine discard with small areas of tree cover.



**Figure 13: Land types occurring in the study area (Land Type Survey Staff, 1972 – 2002)**

**(f) Palaeontology, Archaeology and Cultural Heritage**

The information presented in this section was obtained from following reports:

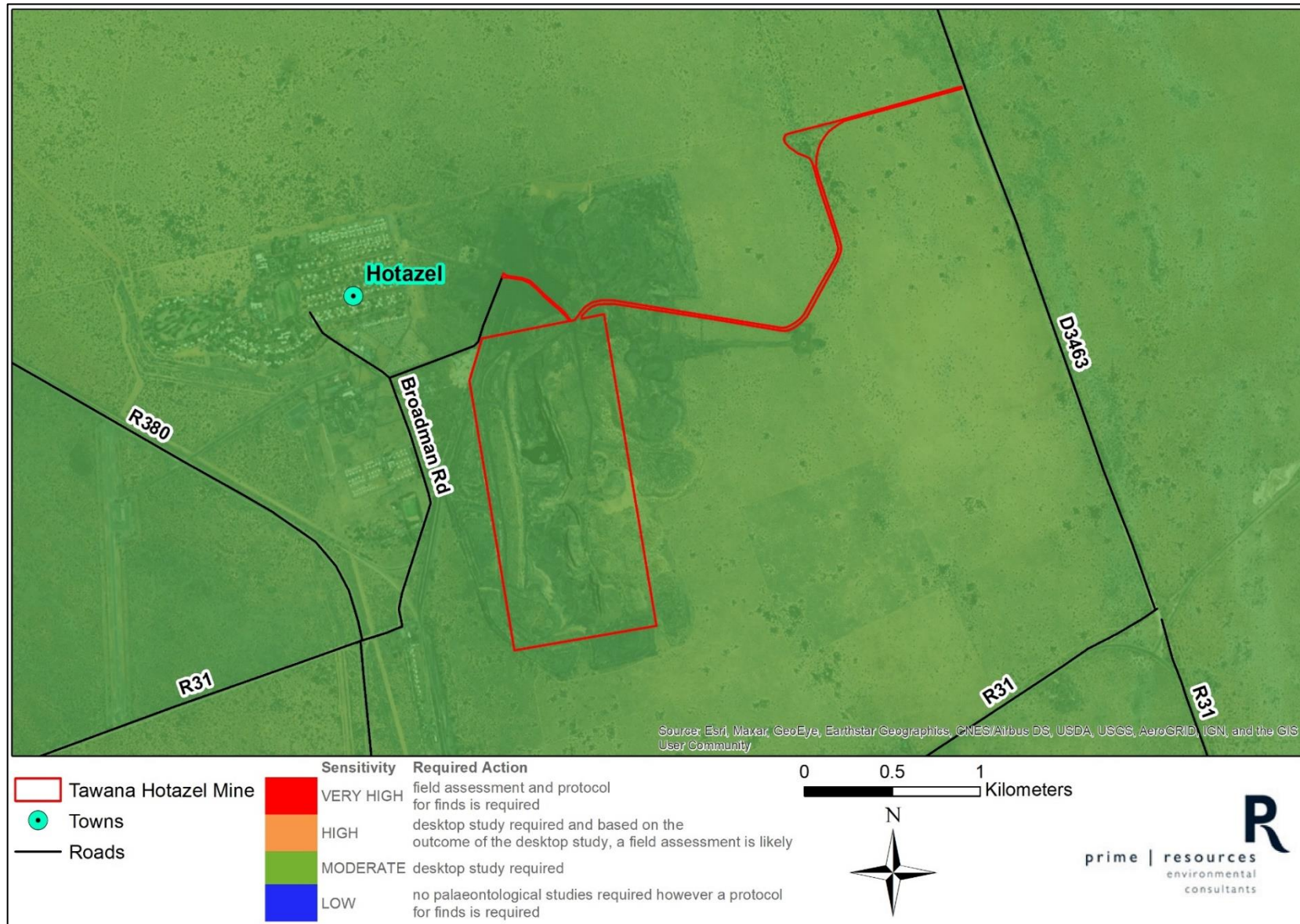
- Palaeontological Impact Assessment (PIA) for the proposed Hotazel Mining Right application, Northern Cape Province compiled by Prof Marion Bamford (November 2020) (refer to Appendix 9)
- A Report on a Heritage Impact Assessment for the Proposed Tawana Hotazel Mine, Hotazel, Northern Cape Province compiled by Archaetnos Culture & Cultural Resource Consultants (April 2021) (refer to Appendix 10).

From the South African Heritage Resources Information System (SAHRIS) Palaeontology (fossil) sensitivity map, the area is indicated as moderately sensitive (green) and this applies to the Kalahari sands (Figure 12). The map indicates that the area is of moderate sensitivity and therefore only a desktop study is required.

From a palaeontological perspective, there are no UNESCO World Heritage Sites in the vicinity of the proposed THM. The mining area lies on the aeolian sands of the Kalahari Group (Quaternary age). Rocks bearing iron and manganese are below the surface and they do not preserve any fossils. Aeolian sands do not preserve fossils as they are windblown. Rarely the sands will entrap more robust fossils, such as fragments of bones or wood, but these are not *in situ*. If palaeo-pans or palaeo-springs are in the area they might preserve fossils. No such deposits have been recorded from the proposed THM, most of the area has been disturbed by previous mining operations and the Google Earth imagery does not show any pan or

spring deposits. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

From a cultural perspective, known heritage sites are situated at a distance to the west of the proposed THM on the opposite side of the town of Hotazel and are therefore not threatened by the proposed development. No sites of cultural heritage importance were identified within the surveyed area.



**Figure 14: Palaeo-sensitivity map (SAHRIS, 2020)**

## (g) Noise

The information presented in this section was obtained from following report:

- Noise Specialist Study for the Proposed Tawana Hotazel Mine in Northern Cape Province compiled by Airshed Planning Professionals (Pty) Ltd (January 2022) (refer to Appendix 11)

### Typical rating levels for noise

SANS 10103 (2008) prescribes the manner in which environmental noise is measured and assessed in South Africa. Table 6 provides the typical rating levels for noise in various districts per SANS 10103 (2008).

**Table 6: Typical rating levels for outdoor noise**

Type of district	Equivalent Continuous Rating Level ( $L_{Req,T}$ ) for Outdoor Noise		
	Day/night $L_{R,dn}^{(c)}$ (dBA)	Day-time $L_{Req,d}^{(a)}$ (dBA)	Night-time $L_{Req,n}^{(b)}$ (dBA)
Rural districts	45	45	35
Suburban districts with little road traffic	50	50	40
Urban districts	55	55	45
Urban districts with one or more of the following: business premises; and main roads	60	60	50
Central business districts	65	65	55
Industrial districts	70	70	60

#### Notes

- (a)  $L_{Req,d}$  = The  $L_{Aeq}$  rated for impulsive sound and tonality in accordance with SANS 10103 for the day-time period, i.e. from 06:00 to 22:00.
- (b)  $L_{Req,n}$  = The  $L_{Aeq}$  rated for impulsive sound and tonality in accordance with SANS 10103 for the night-time period, i.e. from 22:00 to 06:00.
- (c)  $L_{R,dn}$  = The  $L_{Aeq}$  rated for impulsive sound and tonality in accordance with SANS 10103 for the period of a day and night, i.e. 24 hours, and wherein the  $L_{Req,n}$  has been weighted with 10dB in order to account for the additional disturbance caused by noise during the night.

### Noise sensitive receptors

Noise sensitive receptors generally include places of residence and areas where members of the public may be affected by noise generated by the proposed activities. Only those within a 5 km radius of activities are likely to be affected; however, all noise sensitive receptors within a 10 km radius were identified.

Receptors located within 10 km of the proposed THM include residences, schools and medical facilities within the town of Hotazel as well as farmsteads/ homesteads and the Gloria Mine village (Figure 15).

### Local environmental noise propagation and attenuation potential

The main meteorological parameters affecting the propagation of noise include wind speed, wind direction and temperature. Refer to Section 3 g) iv) (a) Meteorological conditions and air quality.

During the day, the wind field is dominated by winds from the northern sectors. During the night, the wind field is mostly from the northeast, east-northeast and south-southeast. Given the predominant wind direction noise impacts are expected to be slightly more notable to the south of the proposed THM during the day and to the southwest and north-northwest of the proposed THM during the night.

Noise reduction caused by a barrier (i.e. natural terrain, installed acoustic barrier, building) depends on two factors namely the path difference of a sound wave as it travels over the barrier compared with direct transmission to the receiver and the frequency content of the noise. The topography of the surrounding area is mostly flat with the main terrain features in the study area being lower lying riverbeds. Sound reflected by the ground interferes with the directly propagated sound. The effect of the ground is different for acoustically hard (e.g., concrete or water), soft (e.g., grass, trees or vegetation) and mixed surfaces. Ground cover was found to be acoustically mixed surrounding the proposed THM.

### Current noise levels and existing acoustic climate

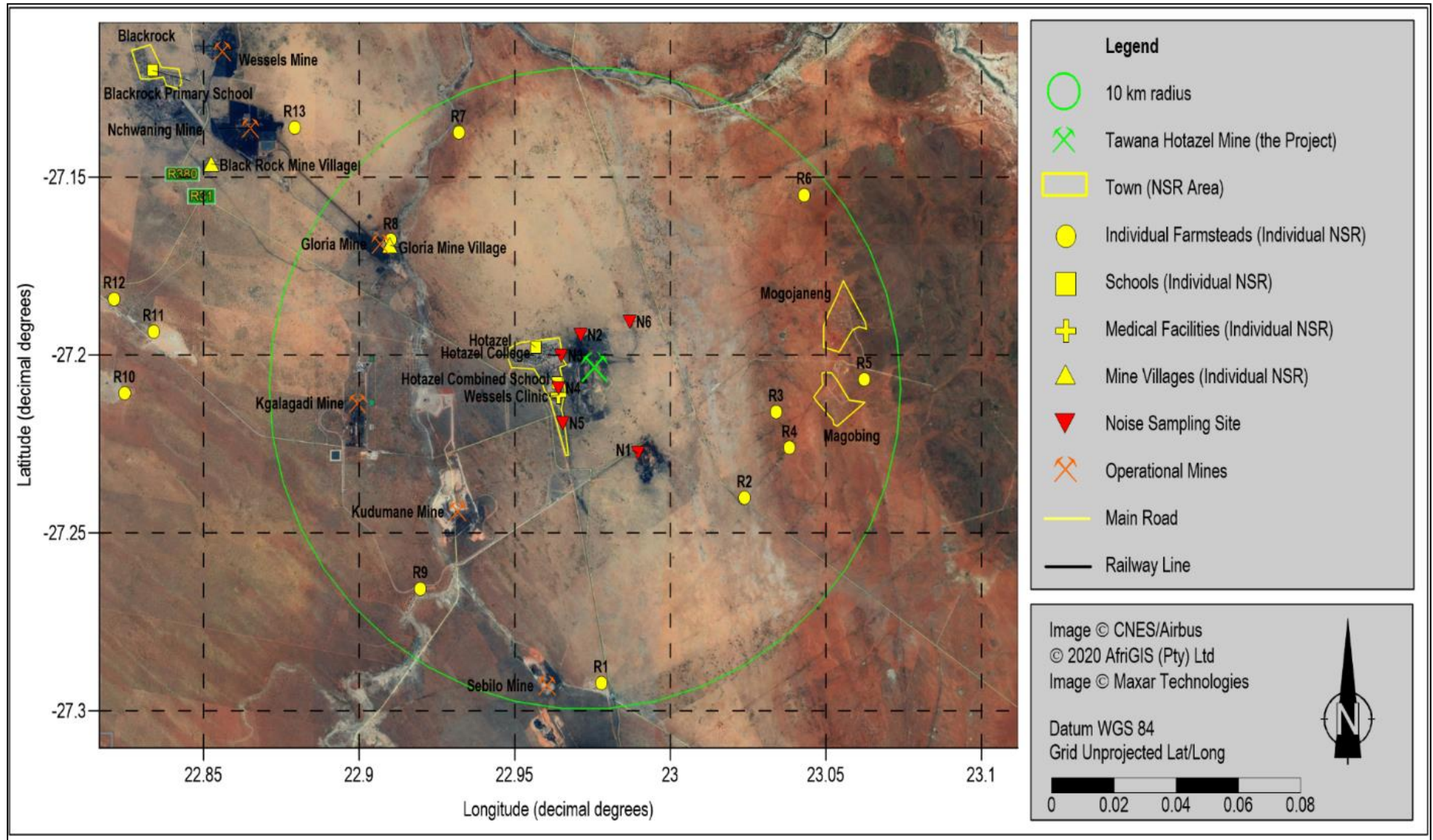
A short-term noise sampling campaign was carried out on the 1 and 2 December 2020 at six locations during which day- and night-time noise measurements were taken per the methods described in SANS 10103 (2008) the NEMA protocols published in GNR320.

The day-time and night-time acoustic climate at the six sampling points was heavily influenced by local noise generating sources, with the R31 (regional main road) activities only audible at Site 1; and railway operations at Site 5. Noise sources at Sites 3, 4 and 5, which were located either in- or near to- Hotazel residential areas were mostly influenced by local sources such as community activity, vehicle traffic and domestic animals. The acoustic sources at Point 6, located close to what appeared to be an unused mine access road, included insects, birds, cattle and community activity.

Refer to Table 7 and Figure 15 below for the results and map showing the sensitive receptors and sampling locations.

**Table 7: Noise measurement sites and levels**

Site	Location and visual and acoustic observations	Continuous day-time noise levels (L <sub>Req,d</sub> )	Continuous night-time noise levels (L <sub>Req,n</sub> )
N1	South of R31: <i>Shrubs, trees, uncultivated land, R31 road to the north and unoperational mine to the south. Noise sources included birds (day-time and evening), vehicle traffic from the R31 and insects (day and night).</i>	Typical of urban district with main roads	Typical of urban districts
N2	North of HMM: <i>Shrubs, trees, uncultivated land, unoperational mine to the south. Noise sources included insects, birds (day and evening) and dogs (night).</i>	Typical of urban districts	Lower than rural districts
N3	East of Hotazel near Dwarsstraat: <i>Uncultivated land, short grass, near residential properties and road. Noise sources included birds (day), insects (day and evening), dogs (evening and night), music (evening), community noise (evening) and vehicle traffic from the residential road.</i>	Lower than rural districts	Typical of suburban districts
N4	Between Wessels Clinic and Hotazel Combined School in Hotazel: <i>Uncultivated land, near unused sports field. Noise sources included insects (day and evening), birds (night), dogs (evening and night), community noise (evening and night), and vehicle traffic (night).</i>	Typical of rural districts	Lower than rural districts
N5	Residential area near railway line: <i>Uncultivated land within residential area and near railway line. Noise sources included birds (day and night), insects (evening), dogs, music (day), community noise (day and evening), vehicle traffic from the residential road (day and evening), and cows (day).</i>	Lower than rural districts	Typical of urban districts
N6	North of proposed THM access road: <i>Uncultivated land, long grass and shrubs near mine access road. Noise sources included birds and insects.</i>	Typical of suburban districts	Typical of rural districts



**Figure 15: Noise sensitive receptors within a 10 km radius of the proposed THM and noise sampling locations**



## **(h) Surface water**

The information presented in this section was obtained from following reports:

- Surface Water Baseline and Impact Assessment Report compiled by iLanda Technologies (Pty) Ltd (November 2021) (refer to Appendix 12)
- Water Research Commission (WRC). The South African Mine Water Atlas (WRC Project No. K5/2234/3)
- Department of Water and Sanitation. 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity (PESEIS) per Sub Quaternary Reaches for Secondary Catchments in South Africa
- MS Basson and JD Rossouw, 2003. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation

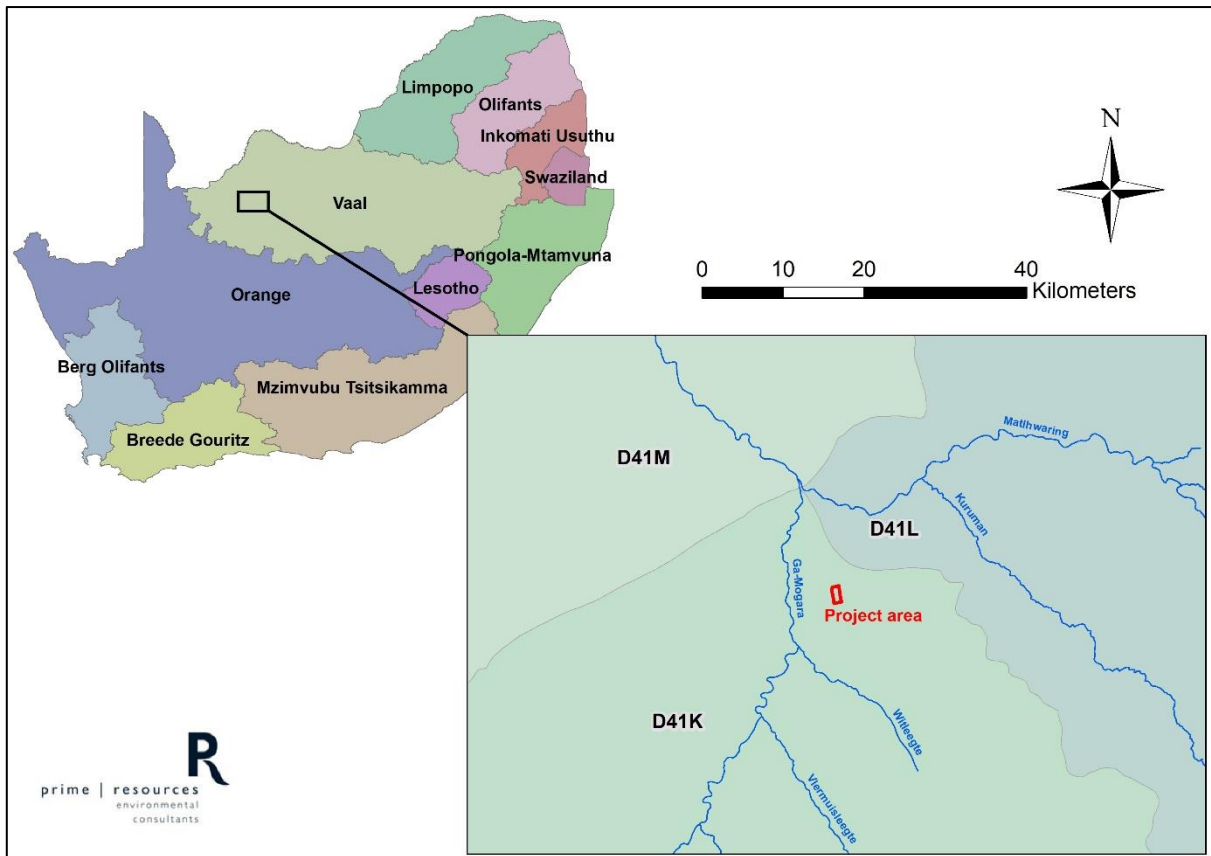
### **Catchment Description and Surface Water Resources**

The proposed THM is located within the newly revised Vaal WMA within Quaternary Catchment D41K between the Kuruman and the Gamagara Rivers within the Gamagara River catchment. The Gamagara River confluences with the Kuruman River to the north of the proposed THM, which eventually joins the Molopo River further downstream to the west. The Gamagara River may be regarded as Largely Natural and non-perennial in nature, while the portion of the Kuruman River directly north of THM may be regarded as Largely Natural and perennial due to its source, a natural spring known as the 'eye of Kuruman' further upstream. The Gamagara River is classified as Critically Endangered, and with the river signature not considered to be adequately protected, while the Kuruman River is classified as Critically Endangered with the river signature considered to be poorly protected according to the latest NBA, 2018 (Van Deventer et al., 2019).

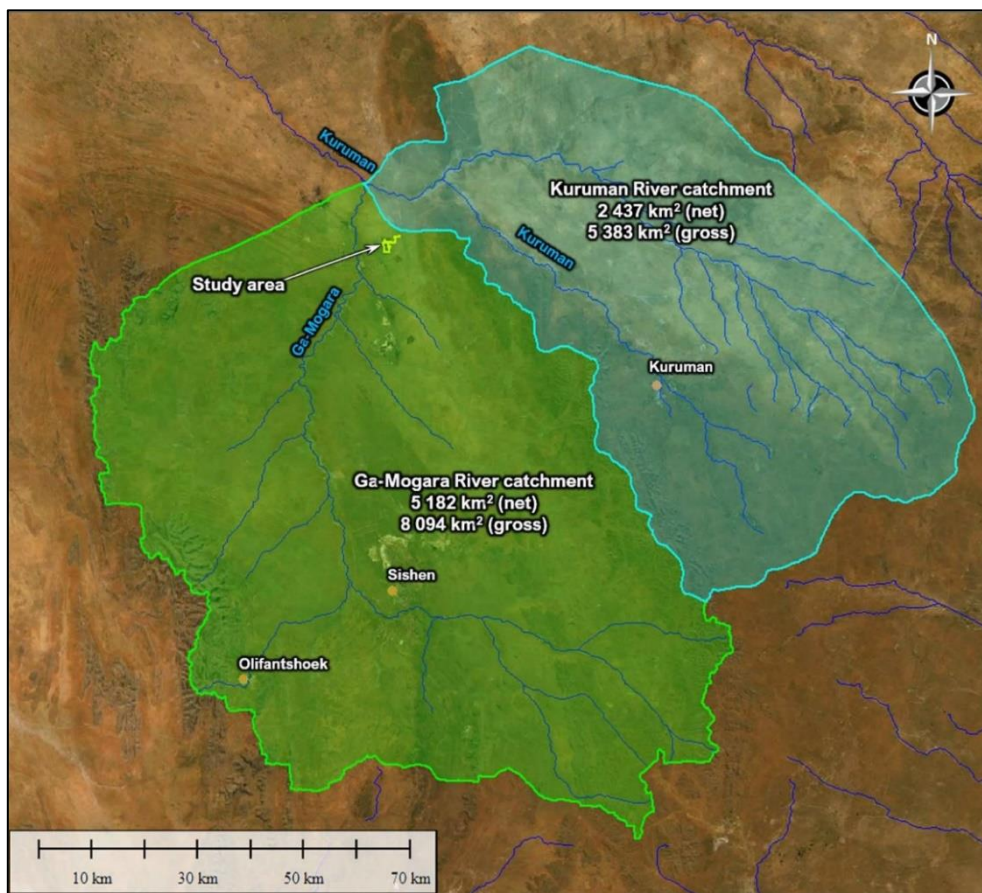
As shown in Figure 16, the proposed THM does not contain rivers or streams within the boundaries of the MR application area. The closest rivers are the Gamagara River (5 km west) and the Kuruman River (10 km north). The area drains generally to the west towards the Gamagara River, which flows from south to north. Within the quaternary catchment, the Witleegte, Gamagara and Vlermuisleegte Rivers are present; these are, however, at a distance greater than 5 km from proposed THM. During the site visit in mid-January 2021, the Kuruman River was flowing strongly (visually estimated at a rate of more than 1 m<sup>3</sup>/s). The Gamagara River was dry. The Gamagara River bed is being mined near the R380 highway. A large river diversion appears to have been constructed and significant construction is underway in the riverbed.

The catchments are largely undeveloped, although significant iron ore and manganese deposits are being mined in the Gamagara River catchment. The Kuruman River catchment comprises mostly agricultural activities.

The proposed THM is not located within a surface water or groundwater Strategic Water Source Area (SWSA) WRC, 2018, with the closest SWSA being the Northern Ghaap Plateau groundwater SWSA, approximately 12 km east and the Sishen/ Kathu groundwater SWSA located approximately 11 km south (WRC, 2017).



**Figure 16: Water Management Area and Quaternary Catchment map**



**Figure 17: Catchment delineation**

## Mean Annual Precipitation and Evaporation

The mean annual rainfall in the Gamagara River catchment is approximately 350 mm, decreasing from south to north. The mean annual precipitation of the MR area is 270 mm. The mean annual evaporation of the MR area is 2 375 mm (S-Pan).

## Climatic water balance

November to April is wetter than May to October. From historical records, 2009 was recorded as having the highest total rainfall between November and April, with 465.2 mm (refer to Table 8 below).

**Table 8: Wettest Years Between November and April**

Rating	Hydrological year	Total rainfall between November and April (mm)
Wettest year	2009	465.2
2nd Wettest year	1955	426
3 <sup>rd</sup> Wettest year	1999	424.8
4 <sup>th</sup> Wettest year	2005	386.5
5 <sup>th</sup> Wettest year	1964	372.3
6 <sup>th</sup> Wettest year	1987	366.4
7 <sup>th</sup> Wettest year	1954	340.7
8 <sup>th</sup> Wettest year	1945	334.7
9 <sup>th</sup> Wettest year	1942	305.1
10 <sup>th</sup> Wettest year	2007	301.8

## Peak Rainfall Data

The following maximum monthly rainfall data (refer to Table 9 below) was obtained from the daily rainfall records obtained for the Baseline Surface Water Report (iLanda Technologies, 2020). The daily rainfall record, was analysed and the annual maximum series was extracted from the data. This annual maximum series was used to determine 24-hour storm depths at various yearly recurrence intervals (peak rainfall scenarios) presented in Table 10 below.

**Table 9: Maximum Monthly Rainfall Data (mm)**

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
115.9	101.5	271	238.6	169.3	209.5	173.1	81.8	127.1	24.9	50.9	53

**Table 10: Peak 24-Hr Rainfall Depths for the proposed THM**

Recurrence Interval (year)	24-hour rainfall depth (mm)
2	39
10	71
20	84
50	103
100	117
200	132

## Baseline hydrology

The catchments were delineated from the quaternary catchments. Many portions of the catchments are endorheic (do not drain to the sea) so these areas are excluded when calculating the net catchment areas. The Gamagara River Catchment has a net area of 5 182 km<sup>2</sup> and a gross area of 8 094 km<sup>2</sup>, with a net mean annual run-off of 3.65 Mm<sup>3</sup>/a (Figure 17 and Table 11).

Both rivers experience occasional dry season surface flows as well as subsurface flows. Both of these contribute to higher-than-expected dry season average flows. The 50-year and 100-year flood peaks for the streams and rivers are shown in Table 12.

**Table 11: Mean annual runoff**

Stream	Mean annual run-off (Net Mm <sup>3</sup> /a)
Gamagara River	3.65
Kuruman River	3.36

**Table 12: Peak flows in the rivers and streams**

Stream	50-yr	100-yr
Gamagara River	621 m <sup>3</sup> /s	789 m <sup>3</sup> /s
Kuruman River	427 m <sup>3</sup> /s	543 m <sup>3</sup> /s

### Buffer Zones

There are no water courses in close proximity to the proposed THM (the closest rivers are the Gamagara River - 5 km west, and the Kuruman River - 10 km north) and therefore no surface water buffer zones are relevant.

### Surface Water Users

The operations may affect the Gamagara River and the Kuruman River. The following likely downstream users were determined from aerial photography, literature surveys and observations made during a site visit of the catchment:

- Domestic users – limited drinking water, but farm labourers and local inhabitants may consume this river water and use it for laundry and cleaning when water is available.
- Recreational users – it is likely that farm labourers and local inhabitants may swim in the rivers when they are flowing and may use the water for washing.
- Industrial users – there are no water quality sensitive industrial users on the Gamagara and Kuruman rivers downstream of the study area.
- Aquatic users – the catchments are impacted by agriculture and mining and sensitive aquatic users are unlikely to be present. Some less sensitive aquatic species may still be present. Further considerations regarding baseline aquatic ecology are described in the Wetlands and Aquatic Biodiversity section below.
- Irrigation users – the river water may be used for opportunistic irrigation.
- Livestock watering – the river water may be used for opportunistic livestock watering.

### Water Quality

The Gamagara River was dry during the site visit. The Kuruman River was flowing. These rivers are normally dry, so obtaining any water quality sample is opportunistic and fortunate. Water quality monitoring data was collected on 20 January 2021 from the Kuruman River and analysed by an accredited laboratory (Figure 18).

The results shown in Table 13 below indicate that the background water quality in the Kuruman River is good, with only elevated calcium, resulting in elevated TDS and electrical conductivity. This is considered naturally occurring calcium.



**Figure 18: Water Quality Sampling Point**

**Table 13: Kuruman River Water Quality Data**

Parameter	20/01/21	Comments	
pH Value @ 25°C	7.7		
Conductivity @ 25°C(mS/m)	47.2	The water quality exceeds the Irrigation guideline value of (40mS/m) on 20/01/2021.	
Total dissolved solids, TDS(mg/l)	336.00	The water quality exceeds the Irrigation guideline value of (260mg/l) on 20/01/2021.	
Calcium as Ca(mg/l)	49.20	The water quality exceeds the Domestic guideline value - Class O (32mg/l) on 20/01/2021.	
Calcium Hardness as CaCO <sub>3</sub> (mg/l)	123		
Total suspended solids, TSS(mg/l)*	<1		
Magnesium as Mg(mg/l)	31.00		
Magnesium Hardness as CaCO <sub>3</sub> (mg/l)	126		
Total Hardness as CaCO <sub>3</sub> (mg/l)*	249	The water quality exceeds the Domestic guideline value - Class I (200mgCaCO <sub>3</sub> /l) on 20/01/2021.	
Sodium as Na(mg/l)	16		
Potassium as K(mg/l)	5.4		
Total Alkalinity as CaCO <sub>3</sub> (mg/l)	211.00		
Chloride as Cl(mg/l)	28.00		
Sulphate as SO <sub>4</sub> (mg/l)	15.03		
Nitrate as NO <sub>3</sub> (mg/l)	0.20		
Nitrate as N(mg/l)	<0.100		
Nitrite as NO <sub>2</sub> (mg/l)	<0.1		
Nitrite as N(mg/l)	<0.1		
Fluoride as F(mg/l)	0.20		
Turbidity(N.T.U)*	1.20		
<b>LEGEND</b>			
RECREATION WATER GUIDELINE EXCEEDANCES	Value		
DOMESTIC WATER GUIDELINE EXCEEDANCES	Class O	Class I	Class II Class III
IRRIGATION WATER GUIDELINE EXCEEDANCES	Value		
LIVESTOCK WATER GUIDELINE EXCEEDANCES	Value		

**(i) Groundwater**

The following information was obtained from

- Tawana Hotazel Mine Groundwater Study compiled by Future Flow Groundwater and Project Management (December 2021) (refer to Appendix 13)
- WRC. The South African Mine Water Atlas (WRC Project No. K5/2234/3)
- Development of Internal Strategic Perspectives (ISP): Groundwater Overview for the Lower Vaal Catchment Management Area (prepared for Directorate Water Resource Planning, 2003)
- Internal Strategic Perspectives (ISP) for the Lower Vaal Management Area (WMA No 10, 2004)
- The online DWS Resource Quality Information Services (RQIS) (<http://www.dwa.gov.za/iwqs/>)
- MS Basson and JD Rossouw, 2003. Lower Vaal Water Management Area: Overview of Water Resources Availability and Utilisation
- Geology description above (Section 3 g iv) (1) (d))

**Aquifer systems**

Three aquifers occur in the area. These three aquifers are associated with a) the primary sandy gravel material, b) the fractured rock and leached banded iron formation aquifer, and c) the dolomitic aquifers of the Griqualand West Sequence.

The fractured rock aquifers are not high yielding, but the dolomitic karst aquifer is well known for its high potential (Van Dyk and Jones, 2006). The following is a description of the natural aquifer systems in the area:

#### Upper primary sandy gravel aquifer

- Forms due to the vertical infiltration of recharging rainfall through the primary sandy gravel material being retarded by the lower permeability of the underlying competent rock. In the region this aquifer ranges between 3 and 10 m in thickness. Groundwater collecting above the sandy gravel / competent material contact migrates down gradient along the contact to lower lying areas.
- Expected to be dry in large portions of the study area for large parts of the year.
- Seasonal and mostly carries water only during and shortly after rainfall events when rainfall recharges into the material. The relatively high transmissivity of the sandy gravel material allows the recharging water to migrate quickly through and out of the material. This high transmissivity rate combined with the high positive evaporation rate of 2 026 mm/a results in the material dry for large portions of the year.
- The borehole yield in this aquifer is seasonally variable due to the strong dependence on rainfall recharge.

#### Fractured rock and leached BIF aquifer

- Although the lower permeability of the competent rock material will retard vertical infiltration of groundwater, some of the water in the upper aquifer will recharge the lower aquifer through faults and fractures. The geological map does not show major faults or fractures in the area, however, large portions of the area are covered by the sandy gravel, therefore surface mapping of fault and fractures is hampered. The hydrogeological map of the area does show the presence of some regional faults in the Makganyene (Vm) and Danielskuil (Vad) Formations that outcrop 8 to 12 km to the east.
- Groundwater flows in the fractured rock aquifer are associated with the secondary fracturing in the competent rock that was formed by the major north / south striking faulting seen from the hydrogeological maps. As such, groundwater flows and contaminant transport will be along discrete pathways associated with the fractures.

#### Dolomitic aquifer

- Dolomitic aquifers are recognised to be of potential concern to mining activities due to the potential large inflow volumes in areas where karstic dolomite is intersected. The dolomitic karst aquifer in the region is well known for its high potential.
- Inspection of exploration drilling logs show that no dolomite has been intersected in any of the exploration boreholes. This is confirmed from discussions with the project geologist. Therefore, it is expected that the dolomitic aquifer will not be intersected by the proposed THM.

The aquifers present in the area are classified as minor aquifers. The aquifers are of high importance to the local landowners outside of town as it is their only source of water for domestic, gardening, and agricultural purposes.

The ISP categorises the supply of water to the town of Hotazel as coming from both groundwater sources and from the Vaal-Gamagara pipeline. As the 2011 Census, 15.6% of households in the local municipality rely on borehole water.

### **Aquifer transmissivity**

The site-specific aquifer transmissivity was calculated from aquifer tests performed on groundwater monitoring boreholes TMBH1, TMBH2 and TMBH3 (refer to Table 14). These boreholes targeted structures identified from the ground geophysical survey. Transmissivities of around 0.08 to 0.16 m<sup>2</sup>/day were calculated for TMBH1 and TMBH3 which represents the fractures present in the area and the transmissivity of 0.04 m<sup>2</sup>/day calculated for TMBH2 represents the general host geology of the area, however there is not enough information available to confirm such a deduction.

**Table 14: Aquifer test results**

<b>Borehole</b>	<b>Units</b>	<b>TMBH1</b>	<b>TMBH2</b>	<b>TMBH3</b>
SWL	mbgl	47.03	26.65	31.50
Test - pump phase duration	min	12	18	27
Abstraction Rate	L/s	0.3	0.3	0.3
Drawdown achieved	m	31.24	52.61	46.72
Recovery achieved	%	39	91	87
Transmissivity (Theis)	m <sup>2</sup> /day	0.16	0.06	0.12
Transmissivity (Cooper-Jacob)	m <sup>2</sup> /day	0.12	0.03	0.11
Transmissivity (Recovery)	m <sup>2</sup> /day	0.08	0.04	0.11
Transmissivity (Average)	m <sup>2</sup> /day	0.12	0.04	0.11

### **Hydrocensus, groundwater levels and flow patterns**

During the November 2020 hydrocensus, a total of eleven boreholes were identified. Some of the boreholes were inaccessible as the borehole was locked, dry or because the hole had collapsed. The depth to groundwater level was measured for eight boreholes and current groundwater quality was analysed in three boreholes. The depth to groundwater level was also measured in the newly drilled groundwater monitoring boreholes drilled during October 2021 (refer to Table 15).

Six of the boreholes belong to South 32 (HMM, which is a neighbouring mining company) and are used for monitoring purposes. Boreholes BH1 and BH3 are included in these boreholes.

The depth to groundwater level measured in the boreholes during the hydrocensus of November 2020 ranged between 20.3 and 32.00 m with an average of 26.76 m. The depth to groundwater level measured in the groundwater monitoring boreholes TMBH1, TMBH2 and TMBH3 during October 2021 ranged between 26.65 and 47.03 m.

The depth to groundwater level in the new monitoring boreholes tends to be greater than that measured in regional boreholes during the hydrocensus. The depth to groundwater level in TMBH1 is 31.24 m with only boreholes York (31.33 m) and JB39 (32.00 m) having greater depths to groundwater level. In boreholes TMBH2 and TMBH3 the depth to groundwater level is measured to be 52.61 m and 46.72 m respectively. This is attributed to the fact that the new monitoring boreholes are located close to the existing opencast pit where the depth to groundwater level is impacted by the previous mine dewatering and the evaporation from the pit lakes. It is also possible that the groundwater levels in the boreholes had not recovered fully after drilling due to the low aquifer transmissivity.



Regionally, the groundwater flows from the higher lying area to the east of THM towards the lower lying Ga-Mogara River west of the mine. Close to the existing pit the groundwater flow patterns are disrupted and are directed towards the pit due to the lower water level in the existing pit.

**Table 15: Hydrocensus results**

Point	Owner	East		South	Elevation mamsl	SWL		Use type	Comment
		LO27, WGS84				mbgl	mamsl		
BH1	South 32	-2 328	-3 010 838		1080.88	N/A		Monitoring	Hole locked. Located on landfill
JB 39	South 32	-2 041	-3 009 900		1061.00	32	1029.00	Monitoring	Hole located next to landfill
JB 38	South 32	-3 101	-3 009 489		1063.97	21.44	1042.53	Monitoring	Hole located between sewerage plant and old mine pit
NG	NG Church	-4 242	-3 009 547		1060.17	20.23	1039.94	Domestic/ garden	Hole located on Church premises
BH 2	Olivier Construction	-3 152	-3 010 203		1052.44	33.74	1018.70	Industrial	Dynamic water level
JB 41	South 32	-1 197	-3 009 874		1058.67	25.51	1033.16	Monitoring	Hole located next to old shooting range
JB 40	South 32	-1 210	-3 008 916		1052.90	26.56	1026.34	Monitoring	Hole located on the farm Hotazel
BH 3	South 32	-1 215	-3 008 918		1063.32	N/A		Monitoring	Dry at 26 m.
BH 4	Pieter Jansen	-463	-3 012 087		1069.65	30.28	1039.37	Not in use	Located on the farm York
York	Pieter Jansen	-369	-3 012 080		1075.72	31.33	1044.39	Domestic/ York wash bay	Located on the farm York
BH 5	Pieter Jansen	567	-3 011 539		1076.08	N/A		Not in use	Hole collapsed
TMBH 1	THM	-2 534	-3 010 126		1067.72	31.24	1036.48	Monitoring	Hole located to the east of north-eastern portion of the pit
TMBH 2	THM	-2 758	-3 009 864		1069.69	52.61	1017.08	Monitoring	Hole located to the north of the pit
TMBH 3	THM	-2 951	-3 011 273		1071.26	46.72	1024.54	Monitoring	Hole located to the west of south-western portion of the pit
TMBH 4	THM	-2 832	-3 011 625		1073.89	31.24	1036.48	Monitoring	Hole located down gradient of the crusher and plant area

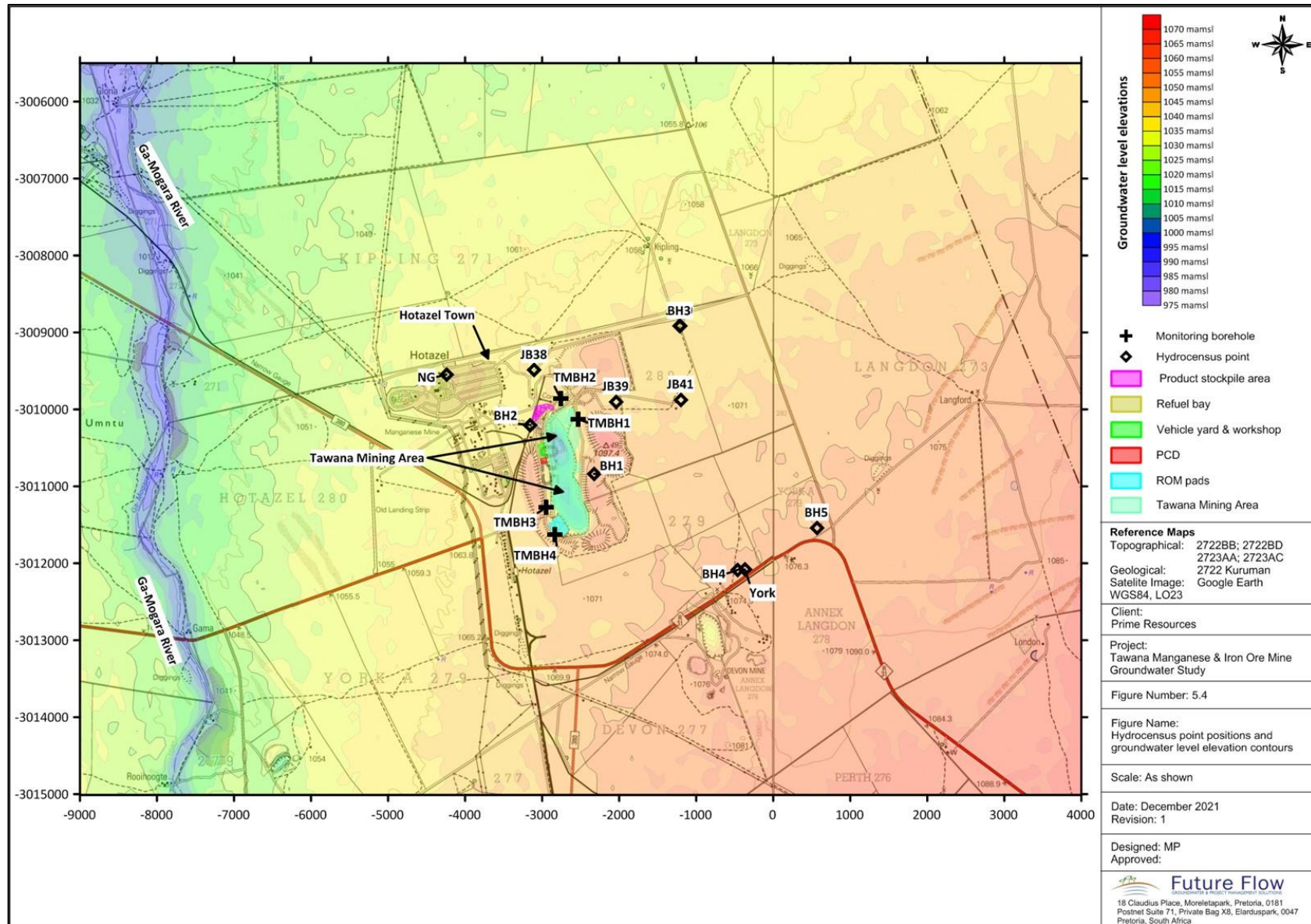
Note:

N/A = Not available

mbgl = metres below ground level

mamsl = metres above mean sea level

All coordinates are provided in Transverse Mercator projection, LO23, and WGS84 datum



**Figure 19: Hydrocensus borehole positions and groundwater level elevation contours**

## Baseline groundwater quality and character

Groundwater samples were collected from:

- Three of the eleven hydrocensus points. Boreholes NG, JB40 and York were sampled;
- The water in the main existing opencast pit (sample HP); and
- Three of the newly drilled groundwater monitoring boreholes (TMBH4 was dry at the time and could not be sampled).

The sample from the church in town (sample NG) and that of monitoring borehole TMBH3 differ notably from the other five samples. None of the elements exceed the SANS241:2015 guideline values in samples NG and TMBH3, while chloride and nitrate exceed the SANS241:2015 guideline value in all five other samples. Sodium and manganese also exceed the guideline values in individual samples. Due to the high chloride and nitrate concentrations the total dissolved solids (TDS) and electrical conductivity (EC) also exceed the SANS241:2015 guideline values in samples HP, JB40, York, TMBH1 and TMBH2 (refer to Table 16).

**Table 16: Groundwater chemical analysis results**

Analysis	Units	SANS 241:2015 guideline value	HP	NG	JB40	York	TMBH1	TMBH2	TMBH3
pH		≥5 - ≤9.7	7.84	8.13	7.41	7.58	7.52	7.3	8.53
EC	mS/m	≤170	456	73.5	365	394	427	367	86.6
TDS	mg/L	≤1 200	4144	458	3036	3230	2858	2591	488
Total Alkalinity	mg/L CaCO <sub>3</sub>	N/G	150	316	30	288	130	200	46.9
Total Hardness	mg/L CaCO <sub>3</sub>	N/G	2080.8	404.1	1454.3	1992	1693	1695	137
Chloride (Cl)	mg/L	≤300	774.9	24	748.3	665.8	728	515	136
Sulphate (SO <sub>4</sub> )	mg/L	≤500 (health)	199	23.6	117	35.7	103	121	88.1
Nitrate (NO <sub>3</sub> -N)	mg/L	≤11	323.3	4.18	119.7	223.6	260	235	14.1
Nitrite (NO <sub>2</sub> -N)	mg/L	≤0.9	0.365	<0.006	0.07	<0.006			
Ammonium (NH <sub>4</sub> )	mg/L	N/G	<0.03	<0.03	1.65	<0.03	<0.008	<0.008	<0.008
Phosphate (PO <sub>4</sub> )	mg/L	N/G	0.12	0.15	0.24	0.2	<0.005	<0.005	<0.005
Fluoride (F)	mg/L	≤1.5	<0.3	0.3	0.5	<0.3	<0.263	<0.263	<0.263
Bromide	mg/L	N/G	6.95	0.12	7.26	6.31			
Calcium (Ca)	mg/L	N/G	384.6	76.3	277.8	311.6	367	427	36.7
Magnesium (Mg)	mg/L	N/G	266.5	50.8	180.9	288.8	189	153	11
Sodium (Na)	mg/L	≤200	239.3	20.7	182.5	150.5	179	133	122
Potassium (K)	mg/L	N/G	5.4	2.2	3.9	4.4	9.54	7.07	2.26
Aluminium (Al)	mg/L	≤0.3	<0.02	<0.02	<0.02	<0.02	<0.002	<0.002	0.098
Arsenic	mg/L	≤0.01	<0.0025	<0.0025	<0.0025	<0.0025			
Cadmium (Cd)	mg/L	≤0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	<0.002
Chromium (Cr)	mg/L	≤0.05	0.002	<0.0015	0.0018	<0.0015	<0.003	<0.003	<0.003
Cobalt (Co)	mg/L	N/G	<0.002	<0.002	<0.002	<0.002	<0.003	<0.003	<0.003
Copper (Cu)	mg/L	≤2	<0.007	<0.007	<0.007	<0.007	0.046	0.043	0.015
Iron (Fe)	mg/L	≤2 (health)	0.08	0.051	0.389	0.034	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	≤0.01	<0.005	<0.005	0.037	<0.005	<0.004	<0.004	<0.004
Manganese (Mn)	mg/L	≤0.4 (health)	0.007	0.003	0.408	<0.002	<0.001	0.168	<0.001
Nickel (Ni)	mg/L	≤0.07	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002
Selenium	mg/L	≤0.04	<0.003	<0.003	<0.003	0.011			

Analysis	Units	SANS 241:2015 guideline value	HP	NG	JB40	York	TMBH1	TMBH2	TMBH3
Vanadium	mg/L	N/G	0.0082	0.0051	0.0015	0.0078			
Zinc (Zn)	mg/L	≤5	0.007	0.183	0.026	0.044	<0.002	0.02	<0.002

Exceed SANS241:2015 guideline value

mS/m = milliSiemens/metre

mg/L = milligram per litre

N/A = Not analysed

N/G = No SANS241:2015 guideline value

Analysis of the water character shows that, in terms of cations, the samples are magnesium dominant. Anion analysis shows that:

- In general the groundwater is chloride dominant;
- Sample NG is bi-carbonate dominant.

The water from the area in general shows a high degree of ion exchange having taken place (implying that water has not been recently recharged). Only sample NG shows a recently recharged character. Sample TMBH3 indicates a sodium chloride dominant character (Figure 20).

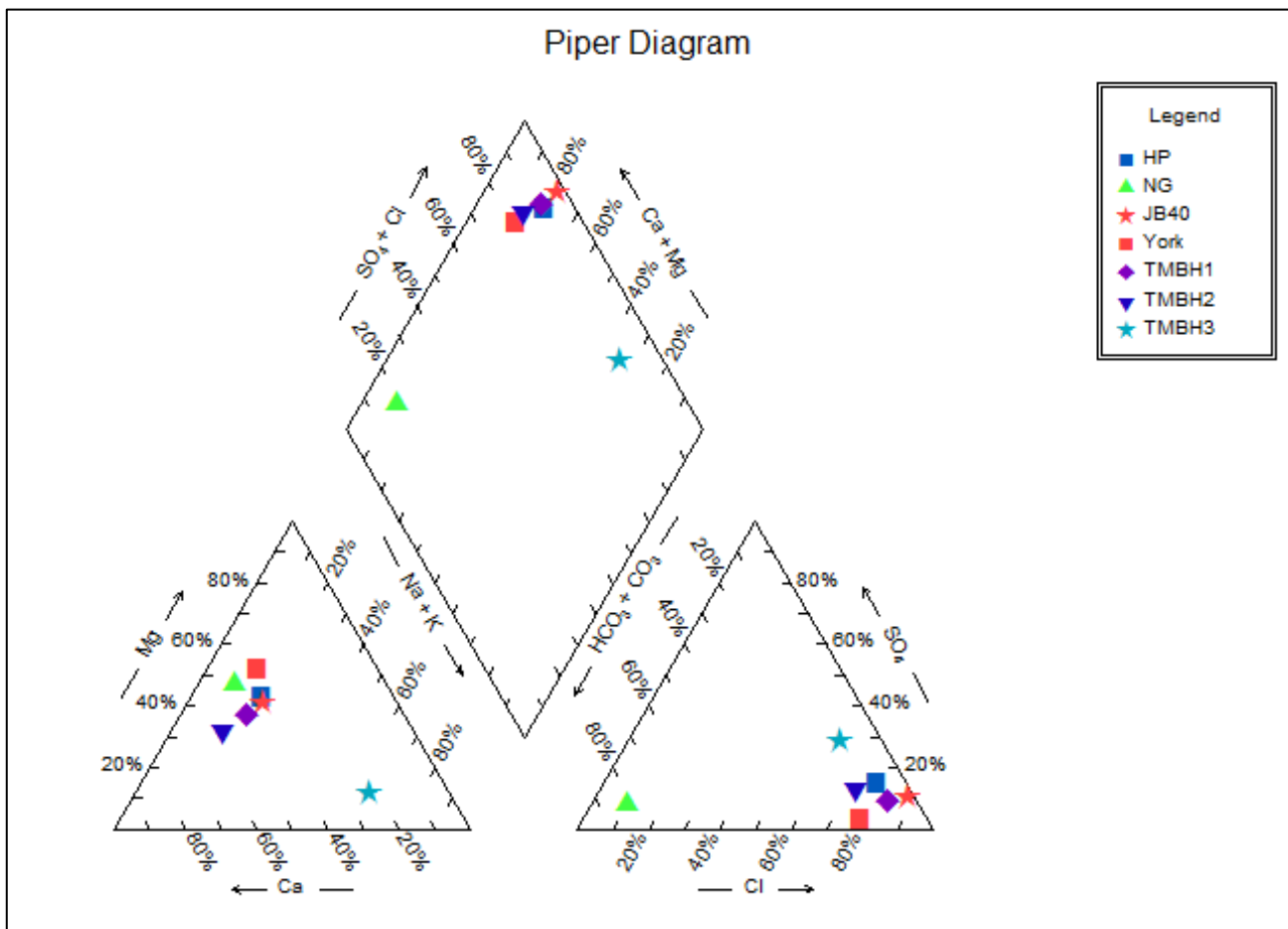


Figure 20: Piper Diagram

### Groundwater availability assessment

Results from the groundwater monitoring borehole drilling and aquifer testing show that groundwater yields in the area are low, and there is a limited groundwater availability associated with the Kalahari formation and the Ongeluk lava. Results from the exploration drilling programs do show some notable groundwater

strikes associated with faulting and/or fracturing. Groundwater strikes generally occur between 30 and 60 m depth, but can occur up to 110 m below surface.

**(j) Geochemistry**

The information presented in this section was obtained from following report:

- Geochemical Assessment for Mining- and related activities associated with the proposed Tawana Hotazel Mine, Northern Cape Province compiled by Prime Resources (June 2021) (refer to Appendix 20)

**Geochemical characterisation of the rock material present on site**

Samples analysed are representative of the material that will be mined, processed and stored on site. A summary of the samples is provided in Table 17.

**Table 17: Geochemical sample description**

Sample	Description
TH1	Calcrete composite sample (waste rock)
TH2	Banded ironstone composite sample (waste rock)
TH5	High grade Mn ore. Sampled at the old plant.
TH6	Low grade Mn ore. Sampled from historic waste rock.
TH7	Composite sample of surface waste rock. BIF, calcrete and quartzite.
TH8	Composite sample of fine material. Appears to have been screened or windblown. Occurs on the roads on the site. Comprised of BIF and manganese.

**Acid base accounting tests**

Results from the acid-base-accounting testing show that none of the material on site is likely to be acid forming. In addition, the samples have very low abundances of sulphur (<0.01%). Therefore, the samples have insufficient sulphide present that if oxidised, could sustain long term acid generation.

**Metal and sulphate leach testing**

Results from the SPLP 1:20 material to solution ratio testing show that copper in the low grade ore sample (TH 6) narrowly exceeded the General Standard for Discharge and manganese in the composite fine sample (TH 8) exceeded the General Standard for Discharge and aesthetic SANS241 drinking water guideline. No other concentrations of the analysed metal and metalloid contaminants of concern have been released in concentrations which exceed water quality guidelines.

The waste rock (represented by TH 1, 2 and 7) and ore samples present a low risk in terms of metal leaching potential. The circum-neutral pH of the solutions resulting from the leach testing as well as the presence of oxyhydroxide iron and manganese minerals within the material inhibits the mobilisation of metal contaminants of concern. The fines material (TH 8) presents a higher risk due to manganese leaching at concentrations exceeding drinking water and discharge standards.

Leach testing was also done using a 1:4 material to solution ratio. Results show that boron exceeded the General Discharge Standard of 1 mg/L in the surface waste rock composite (TH 7). Boron was not leached in detectable concentration in the 1:20 SPLP leach test, and was therefore diluted due to the high leaching ratio. The potential for boron leaching from the waste rock in concentrations exceeding guidelines is therefore dependent on the site-specific rock to water interaction ratio.

Manganese exceeded the General Discharge Standard and aesthetic drinking water standard in the fines composite (TH 8). The concentration of manganese observed in the 1:4 leach test and the 1:20 SPLP test are not markedly different. Given the high abundances of manganese oxide minerals noted in the mineralogy, the concentration of manganese in the solution is not governed by the amount of manganese-bearing mineral present or the water to rock leaching ratio but is more likely to be metered by mineral solubility controls.

### **Pit lake quality modelling**

A geochemical model was developed to simulate the evolution of water in the existing pit lake during mechanical evaporation of the pit lake water. Results show that the pH of the pit lake water is not expected to become acidic during evaporation. A brine liquid will develop with evaporation with a chemical character dependent on the evaporation percentage. Elements that can be present in elevated concentrations compared to the SANS241:2015 Drinking Water Guidelines include chloride, nitrate and sodium. Calcium and magnesium can also be present in high concentrations, but are not expected to exceed drinking water guidelines.

### **(k) Terrestrial Biodiversity**

The information presented in this section was obtained from following report, which was undertaken in line with the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) and 44 of the NEMA:

- Terrestrial Biodiversity Assessment for the Proposed Tawana Hotazel Mining THM, Northern Cape compiled by Field and Form Landscape Science in collaboration with Malachite Ecological Services (November 2021) (refer to Appendix 14).

The proposed THM falls within the Savanna Biome, in the Eastern Kalahari Bushveld Bioregion, in Quarter Degree Square 2722BB and the Kathu Bushveld vegetation type, which is considered to have a conservation status of Least Threatened (Mucina & Rutherford, 2006). The greater area falls within the Griqualand West Centre of Endemism, however the proposed THM is not located within the core geological areas of this centre of floristic endemism, and endemic and near-endemic species are unlikely to occur within the proposed THM. A limited portion, along the existing haul roads and access roads, is located within remaining extent of Kathu Bushveld [Threat Status: Least Concern (LC); Protection Level: Poorly Protected] in terms of the NBA: Terrestrial Remnant Vegetation (2018) (Figure 21). According to the Northern Cape Conservation Plan (C-Plan; 2016) there are Other Natural Areas (ONAs) indicated to remain along existing haul roads within the opencast void and along the access road in the east.

The proposed THM does not fall within a Listed Threatened Ecosystems (2011), Protected and Conservation Areas (PACA; 2020), a National Protected Area Expansion Strategy (NPAES) Focus Areas (2010), an Important Bird and Biodiversity Areas (IBA; 2015) or a SWSA; 2017.



**Figure 21: Northern Cape National Biodiversity Assessment: Terrestrial Remnant Vegetation (2018) associated with the proposed THM and surrounds**

### Habitat Units and Environmental Sensitivity

A detailed field assessment of the proposed THM was undertaken from the 23 - 24 November 2020 to ground-truth the findings of the desktop assessment and to determine the ecological condition of the project area and its surrounds. THM and its surrounds. A list of floral species, indicating species recorded from each habitat unit is included in Appendix 14. During the field assessment four broad habitat units were identified within the proposed THM (Figure 23). All habitat units have historically been subject to varying degrees of disturbance due to mining activities and construction and operation of associated infrastructure. Ongoing disturbances due to grazing and trampling by livestock, horses and donkeys is taking place along the main access road in the east.

The habitat units identified and associated terrestrial ecological sensitivity (Figure 24) are as follows:

#### Existing Infrastructure and Alien Vegetation Communities (Low Sensitivity)

Comprises the majority of the proposed THM, specifically occurring within the residual opencast void within the centre of the MRA and historical processing plant and rail loadout facility in the north of the proposed THM. This habitat unit is characterised by the absence of vegetation and where vegetation is present, these communities are dominated by alien species. These areas have been significantly impacted by historical mining activities and development within this habitat unit will not lead to the significant loss of natural habitat.

#### In-pit Aquatic habitat unit (Medium – Low Sensitivity)

Associated with water contained in the historical opencast workings. Development within this habitat unit will lead to the loss of aquatic habitat that has established within the opencast void. Although having certain faunal biodiversity and habitat value when considering the semi-arid surrounds, this habitat unit is not considered natural, and hosts an overall low floral diversity.

- Vegetation within this habitat unit is dominated by hydrophytic vegetation, most notably dense stands of *Phragmites australis*.
- Various waterfowl were noted within this habitat unit, while adits surrounding the area provide habitat for swallow and swift species, as well as bats.

#### Modified Kathu Bushveld habitat unit (Medium Sensitivity)

Includes areas that have not previously been cleared for mining and associated activities. Remnant Kathu Bushveld vegetation occurs in the vicinity of historical disturbance where, although dominated by indigenous species, alteration to the vegetation structure and composition has taken place. Remnant Kathu Bushveld vegetation also occurs adjacent to the main access road in the east and is currently impacted by ongoing grazing and trampling by livestock, horses and donkey. Development within this habitat unit will lead to the direct loss of reasonably intact bushveld habitat with increased floral and faunal biodiversity, particularly in comparison with the adjacent and surrounding mine-impacted areas. Given historic disturbances within this habitat unit, modifications to faunal assemblages within this habitat have likely occurred, with species utilising these habitats displaying a high degree of behaviour plasticity.

- Tree and shrub species characterising the vegetation within Modified Kathu Bushveld habitat unit include the invasive alien species *Prosopis glandulosa* var. *torreyana* and *P. velutina*, indigenous species such as *Vachellia hebeclada* subsp. *hebeclada*, *Grewia flava* and *Lycium hirsutum*, as well as the nationally protected tree species *Vachellia erioloba* and *V. haematoxylon*. *Tarchonanthus camphoratus* and *Terminalia sericea* occur in low abundance and were only occasionally encountered during the field assessment.
- A moderate diversity of forb species is present with prominent species including *Senna italica* subsp. *arachoides*, various *Hermannia* spp., *Hermbstaedtia odorata*, *Peliostomum leucorrhizum*, *Crotalaria spartioides*, *Orthanthera jasminiflora*, *Geigeria* spp., *Ipomoea* spp., *Kyllinga alba*, *Rhynchosia holosericea*, *Pavonia burchellii* and *Acanthosicyos naudinianus*, amongst others.
- Grasses are relatively sparse, tufted, and dominated by *Aristida* spp., *Eragrostis lehmanniana*, *Schmidtia* spp., with *Pogonarthria squarrosa* and *Setaria verticillata* also recorded.
- Several faunal species were noted during the floral field assessment (either directly, or through discussions with mine personnel) including Rock Hyrax (*Procapra capensis*), Cape Porcupine (*Hystrix africaeaustralis*), Cape Hare (*Lepus capensis*), Ground Squirrel (*Xerus inauris*) and *Gerbilliscus* sp.





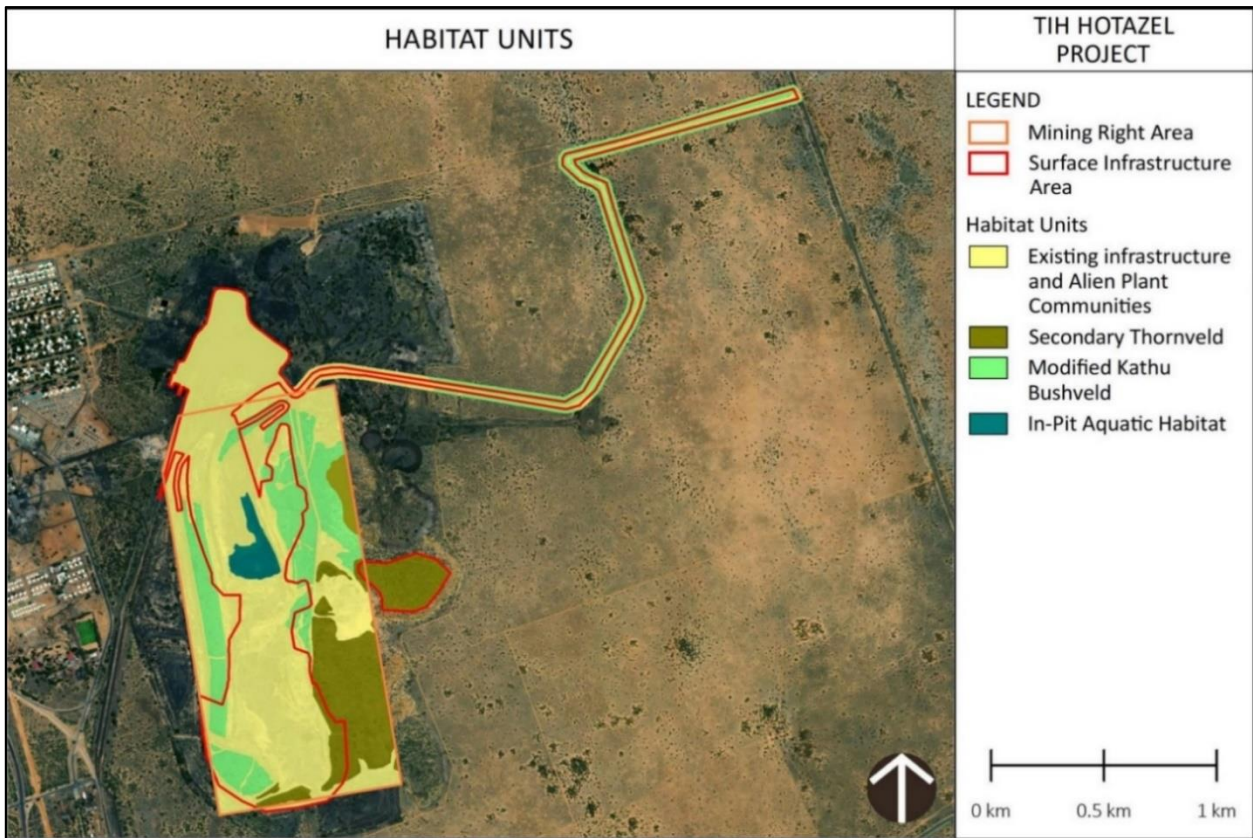
**Figure 22: Photos of the Modified Kathu Bushveld habitat unit, within the MR area (top) and adjacent to the access road (bottom)**

(Photos taken by Field and Form Landscape Science on 23/10/2020)

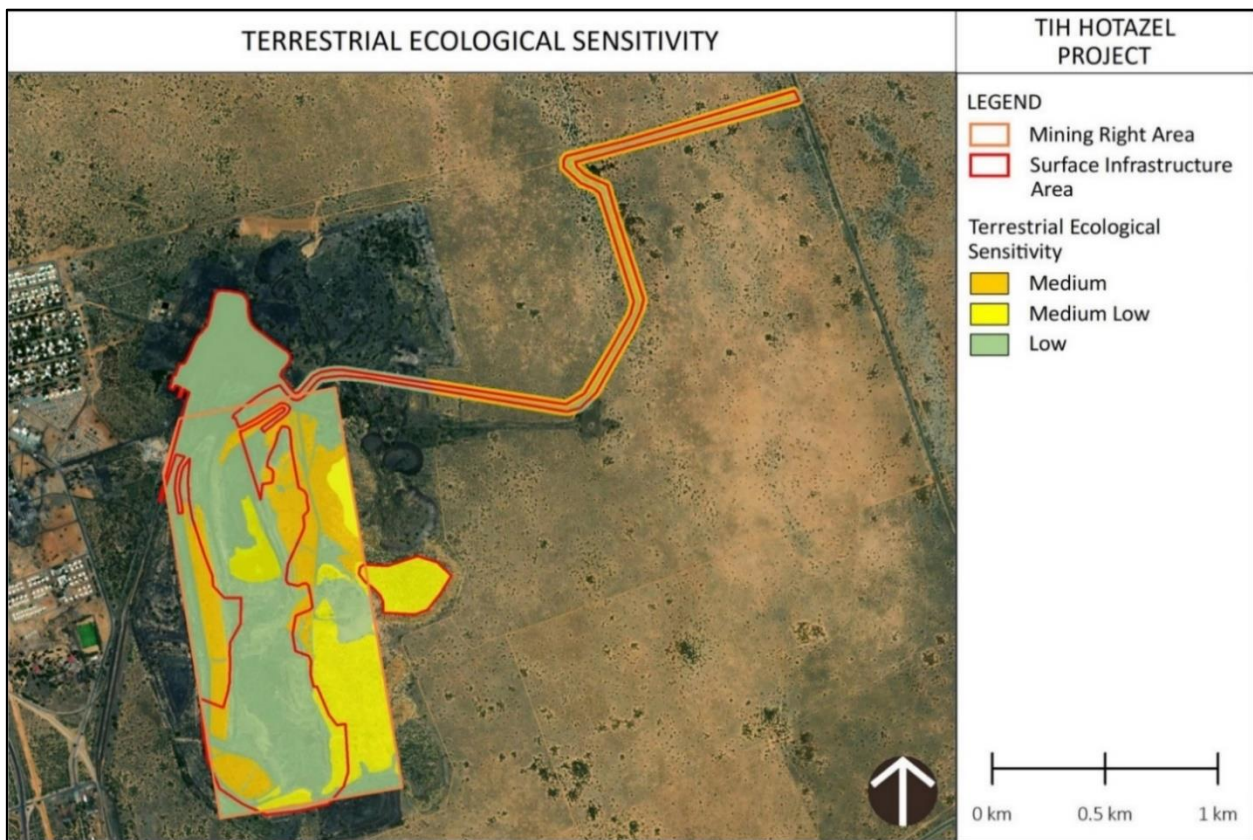
Secondary Thornveld habitat unit (Medium – Low Sensitivity)

Restricted to historical surface dumps and comprises mostly indigenous vegetation that have re-established on these areas over time. Vegetation in this habitat unit has a lowered biodiversity and hosts a high proportion of pioneer forb and grass species, with a low abundance of alien vegetation also present. Development within this habitat unit will not lead to the significant loss of natural habitat.

- Vegetation in these areas is dominated by *Senegalia mellifera* subsp. *detinens*, an indigenous pioneer thorn tree/ large shrub species that rapidly establishes on shallow soils and within previously disturbed areas provided that growing medium is available.
- Forb species recorded include *Ipomoea* spp., *Felicia muricata* and *Senecio inaequidens*, while the most prominent graminoid recorded was *Stipagrotis uniplumis*, a species that plays an important role in soil stabilisation.



**Figure 23: Habitat Units associated with the proposed THM**



**Figure 24: Terrestrial ecological sensitivity of the habitat units associated with the proposed THM**

## **Species of Conservation Concern (SCC), Protected and NEMBA Threatened or Protected Species (TOPS) listed and Endemic Species**

Most indigenous floral and faunal species in the Northern Cape Province are protected under the NCNCA, and species listed under Schedule 1 (Specially Protected) and Schedule 2 (Protected), for which permits are required from the NC DENC prior to disturbing such species, are listed below.

The SCC, Protected and TOPS-listed and Endemic Species occurring within the proposed THM are as follows:

### Existing Infrastructure and Alien Vegetation Communities

- No floral SCC, protected or TOPS listed species were recorded within this habitat unit, and such species have a low probability of occurrence due to past disturbances within this habitat unit.
- No nationally protected or TOPS-listed faunal were recorded or are likely to permanently inhabit this habitat unit.
- One faunal SCC namely Verreaux's eagle (*Aquila verreauxii*) utilises this habitat unit for nesting, breeding and foraging purposes.

### In-pit Aquatic habitat unit

- Fish species, *Tilapia sparrmanii*, is listed as Protected under the NCNCA.
- No other floral or faunal SCC, protected or TOPS-listed species were recorded within this habitat unit, and such species have a low probability of occurring/ residing within this habitat unit.

### Modified Kathu Bushveld habitat unit

- No floral SCC species were recorded or are likely to occur. One TOPS-listed floral species, namely *Harpagophytum procumbens* was recorded.
- Two nationally protected tree species in terms of the National Forests Act (Act No. 84 of 1998) occur, namely *Vachellia erioloba* in relatively low abundance and *V. haematoxylon* in high abundance.
- One provincially protected floral species in terms of Schedule 1 of the NCNCA, namely *H. procumbens*, and several floral species listed under Schedule 2 of this Act, namely *Plinthus sericeus*, *Ammocharis coranica*, *Boophone disticha*, *Crinum sp.*, *Orphanthera jasminiflora*, *Albuca seineri* (= *Ornithogalum seineri*), *Albuca setosa* (= *Ornithogalum setosum*) were recorded.
- No faunal SCC were noted during the field assessment or are likely to occur based on the desktop investigation. Signs of TOPS-listed Aardvark (*Orycteropus afer*) were however noted during the field assessment in the vicinity of the access road. Other faunal TOPS-listed species that may occur are Bat-eared Fox (*Otocyon megalotis*) and Cape Fox (*Vulpes chama*).
- The arachnid species *Harpactira* spp. and *Pterinochilus* spp. are provincially protected under Schedule 1 of NCNCA (Act No. 9 of 2009) and may occur within this habitat unit.
- Based on distributional data, the South African Python (*Python natalensis*) is the only SCC whose distribution includes the proposed THM and historically would have occurred within wooded communities with rocky elements. Although regionally listed as Least Concern (LC), *P. natalensis* is a registered TOPS-listed species. Sundevall's Shovel-snout (*Prosymna sundevallii*) is a near-endemic reptile species with an overlapping distribution with the proposed THM and may occur in more intact Kathu Bushveld along the access road.

### Secondary Thornveld habitat unit

- No floral or faunal SCC, provincially protected or TOPS-listed species were recorded within this habitat unit, and such species have a low probability of occurrence due to past disturbances within this habitat unit.
- *Vachellia haematoxylon*, a national protected tree species in terms of the National Forests Act (Act No. 84 of 1998) occurs scattered within this habitat unit.
- The arachnid species *Harpactira* spp. and *Pterinochilus* spp. are provincially protected under Schedule 1 of NCNCA (Act No. 9 of 2009) and may occur within this habitat unit.

### Alien and Invasive Floral Species

Although a relatively low diversity of alien and invasive floral species is present within the proposed THM, a large proportion of the vegetation, particularly considering the Existing Infrastructure and Secondary Bushveld habitat, are alien or encroacher species, mostly attributed to *Prosopis glandulosa* var. *torreyana*. As a result, the overall floral and faunal species assemblages have an overall reduced biodiversity (based on historic habitat transformation and mining activities) when compared to intact natural habitat in the region and reference state Kathu Bushveld.

Alien and invasive floral species identified within the boundaries of the proposed THM are listed in Table 18 below. A high proportion, but of a relatively low diversity, of alien species is present, when considering the high degree of disturbance within the majority of the proposed THM.

The listed invasive species' categories as indicated by the NEMBA Alien and Invasive Species Lists (2020) as well as the categories as per CARA (Act No. 43 of 1983) are shown. Schedule 6 of the NCNCA (Act No. 9 of 2009) also lists invasive species, none of which were recorded within the proposed THM, which the exception of those species listed under CARA.

Four of the species are NEMBA listed invasive species that require mandatory control, while spreading or allowing the spread of *Prosopis* spp. is prohibited.

**Table 18: Alien floral species identified during the field assessment**

Species	Common name	NEMBA Category*	CARA Category*
<i>Argemone ochroleuca</i>	White-flowered Mexican poppy	1b	1
<i>Boerhavia diffusa</i> var. <i>diffusa</i>	Red spiderling	N/L	N/L
<i>Chenopodium album</i>	White Goosefoot	N/L	N/L
<i>Hypochaeris radicata</i>	False dandelion	N/L	N/L
<i>Nicotiana glauca</i>	Wild tobacco	1b	1
<i>Opuntia ficus-indica</i>	Sweet prickly pear	1b	1
<i>Pennisetum setaceum</i>	Fountain grass	1b	1
<i>Prosopis glandulosa</i> var. <i>torreyana</i>	Honey mesquite	3	2
<i>Prosopis velutina</i>	Velvet mesquite	3	2
<i>Schinus molle</i>	Pepper tree	N/L	N/L
<i>Verbesina encelooides</i>	Wild sunflower	N/L	N/L
<i>Washingtonia robusta</i>	Washington fan palm	N/L	N/L

\*N/L – Not Listed

NEMBA

Category 1b – Invasive species that must be controlled.

Category 3 – Ornamentally used plants that may no longer be planted. Existing plants may remain, except within the flood line of watercourses and wetlands, as long as all reasonable steps are taken to prevent their spread.

CARA

Category 1 – Declared weeds that are prohibited.

Category 2 – Invader plants with a commercial value that must be controlled.

## Herpetofauna

The proposed THM falls within the interface between the grasslands and arid savanna macro-habitat. Based on available aerial imagery in combination with findings from the floral field investigation, limited intact amphibian habitat occurs within the proposed THM and species present will likely comprise of those with a wide distribution and the ability to utilise suboptimal water resources. Six amphibians from four families are confirmed to occur within the 2722BB QDS. Seven reptile species, belonging to six families have been confirmed to occur within the 2722BB QDS however over 30 species are likely to utilise suitable available habitats within the QDS.

- Amphibian species, if present, will likely include Red Toad (*Schismaderma carens*), Power's Toad (*Sclerophrys poweri*) and Boettger's Caco (*Cacosternum boettgeri*).
- Reptile species likely to utilise intact habitats within the proposed THM include Southern Rock Agama (*Agama atra*), Western Ground Agama (*Agama aculeata aculeata*), Namaqua Sand Lizard (*Pedioplanis namaquensis*), Spotted Sand Lizard (*Pedioplanis lineocellata lineocellata*), Kalahari Tree Skink (*Trachylepis spilogaster*), Puff Adder (*Bitis arietans*), Cape Cobra (*Naja nivea*) and Forked-marked Sand Snake (*Psammophis trinasalis*).
- Discussion with mine personnel confirmed the presence of *B. arietans* and *N. nivea* within the proposed THM, while several *P. namaquensis* were noted during the floral field investigation within the Modified Kathu Bushveld habitat unit.

## Avifauna

The information presented in this section was obtained from following report:

- Avifaunal Impact Assessment Report, Tawana Hotazel Mining (Pty) Ltd: Mine & Surface Infrastructure Development , compiled by Feathers Environmental Services (December 2021) (refer to Appendix 15)

An assessment of the current Southern African Bird Atlas Project 2 (SABAP2) data yielded a total of 139 bird species that have been recorded within the nine-pentad broader study area during the SABAP2 atlassing period to date. The presence of these species in the broader study area provides an indication of the diversity of species that could potentially occur in areas where pockets of natural vegetation/habitats persist. Of the 139 species, six of these are considered to be of conservation concern (Kori Bustard *Ardeotis kori*, Martial Eagle, *Polemaetus bellicosus*, Verreaux's Eagle *Aquila verreauxii*, Lanner Falcon *Falco biarmicus*, European Roller *Coracias garrulus* and White-backed Vulture *Gyps africanus*). The SABAP2 reporting rates of Red List birds potentially occurring in bushveld habitat in the proposed THM are low, indicating that human activity has impacted on the avifaunal community and that levels of disturbance are high. These areas are likely to provide foraging and roosting habitat for the large diversity of passerine species recorded in the area. Despite anthropogenic impacts, mostly in the form of mining practices that have largely transformed the landscape resulting in a negative impact on avifaunal abundance, potentially sensitive habitat persists within the proposed THM area.

In order to describe the avifaunal community present, a rapid field survey was conducted in May 2021 to sample the avifauna in all of the primary habitats available within the proposed THM. During the survey, 35 species that are common to this area, 32 of which have been previously recorded by SABAP2 were recorded. The water contained within the open pit and the island in the centre of the water-filled pit have created an

ideal breeding habitat for various water dependent species i.e. herons, cormorants, ibis, grebes, moorhens and coots - species that have not been previously recorded by SABAP2 given the absence of water habitats within the broader area.

Verreaux's Eagle *Aquila verreauxii* is a large, territorial bird of prey with a distribution inextricably linked to mountainous habitat and its main prey of rock hyraxes, a prey base that features prevalently in the study area. Verreaux's Eagle has recently been classified as *Vulnerable* in southern Africa due to a decrease in its range and abundance. Despite the relatively disturbed nature of the proposed development site, the historical open-cast pit has provided suitable nesting platforms and prey base for this species to thrive over the last 11 years. Two nest locations have been observed within the proposed THM (Figure 25). Both the site visit conducted by the vegetation specialist in November 2020 and the more recent rapid field survey conducted as part of this avifaunal assessment in May 2021, confirmed the location of one of the two nests previously observed. The nest at the second location no longer exists and may have been washed away during a heavy rainfall episode in November 2020. Observations of the nest at the first location yielded an inactive nest and no observations of the Verreaux's Eagle (Figure 26). Reports from mine staff and contractors suggest that Verreaux's Eagle still utilise the project area extensively, but they have not observed that eagles on the nest this season (at the time of the May 2021 field survey) . It is important to note that prospecting (i.e. drilling) was underway, within 300m of the Verreaux's Eagle nest, during the November 2020 and May 2021 surveys. It is likely the disturbance associated with the noise of the drilling equipment and the vehicle and pedestrian traffic at the prospecting site, may have temporarily displaced the eagles from the nest and the immediate area.



**Figure 25: Location of the Verreaux's Eagle nest locations within the proposed THM area**



**Figure 26: Photo of one of the Verreaux's Eagle nest locations that occur within the proposed THM area**  
(Photo taken by Feathers Environmental Services on 10/05/2021)

### **Ecological Drivers and Processes**

A key event driving the ecology within the majority of the proposed THM is direct disturbance due to the historical construction and operation of mining and related infrastructure. The direct loss of surface vegetation cover, displacement of suitable soils as growing medium and subsequent loss of the indigenous seed bank, have resulted in large areas of the proposed THM being either devoid of vegetation, particularly along steep embankments of the opencast void or dominated by alien plant species.

Although vegetation re-establishment, another key ecological processes taking place within the proposed THM area, has occurred and continues to take place within disturbed habitats, this increase in vegetation cover is mainly characterised by invasive alien species encroachment and indigenous bush encroachment.

Ecological drivers governing vegetation re-establishment processes within the proposed THM are mainly controlled by climatic conditions, which are characterised by low, variable regional rainfall and seasonal droughts. High temperatures and low surface moisture availability, coupled with generally slow growth rates and episodic recruitment of indigenous species in the region leads to natural indigenous vegetation recovery being slow, allowing opportunity for alien and pioneer woody species, to rapidly establish and persist within disturbed areas. Other drivers include higher CO<sub>2</sub> levels experienced in the historic development of the savanna biome (CEN, 2016) as well as rising CO<sub>2</sub> concentrations due to climate change, that may aggravate bush thickening; as well as fire management, overgrazing, groundwater availability for phreatophytes, and the exclusion of larger browsers from the historical mining area.

### **(I) Wetlands and Aquatic Biodiversity**

The information presented in this section was obtained from following report, which was undertaken in line with the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) and 44 of the NEMA:

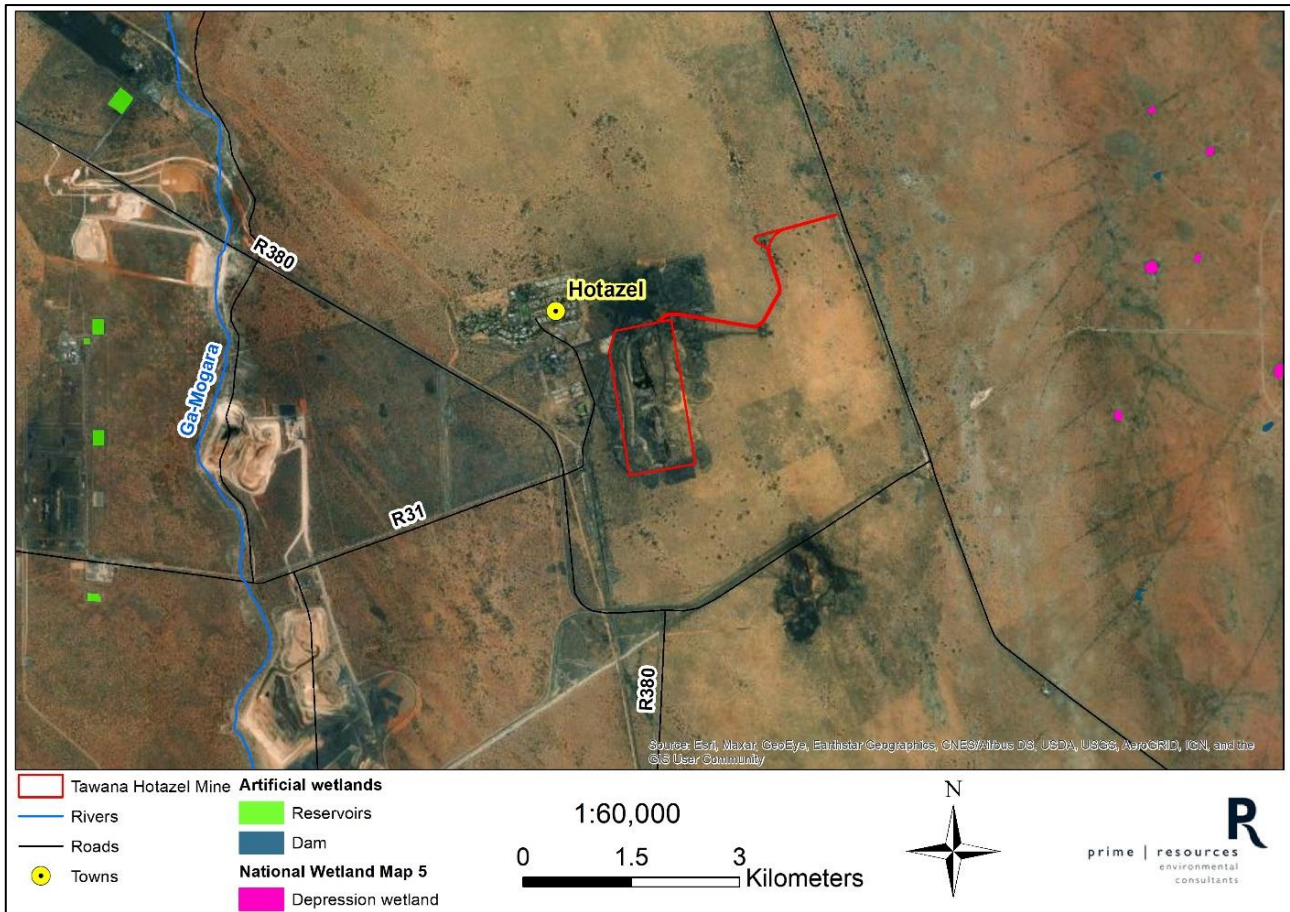
- Aquatic Biodiversity Compliance Statement, Hotazel Mine, compiled by Ecology International (Pty) Ltd (January 2021) (refer to Appendix 16)

The proposed THM is located within the Southern Kalahari freshwater ecoregion, the Vaal WMA and Quaternary Catchment D41K between the Kuruman and the Gamagara Rivers within the Gamagara River Catchment. The closest aquatic systems to the proposed mining activities were determined to be the Gamagara and Kuruman Rivers approximately 5 km and 9 km away, respectively. According to the NFEPA (2011), NBA Wetland Map 5 (2018) databases and from the site inspection, no natural aquatic or wetland systems were identified within the proposed project footprint areas or within the 500 m zone of regulation in accordance with Government Notice 509 as it relates to the NWA. The closest wetland features to the proposed THM, indicated to be depression (pan) wetlands, are shown to occur more than 4km to the east and west (Figure 27). The proposed THM is located within a listed Upstream Management Area. Upstream Management Areas are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river NFEPA's and Fish Support Areas. Further, no NFEPA-classified wetlands or wetland clusters were noted to be associated with the proposed THM.

The opencast pit void within the proposed THM, which is associated with the historical mine workings, is comprised of a moderately sized and relatively deep, artificial pit lake. The pit lake appeared to support both aquatic vegetation that had established within the pit lake, as well as fauna that may have been artificially translocated to the pit lake. Dense stands of *Phragmites australis* were observed in shallower areas making access to the deeper water areas more difficult. Thick layers of detritus and sediment (likely rich in diatoms) were observed in the shallows, where what was recognised as *Tilapia sparrmanii* (provincially Protected fish species) were feeding and taking refuge. The lake water was noted to be very clear with recharge likely mainly associated with seepage associated with interception of the water table together with direct inflows during rainfall events. Substrate within the pit lake comprised mainly of coarse waste rock associated with the historical mine workings and isolated areas of fine sediments and detritus. In most areas, the pit lake was deep with steep high-walls and rocky deposits of waste rock.

Given the lack of naturally occurring surface water features within the general study area, a detailed aquatic assessment was not warranted. The area associated with the proposed mining activities is confirmed to have a low sensitivity from the perspective of natural surface water features. Further, the lack of natural surface water within the proximity of the proposed project means that the impact of the proposed mining activity on the surrounding natural freshwater ecosystem is likely to be low.





**Figure 27: Regional wetlands associated with the proposed THM**

**(m) Socio Economic**

The following information was obtained from the 2019/2020 IDP of the JTGDM, the 2017/2018 IDP of the JMLM (adopted by the Council on 30 March 2017) as well as Census 2011 data and Community Survey 2016 data, provided by Statistics South Africa (Stats SA).

**Provincial context**

The Northern Cape is the largest of the South African provinces, covering an area of 372 889 km<sup>2</sup>. The province is also the least populous of the country's provinces, with a total population of only 1 193 780 (Community Survey 2016). Only 2.1% of the country's total households reside in the Northern Cape.

The capital city of the province is Kimberley. Other important towns include Upington, Springbok, Kuruman and De Aar.

Mining and agriculture are the primary economic sectors of the province. There are alluvial diamonds, iron ore, copper, asbestos, manganese, fluorspar, semi-precious stones and marble resources which have been mined in the region.

The province has fertile agricultural land in the Orange River Valley where grapes and fruit are cultivated intensively. Sheep farming takes place in the interior Karoo. Wheat, fruit, peanuts, maize and cotton are also produced at the Vaalharts Irrigation Scheme near Warrenton.

The Northern Cape is subdivided into five district municipalities: Francis Baard, John Taolo Gaetsewe, Namakwa, Pixley Ka Seme and ZF Mgcawu. The THM is located in the John Taolo Gaetsewe District Municipality.

### **Regional context**

The JTGDM (previously Kgalagadi) is located to the north east of the province and borders Botswana. It is comprised of three local municipalities: Gamagara, Ga-Segonyana and Joe Morolong. JMLM is the largest of these municipalities in terms of area.

The JTGDM comprises of 186 towns and settlements of which the majority (80%) are villages in the JMLM.

The District has an established rail network from Sishen South and between Black Rock and Dibeng. It is characterised by a mixture of land uses, of which agriculture and mining are dominant.

The population of the JTGDM was 242 264 (Community Survey 2016), of which 63.3% were aged between 15 and 64 years and 31.9% of the population was under the age of 15. The official unemployment rate of the District Municipality is 29.7%, while the youth unemployment rate is 37.2%.

From the 2018 cause-of-death data by Stats SA, the JTGDM had the highest proportion of deaths occurring among children below age one year (7.8%). In the Northern Cape province, most natural deaths (6.5 % of all mortalities) are due to tuberculosis. In the JTGDM, other forms of heart disease were the cause of most natural deaths, at 11.4% of all mortalities.

### **Local context and receiving environment**

The primary labour sending areas for the THM are predicted to be the community of Hotazel and other surrounding farms and villages within the JMLM.

The THM is situated within the JMLM, Ward 4. JMLM is the District's largest local municipality in terms of area size; covering an extent of 20 215 km<sup>2</sup>. JMLM is mostly rural, with virgin land surface comprising about 60% of the surface. Agriculture, mining and community services are the primary economic sectors. JMLM has three main nodes where relatively higher economic activity takes place, namely Vanzylsrus, Hotazel and Blackrock. Mining is the predominant economic activity in Hotazel and Blackrock. Vanzylsrus operates as service centre for the surrounding area.

The population of the JMLM was 84 201 (Community Survey 2016), of which 52 % were aged between 15 and 64 years and 38 % of the population was under the age of 15. There has been a major decline of about 25% in the population of JMLM in the 10 year period between 1996 and 2016; this is mainly due to the out-migration from the municipality to the Ga-Segonyana and Gamagara Local Municipalities.

The JMLM has the highest unemployment rate in the JTGDM of 40%. According to 2011 data, there are 7 828 employed, 4 912 unemployed, 6 200 discouraged work seekers and 29 569 other not economically active.

Setswana is the most prevalent language spoken in the community with 90% of people listing it as their first language. Afrikaans and English are the first languages of 4% and 2% of the population respectively.

Of the population aged 20 years and older, 5% have completed primary school, 28% have some secondary education, 13% have completed matric, 4% have some form of higher education and 23% have no form of schooling.

There are 168 schools, 4 police stations, 24 clinics and 3 community health centres located in JMLM. There is no hospital in JMLM. According to the IDP, there are 23 707 households with a population growth of -1%. The average household size is 3.4 persons per household.

JMLM does not own any land in its jurisdiction. Most of the land either belongs to the State or falls under the jurisdiction of the Traditional leaders.

As per the IDP, JMLM itself is not responsible for the implementation of electrification projects. The Municipality acts as a project coordinator for projects implemented by Eskom and the DMRE. Within JMLM, 86% of households have access to electricity. Electricity is used for cooking in 59% of households, while wood is used for cooking in 36% of households.

Groundwater is a major source of water and factors affecting the quality include agricultural activities and environmental issues. Currently, most of the communities within JMLM receive water for free. Of all households, only 7% have access to piped water either in their dwelling or in the yard. As per the 2011 Census, 72% sourced water from a water services provider (municipality or other), 16% used borehole water and 6% received water via a water truck. Vanzylsrus and Hotazel are the only areas that have piped water system in JMLM. According to the IDP, there are 24 villages that are without access to piped water. They receive water by means of truck delivery or through a windmill equipped with a tap. The IDP identified the following as challenges to the provision of water:

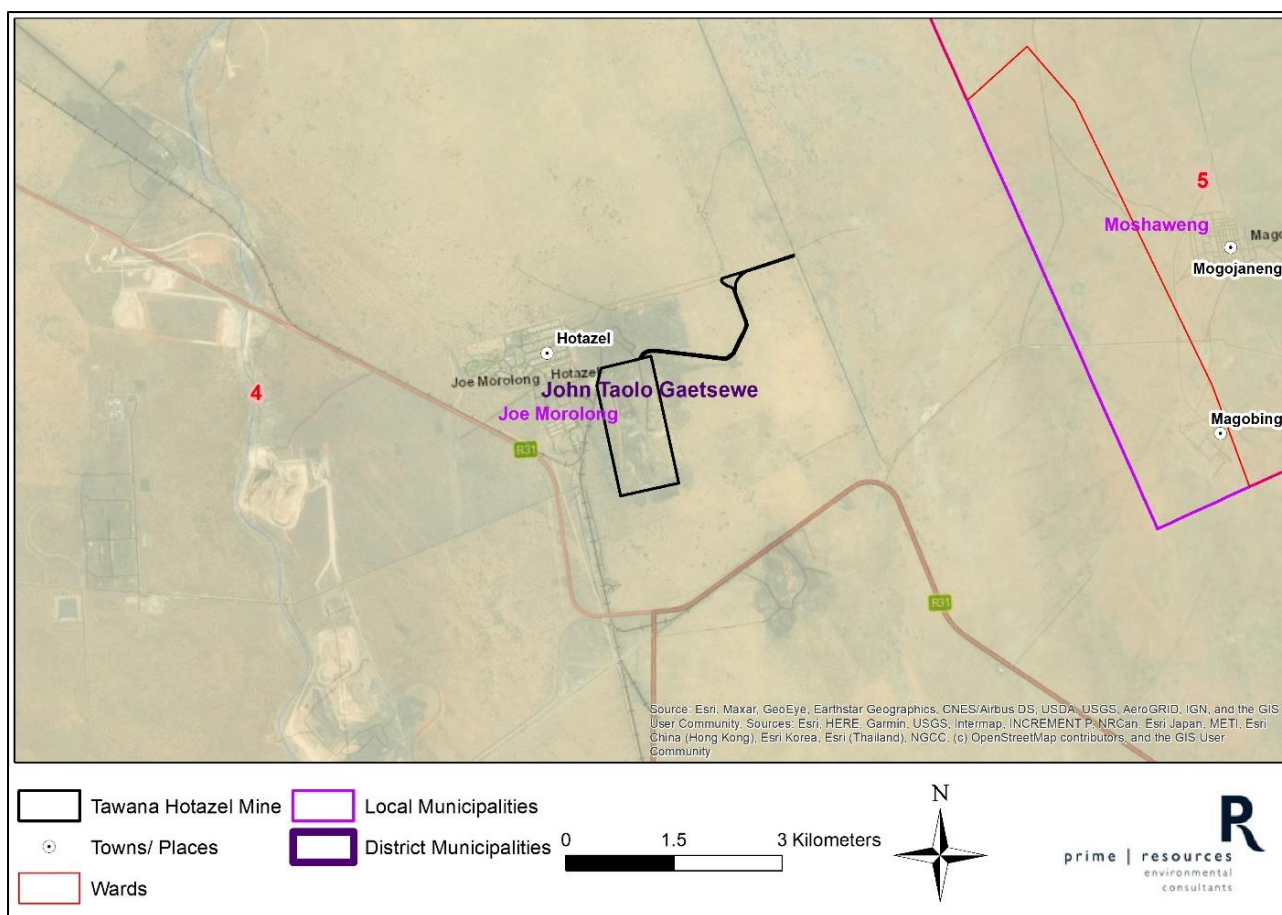
- Community disruptions;
- Vandalism of infrastructure equipment;
- Insufficient funding; and
- Illegal water connections.

Due to the shortage or lack of water supply, JMLM is unable to provide adequate sanitation to its communities. The majority of the population (81%) make use of pit latrines with or without ventilation, 7% of the population have no access to toilet facilities and 6% are connected to a sewerage system.

JMLM collects refuse in Hotazel and Vanzylsrus, serving 1 144 households in the two areas, with 3% of the population having access to such a service. While 84% of households rely on their own refuse dump and 3% do not have access to refuse removal and disposal.

JMLM conducts Environmental Awareness campaigns in all resident wards annually. The communities are given information on issues that need to be taken care of in their respective environmental areas. The most challenging issue of environmental management in JMLM is veld fires and to minimize that the municipality has entered into an agreement with Working on Fire through an Expanded Public Works Programme.

The town of Hotazel consists of approximately 1755 people and 600 households (Census 2011). The majority of the population in Hotazel reside in house or concrete block structures on a separate stand (82%). Hotazel has a large number of households that have access to flush toilets (97%) and piped water into their dwellings (89%). This may be attributed to the area being more urbanized having been developed and supported by surrounding mines in recent years.



**Figure 28: Surrounding settlements and wards**

**(n) Blasting and Vibration**

The information presented in this section was obtained from following reports:

- Blast Impact Assessment for the Proposed Hotazel Project, compiled by Blast Management and Consulting (November 2021) (refer to Appendix 17)
- Blast Designs and Control Recommendations, compiled by A J Rorke – Explosives Application Specialist (March 2021) (refer to Appendix 18)

**Source Environment and Blasting Operations**

The source environment will consist of blasting operations in the planned opencast area (a typical opencast manganese mining operation is envisaged). Blast designs as detailed in Appendix 18 were applied in the evaluation of the project. Evaluation of the blasting operations considered a minimum charge and a maximum charge. The minimum charge was derived from the maximum observed on the 10 m bench designs and the maximum taken from the maximum charge of the 15 m bench designs. Due to recommended single hole firing it is the charge mass given that is applied. The minimum and maximum is then guided by the difference in bench heights applied in the designs. The minimum charge relates to 193.4 kg and the maximum charge relates to 334.2 kg. These values were applied in all predictions for ground vibration and air blast.

**Receiving Environment**

The receiving environment is the area expected to be influenced by the THM and which is directly adjacent to mine, specifically the area adjacent to the opencast pit area. The area of influence is not expected to exceed a distance range of 3500 m radius around the opencast pit.

The receiving environment can be classed into three areas:

- Highly Sensitive: 0 to 500 m which is considered the most sensitive. Ground vibration and air blast will be most significant within the 500 m radius. The levels of ground vibration will be highly dependent on the drilling and blasting parameters applied. In most blasting operations this area is considered the unsafe zone and is normally cleared of all people and animals when blasting is done in a mining environment. Specific legal requirements from the MHSA are also applicable for mining within 500 m from private infrastructure
- Lesser sensitive or medium sensitivity is the 500 to 1500 m reference area. The 1500m radius is considered as a range where influence may be less but still requires active monitoring.
- The lowest critical or low sensitivity area is the 1500 m to approximately 3500 m radius. In this area the effects have more possibility of creating a disturbance than causing damage to structures.

Various installations were identified within 3500 m from the opencast operations associated with the proposed THM (Table 19 and Figure 29 below).

**Table 19: List of points of interest identified**

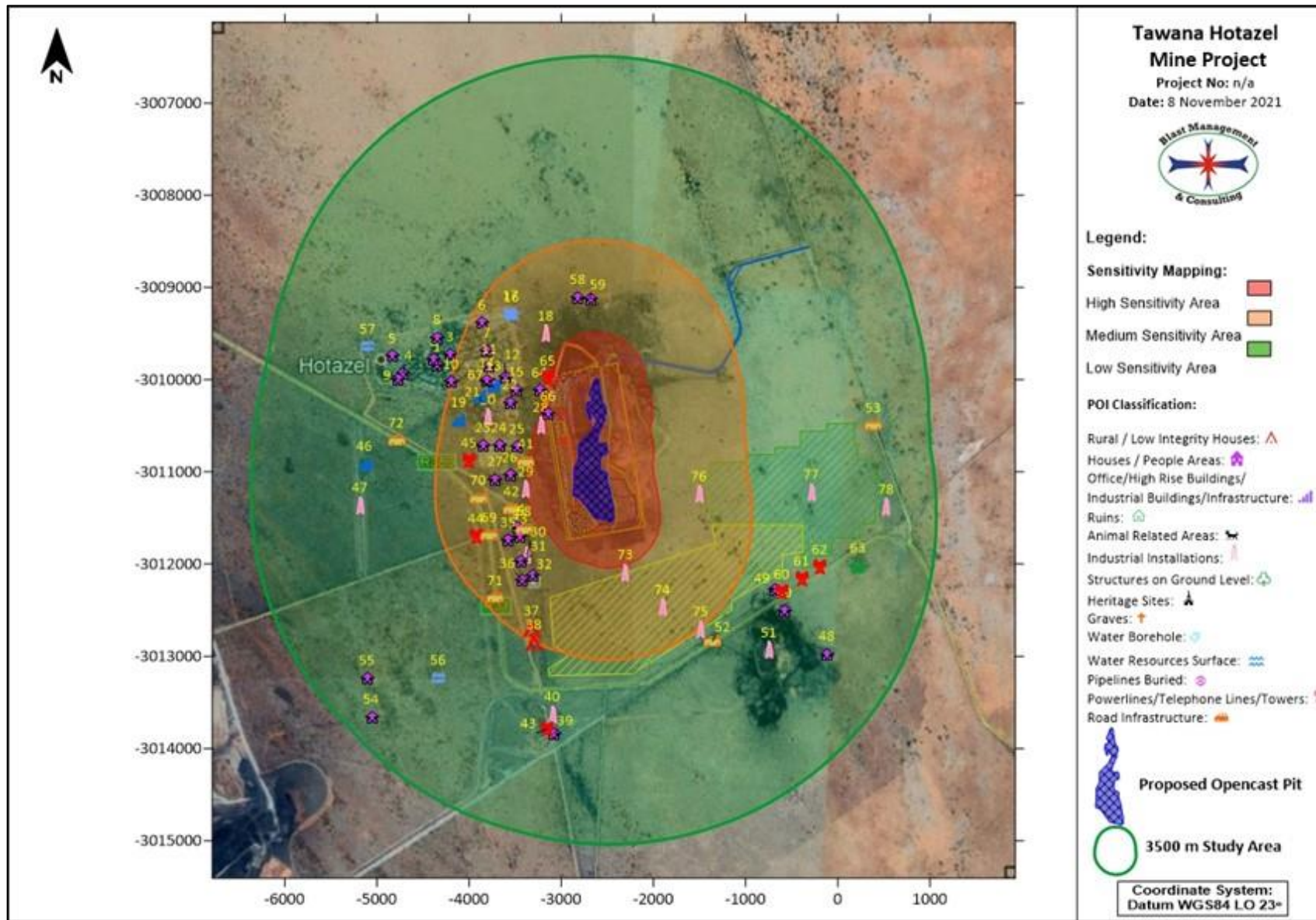
Tag	Description	Tag	Description
1	Pool	40	Railway
2	School	41	Road
3	Sports field	42	Road Intersection
4	Golf Course	43	Powerline
5	Houses	44	Powerline
6	Houses	45	Powerline
7	Houses	46	Airfield Structure
8	Structures	47	Airfield
9	Houses	48	Structures
10	Houses	49	Houses
11	Houses	50	Houses
12	Houses	51	Mining Operation
13	Shops	52	R31 Road
14	Shops	53	Road
15	Houses	54	Lodge
16	Reservoirs	55	Structure
17	Reservoir	56	Waterhole
18	Sewage Plant	57	Reservoir
19	Substation	58	Structures - Shooting Range
20	South 32 Operations	59	Shooting Range
21	South32 Offices	60	Powerline
22	Structures	61	Powerline
23	Houses	62	Powerline
24	Houses	63	Ruins
25	Houses	64	Structures
26	Structures	65	Communication Tower
27	Structures	66	Structure
28	Railway	67	Fuel
29	Railway Yard	68	Gravel Road
30	Railway	69	R31 Road
31	Houses	70	R31 Road
32	Railway Structure	71	R31 Road

Tag	Description	Tag	Description
33	Structures	72	R380 Intersection
34	Structures	73	Hotazel Solar Facility
35	Structures	74	Hotazel Solar Facility
36	Houses	75	Hotazel Solar Facility
37	Low-cost Houses	76	Hotazel 2 Solar Facility
38	Low-cost Houses	77	Hotazel 2 Solar Facility
39	Structures	78	Hotazel 2 Solar Facility

Receptors that will require strict blast control and effective design include:

- Houses;
- Structures including towers and industrial buildings;
- Roads;
- Railway lines;
- Powerlines;
- Telephone towers; and
- The planned PV solar farm located to the south east of the proposed mining area.

Of the installations identified, there are three within 500 m of the opencast pit. These are a railway line, communication tower and a historical mine structure. The infrastructure is considered private property.



**Figure 29: Receiving environment and identified installations**

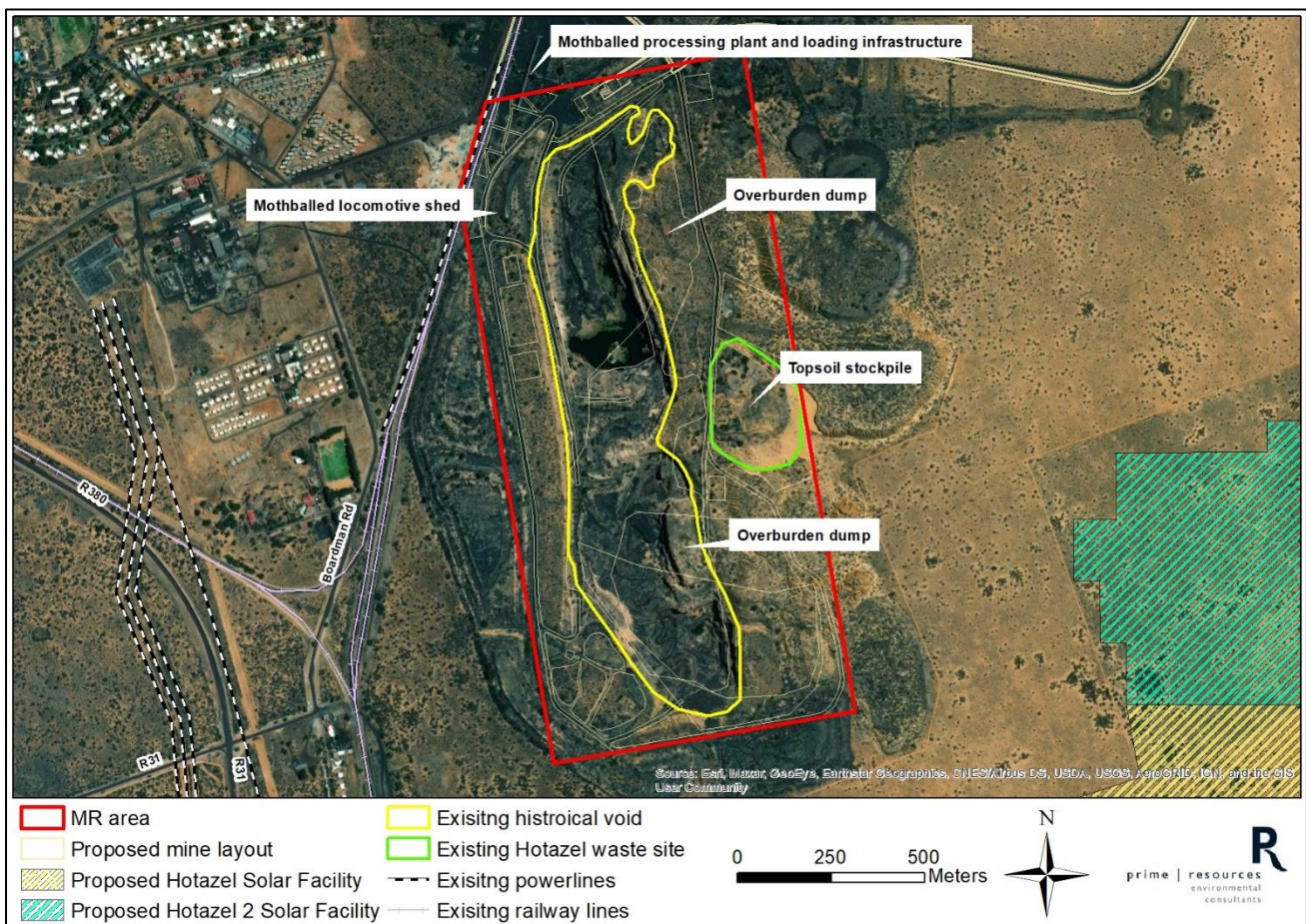
**(o) Visual Context/ Landscape**

The visual character of the regional landscape is already considerably impacted on by mining. The following existing landscape features dominate the character of the project site and surrounds:

- Mining and associated infrastructure (including voids below natural ground-level and large residue deposits above ground-level);
- Overhead railway structures/ lines and power lines;
- Rural and residential land-use features.

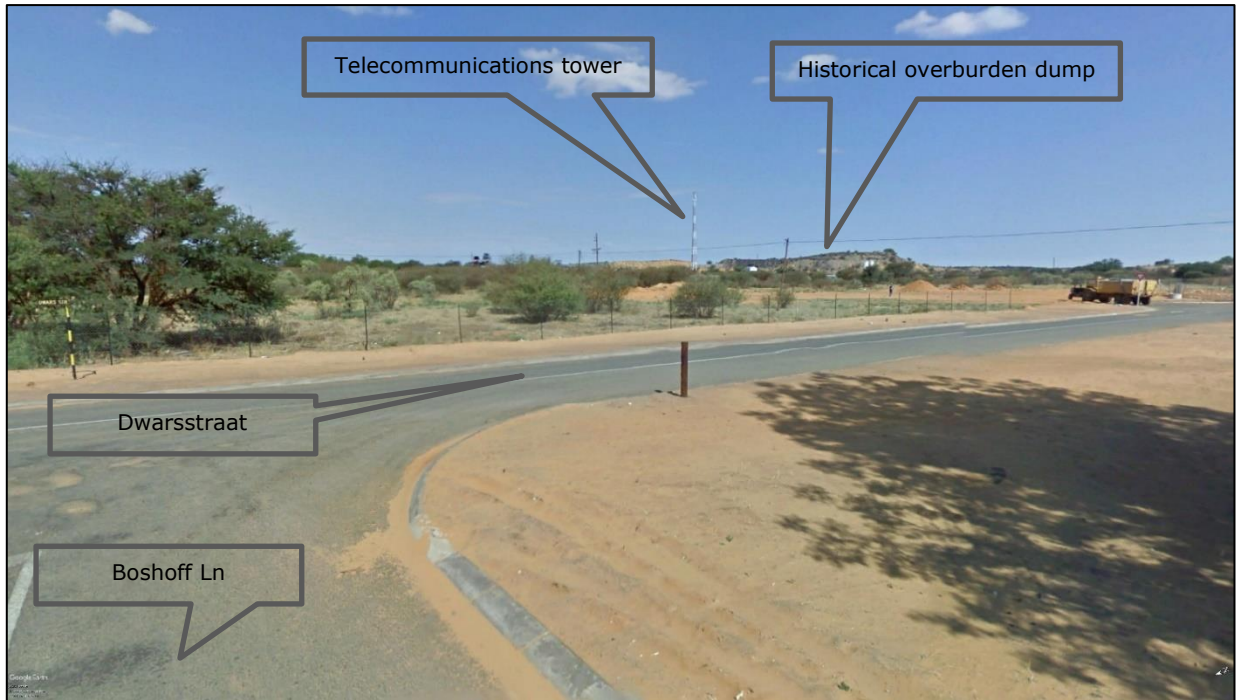
The town of Hotazel is expected to be the main sensitive visual receptor. Historic mining, evidenced by the remaining void, adits, stockpiles of residue material and infrastructure can be seen within and around the proposed mining area (Figure 30). The historical residue deposits and berms can be seen from viewpoints within Hotazel town (Figure 31 and Figure 32).

Through the desktop investigation and site confirmation, the existing historical mine infrastructure and residue deposits surrounding the proposed site results in a low visual sensitivity. Furthermore, the proposed THM will have a comparably similar height and therefore, will minimally alter the visual landscape further. Backfilling/ rehabilitation will also commence immediately after the commencement of the mining operation and this may improve the current visual landscape to a degree.

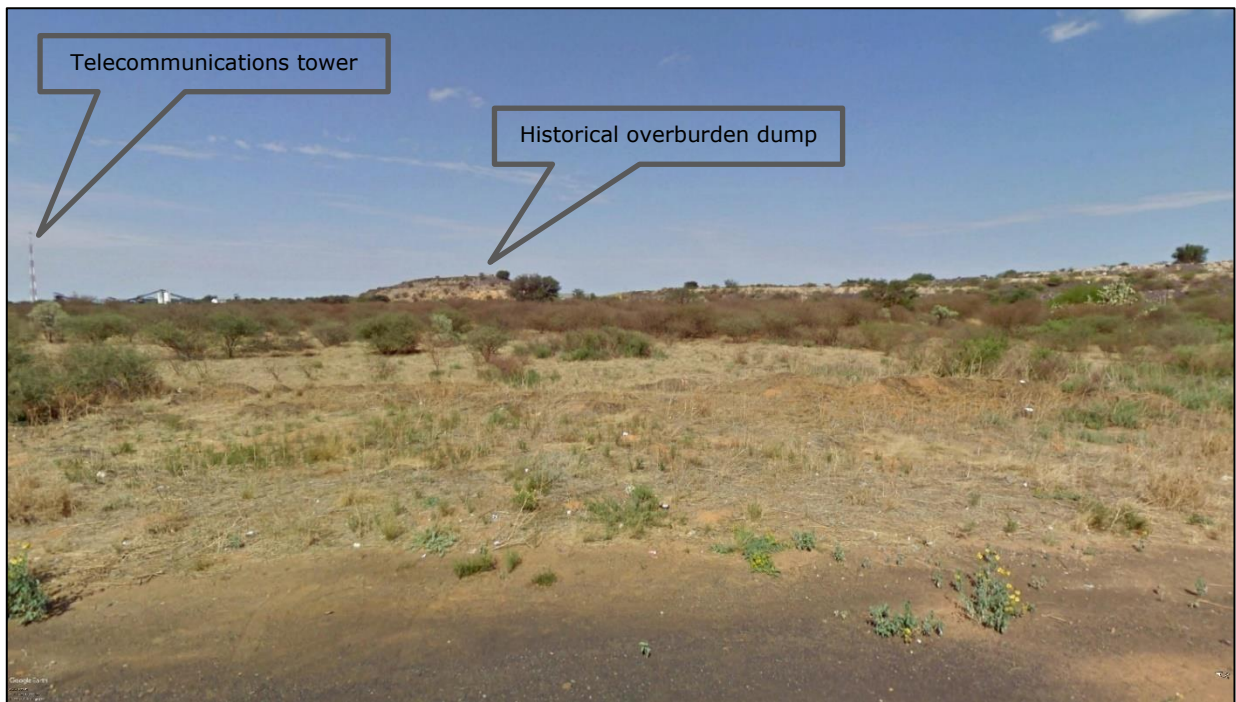


**Figure 30: Land uses and existing landscape features including the location of proposed and historical mine infrastructure in relation to the THM**





**Figure 31: View of the proposed site from a vantage point in Hotazel, north west of the proposed THM, photo facing east (Google, Image captured 2010)**



**Figure 32: View of the proposed site from a vantage point on Boardman Rd in Hotazel, west of the proposed THM, photo facing east (Google, Image captured 2010)**

**(p) Roads and Traffic**

The information presented in this section was obtained from the following reports, which were undertaken in accordance with the Manual for Traffic Impact Studies of the Department of Transport and with reference to the Committee of Transport Officials Traffic Impact Assessment Guidelines:

- Traffic Impact Assessment compiled by Merchelle's Collective (Pty) Ltd (December 2021) (refer to Appendix 19)

The proposed THM is well-located in terms of road infrastructure, being located adjacent to some of the major north-south and east-west roads in the area (R31 and R380). The primary labour sending areas for the THM are predicted to be the community of Hotazel and other surrounding farms and villages within the JMLM. It is therefore anticipated that trips to the mine originate from Hotazel and surrounds (Tsineng, Kathu and Kuruman) (Figure 33).

The road network connecting the proposed THM to the surrounding towns and suburbs consists of the following:

#### **N14**

The N14 is a Class 1 national road under the jurisdiction of South African National Roads Agency SOC Ltd (SANRAL) that cuts across the mining corridor in the Northern Cape linking Upington in the west and ultimately to Gauteng in the east. The road has a 2-lane single carriageway configuration and is located over 50km south-east of the development site. The overall pavement structure appears to be in fair condition, however, in the section near the R31 Intersection, the road has no shoulders and edge breaks were observed, indicating a worn road wearing surface.

#### **R31**

The R31 is a provincial road that can be classified as a Class R2 Rural Major Arterial linking the towns of Hotazel, Kuruman and Kimberley. The road is surfaced and tends to carry significant HV traffic volumes. The pavement condition of the road is poor having severe edge breaks and surface bleeding. Longitudinal cracks and potholes were also observed on the road. As a National road, the maintenance and rehabilitation of the R31 is the responsibility of the SANRAL and mitigation measures should be developed in conjunction with the road agency.

#### **R380**

The R380 is a provincial road that can also be classified as a Class R2 Rural Major Arterial running north-south and linking Hotazel, Kathu and Postmasburg. The road is surfaced and has similar features as the R31 where the pavement condition of the road is poor; characterised by severe edge breaks. A section of the road is currently being rehabilitated by the Northern Cape Department of Roads and Public Works.

#### **D3463**

Road D3463 is a provincial district road and can be classified as a Class R3 Rural Minor Arterial. The road is a low volume surfaced road providing access to mining activity in the north. The road is surfaced up to its intersection with a local road towards Tsineng, where after it continues as a gravel road. The pavement is in fair condition.

#### **Boardman Road**

Boardman Road is a collector-distributor road running in the north-south direction in Hotazel town. The road intersects with the R31 and provides direct access into Hotazel and towards the development site. Boardman Road also comprises several at-grade rail intersections as well as non-motorized transport infrastructure such as sidewalks and raised pedestrian crossings.



**Figure 33: Existing Road Network around the proposed THM and traffic count locations**

(Map compiled by Merchelle's Collective)

### Proposed Access Roads

Existing on-site roads will be utilised as access roads into the mine with two main access points as shown in Figure 34 below.



**Figure 34: Proposed access roads**

(Map compiled by Merchelle’s Collective)

The main entrance to the mine will use the access road off Boardman road and will facilitate access for LDVs. This existing road has a cross-section width varying between 8 m and 16 m. The pavement condition is fair (Figure 35 below). This access road is currently utilised by light and HVs.



**Figure 35: Proposed main entrance access road to the west of the mine**

(Photo taken by Merchelle’s Collective on 26/10/2020)

The transport route to the east, connecting to road DR3463 (from Kuruman to Severn), will facilitate access for HVs. The proposed HV access road has a cross-section width varying between 9 m and 20 m. The pavement condition of this road was observed to be poor (Figure 36 below) and this road will be upgraded. Currently, access onto road DR3463 is closed-off with a sand heap.



**Figure 36: Proposed HV access road to the east of the mine**

(Photo taken by Merchelle's Collective on 26/10/2020)

### **Intersections and Intersection Capacity Evaluation**

The base year for analysis was taken as year 2020. The operation of four critical intersections were evaluated and 12-Hour manual, classified traffic count surveys were commissioned (Figure 33). This represents a study area which extends approximately 5 km to the south and 1.8 km to the west of the proposed THM. The operating performance was evaluated under existing traffic conditions and lane configuration during the AM and PM peak hours. The AM Peak Hour was taken as 06:00-07:00 and the PM Peak Hour as 15:45-16:45.

#### Boardman Road and Mine Access Rd Intersection

Four-way stop-controlled junction providing access towards the proposed mine from the Hotazel town and nearby residences.

- The intersection operates well within capacity at a "B" Level of Service (reasonably free flow conditions) during the AM and PM peak hours.
- The intersection is a raised brick paved intersection encouraging motorists to slow down on approach, making it safe for pedestrians and cyclists.

#### R31 and Boardman Road Intersection

Two way stop controlled intersection providing access to Hotazel town off the provincial route R31, with a generous geometric design with left turn slip lanes along the major road (R31).

- There are several at-grade rail and road intersections along Boardman Rd resulting in a mix of vehicular, rail and pedestrian traffic.
- The intersection has adequate capacity and operates satisfactorily during both the AM and PM peak hours an "A" Level of Service (free flow conditions) during the AM and PM peak hours.

#### R31 and R380 Intersection

Two way stop control (T-junction) junction of two provincial routes located 3km south of the development site.

- Pavement settlement present on road which could be attributed to significant volume of HVs coming the western approach (from Tshipi Mine) and turning left from the southern approach. The pavement structure was likely under designed for current HV volumes.
- Sight distance from the western approach of the intersection is inadequate and motorists must drive further into the intersection to see clearly before turning.
- The intersection has adequate capacity to process current traffic volumes operating at satisfactory at an "A" Level of Service (free flow conditions) during the AM and PM peak hours.
- The approach on R380 operates at a slightly low "C" Level of Service (stable flow, at or near free flow) which may be attributed to the queue of HVs.

### R31 and DR3463 Intersection

Two way stop control junction linked to the proposed HV mine access road off DR3463.

- Sight distance from the eastern approach (DR3463) is inadequate for right-turn movements towards Tsineng. This is due to the R31 (main road) curving at the intersection location. The sight distance could be improved through complete removal of trees and grass in the vicinity of the intersection.
- The intersection appears to be recently improved with left and right turn lanes along the R31.
- The intersection has adequate capacity and operates satisfactorily during both the AM and PM peak hours an "A" Level of Service (free flow conditions) during the AM and PM peak hours.

The identified critical intersections therefore have adequate capacity to process current traffic volumes and movements safely and efficiently on the road network and no capacity improvements are triggered.

### **Existing Traffic Volumes**

In the vicinity of the proposed THM, Boardman Rd. carries low traffic volumes with majority of the commuters travelling from the Hotazel residential areas to the HMM plant located west of the intersection of Boardman Rd. and Road A, during the AM peak period. The low volumes can be attributed to the low population level.

Along the R31, only 7% of the traffic stream turns towards the Hotazel town during the AM peak indicating that the town does not attract significant work trips. The afternoon peak reflects the same number of trips leaving the town.

The majority of observed traffic volumes is through traffic along the R31 from Kuruman passing Hotazel and going towards the Black Rock Mine Offices and Plant in the town of Santoy further north.

## **(2) Description of the current land uses**

### **Land Use**

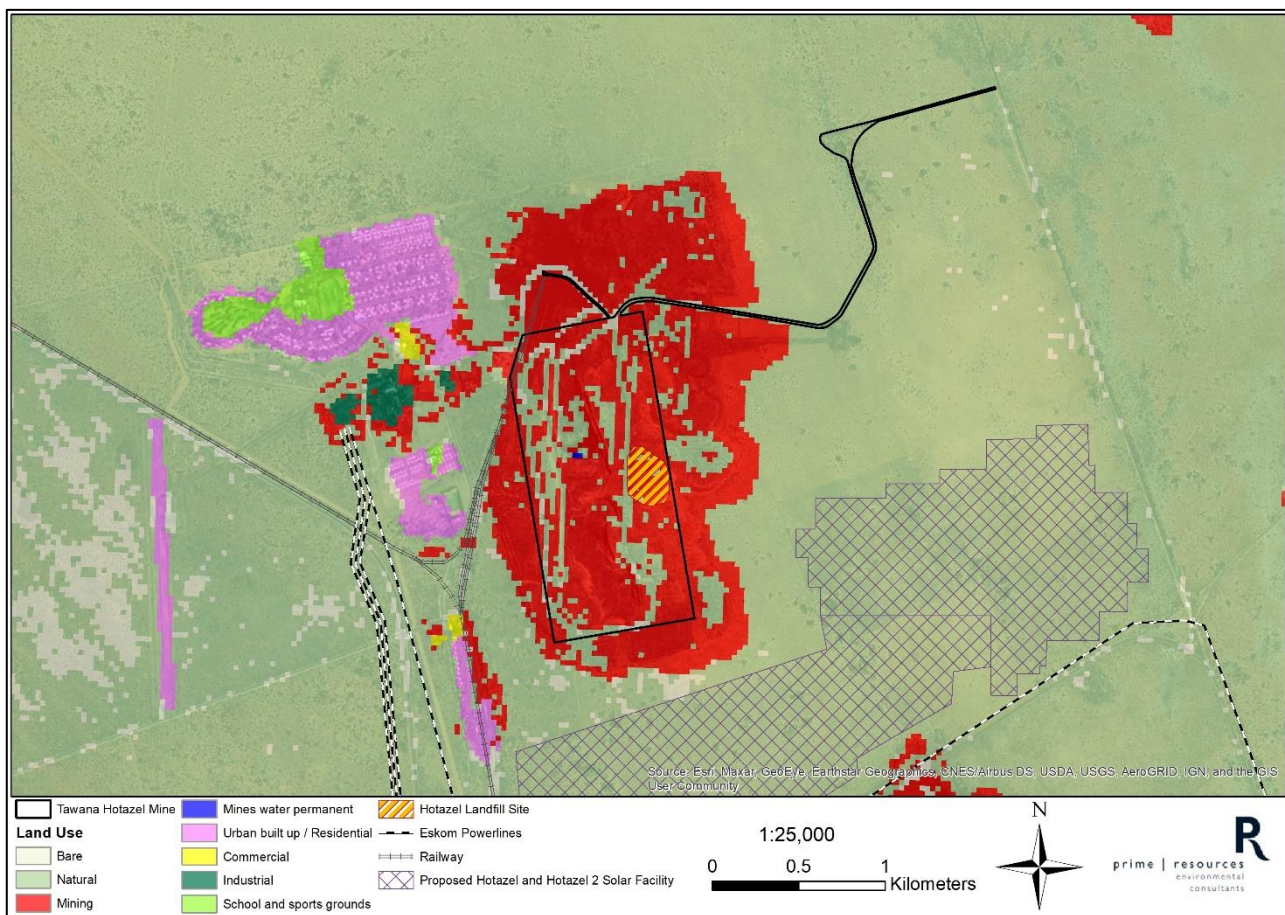
Land use is defined as the operations that are occurring on land, as carried out by humans, with the intention to obtain products and/or benefits through using land resources. Land use therefore refers to the purpose the land serves, such as recreation, natural or agriculture.

From Google Earth satellite imagery, ground-truthed during site-visits undertaken in 2018, 2020 and 2021, the land use associated with the proposed THM is historic mining evidenced by the remaining void, adits, stockpiles of residue material and infrastructure (Figure 30 and Figure 37). No mining is currently taking place at the proposed THM and the mine has been disused since 1989, with the infrastructure appearing old and in a state of disrepair. The land use in the vicinity of the proposed THM comprises primarily mining,

residential and grazing. The Hotazel waste site (G:S:B-, Permit No.: B33/2/441/20/P156, licence date 20 February 1995) is located within the proposed THM. Some of the topsoil stockpiles are being used to cover the waste. Apart from the town of Hotazel, the area immediately surrounding the proposed THM is unpopulated and undeveloped. The proposed Hotazel and Hotazel 2 Solar facilities are located to the south and south-east of THM.

### Land Cover

Land cover is defined as the physical coverage on the earth's surface, such as the vegetation (natural or cultivated) or man-made constructions (buildings, etc.) which occur on the earth surface. Land cover data for the proposed THM was obtained from the SANBI GIS Land Cover Map 2015. The land cover associated with the proposed THM is classified mostly as a mining area with pockets of shrubland, grassland and thicket/bush. There is some mining infrastructure that partially falls within the proposed THM bounds, however the majority is outside, represented by Figure 40. The surrounding area, including the proposed access roads, are indicated as low shrubland, with urban and industrial land uses associated with the town of Hotazel and surrounds.



**Figure 37: Land Uses associated with the proposed THM and surrounds**



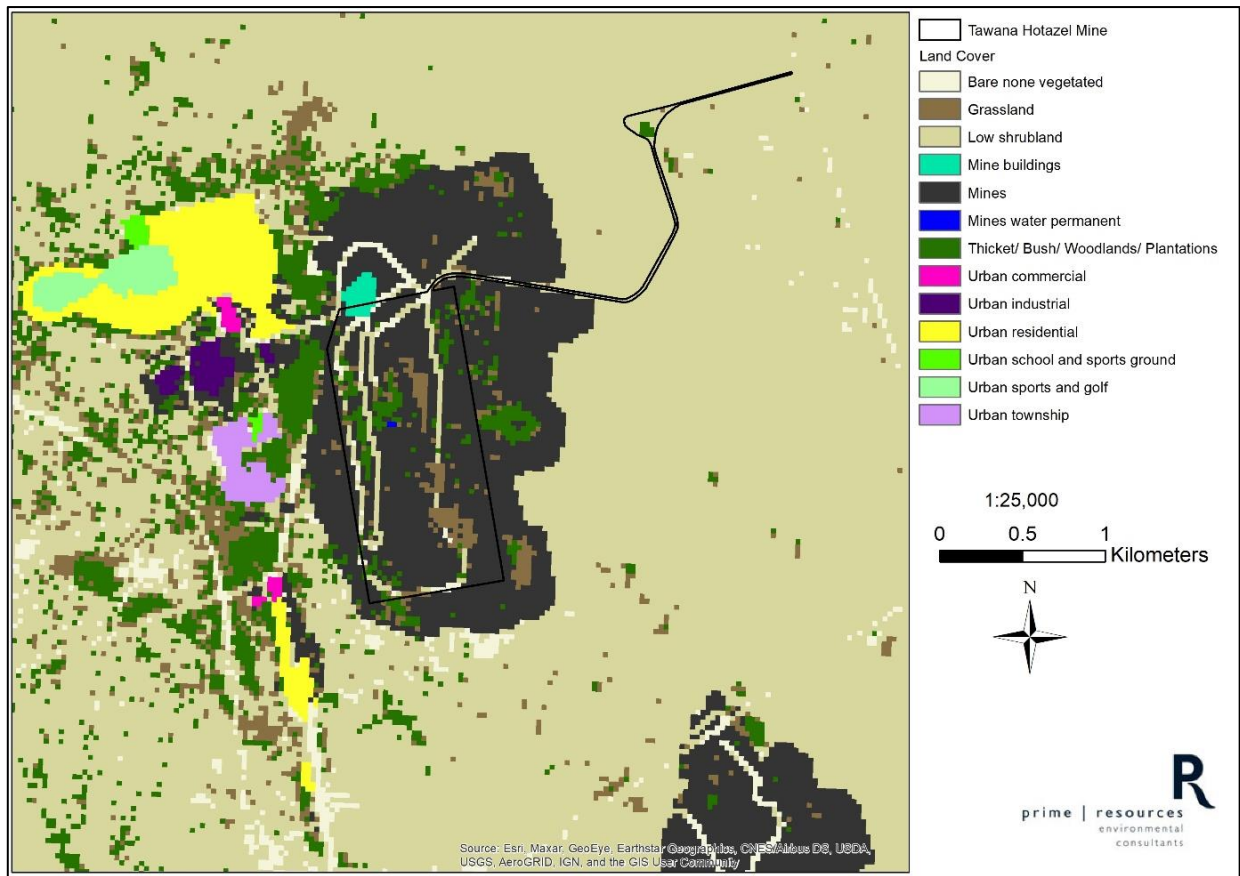
**Figure 38: Google Earth Imagery of the Hotazel waste site located within the proposed THM**



**Figure 39: Hotazel waste site located within the proposed THM**

(Photos taken by Dr Bruce Randell on 20/01/2021)





**Figure 40: Land Cover associated with the proposed THM**



**Figure 41: Photographs showing the state of the proposed THM (04/07/2018)**



**Figure 42: Photos from the site visit showing the open-pit void and adits**

(Photos taken by Field and Form Landscape Science on 23/10/2020)

### **(3) Description of specific environmental features and infrastructure on the site**

Three aquifers occur in the area. These three aquifers are associated with a) the primary sandy gravel material, b) the fractured rock and leached banded iron formation aquifer, and c) the dolomitic aquifers of the Griqualand West Sequence. The aquifers present in the area are classified as minor aquifers. The aquifers are of high importance to the local landowners outside of town as it is their only source of water for domestic, gardening, and agricultural purposes. In Hotazel town the landowners have access to municipal water.

The Kathu Bushveld ecosystem type which is represented on the regional scale, is considered to be Least Threatened, however, features of the ecosystem are underrepresented on-site due to extensive transformation due to historical mining activities. A limited portion, along the existing haul roads and access roads, is located within remaining extent of Kathu Bushveld. According to the Northern Cape Conservation Plan (C-Plan; 2016) there are Other Natural Areas (ONAs) indicated to remain along existing haul roads within the open-pit void and along the access road in the east. The greater area falls within the Griqualand West Centre of Endemism, however the proposed THM is not located within the core geological areas of this centre of floristic endemism, and endemic and near-endemic are unlikely to occur within the proposed THM.

One faunal SCC namely Verreaux's eagle (*Aquila verreauxii*) utilises the site for nesting, breeding and foraging purposes. One TOPS-listed floral species, namely *Harpagophytum procumbens* was recorded on site. Two nationally protected tree species in terms of the National Forests Act (Act No. 84 of 1998) occur, namely *Vachellia erioloba* in relatively low abundance and *V. haematoxylon* in high abundance. One provincially protected floral species in terms of Schedule 1 of the NCNCA, namely *H. procumbens*, and

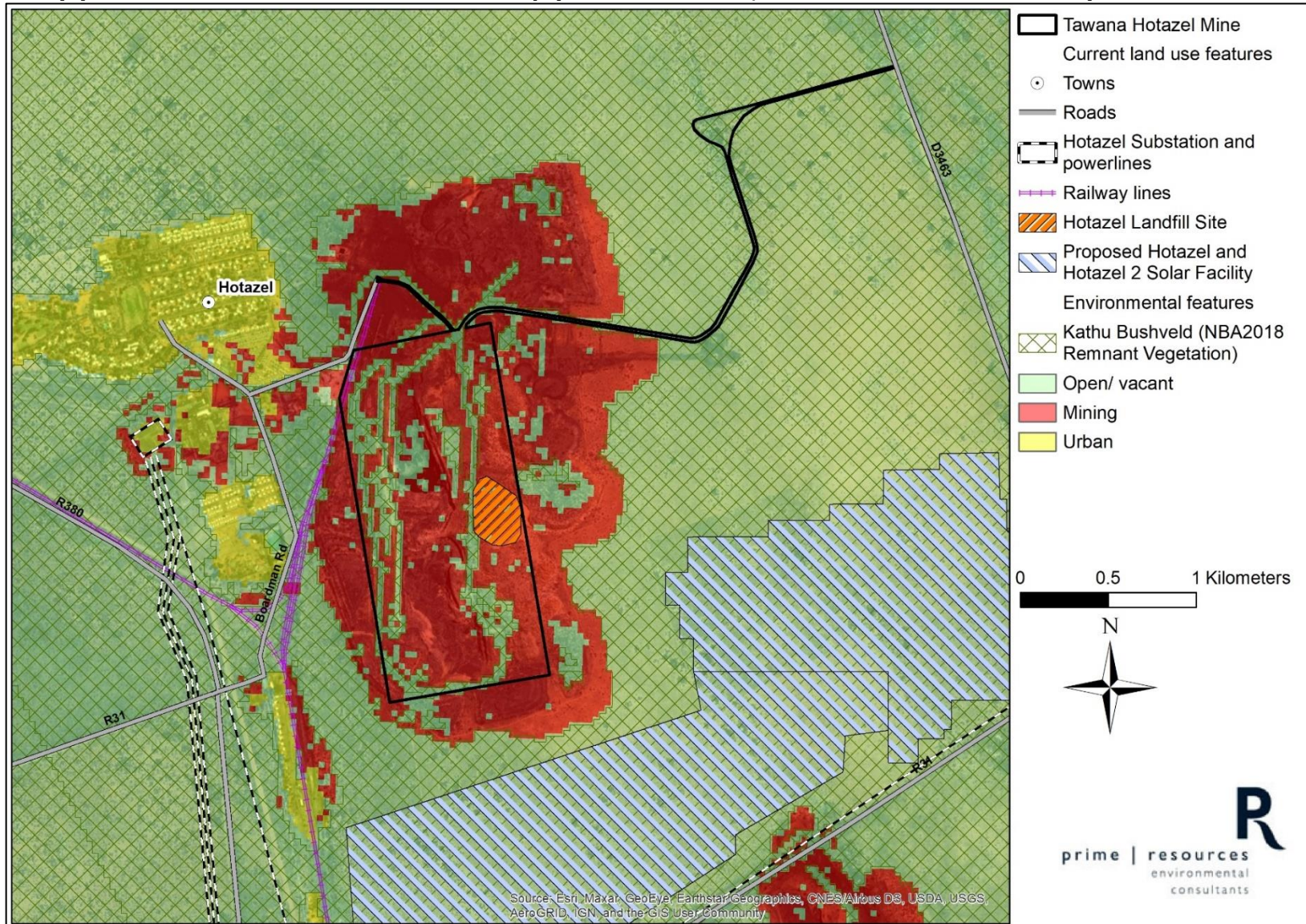
several floral species listed under Schedule 2 of this Act, namely *Plinthus sericeus*, *Ammocharis coranica*, *Boophone disticha*, *Crinum* sp., *Orthanthera jasminiflora*, *Albuca seineri* (= *Ornithogalum seineri*), *Albuca setosa* (= *Ornithogalum setosum*) were recorded on site. Signs of TOPS-listed Aardvark (*Orycteropus afer*) were however noted during the field assessment in the vicinity of the access road. Other faunal TOPS-listed species that may occur are Bat-eared Fox (*Otocyon megalotis*) and Cape Fox (*Vulpes chama*). The arachnid species *Harpactira* spp. and *Pterinochilus* spp. are provincially protected under Schedule 1 of NCNCA (Act No. 9 of 2009) and may occur on site. Based on distributional data, the South African Python (*Python natalensis*) is the only SCC whose distribution includes the proposed THM and historically would have occurred within wooded communities with rocky elements. Although regionally listed as Least Concern (LC), *P. natalensis* is a registered TOPS-listed species. Sundevall's Shovel-snout (*Prosymna sundevallii*) is a near-endemic reptile species with an overlapping distribution with the proposed THM and may occur in more intact Kathu Bushveld along the access road.

There are no water courses or wetlands on the site aside from the moderately sized and relatively deep, artificial pit lake formed in the historic void, which supports both aquatic vegetation that had established within the pit lake, as well as fauna (*Tilapia sparrmanii* a provincially Protected fish species) that had been translocated/ transported to the pit lake.

In terms of infrastructure, the R380 and the R31 roads run in close proximity to the proposed THM. There is also a small section of historic mining infrastructure and gravel roads located within the proposed THM. There are no areas of cultural or historic significance associated with the proposed THM.

The Hotazel waste site (G:S:B-, Permit No.: B33/2/441/20/P156, licence date 20 February 1995) is located within the proposed THM.

**(4) Environmental and current land use map (all environmental, and current land use features).**



**Figure 43: Environmental and current land use map**

**v) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be mitigated**

*(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)*

Table 20 below provide a high-level summary and explanation of the risks and impacts that are expected as a result from the project during the construction, operational and closure phases. Numbers in square brackets reflect the post-mitigation impact significance. The Impact Assessment Report (Appendix 21) provides a detailed assessment and description of the impacts identified.

**Table 20: Impact Assessment Table (with post-mitigation impact significance)**

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
<b>Construction Phase</b>								
Pit dewatering, clearing of vegetation, topsoil stripping and sand removal, and stockpiling of these soil resources, handling and storage of construction materials, collection, storage, and removal of construction related waste, transportation of materials and waste on-site and along the access roads, construction of infrastructure required for the operational phase, diesel generators and construction equipment operation	Direct impact on human health may be impaired as a result of increased pollutant concentrations	<ul style="list-style-type: none"> <li>• Use water bowsers on unpaved roads.</li> <li>• Use water sprays at stockpiles and handling points.</li> <li>• Limit construction (including mobile equipment) activities to take place during day-light hours.</li> <li>• Consider laying down a suitable wearing course on access roads, such as a gravel layer to the road and installing a permeable paver to lock the gravel in place and prevent pulverisation of the rock over time.</li> </ul>	3 [3]	2 [1]	2 [2]	3 [2]	Low [Low]	21 [12]
	Direct impact on vegetation health and an indirect impact on animal and human health, and amenities from increased dustfall rates and pollutant concentrations		3 [1]	2 [0]	2 [2]	2 [1]	Low [Low]	14 [3]
	Direct impact on amenities from an increase in nuisance dust fall rates		2 [1]	2 [1]	2 [2]	2 [2]	Low [Low]	12 [8]
Widening of HV access road connecting to road DR3463	Removal of vegetation and trees and the disturbance and fragmentation of natural fauna and flora	Limit vegetation clearing to the necessary area of construction of the access road and revegetating disturbed areas with native trees, shrubs and herbaceous plants.	4 [3]	1 [1]	2 [2]	5 [3]	Medium [Low]	35 [15]
Construction of new on-site hauls roads and widening of the existing access roads and mechanical	Increase in ambient noise levels and nuisance noise to surrounding sensitive receptors	<ul style="list-style-type: none"> <li>• Evaporators in the pit to be positioned such as to minimize noise and dust fallout, taking account of prevailing wind direction and pit topography.</li> <li>• Machines (e.g., drill rigs) used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily. This will reduce noise and conserve energy.</li> <li>• Acoustic covers of engines should be kept closed when in use or idling.</li> </ul>	6 [4]	2 [1]	2 [2]	3 [2]	Medium [Low]	30 [14]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
evaporation of pit water  Additional traffic loading/ increased vehicle trips generated by construction activities		<ul style="list-style-type: none"> <li>Construction materials such as beams, and bricks should be lowered and not dropped.</li> <li>Restrict construction activities and travel to day-time.</li> <li>Implement good engineering and operational practices.</li> <li>Implement systematic maintenance of all forms of equipment and vehicles to minimise noise.</li> <li>Monitor noise levels from the activities throughout the proposed project to determine level of mitigation required.</li> </ul>						
Additional traffic loading/ increased vehicle trips generated by construction activities	Surrounding road network congestion and reduced intersection capacity	Make public transport available and encourage the use of public transport by staff to reduce trips and emissions.	2 [2]	2 [2]	4 [4]	2 [2]	Low [Low]	24 [24]
Transportation of materials and supplies by HVs and increased volumes of HVs	Deterioration of pavement condition/ quality resulting in unsafe driving conditions	<ul style="list-style-type: none"> <li>Add a gravel layer to the road and install a permeable paver to lock the gravel in place and prevent pulverisation of the rock over time.</li> <li>Do not overload trucks, and ensure that wheel/ axle loading are in accordance to legislation.</li> </ul>	2 [2]	2 [2]	2 [2]	3 [2]	Low [Low]	18 [12]
Dust, unauthorised vehicles access, edge effects from clearance of vegetation and impacts of construction vehicles	Loss of floral and faunal habitat	<ul style="list-style-type: none"> <li>The extent of construction/ pre-mining activities (site clearance) must be limited to the approved development footprint area and the boundaries clearly demarcated on site prior to commencement of site clearance.</li> <li>Areas of increased ecological importance and sensitivity (notably the remnant Kathu Bushveld habitat along the main access road and within the MR area) should be avoided. Consideration should be given to conserve these relatively intact remnant habitats as part of the mine and access road upgrades as far as possible.</li> <li>Due to the occurrence of a high abundance of priority floral species adjacent to the existing access road, the widths of proposed road upgrades should be kept to a minimum.</li> <li>Construction and operational vehicles should be restricted to travelling on designated roadways only and vehicle access beyond the designated and approved clearance footprint areas should be prohibited.</li> <li>All vehicles accessing the project must adhere to a 30 km/hr speed limit and vigilant driving techniques.</li> </ul>	6 [4]	2 [1]	3 [2]	4 [3]	Medium [Low]	44 [21]
Site clearance, construction/ pre-mining activities, an influx of people and associated increased human activity, poaching and trapping of faunal species and potential harvesting of plants	Reduced floral and faunal diversity		6 [4]	2 [1]	3 [2]	4 [3]	Medium [Low]	44 [21]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
Initial vegetation clearing, movement of construction and mining vehicles, increased human activity, noise pollution, vibrations and excessive dust	Displacement of faunal species- Verreaux's Eagle ( <i>Aquila verreauxii</i> ) and other water dependent species	<ul style="list-style-type: none"> <li>Construction and site personnel should receive environmental awareness, biodiversity education training and ongoing training through mechanisms such as toolbox talks. Site induction procedures should include a discussion of key ecological aspects (such as the necessary procedures for working in proximity to sensitive habitats).</li> <li>Rescue and relocation should be undertaken of bulbous species for use in landscaping or in rehabilitation of disturbed areas. This should include provincially protected species such as <i>Crinum</i> sp., <i>Ammocharis coranica</i> and <i>Boophone disticha</i>.</li> </ul>	8 [6]	2 [1]	4 [3]	4 [3]	Medium [Medium]	56 [30]
Site clearance activities, increased human activity and collection or harvesting of species.  Draining of pit lake.	Loss of species of conservation importance - Removal of aquatic vegetation that has established within the pit lake, as well as fauna that has been artificially translocated to the pit lake such as <i>Tilapia sparrmanii</i> (provincially protected fish species)	<ul style="list-style-type: none"> <li>Implement the Fire Management Plan (Table 40).</li> <li>No harvesting of firewood, plant material or collection of floral species by construction workers or mine personnel from the project area or natural areas surrounding the project footprint should be allowed.</li> <li>No wild animals may under any circumstance be handled, interfered with or removed by construction workers or any personnel.</li> <li>Hunting/ killing of fauna is prohibited.</li> <li>Any snares or traps found on or adjacent to the project area must be removed and disposed of.</li> <li>The placement of the proposed refuelling station must occur outside of any delineated sensitive habitat and take into consideration potential buffers imposed within other specialist studies.</li> </ul>	8 [6]	2 [1]	5 [3]	4 [3]	High [Medium]	60 [30]
Disturbance within the project area and eradication and control measures not implemented	Alien invasive species and other detrimental edge effects	<ul style="list-style-type: none"> <li>Trees located in proximity to the development footprint be clearly marked by means of danger tape or similar for the duration of the construction phase.</li> <li>The establishment of a site nursery where smaller plants with relocation potential, including <i>V. erioloba</i> seedlings and saplings, can be kept and propagated during the construction and operational phases should be considered. These plants could be used in the rehabilitation works.</li> <li>Where any protected or TOPS-listed species are to be rescued and relocated, this process should be overseen by a suitably qualified botanist or horticulturalist. Permits for the destruction or relocation of nationally and provincially protected tree, shrub and forbs species must be applied for and obtained from the relevant authorities.</li> <li>Any conditions attached to tree and plant removal permits issued should be strictly implemented.</li> <li>Any removed trees could be mulched and used as soil moisture protection during concurrent rehabilitation or made available to local communities as firewood.</li> </ul>	6 [4]	2 [1]	4 [3]	3 [3]	Medium [Low]	36 [24]



Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
		<ul style="list-style-type: none"> <li>Should any faunal SCC be noted within the project area, the relevant authorities must be notified. Input into the possible relocation of such species must be provided by a suitably qualified ecologist.</li> <li>An Alien and Invasive Plant Species Management Programme must be developed and implemented.</li> <li>Bare soils should be avoided, and adequate indigenous grass cover be achieved on any exposed slopes, and that rehabilitation takes place concurrently, as alien species tend to proliferate within bare, disturbed soils.</li> </ul> <p>Mitigation measure specific to the avifaunal impacts include the following:</p> <ul style="list-style-type: none"> <li>A pre-construction inspection must be undertaken prior to the removal of the water within the open void and the construction of the mine to confirm the Verreaux's Eagle nest status. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick.</li> <li>The removal of the water within the open void and underground workings to be done between April and September.</li> <li>The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species.</li> <li>The overhead power line must be constructed using a bird friendly structure (Inverted Delta-T).</li> <li>Bird flight diverters to be maintained on sections of power line during the operational life span of the 11kV power line.</li> <li>Insulating sleeves on jumpers present on strain poles, terminal poles and box transformers must also be considered.</li> <li>Should electrocutions occur within the on-site substation yard, mitigation can be applied reactively using a range of insulation devices. Site-specific recommendations should be sought from the Endangered Wildlife Trust's Wildlife &amp; Energy Programme.</li> <li>Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads.</li> </ul> <p>Mitigation measure specific to the aquatic biodiversity impacts include the following:</p>						

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
		<ul style="list-style-type: none"> <li>A detailed assessment of the fish species present within the lake must be conducted by an accredited aquatic specialist so as to advise on permit requirements.</li> <li>At present, it is known that at least one fish species identified within pit lake during the present study is listed as Protected under the NCNCA, and as such, a permit will be required to translocate the fish.</li> <li>Further permits may be required depending on any additional species present.</li> <li>When the pit lake is drained and depending on the number of fish species present (see previous comment), a suitably qualified and accredited aquatic specialist must be present so as to identify species for further actions (e.g. translocation, euthanasia, etc.).</li> <li>Under no circumstances are fish to be removed for the purpose of consumption due to potential metal accumulation within tissues of the fish and associated liabilities.</li> </ul>						
Surface preparation, clearing of land and construction of surface infrastructure including the construction of new on-site hauls roads and widening of the existing access roads	Loss of subterranean / previously unidentified heritage and paleontological resources	<ul style="list-style-type: none"> <li>Heritage Protocol and Chance Find Procedure.</li> <li>Fossil Chance Find Protocol.</li> </ul>	4 [2]	1 [1]	2 [2]	2 [1]	Low [Low]	14 [5]
	Erosion and increased suspended solids being transported with storm water	<ul style="list-style-type: none"> <li>Minimise the extent of land / vegetation cleared.</li> <li>Monitor erosion, implement prevention and maintenance measures.</li> <li>Ensure that soil is dry prior to stripping, use truck and shovel equipment instead of bowllscrapers where possible, and implement effective stockpile management throughout the operation phase.</li> <li>Establish vegetation and stormwater management infrastructure on and around slopes.</li> </ul>	4 [2]	1 [1]	2 [2]	3 [3]	Low [Low]	21 [15]
	Contamination of soils, surface water or groundwater from pollution, spillages and improper storage of chemicals	<ul style="list-style-type: none"> <li>Construct the ring road (haul road) around the mine pit to intercept stormwater to be channelled to the stormwater ponds.</li> <li>Ensure machinery is in good working order.</li> <li>Implement a spill management plan and clean up measures.</li> <li>Good housekeeping such as storage of potentially hazardous material and dangerous goods will be within properly constructed and lined or paved areas.</li> <li>Oil traps will be sized, operated and maintained to contain all discarded oil from working areas.</li> </ul>	6 [4]	2 [1]	2 [2]	2 [2]	Low [Low]	20 [14]
	Greenhouse Gas Emissions and Climate Change	<ul style="list-style-type: none"> <li>Limit the removal or vegetation and ensuring adequate re-vegetation or addition of vegetation surrounding the project.</li> </ul>	2 [2]	1 [1]	4 [3]	3 [2]	Low [Low]	21 [12]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
	<ul style="list-style-type: none"> <li>There will be an initial carbon sink loss due to vegetation removal.</li> <li>The main CO<sub>2</sub> contribution from the project will be based on the clearing of vegetation.</li> <li>An increase in CO<sub>2</sub> emissions from vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Additional support infrastructure can reduce the climate change impact on the staff and project, for example ensuring adequate water supply for staff and reducing on-site water usage as much as possible.</li> <li>Ensure the vehicles and equipment are maintained through an effective inspection and maintenance programme.</li> </ul>						
Active dewatering of the existing opencast pit lake and the water contained in the existing underground mine	Lowering of the groundwater levels within the surrounding aquifers and impact on groundwater volumes	Monitor groundwater levels, dewatering volumes, climatic aspects such as rainfall and evaporation.	4 [2]	2 [2]	2 [2]	5 [5]	Medium [Low]	40 [30]
Seepage of pollution and accidental chemical and hydrocarbons spills	Contamination of groundwater and reduced groundwater qualities	<ul style="list-style-type: none"> <li>Monitor groundwater quality.</li> <li>Safe storage of chemicals.</li> <li>Store fuel in sealed tanks and containing walls around tanks.</li> <li>General maintenance and safety precautions must be followed to prevent diesel and hydraulic fluids contaminating the soil.</li> <li>If a spill occurs it must be reported and addressed immediately.</li> <li>Employ good housekeeping practices in terms of hazardous substances and waste management, and maintain a bunded waste storage area on-site with an impermeable surface and a sump and covered with a roof or tarpaulin.</li> </ul>	4 [2]	1 [1]	2 [2]	2 [2]	Low [Low]	14 [10]
<b>Operational Phase</b>								
Mining activities including stockpiling of topsoil and drilling, blasting, excavations, materials handling, crushing and screening, bulldozing, wind erosion, vehicle entrained dust from	Direct impact on human health may be impaired as a result of increased pollutant concentrations	<ul style="list-style-type: none"> <li>Level 2 watering (&gt; 2 litres/m<sup>2</sup>/h) on in-pit and waste stockpiles unpaved roads.</li> <li>Use chemical suppressants on the surface haul roads and access road.</li> <li>Use water sprays at the crusher and screen.</li> <li>Implement an effective inspection and maintenance programme to ensure vehicles remain in good condition and to reduce emissions from vehicles.</li> <li>Mobile equipment emission testing for PM, SO<sub>2</sub> and NO<sub>x</sub> should be conducted regularly as part of the inspection and maintenance programme.</li> </ul>	6 [4]	2 [2]	4 [4]	4 [3]	Medium [Medium]	48 [30]
	Direct impact on vegetation health and an indirect impact on animal and human health, and amenities from increased		3 [1]	2 [0]	4 [4]	2 [1]	Low [Low]	18 [5]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
unpaved roads, vehicle exhausts, grading of unpaved roads and diesel generator exhausts	dustfall rates and pollutant concentrations	<ul style="list-style-type: none"> <li>Consider laying down a suitable wearing course on access roads, such as a gravel layer to the road and installing a permeable paver to lock the gravel in place and prevent pulverisation of the rock over time.</li> </ul>						
	Direct impact on amenities from an increase in nuisance dust fall rates		4 [4]	2 [2]	4 [4]	3 [2]	Medium [Low]	30 [20]
	Loss of subterranean / previously unidentified heritage and paleontological resources	<ul style="list-style-type: none"> <li>Heritage Protocol and Chance Find Procedure</li> <li>Fossil Chance Find Protocol</li> </ul>	4 [2]	1 [1]	3 [3]	2 [1]	Low [Low]	16 [6]
	Increase in ambient noise levels and nuisance noise to surrounding sensitive receptors	<ul style="list-style-type: none"> <li>Position the crushing and screening plant as far away from noise receptors as possible.</li> <li>Machines (e.g., drill rigs) used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily.</li> <li>Equipment from which noise generated is known to be particularly directional (such as those related to the processing plant), should be orientated so that the noise is directed away from noise receptors.</li> <li>Acoustic covers of engines should be kept closed when in use or idling.</li> <li>Restrict travel during night-time.</li> <li>Ensure regular and effective maintenance of equipment.</li> <li>Minimise individual vehicle engine, transmission, and body noise/vibration.</li> <li>Maintain road surfaces regularly to avoid corrugations, potholes etc. and avoid steep inclines.</li> <li>Use rubber linings in for instance chutes and dump trucks to reduce impact noise of dropped material.</li> <li>Minimise the need for trucks/equipment to reverse.</li> <li>Non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.</li> <li>Keep a noise complaints register.</li> <li>Select equipment with lower sound power levels.</li> <li>Enclose sources of significant noise as far as is practically possible.</li> <li>Noise reduction screens, barriers, or berms must be considered for the western side of the THM where noise receptors are located close to the operations.</li> <li>Sound insulation of nearby buildings can be considered if the above measures for source control are insufficient.</li> </ul>	6 [4]	2 [2]	4 [4]	4 [3]	Medium [Medium]	60 [30]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
		<ul style="list-style-type: none"> <li>Monitor noise levels from the activities throughout the proposed project to determine level of mitigation required.</li> <li>In the event that noise related complaints are received it is recommended that short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints.</li> </ul>						
Additional traffic loading/ increased vehicle trips generated by activities at the mine Transportation of ore, materials and supplies by HVs and increased volumes of HVs	Deterioration of pavement condition/ quality resulting in unsafe driving conditions	<ul style="list-style-type: none"> <li>Operational vehicles should be restricted to travelling on designated roadways only and vehicle access beyond the designated and approved clearance footprint areas should be prohibited.</li> <li>Do not overload trucks, and ensure that wheel/ axle loading are in accordance to legislation.</li> <li>The maintenance and rehabilitation of the R31 is the responsibility of the SANRAL and mitigation measures should be developed in conjunction with the road agency.</li> </ul>	2 [2]	2 [2]	2 [2]	3 [2]	Low [Low]	18 [12]
	Surrounding road network congestion and reduced intersection capacity	<ul style="list-style-type: none"> <li>Make public transport available and encourage the use of public transport by staff to reduce trips and emissions.</li> </ul>	2 [2]	2 [2]	4 [4]	2 [2]	Low [Low]	24 [24]
Mining activities, an influx of people and associated increased human activity, poaching and trapping of faunal species and potential harvesting of plants	Loss of floral and faunal habitat	<ul style="list-style-type: none"> <li>The extent of operational activities (drilling, blasting and hauling) must be limited to the approved development footprint area and the boundaries clearly demarcated on site prior to commencement of site clearance.</li> <li>Site personnel should receive environmental awareness, biodiversity education training and ongoing training through mechanisms such as toolbox talks. Site induction procedures should include a discussion of key ecological aspects (such as the necessary procedures for working in proximity to sensitive habitats).</li> </ul>	6 [4]	2 [1]	4 [3]	4 [3]	Medium [Low]	48 [24]
	Reduced floral and faunal diversity		<ul style="list-style-type: none"> <li>Site personnel should receive environmental awareness, biodiversity education training and ongoing training through mechanisms such as toolbox talks. Site induction procedures should include a discussion of key ecological aspects (such as the necessary procedures for working in proximity to sensitive habitats).</li> </ul>	6 [4]	2 [1]	4 [3]	4 [3]	Medium [Low]
Movement of mining vehicles, increased human activity, drilling, blasting, noise pollution, vibrations and excessive dust	Displacement of faunal species	<ul style="list-style-type: none"> <li>The project footprint (including all surface infrastructure) must be clearly demarcated.</li> <li>Implement the Fire Management Plan (Table 40).</li> <li>No harvesting of firewood, plant material or collection of floral species by construction workers or mine personnel from the project area or natural areas surrounding the project footprint should be allowed.</li> <li>No wild animals may under any circumstance be handled, interfered with or removed by construction workers or any personnel.</li> </ul>	8 [6]	2 [1]	4 [3]	4 [3]	Medium [Medium]	56 [30]
Site clearance activities, increased human activity and collection or harvesting of species	Loss of species of conservation importance	<ul style="list-style-type: none"> <li>Hunting/ killing of fauna is prohibited.</li> <li>Any snares or traps found on or adjacent to the project area must be removed and disposed of.</li> </ul>	8 [6]	2 [1]	5 [3]	4 [3]	High [Medium]	60 [30]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
Disturbance within the project area and eradication and control measures not implemented.	Alien invasive species and other detrimental edge effects	<ul style="list-style-type: none"> <li>Trees located in proximity to the development footprint be clearly marked by means of danger tape or similar for the duration of the construction phase.</li> <li>Any removed trees could be mulched and used as soil moisture protection during concurrent rehabilitation or made available to local communities as firewood.</li> <li>Should any faunal SCC be noted within the project area, the relevant authorities must be notified. Input into the possible relocation of such species must be provided by a suitably qualified ecologist.</li> <li>The Alien and Invasive Plant Species Management Programme should continue to be implemented and updated to include any additional species that may be noted during the mining operations.</li> <li>Bare soils should be avoided, and adequate indigenous grass cover be achieved on any exposed slopes, and that rehabilitation takes place concurrently, as alien species tend to proliferate within bare, disturbed soils.</li> <li>Excessive erosion where noted should be rectified immediately making use of soft engineering techniques. Where required topsoil and hessian material must be placed over such areas in order to encourage the establishment of indigenous grass cover.</li> </ul> <p>Mitigation measure specific to the avifaunal impacts include the following:</p> <ul style="list-style-type: none"> <li>If collisions or electrocution impacts are recorded once the power line and on-site substation are operational, it is recommended that the Endangered Wildlife Trust: Wildlife &amp; Energy Programme investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.</li> <li>Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads.</li> <li>Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.</li> <li>Create similar surface water habitats at each of the stormwater ponds by keeping the tall trees in each of these areas and creating an island that will provide an adequate breeding substrate.</li> </ul>	6 [4]	2 [1]	4 [3]	3 [3]	Medium [Low]	36 [24]
Blasting operations to break rock for excavation to access	Ground Vibration - perceptible levels	<ul style="list-style-type: none"> <li>Follow specific blast design, shorter blast holes, smaller diameter blast hole, use of proper stemming procedures and stemming materials as recommended in the designs.</li> </ul>	6 [4]	2 [2]	4 [4]	3 [3]	Medium [Medium]	36 [30]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
the targeted ore material.	Air Blast - rattling of roofs or door or windows	<ul style="list-style-type: none"> <li>The major control effort will be for limiting fly rock to within a maximum risk range of 300 m.</li> <li>Air blast will be controlled by the same measures that are applied for fly rock control.</li> <li>Electronic detonators must be applied, and blast timing designs must be undertaken by on-site planning engineers on a blast-by-blast basis to achieve the single hole initiation requirement.</li> <li>Vibration monitoring will be needed for each blast from the start of blasting.</li> <li>Ideally, the installation of permanent seismic stations at a few points within Hotazel will provide reliable and comparable data.</li> </ul>	6 [4]	2 [2]	4 [4]	3 [3]	Medium [Medium]	36 [30]
	Fly Rock – safety impacts		4 [2]	2 [2]	4 [4]	3 [2]	Medium [Low]	30 [16]
	Noxious fumes		4 [2]	2 [2]	1 [1]	3 [2]	Medium [Low]	21 [10]
Accidental spills, mining, dirty water handling and leaching from surface stockpiles / residue	Contamination of soils and surface water	<ul style="list-style-type: none"> <li>The ring road (haul road) around the mine pit will intercept stormwater which will be channelled to the stormwater ponds.</li> <li>Potentially contaminated water will be stored within the properly constructed and lined PCD.</li> <li>Ensure machinery is in good working order.</li> <li>Implement a spill management plan and clean up measures.</li> <li>Good housekeeping such as storage of potentially hazardous material, explosive storage and dangerous goods will be within properly constructed and lined or paved areas.</li> <li>Oil traps will be sized, operated and maintained to contain all discarded oil from working areas.</li> </ul>	6 [2]	1 [0]	3 [2]	3 [2]	Medium [Low]	30 [8]
Soil stripping and stockpiling	Poor soil stockpiling and compaction may reduce the soil quality.	<ul style="list-style-type: none"> <li>Soil boundaries of soil types that should be stripped and stockpiled separately should be staked at 50 m intervals before any soil stripping commences.</li> <li>Topsoil should be stockpiled separately for later rehabilitation and adequately protected from being blown or washed away or being eroded.</li> <li>Ensure that soil is dry prior to stripping, using truck and shovel equipment instead of bowlscrapers where possible.</li> <li>Regularly oversee the soil stripping activities to ensure orderly stockpiling.</li> </ul>	6 [2]	1 [0]	3 [2]	3 [2]	Medium [Low]	30 [8]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
Mining activities including stockpiling of topsoil and subsoil, opencast mining and blasting, loading and hauling, processing and ore stockpiles  Storage and handling of dangerous goods (bulk fuel storage and explosives handling)	Loss of surface water quality	<ul style="list-style-type: none"> <li>Forced evaporation should be limited to dewatering the existing water body in the pit and should not be used for operational pit water management.</li> <li>Monitor the PCD and stormwater pond water levels.</li> <li>Water reuse from the PCD and stormwater ponds must be maximised.</li> <li>The dirty water pipelines should be subjected to frequent patrols. An efficient system of reporting should be available to allow the immediate tripping of pumps should a leak be found.</li> <li>All drains that collect the wash water and storm water must be maintained regularly. These should be free of debris and silt.</li> <li>The wash bays and workshops must be bunded and all water should be contained and collected.</li> <li>The wash bays and workshops must be equipped with oil separators to remove hydrocarbons from wash down water.</li> </ul>	4 [4]	1 [1]	2 [2]	3 [2]	Low [Low]	21 [14]
Dirty water management	Alteration of surface hydrology	<ul style="list-style-type: none"> <li>Diesel storage and refuelling areas should be concrete bunded.</li> <li>All vehicles should be well maintained and inspected for hydrocarbon leaks weekly.</li> <li>Chemicals should be stored in a central secure area.</li> </ul>	4 [4]	3 [3]	3 [3]	2 [2]	Low [Low]	20 [20]
Excavation of the proposed mine pit and active dewatering of the opencast mine	Lowering of the groundwater levels within the surrounding aquifers. None of the impacted boreholes are used for private domestic or agricultural purposes. No surface water streams fall within the zone of influence of the groundwater level drawdown cone.	<ul style="list-style-type: none"> <li>Monitor the groundwater quality and level.</li> <li>Monitor dewatering volumes.</li> <li>Monitor climate factors such as rainfall and evaporation.</li> <li>Update groundwater flow model every 2 years.</li> <li>Ensure that the backfilling of opencast pit is done appropriately, maximising compaction to decrease water infiltration.</li> </ul>	6 [4]	2 [2]	4 [4]	5 [5]	High [Medium]	60 [50]
Seepage from the mining area and surface ROM pads and the product stockpiles  Handling, storage and disposal of residue material to	Contamination of groundwater and reduced groundwater qualities	<ul style="list-style-type: none"> <li>Monitor the groundwater quality and level.</li> <li>Dams to be sized and constructed correctly and maintained properly.</li> <li>Update groundwater flow model every 2 years.</li> <li>Implement concurrent rehabilitation whereby as much material as available is used to re-fill the opencast void.</li> </ul>	4 [2]	2 [2]	5 [5]	5 [5]	Medium [Medium]	55 [45]



Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
in-pit waste rock dumps								
Seepage of pollution and accidental chemical and hydrocarbons spills		<ul style="list-style-type: none"> <li>The ring road (haul road) around the mine pit will intercept stormwater which will be channelled to the stormwater ponds.</li> <li>Potentially contaminated water will be stored within the properly constructed and lined PCD.</li> <li>Store fuel in sealed tanks and containing walls around tanks.</li> <li>Proper sizing and operation of oil traps.</li> <li>Placing the ROM pads and product stockpiles close to the pit boundary, and within the zone of influence of the groundwater level drawdown cone is a mitigatory measure in itself.</li> <li>Safe storage of chemicals.</li> </ul>	4 [2]	1 [1]	2 [2]	2 [2]	Low [Low]	14 [10]
Mining activities including stockpiling of topsoil and subsoil, opencast mining and blasting, loading and hauling, processing, ore stockpiles and dewatering of pit water	Greenhouse Gas Emissions and Climate Change <ul style="list-style-type: none"> <li>The main sources of GHG due to the proposed operations are the mobile and stationary equipment consuming diesel (scope 1) and the electricity usage (scope 2).</li> <li>The community are likely to be negatively impacted by climate change.</li> </ul>	<ul style="list-style-type: none"> <li>Limit the removal or vegetation and ensuring adequate re-vegetation or addition of vegetation surrounding the project.</li> <li>Additional support infrastructure can reduce the climate change impact on the staff and project, for example ensuring adequate water supply for staff and reducing on-site water usage as much as possible.</li> <li>Investigate solar power for the operations and the community to minimise emissions.</li> <li>Ensure the vehicles and equipment are maintained through an effective inspection and maintenance programme.</li> </ul>	2 [2]	5 [4]	4 [3]	3 [3]	Medium [Low]	33 [27]
	Visual intrusion at night from additional lighting	<ul style="list-style-type: none"> <li>Avoid unnecessary illumination, through measures such as providing lights with cover fittings that limit lateral and upwards "light spill", positioning lights to shine towards the intended areas of illumination rather than using floodlights, making use of Low Pressure Sodium lighting or other types of low impact lighting and using low wattage bulbs to further reduce the impact. Motion sensor activated lighting can also be used instead of lights that illuminate continuously.</li> </ul>	2 [2]	1 [0]	2 [2]	5 [4]	Low [Low]	25 [16]
	Employment opportunities	<ul style="list-style-type: none"> <li>Enhance through the implementation of the Skills Development Plan (SDP) and measures regarding the management of downscaling and retrenchment as detailed in the Social Labour Plan (SLP), prioritizing persons with requisite</li> </ul>	2	4	2	4	Medium Positive	+32

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
	Increased opportunities for SMMEs and stimulation of the local economy	skills from the surrounding areas for employment opportunities, and implementing a Stakeholder Engagement Plan to allow communication of the recruitment process with community members.	2	4	2	3	Low Positive	+24
	Skills development for employees and community members	<ul style="list-style-type: none"> <li>Identify suitable Historically Disadvantaged South African (HDSA) and locally based companies that currently, or in future, could provide local procurement to the mine, maximising the potential benefits to the local economy by ensuring that local labour and service providers are utilised wherever possible, and implementing the Procurement Progression Plan detailed in the SLP.</li> </ul>	2	3	2	4	Low Positive	+28
	In-migration of job-seekers into the project area and associated negative impacts	<ul style="list-style-type: none"> <li>Prioritise local labour to discourage the in-migration of job-seekers to the area.</li> </ul>	6 [6]	4 [4]	2 [2]	3 [2]	Medium [Low]	36 [24]
	Safety impacts on people and animals	<ul style="list-style-type: none"> <li>Control access to the mine site, put up signs warning people of the danger of entering the mine site in unfenced areas, conduct regular security patrols to check for trespassers, develop a Community Health and Safety Policy, adhere to the mine Health and Safety polices and the mitigation measures relating to air quality, noise, traffic safety and blasting.</li> </ul>	4 [3]	2 [2]	3 [3]	3 [2]	Low [Low]	27 [16]
	Decline in community health and safety		6 [4]	4 [4]	2 [2]	3 [2]	Medium [Low]	36 [20]
	Pressure on existing infrastructure and services, nuisance and social ills	<ul style="list-style-type: none"> <li>Prohibit recruitment (by the mine and contractors) from occurring at the mine gate.</li> </ul>	2	4	2	2	Low	16
	Impact on property values adjacent to the project	<ul style="list-style-type: none"> <li>Implement all mitigation measures relating to noise, dust, visual intrusion and the influx of people into the area, adhere to blasting levels, standards and controls and encourage ongoing open communication between the mine and all stakeholders near the mine to improve relations.</li> </ul>	6	4	2	3	Medium	36
<b>Closure and Decommissioning Phase</b>								
Removal of surface infrastructure	Surface water quality deterioration	<ul style="list-style-type: none"> <li>Plant/ equipment / machinery utilised for decommissioning and closure-related activities should be well maintained to ensure that hydrocarbon spills are minimised.</li> <li>Use existing roads.</li> </ul>	3 [2]	2 [0]	2 [1]	3 [2]	Low [Low]	21 [6]
Decommissioning and rehabilitation of the THM - infrastructure removal/demolition, topsoil placement and re-vegetation of	Human health may be impaired as a result of increased pollutant concentrations	<ul style="list-style-type: none"> <li>Measures specified for the construction and operational phase must continue to be implemented into the closure and decommissioning phase until such time as closure objectives for air quality and dust fallout are achieved.</li> </ul>	4 [2]	2 [1]	2 [2]	2 [2]	Low [Low]	18 [10]
	Increase in nuisance dust fall rates		2 [2]	1 [1]	2 [2]	2 [2]	Low [Low]	15 [15]

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
surroundings, vehicle entrainment on unpaved road surfaces and exhaust emissions from vehicles	Increase in ambient noise levels and nuisance noise to surrounding sensitive receptors	<ul style="list-style-type: none"> <li>Measures specified for the construction and operational phase must continue to be implemented into the closure and decommissioning phase.</li> </ul>	4 [2]	2 [1]	2 [2]	2 [1]	Low [Low]	16 [5]
	In-pit waste rock dumps will remain on site resulting in a permanent change to the visual character of the area	<ul style="list-style-type: none"> <li>Shape dumps to achieve deposit stabilisation and to blend with the natural topography, and establish vegetation on the crests of the dump.</li> </ul>	2 [2]	2 [2]	3 [3]	5 [3]	Medium [Low]	35 [21]
Backfilling/ rehabilitation and establishment of vegetation within areas currently devoid of vegetation	Greenhouse Gas Emissions and Climate Change - the previously cleared areas that form part of the project will be rehabilitated resulting in a carbon sink gain	<ul style="list-style-type: none"> <li>The potential impact can be enhanced by ensuring successful rehabilitation.</li> </ul>	2	1	3	3	Low Positive	+18
	Improved habitat conditions in the rehabilitated areas	<ul style="list-style-type: none"> <li>Engineer slopes of final remaining void and construct water-management measures where required.</li> <li>Shape residual dumps that are elevated above surface to achieve deposit stabilisation and to blend with the natural topography, and establishing vegetation on the crests of the dump.</li> </ul>	10	1	3	4	Medium Positive	+56
	Improved visual and aesthetic features of the site while simultaneously transforming the area into a usable landform.  Improved safety of the area, for both livestock and people.		2	1	5	4	Medium Positive	+32
Downscaling and retrenchment	Downscaling and retrenchment of employees	<ul style="list-style-type: none"> <li>Implement the measures in the SLP relating to employee education and upskilling to mitigate the impacts of unavoidable job losses. These include the establishment of future forums, providing information and counselling to retrenched to promote their absorption into the labour market, and offer a post-retrenchment programme to equip retrenched with knowledge and skills</li> </ul>	4 [4]	3 [3]	2 [2]	4 [4]	Medium [Medium]	36 [36]
<b>Post Closure Phase</b>								

Activity	Potential impact	Mitigation measures	Magnitude	Scale	Duration	Probability	Significance	
							Rating	Value
Ineffective backfilling and rehabilitation/re-vegetation	Soil compaction and erosion, exposed and impacted areas beyond the clearance footprint, unsafe voids, denuded areas, proliferation of invasive vegetation	<ul style="list-style-type: none"> <li>Ensure soils are replaced in the correct layers, ripped and re-profiled post-closure.</li> <li>Undertake post-closure monitoring and ensure vegetation is restored adequately.</li> <li>Ensure topography is free draining.</li> <li>Establish vegetation on the crests of the dumps.</li> <li>Implement erosion protection on dump slopes.</li> <li>Should indigenous grass cover not establish successfully after one growing season, active reseeding will be required.</li> </ul>	6 [4]	2 [1]	3 [2]	3 [2]	Medium [Low]	33 [14]
	Nuisance dust fall arising from the in-pit waste rock dumps and denuded areas during dry and windy conditions	<ul style="list-style-type: none"> <li>Shape dumps to achieve deposit stabilisation and establish vegetation on the crests of the dumps.</li> </ul>	6 [4]	2 [1]	3 [2]	3 [2]	Medium [Low]	33 [14]
Recovery of groundwater levels	It is expected that by 100 years post closure the groundwater level in the rehabilitated pit will have risen to around 10 m above the regional groundwater levels	<ul style="list-style-type: none"> <li>Positive impact, no mitigation required.</li> <li>No decant is expected by 100 years post closure.</li> </ul>	6	2	5	5	High Positive	+65
Poor quality seepage from the mining area	Migration of contamination plume - It is expected that by 100 years post closure the plume will not have spread more than 200 m from the pit boundary	<ul style="list-style-type: none"> <li>No surface water bodies or privately owned boreholes fall within the expected zone of influence of the plume.</li> <li>Monitor the groundwater quality for 5 years post closure.</li> <li>Remove ROM pads and product stockpiles and rehabilitate footprint area.</li> <li>Backfill and rehabilitate the opencast pit.</li> </ul>	4 [2]	2 [2]	5 [5]	5 [5]	Medium [Medium]	55 [45]

**vi) 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 EAP and a number of specialists were appointed to assess the significance of the environmental aspects on the receiving environment. Refer to Section 3 h) below for a full description on methodology. All comments and concerns raised during the Scoping Phase public participation process were addressed. Since the Final Scoping Report, further detail has been added to the project description and mine layout including the addition of:

- Stormwater ponds
- Sand and topsoil stockpile area
- Septic tank
- Weighbridge and office
- Water line and overhead powerline

The methodology used in determining the significance of impacts or risks has not amended since the Scoping Phase. The possible impact resulting from the proposed project were investigated further and a more in-depth impact assessment was undertaken. This impact assessment resulted in additional impacts being incorporated into the assessment and the revision of the scoring of some of the impacts addressed in the Scoping Report (Section 3.v); p.127).

**vii) 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)*

The proposed initial layout (currently preferred) is reflected in Figure 4. The potential impacts have been addressed in Table 20.

The advantages of the current project layout and site include:

- THM is located in an area where there is limited natural vegetation due to the historical mining activities that were undertaken.
- The footprint of the THM is limited to the footprint of the MR area and as far as possible the surface infrastructure is to be placed on already disturbed areas and away from the orezone, so as not to sterilise the resource.
- The site is not located near a watercourse.
- The site is located near a viable road network that allows for the transport of ore.
- The design and layout prioritises compatible land-use, namely the existing void, which correlates with the location of the orezone within the property, the boundary of the MR area and the existing infrastructure on surface.
- The chosen layout is also the most suitable in terms of fitting the required infrastructure within the boundary of the MR area while taking cognisance of surrounding sensitive receptors.

- No sites of significant archaeological or palaeontological significance were identified within the footprint of the THM.

Disadvantages of the current project layout and site include:

- The THM is located within close proximity to the town of Hotazel and the planned PV solar farm.
- Remnants of the Kathu Bushveld habitat (Medium ecological sensitivity where the abundance of protected and TOPS-listed species occur) exist along the main access road and within the MR area.
- Verreaux's eagle (*Aquila verreauxii*), a faunal SCC, utilises the site for nesting, breeding and foraging purposes.
- The opencast pit void within the proposed THM, which is associated with the historical mine workings, is comprised of a moderately sized and relatively deep, artificial pit lake. *Tilapia sparrmanii* (a provincially Protected fish species) were feeding and taking refuge within the lake.

**viii) 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 21: Concerns raised by IAPs and proposed mitigation measures**

Issue / concern raised	Proposed alternative / mitigation and assessment thereof
Is there an offsetting strategy for protected species?	Permits for the destruction or relocation of nationally and provincially protected tree, shrub and forbs species will be applied for and obtained from the relevant authorities. Where any protected species are to be rescued and relocated, this process will be overseen by a suitably qualified botanist or horticulturalist. The establishment of a site nursery where smaller plants with relocation potential, including <i>V. erioloba</i> seedlings and saplings, can be kept and propagated during the construction and operational phases will be established.
R31 and DR3463 intersection is curving and poses high vehicles accidents in particular to road trucks that will be coming from the mine site for the transportation of ore to Lohatla. Is THM looking into impact of traffic on big intersection? Currently high vehicle accident area and increase of vehicles intersecting during peak hours.	A Traffic Impact Assessment specialist study was carried out including an intersection capacity evaluation. The intersection has adequate capacity to process current traffic volumes and movements safely and efficiently on the road network and no capacity improvements are triggered. Sight distance at the intersection of R31 and DR3463 will be improved by removing trees and grass in the vicinity of the intersection. This will provide for safe turning movement of heavy vehicles at this intersection.
Hotazel town is fully occupied by mine workers and others working shifts and the noise from mining activities will have an impact on their sleeping patterns and fatigue recovery.	Noise propagation simulations indicate that noise generated during day will be detectable in Hotazel town but will likely not result in disturbance or complaints. However, due to low baseline night-time noise levels, night-time activities at THM could have a significant impact on environmental noise levels at Hotazel town during the night (22:00 to 06:00). The increase in noise levels in a large portion of Hotazel town may exceed the 3-dBA limit and complaints are expected. The increase in noise levels at receptors outside Hotazel town will be slight or mostly undetectable and complaints are not expected. Mitigation and management measures are required and will be implemented during all project phases including good engineering and operational practices, enclosure of processing plant equipment and that a noise reduction barrier, such as an earth berm, must be built on the western side of the THM, between the THM operations and Hotazel town where noise receptors are located close to the operations.
How far is the closest house from a closest blasting block? How will it be monitored?	The nearest house is 658 m from the pit area and the expected levels of ground vibration at this point is 3.1 mm/s. This is well within the general accepted safe limit of 12.5 mm/s applied. Recommendations

Issue / concern raised	Proposed alternative / mitigation and assessment thereof
<p>What will be a blasting impact on plant close to mine workings?</p> <p>Vibration travels faster than noise and there is community next to the pit, why would its impact be minimal?</p> <p>Is there no chance of cracking sewage facility? What is mining impact? (blasting) on the airstrip?</p>	<p>have been made for ground vibration, air blast and video monitoring using seismographs and video camera. The drill and blast parameters set to be used show expected vibrations of 6.6 mm/s at the closest structure at 417 m. The sewage plant is located 728 m from the pit area. The expected vibration at this point is 2.6 mm/s, which is below the general accepted safe limit. The airstrip is located 2313 m from the pit area and there is no concern with regards to ground vibration, air blast or fly rock. Communication with the airstrip must be established in terms of blasting and air traffic clearance.</p>
<p>Due to the scarcity of water in the area, a dry processing plant was selected as the preferred option. Will it not create more dust to nearby community?</p> <p>What other controls are being considered other than suppression on hauling roads?</p> <p>Positioning location of product stockpiles and fines vs community houses direction?</p> <p>Dust exposure surveys within households to understand level of exposure and establishment of dust monitoring station to monitor PM10 due to sensitive receptors?</p>	<p>An Air Quality Impact Assessment specialist study was carried out. Mitigation measures will include watering on in-pit and waste stockpiles unpaved roads, water sprays with chemicals on haul roads and access roads and water sprays at the crusher and screen.</p> <p>Indoor air quality sampling/monitoring has not been undertaken but two short fine particulate matter sampling campaigns were undertaken at two areas in Hotazel town using passive particulate matter samplers which is a very cost-effective method of sampling multiple size fractions of fine particulate matter as well as for source apportionment. Four months of dustfall sampling was also undertaken at four sites with two sites being in Hotazel town.</p>
<p>If it happens that during project execution phase an eagle is seen, how will it be captured and relocated?</p>	<p>A pre-construction inspection will be undertaken to confirm the Verreux's Eagle nest status. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick and/or eggs.</p>
<p>Mine reticulation will be provided at 11 kV from the Hotazel substation. Capacity? Impact on Hotazel town?</p> <p>What are the time lines for the application approval and infrastructure installation with Eskom.</p>	<p>Eskom has indicated that they have capacity and an application for 4.0 mVA has been submitted. The entire processing plant will be diesel operated. Until such time as power infrastructure is installed on site a mix of solar and diesel generators will be used as an alternate supply source.</p>
<p>Potable water demand and supply impact on Hotazel operations and communities?</p> <p>Where will evaporators be positioned and how big are they? Is any chance for them adding to noise?</p> <p>Excess water management through evaporation system- is it the best practical practice while there is water scarcity in the country and in the region?</p>	<p>Sedibeng Water are responsible for the allocation of their water resources. It is assumed that if Sedibeng water approves the off-take agreement then they have done a capacity assessment with approvals accordingly. Sedibeng water should have supply agreements with their existing customers and should not allocate additional water to new customers that they cannot deliver.</p> <p>Evaporator fans will be located below the pit perimeter. Forced evaporation will be limited to dewatering the existing water body in the pit and will not be used for ongoing operational pit water management.</p>
<p>Hotazel/ Magobing/ Magojaneng residents are the closest local community, how will they ensure local employment?</p>	<p>Tawana will make use of local labour as far as possible in all stages and for all aspects of the project. This applies to all contractors during construction.</p>
<p>Potential impacts in terms of vibration, dust and shading on the proposed solar facility to the south/south-east of the mine.</p>	<p><b>Blasting and vibrations:</b></p> <p>There is no specific limits for solar installations. A conservative 25 mm/s vibration and air blast 134 dB is applied. These are similar for normal well build houses where people will reside. The nearest point between the pit area and the two solar farms are 758 m and 946 m. The expected levels of ground vibration and air blast are well within accepted norms for safe blasting. Fly rock unsafe zone was calculated to 291 m. The solar facilities are located outside of this zone. However a general clearance zone of 500 m is normally applied by mines. It will however still be required by the blasting team to ensure that all is done not to create fly rock. Part of the monitoring programme recommended includes two locations at closest point between the pit and the solar facilities. These points are intended to act as governing</p>

Issue / concern raised	Proposed alternative / mitigation and assessment thereof
	<p>the ground vibration and air blast yielded by blasting. The monitoring positions are located such that it should be best location for strictest control. Any distance further will indicate lower levels.</p> <p><b>Air Quality/ Dust:</b>            Baseline dustfall sampling was undertaken at the proposed location of the solar facility and the highest sampled pre-development dustfall rate at this site was 673 mg/m<sup>2</sup>-day. With the highest simulated dustfall rate (103 mg/m<sup>2</sup>-day for unmitigated operations) added to that, the dustfall rates at the solar facility could be 776 mg/m<sup>2</sup>-day. Dustfall rates would increase with increased use of public roads and on-site (solar facility) support operations.</p> <p>A dustfall rates sampling network will be set up and it has been recommended that two units be located on the boarder of the solar facility. It has been recommended that progress reports should be reported to all IAPs affected by pollution and stakeholder forum/feedback meetings be scheduled and held at least on a bi-annual basis and that a complaints register must be kept at all times. Regular (maximum of 5 years) review of the mitigation, management and monitoring procedures should take place.</p>

**ix) Motivation where no alternative sites were considered**

No alternative sites were assessed as the proposed location was selected based on the location of the MR area, surface access rights, as well as the location of the orezone within the property determined from the exploration results. Refer to Section 3 g) i).

**x) Statement motivating the alternative development location within the overall site**

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

The site selection is based on the location of the existing historical mine. The THM is located in an area where there is limited natural vegetation due to the historical mining activities that were undertaken. The footprint of the THM is also limited to the footprint of the MR area and as far as possible the surface infrastructure must be placed on already disturbed areas and away from the orezone, so as not to sterilise the resource. Other factors include the location of existing infrastructure such as the access roads and the municipal waste dump. The design and layout prioritises compatible land-use, namely the existing void, which correlates with the location of the orezone within the property, the boundary of the MR area and the existing infrastructure on surface. The chosen layout is also the most suitable in terms of fitting the required infrastructure within the boundary of the MR area while taking cognisance of surrounding sensitive receptors. Refer to Section 3 g) i).

**h) 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 were 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)*

The Prime Resources Impact Assessment Methodology and rationale was used to assess the significance of the potential impacts of the initial layouts on the surrounding biophysical and socio-economic environments.



The objective of the Impact Assessment is to rate the significance of potential impacts of the project prior to and after the implementation of mitigation measures. The methodology encompasses an assessment of the nature, consequence (magnitude, extent, duration) and probability (likelihood) of the identified potential environmental and social impacts of the project. The reversibility of the impact as well as the cumulative impact are also considered. The impact is assessed prior to and after implementation of potential mitigation measures.

The following risk assessment model has been used for determination of the significance of impacts.

**Significance = (magnitude + duration + scale) x probability**

The maximum potential value for significance of an impact is 100 points. Environmental impacts can therefore be rated as high, medium or low significance on the following basis:

High environmental significance	60 – 100
Medium environmental significance	30 – 59
Low environmental significance	0 – 29

<b>Magnitude (M)</b>	
Minor (2)	Change not measurable; or threshold never exceeded There is no need for people to adapt and will not notice changes to livelihoods and lifestyles
Low (4)	Low disturbance of degraded areas, which have little conservation value Minor change in species occurrence or variety Minor deterioration (nuisance or minor deterioration) or harm to receptors Change to receiving environment not measurable; or identified threshold never exceeded People are able to adapt and maintain pre-impact livelihoods and lifestyles
Moderate (6)	Moderate/measurable deterioration or harm to receptors Receiving environment moderately sensitive Identified threshold occasionally exceeded People are able to adapt with difficulty (with no resettlement). Pre-impact livelihoods and lifestyles can be maintained with difficulty or with support or intervention Disturbance of areas that have potential conservation value or are of use as resources Complete change in species occurrence or variety
High (8)	High, measurable deterioration or harm to receptors Receiving environment highly sensitive Identified threshold often exceeded Pre-impact livelihoods and lifestyles cannot be maintained or resettlement is required
Very High / Unknown (10)	Loss of ecosystem function Loss of an irreplaceable natural resource (including cultural and heritage resources) Disturbance of pristine areas that have important conservation value Human health and or safety is compromised Receptors of impact are of conservation importance; or identified threshold (such as SANS limits, Resource Quality Objectives, etc.) consistently exceeded Unknown
<b>Scale (S)</b>	
Footprint (0)	Occurs only within the footprint of the activity
Site (1)	Occurs only within the site of the project
Local (2)	Occurs within approximately 2.5 km of the activity
Regional (3)	A regional scale as determined by administrative boundaries, habitat type/ecosystem or regional loss of a species population.
National (4)	Nationally important or macro-economic consequences
International (5)	Internationally important agreements and resources are affected such as areas protected by international conventions, international waters etc. Unknown
<b>Duration (D)</b>	
Immediate (1)	Completely reversible without management Impact is instantaneous and ceases imminently

Short (2)	Naturally reversible or reversible with minimal management Impact ceases when the activity ceases
Medium (3)	Impact can be reversed with sufficient management Impact ceases when project ends
Long (4)	Impact is potentially irreversible even with management
Permanent (5)	Impact remains after the life of the project The impact will continue indefinitely / ad infinitum Unknown
<b>Probability (P)</b>	
Improbable (1)	Improbable, almost impossible
Unlikely (2)	Low probability, unlikely to occur
Likely (3)	Medium probability, likely to occur
Expected (4)	High probability, expected to occur
Definite (5)	Definite (certain) or unknown

The significance of a particular impact which is reduced through the application of the recommended mitigation measures is indicated within square brackets. Where mitigation measures are recommended in order to reduce the significance of a potential impact, these have been indicated. The tabulated impact assessments are further elaborated upon in Table 20.

#### **i) 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 - the supporting impact assessment conducted by the EAP must be attached as an appendix)*

Refer to Table 20 and Appendix 21 for the detailed impact assessment compiled by the EAP, informed by specialist input.

#### **j) 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 - attach copies of Specialist Reports as appendices)*

Independent specialists were appointed to undertake various specialist investigations. The specialists investigated the baseline environment and the potential impacts (including cumulative impacts) of the proposed THM in relation to the construction, operational, closure and decommissioning and post closure phases. The specialists also recommended appropriate and implementable mitigation measures to avoid, reduce and/or mitigate the potential impacts that were identified. The specialists also addressed the comments and concerns raised by IAPs within their necessary disciplines. The impacts identified by the specialists are described in Table 20.

**Table 22: Specialist reports that informed the EIA process**

<b>Specialist Report</b>	<b>Author</b>	<b>Appendix</b>
Air Quality, Greenhouse Gas Emissions and Climate Change Impact Assessment	Airshed Planning Professionals (Pty) Ltd	7
Agricultural Compliance Statement	Digital Soils Africa (Pty) Ltd	8
Palaeontological Impact Assessment	Professor Marion Bamford	9
Heritage Impact Assessment	Archaetnos Culture & Cultural Resource Consultants	10
Noise Impact Assessment	Airshed Planning Professionals (Pty) Ltd	11
Surface water Impact Assessment	iLanda Technologies (Pty) Ltd	12
Groundwater Impact Assessment	Future Flow Groundwater and Project Management	13
Terrestrial Biodiversity Impact Assessment	Field and Form Landscape Science in collaboration with Malachite Ecological Services	14
Avifaunal Impact Assessment	Feathers Environmental Services	15

<b>Specialist Report</b>	<b>Author</b>	<b>Appendix</b>
Aquatic Biodiversity Compliance Statement	Ecology International (Pty) Ltd	16
Blasting and Vibrations Impact Assessment	Blast Management and Consulting	17
Traffic Impact Assessment	Merchelle's Collective (Pty) Ltd	19
Geochemical Assessment	Prime Resources (Pty) Ltd	20

**Table 23: Specialist recommendations considered in the EIA process**

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
Terrestrial Biodiversity Impact Assessment	<ul style="list-style-type: none"> <li>• Based on the findings of the assessment, it is the opinion of the specialist that the project be considered favourably, provided that the mitigation measures as outlined in this report be implemented.</li> <li>• An Alien and Invasive Plant Species Management Plan is in place prior to commencement of construction and mining activities.</li> <li>• A Rehabilitation Plan is in place prior to commencement of mining activities.</li> <li>• Management of soils throughout the LoM should also be addressed.</li> <li>• Where possible, remnant Modified Kathu Bushveld vegetation should remain conserved due to the abundance of protected and TOPS-listed species occurring within this habitat unit.</li> <li>• No areas beyond the approved project footprint should be disturbed and strict management of edge effects such as bush encroachment, erosion and alien invasive species management must take place throughout the LoM to prevent degradation of surrounding natural habitat.</li> <li>• The relevant permits must be obtained for any protected tree species such as <i>Vachellia erioloba</i> and <i>V. haematoxylon</i>, provincially protected plant species or TOPS-listed species that will be destroyed, removed or relocated during the construction and operational phases of the project. Any conditions attached to such permits have to be implemented.</li> <li>• It is recommended that trees located in proximity to the development footprint be clearly marked by means of danger tape or similar for the duration of the construction phase.</li> <li>• The implementation of low noise techniques is recommended.</li> <li>• Any lighting require must be directed away from sensitive habitats and the use of sodium vapour lights are recommended so as to not impact nocturnal faunal-invertebrate dynamics, through the attraction of species to these artificially lit areas.</li> <li>• The establishment of a site nursery where plants with relocation potential, including bulbous protected floral species, may be kept and propagated for use during the rehabilitation phase should be considered.</li> <li>• Any disturbed and compacted areas outside of the project footprint must be ripped, reprofiled and self-succession of indigenous grass and forb species allowed.</li> <li>• Where self-succession does not occur over a period of one growing season, active revegetation by means of applying an indigenous veld grass mixture is recommended.</li> </ul>	Yes	Table 20 and Table 27
Avifaunal Impact Assessment	<ul style="list-style-type: none"> <li>• While the Verreaux's Eagle <i>Aquila verreauxii</i> is relatively tolerant of human disturbance, the reopening of the proposed mine development and its associated activities are going to be a significant cause of disturbance to the resident pair and its progeny and it is very likely that the birds will be displaced from this location.</li> <li>• A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest status must be conducted. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick/ eggs.</li> </ul>	Yes	Table 20 and Table 27

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
	<ul style="list-style-type: none"> <li>The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species.</li> <li>The overhead power line must be constructed using a bird friendly structure (Inverted Delta-T).</li> <li>Additional mitigation in the form of insulating sleeves on jumpers present on strain poles, terminal poles and box transformers must also be considered.</li> <li>If collision or electrocution impacts are recorded once the power line and on-site substation are operational, it is recommended that the Endangered Wildlife Trust: Wildlife &amp; Energy Programme investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.</li> <li>Bird flight diverters to be maintained on sections of power line during the operational life span of the 11kV power line.</li> <li>Vehicles must utilise existing roads only.</li> <li>Speed restrictions to be enforced for all vehicles to limit avifaunal collisions.</li> <li>Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads.</li> <li>Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure. The recommendations of the botanical study must be strictly implemented.</li> <li>Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.</li> <li>Maximum use should be made of existing roads and the construction of new roads must be kept to a minimum. New roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats.</li> <li>In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.</li> <li>An opportunity exists to create similar surface water habitats at each of the stormwater ponds by keeping the tall trees In each of these areas and creating an island that will provide an adequate breeding substrate.</li> </ul>		
	<ul style="list-style-type: none"> <li>The removal of the water within the open void and underground workings to be done between April and June outside of the waterfowl breeding season.</li> </ul>	Not included - Full dewatering will take longer than three months and it is proposed that dewatering will be carried out from April until September.	

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
Aquatic Biodiversity Compliance Statement	<p>Cognisance must be given to the presence of an artificial, yet functional, aquatic ecosystem present within the void left by previous mining activities, and the presence of at least one provincially Protected fish species, <i>Tilapia sparrmanii</i>. Accordingly, the following recommendations pertaining to the way forward are proposed:</p> <ul style="list-style-type: none"> <li>• Should the draining of the pit lake be required for future mining purposes, a detailed assessment of the fish species present within the lake will need to be conducted by an accredited aquatic specialist so as to advise on permit requirements. At present, it is known that at least one fish species identified within pit lake during the present study is listed as Protected under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009), and as such, a permit will be required should translocations (or any other activity involving the fish species present) be undertaken. Further permits may be required depending on any additional species present.</li> <li>• In the event that the pit lake is drained and depending on the number of fish species present (see previous comment), a suitably qualified and accredited aquatic specialist must be present so as to identify species for further actions (e.g. translocation, euthanasia, etc.).</li> <li>• Under no circumstances are fish to be removed for the purpose of consumption due to potential metal accumulation within tissues of the fish and associated liabilities.</li> </ul>	Yes	Table 20 and Table 27
Heritage Impact Assessment	<ul style="list-style-type: none"> <li>• The development may continue, after receiving environmental authorisation for which input has been provided by SAHRA.</li> <li>• Due to archaeological sites being subterranean in essence, it is possible that all cultural sites may not have been identified. Care should therefore be taken when development work commences that, if any more artifacts are uncovered, a qualified archaeologist be called in to investigate.</li> <li>• Proposed management measures for potential impacts, which should be followed as heritage protocol and Chance Find Procedure.</li> </ul>	Yes	Table 20 and Table 28
Palaeontological Impact Assessment	<ul style="list-style-type: none"> <li>• It is recommended that no palaeontological site visit is required.</li> <li>• Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the aeolian sands of the Quaternary.</li> <li>• There is very small chance that fossils from pans or springs may have been entrapped in the sands of the Kalahari Group (Quaternary).</li> <li>• Therefore, a Fossil Chance Find Protocol should be added to the EMP: if fossils are found once drilling and excavations have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.</li> </ul>	Yes	Table 20 and Table 28

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
Air Quality Impact Assessment and Greenhouse Gases and Impacts of Climate Change	<p>To ensure the lowest possible impact on AQSRs and environment it is recommended that the air quality management plan as set out in the specialist report should be adopted. This includes:</p> <ul style="list-style-type: none"> <li>• The management of the proposed operations; resulting in the mitigation of associated air quality impacts.</li> <li>• The use of chemical suppressants on the surface haul roads and access road should be considered.</li> <li>• The dustfall sampling and ambient fine particulate monitoring.</li> <li>• Should the dustfall sampling show higher rates than those estimated in this study it is suggested that THM investigate and consider adopting additional mitigation and management measures. Fallout dust tends to settle relatively close to sources of emissions and thus if the dustfall sampling show significantly higher rates there is likely to be significantly higher finer particulate matter concentrations as well.</li> <li>• Record keeping and community liaison procedures.</li> <li>• Based on the findings and provided the measures recommended are in place as well as regular (maximum of 5 years) review of the mitigation, management and monitoring procedures takes place, it is the specialist opinion that the project may be authorised but investigations into economically and environmentally viable mitigation measures to reduce fine particulate matter (especially PM10) should be undertaken prior to initiation of operations and feedback provided to the authorities.</li> </ul> <p>The following is recommended to reduce the impacts of climate change on the project and the community:</p> <ul style="list-style-type: none"> <li>• Additional support infrastructure can reduce the climate change impact on the staff and project, for example ensuring adequate water supply for staff and reducing on-site water usage as much as possible.</li> <li>• THM could initiate a community development programme.</li> <li>• Investigating solar power for the operations to minimise scope 2 emissions.</li> </ul> <p>The following is recommended to reduce the GHG emissions from project:</p> <ul style="list-style-type: none"> <li>• Ensuring the vehicles and equipment are maintained through an effective inspection and maintenance programme.</li> <li>• Limiting the removal or vegetation and ensuring adequate re-vegetation or addition of vegetation surrounding the project.</li> </ul>	Yes	Table 20 and Table 32
Noise Impact Assessment	<ul style="list-style-type: none"> <li>• It is the noise specialist's opinion that, from an environmental noise perspective, the project may be authorised.</li> <li>• Due to low baseline noise levels in Hotazel town, especially during the night, strong community action can be expected if noise generating sources are not properly mitigated and controlled.</li> <li>• Recommended mitigation and management measures include regular servicing and maintenance of the vehicle fleet, minimising the need for trucks to reverse, maintenance of road surfaces, minimising of idling times, choosing equipment and vehicles with low noise profiles, considering using 'smart' reverse alarms and possible establishment of a barrier, such as an earth berm, between the THM operations and Hotazel town.</li> <li>• Regular (at least annual) monitoring of environmental noise is recommended. The recommended locations for noise monitoring are the same as for the baseline survey.</li> </ul>	Yes	Table 20 and Table 32

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
	<ul style="list-style-type: none"> <li>It is recommended that wherever possible, significant noise generating activities be limit to the daytime (06:00 to 22:00).</li> </ul>		
Surface water Impact Assessment	<ul style="list-style-type: none"> <li>No specific recommendations made.</li> <li>The surface water monitoring programme and recommended mitigation measures have been included in the EIAR.</li> </ul>	N/A	N/A
Groundwater Impact Assessment	<p>It is recommended that the project be authorized. This recommendation is based on:</p> <ul style="list-style-type: none"> <li>The impact assessment shows that it not expected that there will be a significant impact on the groundwater levels in the area. No privately-owned boreholes around the proposed development area will be impacted by the groundwater level drawdown in the fractured rock aquifer;</li> <li>It is not expected that there will be a notable impact on the groundwater qualities within the proposed development area.</li> </ul> <p>Additional recommendations:</p> <ul style="list-style-type: none"> <li>Monitor the groundwater quality and levels. It is recommended that the monitoring programme start with a monthly interval for the first year. Ideally, the monitoring programme should start a year before mining starts in order to be able to build a database that is not impacted by the mining activities. Once the monthly database is established the monitoring frequency can change to quarterly.</li> <li>Monitor dewatering volumes.</li> <li>Monitor climatic aspects such as rainfall and evaporation.</li> <li>Update the geochemical assessment - The material sampled for the geochemical assessment has been exposed on surface since the previous mining activities stopped in 1989. It is possible that oxidation and leaching of elements by rainfall has impacted the test results. It is recommended that the geochemical assessment be updated once the mine is operational and fresh material is available.</li> <li>Update the numerical groundwater flow and contaminant transport models - It is recommended that the numerical groundwater flow and contaminant transport models be updated on a 2-yearly basis based on time series groundwater level and quality data as obtained from the groundwater monitoring programme as well as climatic aspects such as rainfall and evaporation. Re-calibrating the models based on time series data will increase the confidence level of the predictions. Any changes in the mine design, progression plan and surface layouts can also be included and the impact simulations updated.</li> <li>PCD to be lined.</li> </ul>	Yes	Table 20 and Table 30



List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
	<ul style="list-style-type: none"> <li>• Dams to be sized and constructed correctly and maintained properly.</li> <li>• Good housekeeping such as safe storage of potentially hazardous material will be within properly constructed and lined or paved areas.</li> <li>• Oil traps will be sized, operated and maintained to contain all discarded oil from working areas.</li> <li>• Store fuel in sealed tanks with containing walls around tanks.</li> <li>• The vehicle yard and workshop will be paved, with appropriate oil traps and other infrastructure in place.</li> <li>• Remove ROM pads and product stockpiles and rehabilitate footprint area.</li> <li>• Backfill and rehabilitate the opencast pit.</li> </ul>		
Geochemical Assessment	<p><u>Measures for the management of waste rock:</u></p> <ul style="list-style-type: none"> <li>• Freshly exposed waste rock stockpiles on surface (if present) should have water management measures to ensure that unrestricted discharge to the environment does not take place. This recommendation is provided as freshly exposed waste rock may initially leach higher concentrations of soluble metals than that anticipated in the long term.</li> <li>• In the long term, backfilling of waste rock into the opencast pit void is recommended. The proposed backfilling of the waste rock into the opencast pit requires that exemption from the provisions of Regulation 4 of GN 704 of 1999 Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources is sought. The following motivates for this exemption: <ul style="list-style-type: none"> <li>a. Backfilling is considered an acceptable long term storage solution for the waste rock due to the low geochemical risk the waste rock presents. The waste rock is non-acid generating and very low concentrations of soluble anions, metals and metalloids are anticipated to arise in the long-term in neutral pH conditions.</li> <li>b. Provision of a stable repository for waste rock – long-term slope stability of large waste rock dumps is not of concern when the material is backfilled. Stability aspects such as subsidence may, however, be of concern and the area is to be managed appropriately in terms of the mine closure and rehabilitation plan;</li> <li>c. Reduction of exposed surface area – waste rock material stockpiled on surface has a greater surface area for rainwater interaction, leading to higher runoff volumes and a greater impact on surface water resources. Backfilling limits exposure of the slopes of both the pit and overburden stockpiles to atmospheric weathering and oxidation. Where residue material has been backfilled, only the upper surface is exposed to atmospheric conditions in the long term;</li> <li>d. Avoidance of pit lakes –the backfilling of a pit eliminates the creation of a pit lake which in itself carries environmental and safety concerns, and therefore promotes a free-draining surface in the long-term;</li> <li>e. Restoration of impacted land to beneficial use – areas that would host waster rock dumps can be rehabilitated to an acceptable end-use.</li> </ul> </li> </ul>	Yes	Table 20 and Table 35

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
	<ul style="list-style-type: none"> <li>It is recommended that the backfilled waste rock should be compacted to restrict rainwater infiltration and the resulting landform shaped to promote rainwater runoff.</li> </ul> <p><u>Measures for the management of fines and ore material:</u></p> <ul style="list-style-type: none"> <li>Freshly exposed ore stockpiles on surface should have water management measures to ensure that unrestricted discharge to the environment does not take place.</li> <li>The material is classed as a Type 3 waste which, according to the local guidelines, would require a Class C liner. It is motivated that a Class C liner is not a practical barrier for ore stockpiles as the areas are extensively worked with machinery and would result in damages to such a liner system. It is recommended that a compacted base or concrete base be considered as alternative barriers at the ore stockpiles. No stockpiles of ore material will remain on the site post-closure and rehabilitation.</li> <li>Although the larger fractions of THM ore material do not pose long-term metal leaching risk, fine material that is wind-blown or washed away does present a higher risk. Management measures to control windblown fines material should therefore be put in place (as advised by air quality specialists). Water management measures to prevent unrestricted discharge of water arising from the stockpile area should be in place with silt traps as necessary to control the amount of fine material entering water facilities.</li> </ul>		
Blasting and Vibrations Impact Assessment	<ul style="list-style-type: none"> <li>Regulatory requirements – MSHA Reg. 4.16(2): Regulatory requirements indicate specific requirements for all non-mining structures and installations within 500 m from the mining operation. Three points of interest are observed within 500 m from the mining area including a railway, a communication tower and a historical mine structure. The mine will have to apply for the necessary authorisations as prescribed in the various acts, and specifically Mine Health and Safety Act Reg 4.16 as well as recommendations regarding infrastructure within the pit area.</li> <li>Regulatory requirements – MSHA Reg. 17.6(a): On review of the pit area’s location, there is no private infrastructure within 100 m from the pit area. Mine Health and Safety act regulation 17.6(a) may not be required. A final inspection of area and structures must be done prior to dismissing this requirement.</li> <li>Blast designs can be reviewed prior to first blast planned and done. Specific attention can be given to the possible use of electronic initiation rather than conventional timing systems. This will allow for single blast hole firing instead of multiple blast holes where necessary if ground vibration is of concern for the specific blast. Single blast hole firing will provide single hole firing – thus less charge mass per delay and less influence.</li> <li>It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done, and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not.</li> <li>The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the</li> </ul>	Yes	Table 20 and Table 33

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included																												
	<p>blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels.</p> <ul style="list-style-type: none"> <li>The calculated minimum safe distance is 291 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance.</li> <li>The R31 Provincial road is at an approximate distance of 1008 m from the Pit area and will require no specific consideration regarding effects from blasting operations. The R380 road is at closest distance of 1950 m. There are other Roads and Gravel roads in the vicinity of the Project area but are all expected to be within the recommended limits. There may however be people and animals on these routes and will require careful planning to maintain safe blasting radius. It will be required that clearance distances are set, and road travel managed during blasting operations.</li> <li>The option of photographic survey of all structures up to 1500 m from the pit areas is recommended. The mine will be operating for a significant number of years. This will give advantage on any negotiations with regards to complaints from neighbours on structural issues due to blasting. This process can however only succeed if done in conjunction with a proper monitoring programme. It is expected that ground vibration levels will be significantly less than proposed limits at 1500 m, but this process will ensure record of the pre-blasting status of the nearest structures to the pit area. At 1500 m the expected level of ground vibration will be perceptible.</li> <li>Recommended ground vibration air blast limits:</li> </ul> <table border="1"> <thead> <tr> <th>Structure Description</th> <th>Ground Vibration Limit (mm/s)</th> <th>Air Blast Limit (dBL)</th> </tr> </thead> <tbody> <tr> <td>National Roads/Tar Roads:</td> <td>150</td> <td>N/A</td> </tr> <tr> <td>Electrical Lines:</td> <td>75</td> <td>N/A</td> </tr> <tr> <td>Railway:</td> <td>150</td> <td>N/A</td> </tr> <tr> <td>Transformers</td> <td>25</td> <td>N/A</td> </tr> <tr> <td>Water Wells</td> <td>50</td> <td>N/A</td> </tr> <tr> <td>Telecoms Tower</td> <td>50</td> <td>134</td> </tr> <tr> <td>General Houses of proper construction</td> <td>USBM Criteria or 25 mm/s</td> <td rowspan="3">Shall not exceed 134dB at point of concern but 120 dB preferred</td> </tr> <tr> <td>Houses of lesser proper construction (preferred)</td> <td>12.5</td> </tr> <tr> <td>Rural building – Mud houses</td> <td>6</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>A further consideration of blasting times is when weather conditions could influence the effects yielded by blasting operations. It is recommended not to blast too early in the morning when it is still cool or when there is a possibility of atmospheric inversion or too late in the afternoon in winter. Do not blast in fog. Do not blast in the</li> </ul>	Structure Description	Ground Vibration Limit (mm/s)	Air Blast Limit (dBL)	National Roads/Tar Roads:	150	N/A	Electrical Lines:	75	N/A	Railway:	150	N/A	Transformers	25	N/A	Water Wells	50	N/A	Telecoms Tower	50	134	General Houses of proper construction	USBM Criteria or 25 mm/s	Shall not exceed 134dB at point of concern but 120 dB preferred	Houses of lesser proper construction (preferred)	12.5	Rural building – Mud houses	6		
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List of studies undertaken	Recommendations of specialist reports	Specialist recommendations in the EIAR	Section of report where specialist recommendations have been included
	<p>dark. Refrain from blasting when wind is blowing strongly in the direction of an outside receptor. Do not blast with low overcast clouds. These 'do nots' stem from the influence that weather has on air blast. The energy of air blast cannot be increased but it is distributed differently and therefore is difficult to mitigate.</p> <ul style="list-style-type: none"> <li>• It is recommended that a standard blasting time is fixed and blasting notice boards setup at various routes around the project area that will inform the community of blasting dates and times.</li> <li>• Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. This will bring about unbiased evaluation of levels and influence from an independent group. Monitoring could be done using permanent installed stations. Audit functions may also be conducted to assist the mine in maintaining a high level of performance with regards to blast results and the effects related to blasting operations.</li> <li>• Video of each blast will help to define if fly rock occurred and from origin. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions.</li> <li>• The Hotazel airstrip is located directly west of the pit area at 2313 m away. It is recommended that communication be setup to ensure that there is no air traffic at time of blasting.</li> </ul>		
Traffic Impact Assessment	<ul style="list-style-type: none"> <li>• Improvement of sight distance at the intersection of R31 and DR3463 through complete removal of trees and grass in the vicinity of the intersection. This will provide for safe turning movement of HVs at this intersection.</li> <li>• Improvement of sight distance at the intersection of R31 and R380 through complete removal of trees and grass in the vicinity of the intersection. This will provide for safe turning movement of HVs at this intersection.</li> <li>• Upgrading of the proposed Main Entrance access road connecting to Boardman Rd. as follows: <ul style="list-style-type: none"> <li>○ Surfacing of road (this will also address dust generation impacts)</li> <li>○ Provision of sidewalks and a taxi layby</li> </ul> </li> <li>• Implementation of the proposed mitigation and monitoring measures for CO<sub>2</sub> emissions, pavement condition, dust generation, noise generation and disturbance to fauna and flora.</li> <li>• Improvement of road safety through: <ul style="list-style-type: none"> <li>○ Limiting heavy deliveries to daytime.</li> <li>○ Limiting abnormal loads to daytime and dry weather, providing escort, and applying stop-go control at locations of restricted road width.</li> <li>○ Regular grading of the road surface of the access roads.</li> </ul> </li> <li>• All other environmental impacts due to traffic generation are considered minor and it is recommended that the THM proceed with development from a Traffic Engineering Perspective.</li> </ul>	Yes	Table 20 and Table 26

## **k) Environmental impact statement**

### **i) Summary of the key findings of the environmental impact assessment**

The significance of the majority of the negative impacts identified, can be mitigated to **low or medium significance after the implementation of mitigation measures** (Table 20). During the closure and post closure phase, the impact of job losses and the migration of the groundwater contamination plume will remain **medium** significance impacts.

### **ii) 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)*

Refer to Figure 44 for a composite map.

### **iii) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives**

A summary of the positive and negative impacts of the proposed project is described in Section 3 g) v) and Table 20.

## **l) 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)*

Specialist recommendations, which could be included as EMPr conditions, are discussed in Table 23. Mitigation measures as well as the significance of the impacts prior and post mitigation are provided in Table 20 and contained in the respective specialist studies.

Refer to Table 24 for the proposed impact management objectives and the impact management outcomes.

**Table 24: Proposed impact management objectives and impact management outcomes for inclusion in the EMPr**

ASPECT	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION TYPE	MANAGEMENT OUTCOMES / STANDARD TO BE ACHIEVED
Air quality	<ul style="list-style-type: none"> <li>Impacts due to dust and particulate matter / gaseous emissions from crushing and screening operations and vehicles travelling on unpaved roads as well as vehicles exhausts</li> </ul>	<ul style="list-style-type: none"> <li>To ensure that operations at the facility do not significantly reduce the air quality within the region</li> <li>To limit exposure of the public, private companies / industries and fauna/ flora to unacceptable risks</li> <li>To minimise the risk of pollution associated with the road transport of material</li> <li>To reduce the emissions from the vehicles</li> <li>To minimise the amount of dry material susceptible to wind erosion</li> <li>To minimise the entrainment potential of dust</li> <li>To respond with corrective action to public complaints about dust related health and nuisance impacts</li> <li>To minimise the risk of pollution arising from in-pit waste rock dumps post closure</li> </ul>	<ul style="list-style-type: none"> <li>Avoid/stop or reduce impact at source</li> <li>Modify impact through design</li> <li>Control impact through management</li> <li>Repair or remedy impact through rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>Actively control the generation of dust and monitor the dust fallout and limit dust generated to below the National Dust Control Regulations (NDCR) standards</li> <li>National Ambient Air Quality Standards (NAAQS)</li> <li>Keep PM<sub>10</sub>, PM<sub>2.5</sub> and dust fallout levels at key receptor sites around the project area within guideline levels. As the guidelines vary depending on the priority area and year, consult SAAQIS for the most recent guidelines</li> <li>Control air quality impacts as per Table 32 of the EMPr</li> </ul>
Biodiversity	<ul style="list-style-type: none"> <li>Loss of floral and faunal habitat</li> <li>Reduced floral and faunal diversity</li> <li>Displacement of faunal species</li> <li>Loss of species of conservation importance</li> <li>Alien invasive species and other detrimental edge effects</li> <li>Ineffective backfilling and rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>To minimise the area of disturbance.</li> <li>To remove, protect and conserve Species of Conservation Importance.</li> <li>To mitigate the displacement and direct mortality impacts</li> <li>To prevent proliferation of alien invasive species.</li> <li>To rehabilitate the areas disturbed by mining activities to an acceptable end land use that is resilient, self-sustaining and comparable to the surrounding areas and in agreement with commitments to stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid/stop or reduce impact at source</li> <li>Modify impact through design</li> <li>Control impact through management</li> <li>Repair or remedy impact through rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>Monitor and eradicate alien invasive vegetation species as per the requirements of CARA and NEMBA</li> <li>Control impacts as per Table 27 of the EMPr</li> <li>Implement the Closure Plan</li> </ul>
Heritage and palaeontology	Loss of subterranean / previously unidentified heritage and paleontological resources	To avoid disturbing sites of heritage and paleontological importance. Where disturbance of sites is unavoidable, the	Control through management	<ul style="list-style-type: none"> <li>Adherence to NHRA</li> <li>Control impacts as per Table 28 of the EMPr</li> </ul>

ASPECT	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION TYPE	MANAGEMENT OUTCOMES / STANDARD TO BE ACHIEVED
		objective is to ensure that adequate measures are taken to conserve the information held within the sites.		
Noise	Nuisance noise from blasting and mobile crushing and screening, operational traffic and product loading / hauling	To prevent public exposure to disturbing noise in excess of 5 dBA increases above ambient noise levels.	<ul style="list-style-type: none"> <li>Control impact through management</li> <li>Modify impact through design</li> </ul>	<ul style="list-style-type: none"> <li>Control noise impacts as per Table 32 of the EMPr</li> <li>Compliance with SANS 10103:2008 Acceptable Ambient Levels and SANS 10210 of 2004, the national standard for the calculating and predicting of road traffic noise</li> <li>SANS 10328:2008</li> </ul>
Soil and land capability	<ul style="list-style-type: none"> <li>Spills and contamination impacts</li> <li>Increase in erosion and loss of soil resources</li> <li>Reduced soil fertility</li> <li>Poor soil stockpiling and compaction may reduce the soil quality</li> </ul>	<ul style="list-style-type: none"> <li>To conserve soil resources disturbed by the THM</li> <li>To rehabilitate the areas disturbed by mining activities to an acceptable end land use that is resilient, self-sustaining and comparable to the surrounding areas and in agreement with commitments to stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Modify impact through design</li> <li>Control through management</li> </ul>	<ul style="list-style-type: none"> <li>Control impacts as per Table 31 of the EMPr</li> <li>Manage soils in line with the requirements of the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GNR331 of 2014)</li> </ul>
Surface and groundwater	<ul style="list-style-type: none"> <li>Contamination from pollution, spillages and improper storage of chemicals</li> <li>Contamination from mining and dirty water handling and leaching from surface stockpiles / residue</li> <li>Reduction in surface and groundwater quality</li> </ul>	<ul style="list-style-type: none"> <li>To prevent discharges of contaminated water to the environment.</li> <li>To avoid pollution of the environment from chemicals, materials and waste.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid/stop or reduce impact at source</li> <li>Modify impact through design</li> <li>Control impact through management</li> </ul>	<ul style="list-style-type: none"> <li>Adherence to GN704 of the NWA and liner requirements of GNR635 and 636 of the NEM:WA</li> <li>Adherence to WUL</li> <li>MSDS must be referred to and hazardous materials stored, handled and transported as per the Hazardous Substances Act No. 15 of 1973 and relevant Regulations</li> <li>SABS Code for mine residue deposits</li> <li>Control impacts as per Table 29 and Table 30 of the EMPr</li> </ul>
	Erosion and increased suspended solids being transported with storm water	To avoid soil erosion from uncontrolled runoff, conserve soil in the topsoil stockpiles and cleared areas.		<ul style="list-style-type: none"> <li>Design and construct water management infrastructure as per GN704 of 1999 and the DWA Best Practise Guidelines</li> <li>Control impacts as per Table 29 of the EMPr</li> </ul>

ASPECT	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION TYPE	MANAGEMENT OUTCOMES / STANDARD TO BE ACHIEVED
Groundwater	<ul style="list-style-type: none"> <li>Lowering of the groundwater levels within the surrounding aquifers</li> <li>Contamination of groundwater and reduced groundwater qualities</li> </ul>	To prevent unacceptable negative impacts on surrounding groundwater users.	<ul style="list-style-type: none"> <li>Control impact through management</li> </ul>	<ul style="list-style-type: none"> <li>Control impacts as per Table 30 of the EMPr</li> </ul>
Blasting	<ul style="list-style-type: none"> <li>Ground vibration - perceptible levels</li> <li>Air blast - rattling of roofs or door or windows</li> <li>Fly rock – safety, damage to structures</li> <li>Noxious fumes</li> </ul>	<ul style="list-style-type: none"> <li>To prevent injury to people and animals and to avoid damage to structures.</li> <li>To minimise vibrations and air blast impacts on surrounding communities.</li> </ul>	<ul style="list-style-type: none"> <li>Modify impact through design</li> </ul>	<ul style="list-style-type: none"> <li>Use internationally accepted standards for safe blasting for ground vibration and recommendations on air blast e.g. those published by the United States Bureau of Mines (USBM).</li> <li>Control impacts as per Table 33 of the EMPr.</li> </ul>
Traffic, road condition and socio-economic	<ul style="list-style-type: none"> <li>Additional traffic loading/ increased vehicle trips generated by activities at the mine - Safety risks to third parties and animals.</li> <li>Deterioration of pavement condition/ quality resulting in unsafe driving conditions</li> <li>Dust pollution to sensitive receptors adjacent to access roads</li> <li>Noise pollution to nearby residential areas within earshot</li> </ul>	<ul style="list-style-type: none"> <li>To prevent traffic related impacts.</li> </ul>	<ul style="list-style-type: none"> <li>Modify impact through design</li> <li>Control impact through management</li> </ul>	<ul style="list-style-type: none"> <li>Recommended upgrades to be signed off by the Road Authority prior to the commencement of construction</li> <li>Trucks should not be overloaded, and wheel/axle loading should be in accordance to legislation (TMH 3)</li> </ul>
Socio-economic	<ul style="list-style-type: none"> <li>Possible in-migration of job seekers into the area resulting in the formation of new informal settlements as well as secondary impacts of in-migration including pressure on existing infrastructure, an increase in crime and social ills and mining may lead to a reduction in property value.</li> </ul>	To mitigate the negative social impacts of the project.	<ul style="list-style-type: none"> <li>Control impact through management</li> </ul>	<ul style="list-style-type: none"> <li>Relevant labour laws</li> <li>Enhance positive impacts by complying with the Mining Charter and the SLP</li> <li>Control impacts as per Table 36 of the EMPr</li> </ul>
	<ul style="list-style-type: none"> <li>Direct and indirect socio-economic benefits from the generation of employment (wages), taxes and profits and from the procurement of goods and services, and the increased spending power of employees.</li> <li>Direct and indirect socio-economic benefits from skills development and SLP initiatives.</li> </ul>	<ul style="list-style-type: none"> <li>To enhance the socio-economic benefits of the project.</li> <li>To maximise opportunities for local residents.</li> </ul>	<ul style="list-style-type: none"> <li>Positive impact which does not require mitigation; measures to enhance positive impacts will be investigated</li> </ul>	<ul style="list-style-type: none"> <li>Control impacts as per Table 36 of the EMPr</li> </ul>



ASPECT	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION TYPE	MANAGEMENT OUTCOMES / STANDARD TO BE ACHIEVED
	<ul style="list-style-type: none"> <li>Safety risks to third parties and animals on site will reduce as the mine will be fenced with access controls in place.</li> </ul>			
	Downscaling and retrenchment of employees.	To mitigate the negative social impacts of the project.	<ul style="list-style-type: none"> <li>Control impact through management</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the social impacts by following the relevant labour laws and enhance positive impacts by complying with the Mining Charter and the SLP</li> <li>Control impacts as per Table 36 of the EMPr</li> </ul>
Visual aesthetics	Visual intrusion at night from additional lighting.	To limit the visual impact of the project on the surrounding landowners/ communities	<ul style="list-style-type: none"> <li>Modify impact through design</li> <li>Control impact through management</li> </ul>	<ul style="list-style-type: none"> <li>Control impacts as per Table 26 of the EMPr</li> </ul>
	Backfilling/ rehabilitation of the currently disturbed area upon completion of mining may improve the visual and aesthetic features of the site while simultaneously transforming the area into a usable landform.	To rehabilitate the areas disturbed by mining activities to an acceptable end land use that is resilient, self-sustaining and comparable to the surrounding areas and in agreement with commitments to stakeholders.	<ul style="list-style-type: none"> <li>Positive impact which does not require mitigation; measures to enhance positive impacts will be investigated</li> </ul>	<ul style="list-style-type: none"> <li>Implement the Closure Plan.</li> <li>Control impacts as per Table 31 and Table 35 of the EMPr</li> </ul>

### **m) 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)*

Specialists and the EAP assessed the potential impacts of the layouts and from the findings of the assessments no further alternatives were identified during the EIA phase. The findings indicated that the layouts would not result in any fatal flaws in terms of environmental and socio-economic impacts if the recommended mitigation measures (refer to Table 20) are implemented.

### **n) 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)*

None, as all the relevant aspects have already been included as commitments as per this EMPr (Part B of this document) in terms of mitigation (detailed in Table 20), monitoring (detailed in Section 1 i) p.214 of Part B), and closure (Appendix 22).

### **o) Description of any assumptions, uncertainties and gaps in knowledge**

*(Which relate to the assessment and mitigation measures proposed)*

Uncertainties and gaps in knowledge as identified in the individual specialist studies are applicable (refer to various appendices).

#### Air Quality

- Meteorology: There were no on-site or nearby SAWS weather stations thus it was decided to use the WRF modelled meteorological data for a point on-site. The data for the period January 2017 to December 2019 was used in the dispersion modelling. The closest SAWS stations are Kuruman and Kathu which are both approximately 50 km away from this site and based on the terrain and land use in the area these sites most likely will not be representative. Taking into account the land use surrounding the stations (especially close to the stations) it is not the same as the site and the effects of the difference in land use on the other meteorological parameters (not measured by these stations) but required for dispersion modelling would vary. The National Code of Practice for Air Dispersion Modelling described in the Regulations regarding air dispersion modelling discusses this and it is evident from surface roughness lengths, albedo values and Bowen ratios provided in the regulations and international modelling guidelines for different land uses vary in terms of these parameters which affect the wind profile, atmospheric mixing and other planetary boundary layer parameters.
- The National Code of Practice for Air Dispersion Modelling described in the Regulations regarding air dispersion modelling prescribes the use of a minimum of one year of on-site data or at least three years of appropriate off-site data for use in Level 2 and Level 3 assessments. It also states that the meteorological data must be for a period no older than five years to the year of assessment. The dataset period is within the timeframe recommended by the National Code of Practice for Air Dispersion Modelling as the meteorological data is for three years (modelled data) and less than five years old during the assessment period (2020/2021).
- A quantitative assessment of long-term (one year) baseline air quality was not possible due to the limited sampling periods allowed for as part of the air quality study due to the EIA timeframes.

- Emissions: The impact assessment is limited to the pollutants of concern. These pollutants are regulated under NAAQS or considered key pollutants released by the operations associated with the Project. The quantification of sources of emission is restricted to the project operations. Other existing sources of emission within the area including mining, processing, and farming activities, domestic fires, biomass burning, vehicle exhaust emissions and dust entrained by vehicles on public roads will not be included as part of the emissions inventory and simulations. Without detailed proposed (for when this project will be operational) operational data for other companies' mining and processing operations as well as estimated future vehicle data for public roads it is difficult to quantify these sources for the period of the proposed project operations. It is difficult to predict the contribution of the domestic and natural fires and farming sources to air quality during the period of the proposed project operations due to variability of these operations with regards to locality, spatial extent and duration.
- Dispersion Simulations: It is assumed that all NO<sub>x</sub> emitted is converted to NO<sub>2</sub>.
- Assessment of impacts: The health risk assessment is limited to the screening of ambient air concentrations against NAAQS and applicable international legal guidelines and limits and does not include a detailed human health risk assessment. Human health risk can occur due to exposures through inhalation, ingestion and dermal contact. The scope of the study will be confined to the quantification of impacts due to exposures via the inhalation pathway only. A human health risk and nuisance and environmental impact screening assessment for the project operational phase is based on dispersion simulation results.
- The impact of the construction and decommissioning phase impacts are expected to be similar or somewhat less significant than operational phase impacts. Mitigation and management measures recommended for the construction phase are also applicable to the decommissioning phase. No impacts are expected post-closure provided the rehabilitation of final landforms is successful.
- Manganese: There are no NAAQS for manganese and there is substantial variability in the international limits proposed for Mn (with the most commonly referred to chronic inhalation criteria or guidelines ranging from 0.05 µg/m<sup>3</sup> to 0.3 µg/m<sup>3</sup>). Reference is made to the inhalation guideline values (GVs) published by the World Health Organisation (WHO); the inhalation reference concentrations (RfCs) published by the US EPA Integrated Risk Information System; and minimal risk levels for hazardous substances published by the US Agency for Toxic Substances and Disease Registry in the legislation section.
- The predicted annual average pollutant concentrations will be assessed against the WHO GV even though the US EPA IRIS RfC appears to be a stricter value based on the fact that the US EPA IRIS defines chronic exposure as "repeated exposure by the oral, dermal, or inhalation route for more than approximately 10% of the life span in humans".
- Potential manganese ground-level concentrations as a result of the project operations will be included in this study by multiplying the simulated PM<sub>10</sub> concentrations by the manganese content of the ore. This methodology will be used as at the time of the study there will likely be no measured values for the manganese content for the individual sources included (being a proposed operation) thus there are two assumption that can be applied in the study.
- Classification of certain sources as non- manganese sources based on the reasoning that they will have a lower manganese content; or all sources have the same manganese content associated with

the inhalable particulate matter (PM<sub>10</sub>) fraction which would not be the case. Considering the roads for example, the assumption of the same Mn content as the ore would fundamentally mean that the vehicles are travelling along the ore body.

- Both the application of the ore manganese content in PM to all sources as well as the exclusion of certain sources (due to low manganese content) would theoretically result in inaccurate representation of the potential manganese ground-level concentrations.
- Multiple studies have determined that manganese ground-level concentrations tend to be linked with particulate matter with an aerodynamic diameter less than 5 µm (PM<sub>5</sub>) and not PM<sub>10</sub>, thus applying either of the methodology above could possibly result in an overestimation of manganese ground-level concentrations.
- GHG: Scope 1 and Scope 2, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions will be calculated for the construction phase and operational phase and converted to CO<sub>2</sub> equivalent (CO<sub>2</sub>-e) emissions.

### Heritage

- Cultural Resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity. These include all sites, structures and artifacts of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are included in this.
- The significance of the sites, structures and artifacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects.
- Cultural significance is site-specific and relates to the content and context of the site. Sites regarded as having low cultural significance have already been recorded in full and require no further mitigation. Sites with medium cultural significance may or may not require mitigation depending on other factors such as the significance of impact on the site. Sites with a high cultural significance require further mitigation.
- The latitude and longitude of any archaeological or historical site or feature, is to be treated as sensitive information by the developer and should not be disclosed to members of the public.
- It is almost impossible to locate all the cultural resources in a given area, as it will be very time consuming. Developers should however note that the report should make it clear how to handle any other finds that might occur. In this particular case the area was very large and some areas inaccessible due to the vegetation cover being high and dense in certain areas.
- It never is possible to know all sites previously recorded in a certain area to be investigated. However, providing this background only gives a broad base as to what can be expected and apart from predicting what may be found, it has no influence on the study.
- It should be noted that access could not be gained to the entire project area due to it being a dangerous area resulting from past mining activities. However, those areas could be viewed from a distance and are entirely disturbed and thus are likely not containing any heritage features.

### Palaeontology

- Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the banded iron formation, jaspilite and crocidolite, sandstones and aeolian sands are typical for the country and do not contain fossil plant, insect, invertebrate and vertebrate material. The aeolian sands of the Quaternary period would not preserve fossils.

#### Noise

- Meteorology: There was neither an on-site weather station nor a nearby South African Weather Service (SAWS) weather stations thus it was decided to use the WRF (Weather Research and Forecasting) modelled meteorological data for a point on-site. Data for the period January 2017 to December 2019 was used in the noise propagation simulations. The closest SAWS stations are Kuruman and Kathu which are both approximately 50 kilometres (km) away from this site and based on the terrain and land use in the area these sites most likely will not be representative.
- No recent baseline data was available thus a baseline noise survey was conducted on the 1 and 2 December 2020 to determine current noise levels within the area.
- The environmental noise assessment focused on the evaluation of impacts for humans. It is important to note that the applicability of environmental noise assessments to wildlife is limited as it is not possible simply to infer the impacts of anthropogenic noise on wildlife from the human literature. This is because the hearing ranges and sensitivities of non-human animals can be very different from those of humans. Noise studies on humans understandably use methodologies that tailors the quantification of anthropogenic noise to our hearing capabilities: for example, the use of microphones limited to the human hearing range (20 Hz – 20 kHz) and the implementation of frequency filters effectively mimicking human auditory sensitivity (A-weighting). As such, noise measurements may cover only part of the relevant acoustic range for other species. Moreover, species differences in behaviour, physiology and ecology, in addition to hearing capabilities and perception, mean that extrapolations from human studies can provide only a limited understanding of the potential impact of anthropogenic noise on wildlife.
- The extent to which the mitigation measures will reduce the noise is currently unknown but it is expected that the implementation of these mitigation measures will reduce the expected levels of noise significantly.

#### Potable water

- Sedibeng Water are responsible for the allocation of their water resources. It is assumed that if Sedibeng water approves the off-take agreement then they have done a capacity assessment with approvals accordingly. Sedibeng water should have supply agreements with their existing customers and should not allocate additional water to new customers that they cannot deliver.

#### Groundwater

- Plotting the depth to groundwater level in the aquifer against topography (excluding the new monitoring boreholes where the groundwater levels could be impacted by external factors) shows a 62.5 % correlation. It has to be cautioned that the correlation is based on only 7 data points and do not necessarily carry any statistical weight.
- The impact simulations must be updated for any changes in the mine design, progression plan and surface layouts.

- The numerical groundwater flow model can be updated regularly (2 yearly) over the life of mine to increase the model accuracy in predicting the expected groundwater level drawdown cone and the expected impacts on the surrounding environment. This will include identifying boreholes used for private water supply boreholes and surface streams that might be impacted.

### Biodiversity

- Modelled biodiversity databases have accuracy limitations and as a result, must be ground-truthed for verification. The information obtained from various databases as included in Sections 2, 3 and 5 of this report is however considered to be useful as background to the assessment, and the data have also been used to inform the field assessment, specifically where areas of increased conservation importance are indicated;
- The emphasis of the current baseline phase assessment is on terrestrial biodiversity, and although the hydrological setting of the project area has also been considered, an assessment of freshwater resources including wetlands within the project area falls outside of the scope of this study;
- The results of the field assessment are based on a single site assessment, undertaken over two days on 23 - 24 November, during the wet (Summer) season, under favourable conditions;
- In order to obtain a comprehensive understanding of the dynamics and diversity of the biota on a site, biodiversity studies should ideally include investigations through the different seasons of the year coupled with extensive sampling of the area. As the current assessment relied on information gained during a single season site survey and a field assessment of limited duration, available desktop information for the area, as well as professional judgment and experience were also considered;
- Due to the complexity of natural ecosystems and seasonality of species, it is possible that some aspects pertaining to terrestrial biodiversity, including certain floral species, may have been overlooked during the field assessment. All effort was however made by the consultants to gather and convey accurate information, although the possibility exists that additional information with regard to the project area may come to light at a later stage. It is also important to note that the majority of floral SCC are also known to be extremely seasonal and only flower during specific periods of the year. Prior information on potential threatened flora that may occur in the project area was however known and special emphasis was placed in searching for such species during the field assessment, taking the high level of historical disturbance associated with the project area into consideration;
- The faunal component comprises a desktop assessment only. This component focuses on mammals and herpetofauna (amphibians and reptiles). The field assessment did not include a faunal assessment, and was limited to a floral investigation only; where possible, incidental faunal observations were however noted;
- Information of avian species diversity falls outside of the scope of this assessment and is discussed within the avifaunal assessment compiled by Feathers Environmental; and
- A hand-held Garmin eTrex 20x device were used during the field assessment and this has an accuracy of 3-6m. As a result, potential georeferencing errors, including such limitations in Global Positioning System (GPS) accuracy may result in slight discrepancies in the maps.

### Avifauna

- The report is the result of a short-term study and is based on a single one-day site visit to the proposed development area. No long-term, seasonal monitoring was conducted by the avifaunal specialist. This assessment relies upon secondary data sources with regards to bird occurrence and abundance such as the SABAP2 project. This comprehensive datasets provide a valuable baseline against which any changes in species presence, abundance, and distribution can be monitored. However, primary information on bird habitat and avifaunal species occurrence collected during the site visit and together with professional judgement, based on extensive field experience since 2006, was used directly in determining which species of conservation importance are likely to occur within suitable avifaunal habitat types within the proposed development area. Based on these findings, the specialist was able to identify and assess the anticipated impacts
- By virtue of their mobility, the assessment of bird presence and abundance cannot be confined to the proposed mine development project site, therefore the study area was defined as a 2km zone around the proposed development area.
- The location of the proposed power line alignment was not provided for assessment. Although the impacts of this infrastructure on the resident avifauna has been assessed in this report, it is assumed that a separate basic or environmental impact assessment process has been/is being conducted for the proposed power line.
- Although the proposed mine development is located within a single pentad grid cell (2710\_2255), a larger area is necessary to obtain a dataset that is large enough (encompassing nine pentad grid cells) to ensure that reasonable conclusions about species diversity and densities, in a particular habitat type, can be drawn. Coverage by SABAP2 is adequate with a total of 49 full protocol data cards being completed across the nine pentads. The SABAP2 data is regarded as a reliable record of the avifauna likely to occur within the project area.
- The focus of this avifaunal impact assessment is primarily on the potential impacts on Red List and priority non-Red List species i.e. species that are vulnerable to the displacement impacts associated with the surface infrastructure construction and operation of the proposed mine. The impact on the common species is also considered, albeit in less detail.
- Predictions in this study are based on experience of these and similar species in different parts of South Africa, through the authors' experience working in the avifaunal specialist field since 2006. However, bird behaviour can't be reduced to formulas that will hold true under all circumstances. It must also be noted that, it is often not possible to entirely eliminate the risk of the disturbance and displacement impacts associated with the construction and operational activities. Our best possible efforts can probably not ensure zero impact on birds. Assessments such as this attempt to minimise the risk as far as possible.

#### Aquatic Biodiversity

- To obtain a comprehensive understanding of the dynamics and diversity of the biota on a site, including species of conservation concern, studies should include investigations through the different seasons of the year, over a number of years, and extensive sampling of the area. This is particularly relevant where seasonal limitations to biodiversity assessments exist for the area of the proposed activity. Due to project time constraints inherent with Environmental Authorisation application processes, such long-term research is seldom feasible, and information contained within this report is based on a single field survey conducted during a single season.

- Given the lack of naturally occurring surface water features within the general study area, a detailed aquatic assessment was not warranted. It was, however, understood that an artificial impoundment is located within the previous mine pit void which supports fish and other aquatic life forms. As such, the present study included a cursory site visit and development of the aquatic compliance statement, with general recommendations for the way forward on dealing with the fish species present within the void (i.e. visual assessment of aquatic ecosystem within the void with no collection of fish or macroinvertebrates for species identification).

#### Socio-economic

- The 2016 Community Survey is the most current source of official statistics and this has been used to generate a baseline profile of the district and the area directly surrounding THM. The 2011 South African Census was also used to supplement information from the 2016 Community Survey. This data may now be out of date to some degree and may no longer accurately reflect the current socio-economic profile.

#### Blasting

- The project area is not currently an active full-scale mining operation. Drilling and blasting operations were done previously.
- The anticipated levels of influence estimated in this report are calculated using standard accepted methodology according to international and local regulations.
- The assumption is made that the predictions are a good estimate with significant safety factors to ensure that expected levels are based on worst case scenarios. These will have to be confirmed with actual measurements once the operation is active.
- The limitation is that no data was available from this operation for a confirmation of the predicted values.
- Blast designs was provided from external consultant Blast Vision (PTY) Ltd – AJ Rorke. The designs from Blast Vision were applied in the evaluation of the project. The recommendations in the report were also considered and applied in this evaluation.
- These designs may change when the project is started.

#### Visual

- Visual perception is a subjective experience, as it is influenced largely by personal values. A degree of subjectivity is therefore bound to influence the rating of visual impacts. In order to limit such subjectivity, a combination of quantitative and qualitative assessment methods has been used.

#### Traffic

- For the purposes of distributing the predicted trips to the road network, the following assumptions were made:
  - Staff/construction labour will arrive from the nearby residential areas of Hotazel, Tsineng, Mothibistad and Kuruman accessing the site via the R31, D3463 and Boardman Rd.
  - Engineers and contractors are assumed to arrive from Kuruman, Kathu and Johannesburg via the R31 and R380.



- The delivery of construction materials is assumed to arrive from major economic nodes of Johannesburg, Vryburg and Kimberley via the N14, R31 and R380.
- The delivery of abnormal loads will require an Abnormal Load Route Determination study and is not dealt with further in this study.

**p) Reasoned opinion as to whether the proposed activity should or should not be authorised**

**i) Reasons why the activity should be authorized or not**

The findings of the EIA indicated that the layout would not result in any fatal flaws in terms of environmental and socio-economic impacts, if the recommended mitigation measures (Table 20) are implemented.

**ii) Conditions that must be included in the authorisation**

- Land use agreements between THM and the landowner must be finalised prior to the commencement of construction.
- Water and electricity service level agreements must be obtained.
- Approval must be obtained in terms of Section 40 of the NWA before commencing with any water use activities (defined in terms of Section 21 of the NWA).
- Permits for the destruction or relocation of nationally and provincially protected species must be applied for and obtained from the relevant authorities. Where any protected or TOPS-listed species are to be rescued and relocated, this process should be overseen by a suitably qualified specialist.
- The commitments as per this EIAR and EMPr in terms of mitigation and monitoring must be adhered to.
- Rehabilitation and closure must be undertaken as per the Closure Plan (Appendix 22) and as agreed with the Competent Authority (DMRE), as per the EA.

**(5) Specific conditions to be included into the compilation and approval of EMPr**

All recommended measures which must be adhered to, have been included as commitments in this EMPr (Part B).

**(6) Rehabilitation requirements**

Rehabilitation requirements have been provided for in the Closure Plan (refer to Appendix 22).

**q) Period for which the Environmental Authorisation is required**

The period for which authorisation is required will be for 30 years.

**r) 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 Environmental Impact Assessment report and the Environmental Management Programme report)*

The undertaking is applicable to both the EIAR and the EMPr.

**s) Financial Provision**

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

As per the NEMA Regulations on Financial Provisioning (GN1147 of 2015) the sum of the financial provision has been included in the EMPr.

Since the mine has not yet been constructed, no rehabilitation / remediation activities have been implemented for the preceding 12 months, nor will any rehabilitation or remediation activities be implemented in the forthcoming 12 months. The financial provision for the annual rehabilitation and remediation at the THM is therefore R 0.

Total 1, the financial provision for the final rehabilitation, decommissioning and mine closure activities at THM, has been calculated to be **R 35 947 195** (incl. P&Gs + contingencies).

Total 2, the financial provision for the residual environmental impacts (Section 5 of the Environmental Risk Assessment Report), is calculated as **R 5 959 845** (incl. P&Gs + contingencies).

The total financial provision (Total 1 + Total 2 + VAT) for the THM, is therefore **R 48 193 096** (value as per date of assessment – 2021).

**i) Explain how the aforesaid amount was derived**

As per GNR1147 of 2015 a holder of a right in terms of the MPRDA must determine and make financial provision for the rehabilitation and management of negative environmental impacts from mining operations to the satisfaction of the Minister responsible for Mineral Resources. According to Regulation 5 a holder must make financial provision for rehabilitation and remediation; decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and remediation and management of latent or residual environmental impacts which may become known in future, including the pumping and treatment of polluted or extraneous water. Regulation 6 makes provision for the method of determining the costs of the financial provision and states that a holder must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for the above.

The 2005 Guideline for Evaluation of the Quantum for Closure-Related Financial Provision compiled by the then DME describes the recommended procedure for determining the quantum for financial provision in Section B thereof, entitled "Working Manual for the Determination of the Quantum". The recommended procedure was therefore followed for the purposes of this 2021 evaluation of the quantum for the THM (refer to Appendix 22 for the closure plan and detailed methodology used to calculate the quantum).

**ii) 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)*

The required financial provision will be provided for/set aside, through a financial/ rehabilitation guarantee upon the request of the DMRE.

**t) Deviations from the approved Scoping Report and plan of study**

**i) 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)*

Since the Final Scoping Report, further detail has been added to the project description and mine layout including the addition of:

- Stormwater ponds
- Sand and topsoil stockpile area
- Septic tank
- Weighbridge and office
- Water line and overhead powerline

The methodology used in determining the significance of impacts or risks has not amended since the Scoping Phase. The possible impact resulting from the proposed project were investigated further and a more in-depth impact assessment was undertaken. This impact assessment resulted in additional impacts being incorporated into the assessment and the revision of the scoring of some of the impacts addressed in the Scoping Report (Section 3.v); p.127).

#### **ii) Motivation for the deviation**

The deviation resulted in additional potential impacts being considered and addressed and a more accurate assessment of impact significance.

#### **u) Other Information required by the competent Authority**

- i) 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:**

##### **(1) Impact on the socio-economic conditions of any directly affected person**

*(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an appendix and confirm that the applicable mitigation is reflected herein)*

Directly affected persons include:

#### **Landowners**

The land is privately owned. At present, the landowner (South 32 - HMM) would therefore be the only directly affected party. It is required that a suitable agreement will be drawn up between THM and the landowner for the activities proposed.

There are no communities within the project footprint.

#### **Adjacent Landowners and Occupiers**

Potential negative impacts on adjacent landowners and occupiers include:

- Air quality impacts due to dust and particulate matter / gaseous emissions.
- Further reduction in floral and faunal diversity, increased alien vegetation proliferation and encroachment and edge effects.
- Displacement of fauna due to habitat loss or transformation, disturbance to and mortality of fauna.
- Loss of subterranean / previously unidentified heritage and paleontological resources.

- Erosion from stormwater runoff.
- Greenhouse gas emissions and climate change impacts.
- Nuisance noise.
- Ground vibrations, air blast and fly rock due to blasting.
- Contamination of soils and groundwater from machinery, spills, mining and dirty water handling and leaching from surface stockpiles / residue.
- Lowering of the groundwater levels within the surrounding aquifers and impact on groundwater volumes.
- Visual intrusion at night from additional lighting.
- Possible in-migration of job seekers into the area resulting in the formation of new informal settlements as well as secondary impacts of in-migration including pressure on existing infrastructure, an increase in crime and social ills and mining may lead to a reduction in property value.
- Deterioration in road pavement quality resulting in unsafe driving conditions.
- Inadequate sight distance at intersections could cause accidents.
- Safety risks to third parties and animals.
- In-pit waste rock dumps will remain on site resulting in a permanent change to the visual character of the area.

Potential positive impacts on adjacent landowners and occupiers include:

- Safety risks to third parties and animals on site will reduce as the mine will be fenced with access controls in place.
- Direct and indirect socio-economic benefits from the generation of employment (wages), taxes and profits and from the procurement of goods and services, and the increased spending power of employees.
- Direct and indirect socio-economic benefits from skills development, SLP initiatives and increased opportunities for SMMEs and stimulation of the local economy.
- Greenhouse gas emissions and climate change impacts where the previously cleared areas that form part of the project will be rehabilitated resulting in a carbon sink gain.
- Backfilling/ rehabilitation of the currently disturbed area upon completion of mining may improve the visual and aesthetic features of the site while simultaneously transforming the area into a usable landform.
- Backfilling/ rehabilitation of the currently disturbed area upon completion of mining may improve safety of the area, for both livestock and people.

### ***Land claimants***

According to the JTGDM Integrated Human Settlements Sector Plan, Final Report 2019/20, there are 10 Land Restitution cases within the borders of JMLM which has been submitted to the Department of Land Reform and Rural Development for processing and have been resolved.

Correspondence from the Chief Director: Land Restitution Support – Northern Cape, dated 19 April 2021 indicates that a claim appears on the databases for claims up to 31 / 12 / 1998 and between 1 / 07 / 2014 and 27 / 07 / 2016 against the property Re Portion of RE of Farm Hotazel No. 280, but does not provide any further information in this regard (see Appendix 23).

## **(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, bulk sampling or alluvial diamond prospecting 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 an appendix and confirm that the applicable mitigation is reflected herein)*

Cultural heritage and palaeontology studies were undertaken to inform the scoping report. The potential impact to fossil heritage resources is extremely low. However, since there is a chance that fossils may occur on the land surface, a Fossil Chance Find Protocol has been added to the EMPr. No palaeontological site visit was required.

From a cultural perspective, Stone Age people did utilize and settled in the area. However chances of finding Stone Age sites is reasonably high due to the lack of research in the area. However, the proposed mining area is almost entirely disturbed and thus it is expected that only finds out-of-context are likely to be identified. A few such sites are known toward the Gamagara River. No Early or Middle Iron Age sites have been identified in the area of study and chances of finding Iron Age sites and occurrences in the proposed THM are low. Sites associated with the first white farmers, early missionaries and mining companies, from the Historical Age may be expected in the proposed THM. These may include graves and buildings, including farm houses and outbuildings. Significance can only be determined on identification of such features, however the disturbance within the area, makes such finds unlikely. Graves are always of a high cultural significance due to the religious and social context thereof. If such sites are identified they will have to be dealt with in accordance with ethical guidelines and legislation in this regard. Due to the disturbed nature of the proposed THM, the existence of any graves within the proposed THM is very unlikely.

Sites of archaeological or paleontological significance are therefore unlikely to be present in the area (having been exposed, destroyed or otherwise removed during historical mining activities). However, there is always a chance that buried artefacts may be unearthed during vegetation clearing and earth moving activities. The potential impact can be mitigated by implementing a chance finds procedure to prevent damage to buried resources which may be of significance, in the unlikely event that they are unearthed.

### **v) 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 an appendix)*

Site, layout, technological and operational alternatives were assessed for the project during the Scoping Phase as required by section 24(4)(b)(i) of NEMA. No further alternatives have been assessed as part of the EIA phase (aside from the slight modification in the mine layout, Figure 4). This EIAR/EMPr addresses the following requirements in terms of sections 24(4)(a) and (b) of the Act:

Section of NEMA	Contents	Description of how the aspect has been addressed
<b>Section 24(4)(a)</b>		
24(4)(a)	Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment –	Refer to Section 3 g) vi), p.143 for the methodology used for the assessment of impacts and Section 3 g) ii), p.31 for the

Section of NEMA	Contents	Description of how the aspect has been addressed
	must ensure, with respect to every application for an environmental authorisation—	public participation process that was followed.
24(4)(a)(i)	Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;	<p>The Scoping Report and EIAR are made available to all the relevant organs of state: the relevant local and district municipality; DFFE and Northern Cape Province Department of Agriculture, Environmental Affairs, Land Reform and Rural Development as the authority regarding environmental matters, agriculture and land affairs, land reform and rural development; DWS for the activities requiring a WUL; Ngwao-Boswa Jwa Kapa Bokone (the Provincial Heritage Resources Authority of the Northern Cape Province) (via SAHRIS) as the authority regarding cultural heritage matters; Northern Cape Department of Roads and Public Works and SANRAL as the road authority; Transnet as the authority relating to rail infrastructure, Eskom as the authority relating to electricity infrastructure and South African Civil Aviation Authority relating to aviation- for comment during public participation processes. The DMRE remains the Competent Authority.</p> <p>Coordination is required between the DWS and DMRE regarding matters related to the design of impoundments for the storage and handling of residue. The DMRE are the CA for this element in terms of the NEMWA but the DWS chief engineer will be evaluating technical designs of the facility in terms of the NWA.</p>
24(4)(a)(ii)	That the findings and recommendations flowing from an investigation, the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set out in section 2 are taken into account in any decision made by an organ of state in relation to any proposed policy, programme, process, plan or project;	The findings and recommendations of specialist investigations, and general objectives and the principles of environmental management, were addressed in this EIAR and EMPr. Refer to Section 1.g), p. 185 of the EMPr - part B of this document.
24(4)(a)(iii)	That a description of the environment likely to be significantly affected by the proposed activity is contained in such application;	Refer to Section 3 g) iv), p. 63 for a detailed description of the baseline environment likely to be affected by the project.
24(4)(a)(iv)	Investigation of the potential consequences for or impacts on the environment of the activity and assessment of the significance of those potential consequences or impacts; and	Refer to Section 3 g) v), p.127 and Appendix 21 for the assessment of the potential impacts.
24(4)(a)(v)	Public information and participation procedures which provide all interested and affected parties, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures; and	Refer to Section 3 g)ii), p.31 which details the Scoping phase and EIA public participation process that was followed.
24(4)(A)	Where environmental impact assessment has been identified as the environmental instrument to be utilised in informing an application for environmental authorisation, subsection (4)(b) is applicable	EIA has been identified as the environmental instrument therefore (4)(b) is applicable.

Section of NEMA	Contents	Description of how the aspect has been addressed
<b>Section 24(4)(b)</b>		
24(4)(b)	Must include, with respect to every application for an environmental authorisation and where applicable—	
24(4)(b)(i)	Investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;	Alternatives have not been considered in depth as no feasible alternatives were identified. Refer to Section 3 g) i) p.28.
24(4)(b)(ii)	Investigation of mitigation measures to keep adverse consequences or impacts to a minimum;	Mitigation measures for potential impacts have been identified. Refer to Table 20 and Section 1 g), p.185 of the EMPr- Part B of this document.
24(4)(b)(iii)	Investigation, assessment and evaluation of the impact of any proposed listed or specified activity on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), excluding the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act;	The NHRA has been taken into account, and a heritage and palaeontological assessment have been undertaken. Refer to Section 3 g) v), Appendix 9 and Appendix 10.
24(4)(b)(iv)	Reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;	The assumptions made and gaps in knowledge have been identified as set out in Section 3 o), p.164.
24(4)(b)(v)	Investigation and formulation of arrangements for the monitoring and management of consequences for or impacts on the environment, and the assessment of the effectiveness of such arrangements after their implementation;	Management and monitoring measures have been specified in Sections 1 g) and i) on pages 185 and 214 respectively of the EMPr - Part B of this document. Implementation and suitability of the EMPr will be audited every second year or as per the frequency indicated in the EA as per of Regulation 34 of the NEMA EIA Regulations, GNR982 of 2014 (as amended by GNR326 of 2017).
24(4)(b)(vi)	Consideration of environmental attributes identified in the compilation of information and maps contemplated in subsection (3); and	Refer to Section 3 e)iv), p. 63, the ESR (Appendix 3) and Site Sensitivity Verification Report (Appendix 4) for maps indicating geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes informed by maps compiled by relevant departments.
24(3)	The Minister, or an MEC with the concurrence of the Minister, may compile information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be taken into account by every competent authority.	
24(4)(b)(vii)	Provision for the adherence to requirements that are prescribed in a specific environmental management Act relevant to the listed or specified activity in question.	Listed activities have been identified. Refer to Section 3 d) i). EIA has been identified as the environmental instrument in terms of NEMA. An AEL is not required as per NEMAQA. Permits may be required as per NEMBA in the unlikely event that SCC are identified. The area does not fall within a protected area as per NEMPAA. A WUL is required and engagement has occurred with the DWS.

## **PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT**

### **1 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME**

#### **a) 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 herein as required)*

The details of the EAP are provided in Part A, Section 3 a) i) p.1 and ii) p.1. The curriculum vitae of the EAP and Company Profile of Prime Resources can be found in Appendix 1 and 2 respectively.

#### **b) Description of the aspects of the activity**

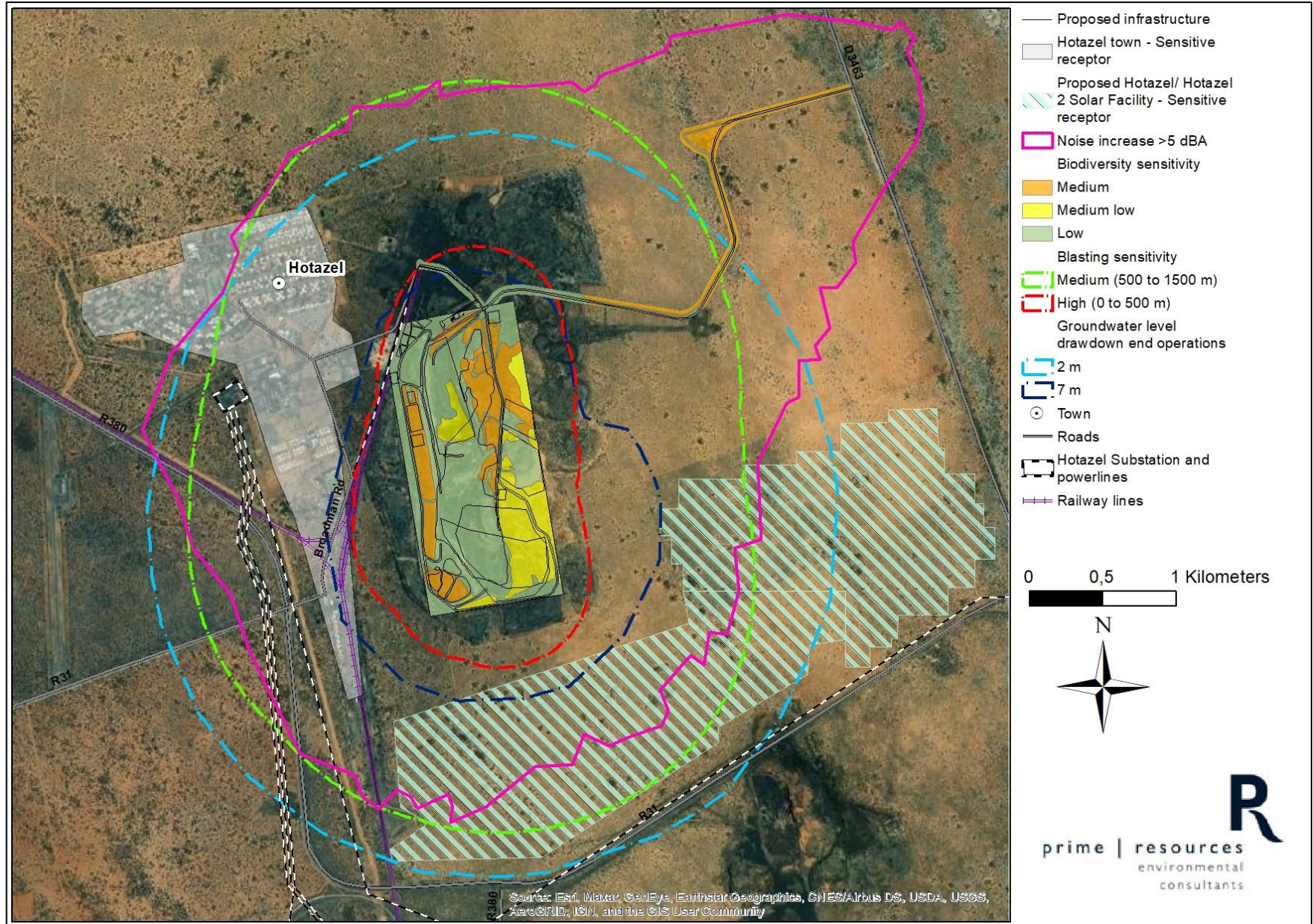
*(Confirm that the requirement to describe the aspects of the activity that are covered by the environmental management programme is already included in PART A herein as required)*

The aspects of the activity covered by the EMPr are detailed in Part A, Section 3 d) p.3.

#### **c) Composite map**

*(Provide a map 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 should be avoided, including buffers)*





**Figure 44: Integrated Environmental and Social Sensitivity map**

## **d) Description of impact management objectives including management statements**

### **i) Determination of closure objectives**

*(ensure that the closure objectives are informed by the type of environment described herein)*

The current vision for closure of the mine is to rehabilitate the areas disturbed by mining activities to an acceptable end land use that is resilient, self-sustaining and comparable to the surrounding areas and in agreement with commitments to stakeholders by ensuring that the following objectives are met (refer to the Closure Plan - Appendix 22):

- All statutory and other legal requirements are adhered to;
- Full awareness with landowner and other IAPs regarding the mine closure concept and timing thereof;
- The landowner is left with no residual liability for site rehabilitation and/or maintenance;
- Land use options for rehabilitation will be considered during the life of mine in accordance with changes in the mine's development;
- All surface infrastructure is removed;
- No stockpiles of ore material remain on the site post-closure;
- The final waste dumps are sloped, capped (depending on soil availability), and vegetated in order to reduce oxygenation and rainfall recharge into the facilities and to minimise erosion on the slopes;
- The extent of the final opencast void is limited due to the application of concurrent backfilling / rehabilitation during the operational phase;
- The final opencast void is rehabilitated by modifying the slopes of the perimeter walls to be stable and not susceptible to erosion. The sloped area is revegetated;
- The soil is considered uncontaminated according to applicable legislation (currently Part 8 of Chapter 4 of the NEMWA);
- Dust generated from the waste dumps and denuded areas, prior to vegetation establishment, adheres to limits which apply at that time (currently the National Dust Control Regulations, GNR827 of 2013);
- Vegetation across the rehabilitated footprint is established and self-sustaining;
- The rehabilitated landform is free draining and adhere to applicable best practice in terms of water management for mine closure (currently the 2006 DWA Best Practice Guideline);
- The rehabilitated landform is inconspicuous / aesthetically compatible in relation to the surrounding landscape;
- Runoff and seepage from rehabilitated areas does not exceed applicable standards, including the WUL objectives;
- No impact on water quantity or quality available to private groundwater users;
- All haul roads and other on-site access roads are rehabilitated unless required for end land use by landowner; and
- The rehabilitated site is ultimately rendered safe for the nearby communities and animals, for the foreseeable future, in compliance with relevant standards (currently the Occupational Health and Safety Act No. 85 of 1993 and relevant Regulations).

### **ii) 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**

The activities which may result in damage or pollution to the environment have been rated and assigned a value pre- and post mitigation to determine the risk. Refer to Table 20 for the proposed mitigation measures.

In terms of Section 30 of NEMA, an incident means an unexpected, sudden and uncontrolled release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant harm to the environment, human life or property. Section 30A defines an emergency situation as a situation that has arisen suddenly that poses an imminent and serious threat to the environment, human life or property, including a 'disaster' as defined in section 1 of the Disaster Management Act, 2002 (Act No. 57 of 2002), but does not include an incident referred to in section 30.

Contractors must be provided with a copy of the Emergency Preparedness and Response Plan (EPRP) and will be briefed on the contents of the plan during induction prior to the commencement of construction activities. Employees will be briefed regarding the EPRP as part of their induction. All employees and contractors are responsible for reporting any accident/emergency immediately, and if required notifying the emergency response teams. Management must be aware of their responsibilities in case of emergency. The ECO will monitor that the EPRP is being adhered to by the contractors as well as by employees during the LoM. Tawana will review its EPRP, in particular, after the occurrence of incidents or emergency situations. Tawana will also periodically test response procedures.

An EPRP must be developed for each potential environmental emergency situation. Components of the EPRP are detailed below:

### **General communication procedures and reporting requirements**

Communication procedures include:

- Communication of hazards to local communities and local authorities; and
- Co-ordination of emergency response (both internal and with local emergency services) that will deal effectively with accidents and prevent major disasters.
- In the event of a major environmental incident, Section 30 of NEMA must be followed.

### **Emergency and hazard identification**

The following emergencies / hazards may occur at the site, for which emergency procedures must be developed:

- Natural Disasters;
- Strikes, protest or unrest;
- Health and Disease Outbreaks;
- Serious Incident or Fatality;
- High Potential Risk Incidents (Serious environmental pollution/ uncontrolled emissions); and
- Other emergencies.

The Environmental Incident Report Sheet, must be completed in the event of an environmental incident/emergency accident, refer to Table 43. These forms will be managed by the ECO and will be used to improve environmental management measures to prevent re-occurrence of environmental incidents.

#### **iii) Potential risk of acid mine drainage**

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

A geochemical assessment of the waste rock and ore material of the THM was undertaken by Prime Resources (refer to Appendix 20). It was found that **the waste rock and ore material were non-acid forming and presented a very low risk in terms of acid generation**. The waste rock presented a low geochemical risk in terms of metal leaching and can be considered for backfilling into the opencast pit.

**iv) Steps taken to investigate, assess, and evaluate the impact of acid mine drainage**

As described in Part A Section 3 g) iv) (1) (j) and Part B Section d)iii) above, a geochemical assessment of the waste rock and ore material of the THM was undertaken by Prime Resources (refer to Appendix 20). Composite samples representative of the various types of rock material arising at the project were assessed and analysed. Samples analysed are representative of the material that will be mined, processed and stored on site. A summary of the samples is provided in Table 17.

The waste rock presented a low geochemical risk in terms of metal leaching and can be considered for backfilling into the opencast pit. The samples of high and low grade ore also present a low risk in terms of metal leaching, with the exception of low concentrations of copper which slightly exceed general discharge standards. The fine fraction of material arising from ore stockpiles was found to leach manganese in concentrations which could exceed guidelines.

**v) Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage**

Recommendations for the management of ore and waste rock materials at THM have been provided and include the following (refer to Appendix 20):

Measures for the management of waste rock

- Freshly exposed waste rock stockpiles on surface (if present) should have water management measures to ensure that unrestricted discharge to the environment does not take place. This recommendation is provided as freshly exposed waste rock may initially leach higher concentrations of soluble metals than that anticipated in the long term.
- In the long term, backfilling of waste rock into the opencast pit void is recommended. The proposed backfilling of the waste rock into the opencast pit requires that exemption from the provisions of Regulation 4 of GN 704 of 1999 Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources is sought. The following motivates for this exemption:
  - Backfilling is considered an acceptable long term storage solution for the waste rock due to the low geochemical risk the waste rock presents. The waste rock is non-acid generating and very low concentrations of soluble anions, metals and metalloids are anticipated to arise in the long-term in neutral pH conditions.
  - Provision of a stable repository for waste rock – long-term slope stability of large waste rock dumps is not of concern when the material is backfilled. Stability aspects such as subsidence may, however, be of concern and the area is to be managed appropriately in terms of the mine closure and rehabilitation plan;
  - Reduction of exposed surface area – waste rock material stockpiled on surface has a greater surface area for rainwater interaction, leading to higher runoff volumes and a greater impact on surface water resources. Backfilling limits exposure of the slopes of both the pit and overburden stockpiles to atmospheric weathering and oxidation. Where residue material has

been backfilled, only the upper surface is exposed to atmospheric conditions in the long term;

- Avoidance of pit lakes –the backfilling of a pit eliminates the creation of a pit lake which in itself carries environmental and safety concerns, and therefore promotes a free-draining surface in the long-term;
- Restoration of impacted land to beneficial use – areas that would host waste rock dumps can be rehabilitated to an acceptable end-use.
- It is recommended that the backfilled waste rock should be compacted to restrict rainwater infiltration and the resulting landform shaped to promote rainwater runoff.

#### Measures for the management of fines and ore material

- Freshly exposed ore stockpiles on surface should have water management measures to ensure that unrestricted discharge to the environment does not take place.
- The material is classed as a Type 3 waste which, according to the local guidelines, would require a Class C liner. It is motivated that a Class C liner is not a practical barrier for ore stockpiles as the areas are extensively worked with machinery and would result in damages to such a liner system. It is recommended that a compacted base or concrete base be considered as alternative barriers at the ore stockpiles. No stockpiles of ore material will remain on the site post-closure and rehabilitation.
- Although the larger fractions of THM ore material do not pose long-term metal leaching risk, fine material that is wind-blown or washed away does present a higher risk. Management measures to control windblown fines material should therefore be put in place (as advised by air quality specialists). Water management measures to prevent unrestricted discharge of water arising from the stockpile area should be in place with silt traps as necessary to control the amount of fine material entering water facilities.

#### **vi) Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage**

Refer to Part B Section d)v) p. 182 above.

#### **vii) Volumes and rate of water use required for the mining operation**

- All potable water will be supplied through the Vaal Gamagara water scheme via a bulk water meter, managed by Sedibeng Water.
- Water will be required for processing, mining, change houses, offices, and workshops. Each supply area will be individually metered to enhance control and minimize wastage.
- Water supply for other purposes (i.e. dust suppression and industrial use on site) will be sourced from either the stormwater ponds or the PCD.
- The estimated potable water consumption volume is 4800 – 6480 litres per day plus 10% for wastage/losses.
- The remainder of the water to be used for general purposes (i.e. dust suppression and process water purposes) will be sourced from the PCD and the stormwater ponds.
- A lined 5 m deep PCD is planned with a minimum capacity of 20 000 m<sup>3</sup>.
- The site has been split into three main catchment areas, excluding the mining pit, resulting in a total of three planned stormwater ponds to store as much of the surface water as practically possible. The

surface water will mainly be intercepted by the roads and channelled to the respective stormwater ponds. The capacity of the stormwater ponds is as follows: stormwater pond 1 (12 250 m<sup>3</sup>), stormwater pond 2 (6500 m<sup>3</sup>) and stormwater pond 3 (7313 m<sup>3</sup>). The ponds have been sized for a 1 in 50 year return flood.

- Mine dewatering will be carried out using diesel powered submersible pumps installed in sumps at the bottom of the pit. Water will be pumped from the open pit and discharged into the PCD.
  - The expected groundwater inflow volumes into the mine workings are shown in Table 25 below.
  - During the construction phase, and the associated initial dewatering of the water in the existing pit and underground, water currently in storage in the aquifer will enter the excavation. Then, as the groundwater in storage is depleted inflows will be controlled by regional migration of groundwater towards the pit and the aquifer transmissivities.
  - The average groundwater inflows will reduce to 155 m<sup>3</sup>/day for the period 2025 to 2035 after which it will increase again as the pit increase in depth (and depth below the regional groundwater levels). During the period 2035 to 2045 the average daily inflow volumes will be in the order of 180 m<sup>3</sup>/day. For the period 2045 to the end of LoM the average inflows are expected to be in the order of 245 m<sup>3</sup>/day.
  - These inflows are considered to be high compared to what will enter the mine in reality during the LoM. Also, with the high evaporation of 2 026 mm/a in the study area can be expected that a large percentage of the water entering the pit from the surrounding aquifers will evaporate before it has to be pumped to surface.

**Table 25: Groundwater inflow volumes into the mine excavation**

Unit	2025 (end of construction phase)	2035	2045	final (end of LoM)
m <sup>3</sup> /day	170	155	180	245

**viii) State whether a Water Use Licence has been applied for**

The process of applying for a WUL from DWS for the full set of water uses associated with the mine has commenced through the submission of a pre-application enquiry via the eWULAAS portal. The application has been assigned reference no. WU21348 (refer to Appendix 5). A pre-application consultation meeting was held with the DWS on 9 September 2021 and minutes of that meeting form part of the consultation record in this EIAR (refer to Appendix 6.7).

Project activities that require a WUL include – dewatering, dust suppression, mechanical evaporation, the construction and management of product stockpiles and waste rock dumps (residue material), septic tank and the operation of water management infrastructure (PCD, stormwater ponds, trenches and berms to separate clean and dirty water).

**e) Impacts to be mitigated in their respective phases**

*(Measures to rehabilitate the environment affected by the undertaking of any listed activity)*

The impacts to be mitigated in their respective phases are described in Table 20.

## **f) Impact management outcomes**

*(A description of impact management outcomes, identifying the standard of impact management required for the aspects requiring management)*

Refer to Table 24 for the proposed impact management objectives and the impact management outcomes.

## **g) Impact management actions**

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

The tables below detail the specific management programmes to be implemented to manage the potential impacts of the THM on the biophysical and socio-economic aspects of the environment. The Management Programmes were informed by the relevant specialist studies and with input from the mine team.

The tables indicates the party responsible for ensuring that the commitments are adhered to and implemented as necessary. The relevant timeframes are also indicated. The standards to which impact management will be measured are found in Table 24.

Management Programmes for the following aspects are included in this section:

- Access, General Safety, On Site Communication, Complaints and Records (refer to Table 26)
- Biodiversity (refer to Table 27)
- Heritage and paleontological resources (refer to Table 28)
- Surface Water (refer to Table 29)
- Groundwater (refer to Table 30)
- Soil, Erosion, Land Use and Capability (refer to Table 31)
- Air quality and Noise (refer to Table 32)
- Blasting (refer to Table 33)
- Waste and Hydrocarbons (refer to Table 34)
- Mine Residue Deposits (refer to Table 35)
- Socio-economics (refer to Table 36)

In addition to the above, Tawana will also implement the following protocols on site:

- Refuelling of Equipment (refer to Table 37)
- Hydrocarbon and Chemical Substance Spill and Clean-up (refer to Table 38)
- Handling and Storage of Hazardous Substances (refer to Table 39)
- Fire Management Plan (refer to Table 40)
- Storm Evacuation Procedure (refer to Table 41)
- Waste Management Procedure (refer to Table 42)
- Environmental Incident Report Sheet (refer to Table 43)
- Environmental Method Statement

An Environmental Control Officer (ECO) must be appointed at THM to ensure that the various management programmes and protocols detailed herein are implemented and that the necessary auditing, reporting and monitoring are conducted. The ECO should have an appropriate 3-year Bachelor's degree / National Diploma in Natural, Engineering or Environmental Sciences or related field and preferably experience in a related or similar field. Until such time as it is possible to employ a suitably qualified ECO, the services of a contracted

specialist must be employed to perform the necessary management / monitoring procedures. The ECO must undergo rigorous training associated with the management plans and monitoring programmes. The ECO will report directly to mine management to ensure that mitigation measures can be approved and installed expediently.



**Table 26: Environmental Management Programme: Access, General Safety, On Site Communication, Complaints and Records**

Applicable Mining Phase	Management measure	Responsible Person
Construction and Operational Phase	<ul style="list-style-type: none"> <li>• Copies of the EMPr will be kept on site at all times and will be available to the ECO and the Site Manager.</li> <li>• Contractor will implement a checklist that meets the requirements of the EMP, which will be used on a daily basis during inspections. Copies of this checklist must be kept on site by the Site Manager for inspection and auditing purposes. Contractors’ meeting minutes must reflect environmental queries, incidents, agreed actions and dates of full compliance with the conditions of the EMP. These minutes will form part of the official environmental record for the project.</li> <li>• The site boundaries are to be clearly demarcated prior to commencement of site clearance and the mining area will be fenced off and access to the operations will be restricted.</li> <li>• Tawana will implement an inspection schedule and record all inspections undertaken at the operations.</li> <li>• Tawana will implement a permanent security force at the operations, who will patrol the mining area on a daily basis.</li> <li>• The DR3463 is a provincial road, thus any proposed access to and from this road needs to be approved by the Northern Cape Province Department: Roads and Public Works. Undertake the designs for this access road in line with the provincial requirements, and submit for approval.</li> <li>• Improvement of sight distance at the intersections of R31 and DR3463 and the R31 and R380 must be achieved through complete removal of trees and grass in the vicinity of the intersections. Any such clearing must be done with the approval of the Northern Cape Department of Roads and Public Works. Refer to Table 27 for management measures around potentially protected and TOPS-listed plants located at this intersection and the permit requirements for the removal thereof.</li> <li>• Upgrade the main entrance access road connecting to Boardman Rd. by surfacing the road and providing sidewalks and a taxi layby area.</li> <li>• All vehicles accessing the project must adhere to a 30 km/hr speed limit and vigilant driving techniques.</li> <li>• Limit heavy deliveries to daytime.</li> <li>• Limit abnormal loads to daytime and dry weather, providing escort, and applying stop-go control at locations of restricted road width.</li> <li>• Regularly grade the road surface of the access roads.</li> <li>• Strict safety regulations will be implemented, including using the appropriate PPE and access conditions for private people.</li> <li>• Adhere to the Fire Management Plan in Table 40.</li> <li>• Light pollution must be kept to a minimum. Any lighting require must be directed away from sensitive habitats. Provide lights with cover fittings that limit lateral and upwards “light spill”, position lights to shine towards the intended areas of illumination rather than using floodlights, make use of Low Pressure Sodium lighting or other types of low impact lighting and use low wattage bulbs. Motion sensor activated lighting can also be used instead of lights that illuminate continuously.</li> <li>• Tawana will make sufficient operational budget and resources available to implement the conditions of the EMPr during and after mining.</li> <li>• Method statements are required from contractors or any other person working on the site, for specific actions in sensitive areas on request of the ECO. The format of the Environmental Method Statement is provided in Table 62. The method statement may be modified from time to time, upon agreement between the ECO and the Site Manager. The method statement will describe the scope of the intended activity in a step-by-step description to ensure that the ECO and the Site Manager understand the intentions of the person undertaking the work. As part of this process, the ECO will devise mitigation measures that will minimise environmental impacts associated with the activity. The person undertaking the work will be evaluated against the mitigation measures.</li> <li>• Records related to the implementation of the EMP must be filed by the ECO and Site Manager on site where it can be retrieved easily. All records must be available for scrutiny by any relevant authority or stakeholder.</li> <li>• Photographs must be taken at fixed locations at the mining site, before, during mining and after rehabilitation as a visual reference. These</li> </ul>	<p>Site Manager</p> <p>ECO</p>

Applicable Mining Phase	Management measure	Responsible Person
	<p>photographs must be filed with the other records related to the EMP on site for inspection at any time.</p> <ul style="list-style-type: none"> <li>Review the Financial Provision on an annual basis as per the requirements of Section 24(P)(3) of NEMA.</li> <li>Conduct external environmental audits of the EMP and EA as per the NEMA EIA Regulations, GNR982 of 2014 (as amended) and according to the frequency indicated in the EA (which will not exceed intervals of five years).</li> </ul>	
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>Discussions will be undertaken with the landowner during the operational phase to identify access roads and other infrastructure that the landowner/ surrounding community would like to use after mining ceases.</li> <li>Implement the Closure Plan (Appendix 22)</li> </ul>	Project Manager

**Table 27: Environmental Management Programme: Biodiversity**

Applicable Mining Phase	Management measure	Responsible Person
Pre-construction and Construction Phase	<ul style="list-style-type: none"> <li>The estimated number of protected and TOPS-listed plants per species should be determined prior to site clearance taking place by means of a site walkthrough of the final proposed development footprint areas. Priority floral species are confined the Modified Bushveld habitat unit, which includes areas adjacent to the existing access road.</li> <li>A search and rescue plan for the identified SCC must be developed and submitted for approval.</li> <li>Rescue and relocation should be undertaken of bulbous species for use in landscaping or in rehabilitation of disturbed areas. This should include provincially protected species such as <i>Crinum sp.</i>, <i>Ammocharis coranica</i> and <i>Boophone disticha</i>.</li> <li>Where any protected or TOPS-listed species are to be rescued and relocated, this process should be overseen by a suitably qualified botanist or horticulturalist. Permits for the destruction or relocation of nationally and provincially protected tree, shrub and forbs species must be applied for and obtained from the relevant authorities: <ul style="list-style-type: none"> <li>For the destruction, removal or relocation of <i>Vachellia erioloba</i> and <i>V. haematoxylon</i> trees that are protected in terms of the National Forests Act (Act No. 84 of 1998), the required permit must be applied for and obtained from the Department of Fisheries, Forestry and the Environment (DFFE).</li> <li>For the destruction, removal or relocation of the TOPS-listed species <i>Harpagophytum procumbens</i>, the required permit must be applied for and obtained from the DFFE.</li> <li>For the destruction or removal of plant species that are protected in terms of the NCNCA (Act No. 9 of 2009), including <i>H. procumbens</i>, a permit should be applied for and obtained from the NC DENC after consultation with the relevant authorities.</li> </ul> </li> <li>Any conditions attached to tree and plant removal permits issued should be strictly implemented.</li> <li>Where possible, the direct loss of protected and TOPS-listed species should be avoided, with specific mention of protected and TOPS-listed plants falling outside of the immediate mine development footprint area. It is recommended that trees located in proximity to the development footprint be clearly marked by means of danger tape or similar for the duration of the construction phase. Large, prominent <i>V. erioloba</i> trees in proximity to mining operations could be mapped by means of GPS coordinates and indicated on mine plans to promote their conservation.</li> <li>Establish a site nursery where smaller plants with relocation potential, including <i>V. erioloba</i> seedlings and saplings, can be kept and propagated. These plants could be used in the rehabilitation works.</li> <li>Areas of increased ecological importance and sensitivity (notably the remnant Kathu Bushveld habitat along the main access road and within the MR area, indicated as being of Medium ecological sensitivity) should be avoided due to this habitat harbouring the majority of priority floral species. Consideration should be given to conserve these relatively intact remnant habitats as part of the mine and access</li> </ul>	ECO / botanical and faunal specialist/aquatic specialist



Applicable Mining Phase	Management measure	Responsible Person
	<p>road upgrades as far as possible.</p> <ul style="list-style-type: none"> <li>• Areas of increased ecological sensitivity and floral species diversity within natural habitat bordering the project area, as well as the main access road, should be off limits to construction vehicles and workers.</li> <li>• Due to the occurrence of a high abundance of priority floral species adjacent to the existing access road, the widths of proposed road upgrades should be kept to a minimum.</li> <li>• No areas should be cleared of natural vegetation if not required for construction of the proposed mining operation and related infrastructure.</li> <li>• The extent of construction/ pre-mining activities (site clearance) must be limited to the approved development footprint area.</li> <li>• The placement of the proposed refuelling station must occur outside of any delineated sensitive habitat and take into consideration potential buffers imposed within other specialist studies. Adhere to the waste and hydrocarbon management plan as detailed in Table 34.</li> <li>• No harvesting of firewood, plant material or collection of floral species by construction workers or mine personnel from the project area or natural areas surrounding the project footprint should be allowed.</li> <li>• Construction vehicles should be restricted to travelling on designated roadways only and vehicle access beyond the designated and approved clearance footprint areas should be prohibited.</li> <li>• Contractors should receive environmental awareness, biodiversity education training and ongoing training through mechanisms such as toolbox talks. Site induction procedures should include a discussion of key ecological aspects (such as the necessary procedures for working in proximity to sensitive habitats).</li> <li>• Awareness initiatives should include training road users about the presence of avifaunal species utilising the roads.</li> <li>• A pre-construction inspection must be undertaken prior to the removal of the water within the open void and the construction of the mine to confirm the Verreaux's Eagle nest status. Should the nest be active it is recommended that the Endangered Wildlife Trust: Birds of Prey Programme be contacted to ensure the appropriate measures are taken to incubate and/or relocate the chick.</li> <li>• The removal of the water within the open void and underground workings to be done between April and September.</li> <li>• The construction of an island within the proposed stormwater ponds, utilising the existing vegetation (i.e. do not remove large trees in these areas) will provide alternative nesting habitat for the resident waterfowl species.</li> <li>• Every effort must be made to select a power line route that poses the least risk to birds, avoiding key avifaunal habitat.</li> <li>• The overhead 11kV power line connecting the mine office and weighbridge to the on-site mini substation must be constructed using a bird friendly structure (Inverted Delta-T).</li> <li>• Additional mitigation in the form of insulating sleeves on jumpers present on strain poles, terminal poles and box transformers must also be considered.</li> <li>• A detailed assessment of the fish species present within the lake must be conducted by an accredited aquatic specialist prior to draining of the pit lake, to advise on permit requirements. Permits will be required should translocations (or any other activity involving the fish species present) be undertaken.</li> <li>• Depending on the number of fish species present and when the pit is drained, a suitably qualified and accredited aquatic specialist must be present so as to identify species for further actions (e.g. translocation, euthanasia, etc.).</li> <li>• Under no circumstances are fish to be removed for the purpose of consumption due to potential metal accumulation within tissues of the fish and associated liabilities.</li> </ul>	
Operational Phase	<ul style="list-style-type: none"> <li>• Site personnel should receive environmental awareness, biodiversity education training and ongoing training through mechanisms such as toolbox talks. Site induction procedures should include a discussion of key ecological aspects (such as the necessary procedures for working</li> </ul>	ECO and a qualified

Applicable Mining Phase	Management measure	Responsible Person
	<p>in proximity to sensitive habitats). Awareness initiatives should include training road users about the presence of avifaunal species utilising the roads.</p> <ul style="list-style-type: none"> <li>• The extent of operational activities (drilling, blasting and hauling) must be limited to the approved development footprint area and the boundaries clearly demarcated on site prior to commencement of site clearance.</li> <li>• Operational vehicles should be restricted to travelling on designated roadways only and vehicle access beyond the designated and approved clearance footprint areas should be prohibited.</li> <li>• The project footprint (including all surface infrastructure) must be clearly demarcated.</li> <li>• No harvesting of firewood, plant material or collection of floral species by construction workers or mine personnel from the project area or natural areas surrounding the project footprint should be allowed.</li> <li>• No wild animals may under any circumstance be handled, interfered with or removed by any personnel.</li> <li>• Hunting/ killing of fauna is prohibited.</li> <li>• Any snares or traps found on or adjacent to the project area must be removed and disposed of.</li> <li>• In order to reduce noise pollution, proper maintenance of equipment is required, and the implementation of low noise techniques is recommended. Adhere to the Air quality and Noise management plan as detailed in Table 32.</li> <li>• Light pollution must be kept to a minimum.</li> <li>• No waste other than residue-related streams should be disposed of on-site. All non-hazardous waste must be stored temporarily within a covered bins / skip. Adhere to the waste and hydrocarbon management plan as detailed in Table 34.</li> <li>• Any removed trees should be mulched and used as soil moisture protection during concurrent rehabilitation or made available to local communities as firewood.</li> <li>• Should any faunal SCC be noted within the project area, the relevant authorities must be notified. Input into the possible relocation of such species must be provided by a suitably qualified ecologist.</li> <li>• An Alien and Invasive Plant Species Management Programme, including consideration of the bush encroacher species, <i>Senegalia mellifera</i> subsp. <i>detinens</i> should be developed and implemented for the mine and updated to include any additional species that may be noted during the mining operations. Special attention must be paid to the control of NEMBA Category 1b alien invasive species, as well as <i>Prosopis glandulosa</i> var. <i>torreyana</i>, specifically also along the MR area boundaries to prevent the spread of such species into adjacent properties and surrounding natural habitat.</li> <li>• Bare soils should be avoided, and adequate indigenous grass cover should be achieved on any exposed slopes with concurrent rehabilitation, as alien species tend to proliferate within bare, disturbed soils.</li> <li>• Excessive erosion where noted should be rectified immediately making use of soft engineering techniques. Where required topsoil and hessian material must be placed over such areas in order to encourage the establishment of indigenous grass cover.</li> <li>• Adequate storm water management measures must be put in place to limit increased runoff and sedimentation of water resources. Adhere to the surface water management plan as detailed in Table 29.</li> <li>• If collision or electrocution impacts are recorded once the 11kV power line and on-site substation are operational, it is recommended that the Endangered Wildlife Trust: Wildlife &amp; Energy Programme investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.</li> <li>• Awareness initiatives to educate road users about the presence of avifaunal species utilising the roads.</li> <li>• Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.</li> <li>• Create similar surface water habitats at each of the stormwater ponds by keeping the tall trees in each of these areas and creating an</li> </ul>	<p>ecologist/ botanist if required</p>

Applicable Mining Phase	Management measure	Responsible Person
	island that will provide an adequate breeding substrate.	
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>Land disturbed during mining will be rehabilitated according to the Closure Plan (Appendix 22).</li> <li>Should indigenous grass cover not establish successfully after one growing season, active reseeding will be required.</li> <li>Implementation of the Alien and Invasive Species Management Plan should continue during the closure and rehabilitation phase.</li> <li>Monitor all rehabilitated areas for erosion.</li> <li>Monitor reestablishment success of relocated species.</li> <li>Monitor areas that have been revegetated (either through succession or reseeding) to ensure that adequate vegetation cover has been achieved.</li> <li>Where large bare areas are noted, reseeding must take place at the beginning of the following rainy season and where tree mortalities are noted, these must be replaced.</li> </ul>	ECO / Botanist
Post Closure	<ul style="list-style-type: none"> <li>Areas that have been revegetated (either through succession or reseeding) as part of the rehabilitation process, must be monitored for a period of two years once rehabilitation has been completed to ensure that adequate vegetation cover has been achieved.</li> <li>Where large bare areas are noted, reseeding must take place at the beginning of the following rainy season and where tree mortalities are noted, these must be replaced.</li> <li>All rehabilitated areas should be monitored for erosion, and where encountered, immediate rectification must take place.</li> <li>Implementation of the Alien and Invasive Species Management Plan should continue during the post closure phase for a period of two years.</li> <li>Ensure that the post-mining landscape is self-sustaining, and in line with future land use of the project area.</li> </ul>	Project Manager

**Table 28: Environmental Management Programme: Heritage and Paleontological Resources**

Applicable Mining Phase	Management measure	Responsible Person
Construction Phase	<ul style="list-style-type: none"> <li>Due to archaeological sites being subterranean, it is possible that all cultural sites may not have been identified. Care should therefore be taken when development work commences that, if any more artifacts are uncovered, a qualified archaeologist be called in to investigate and the following Heritage Protocol and Chance Find Procedure be implemented: <ul style="list-style-type: none"> <li>Loose stone tools found are usually of minor significance and should just be left as it is.</li> <li>Areas where a substantial number of stone tools are found together should be geo-referenced and left alone until such time as an archaeologist can visit the site to determine its significance.</li> <li>Although chances of finding Iron Age remains are slim, it should be treated similar to the above. Potshards found out of context should be left alone, but areas with stone walling or substantial pottery and other cultural remains should be geo-referenced and left alone until investigated by an archaeologist.</li> <li>All buildings and remains of buildings and other structures believed to be older than 60 years should be geo-referenced and left alone until and a heritage expert can be called in to determine the cultural significance thereof.</li> <li>Graves should be left <i>in situ</i>, geo-referenced and left alone until investigated by an archaeologist.</li> </ul> </li> <li>Fossil Chance Find Protocol (Only required if fossils are seen on the surface when drilling/excavations commence): <ul style="list-style-type: none"> <li>When excavations begin, the ECO or designated person must give the rocks a cursory inspection.</li> <li>Put any fossiliferous material (plants, insects, bone, coal) aside in a suitably protected place and send photographs of the putative fossils to the palaeontologist for a preliminary assessment and to determine if a site inspection is required.</li> </ul> </li> </ul>	ECO and a qualified archaeologist/palaeontologist if required

Applicable Mining Phase	Management measure	Responsible Person
	<ul style="list-style-type: none"> <li>○ Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.</li> <li>○ If there are fossils but no good fossil material is recovered then a site inspection by the palaeontologist will not be necessary but a final report must be compiled by the palaeontologist and sent to SAHRA once the project has been completed.</li> <li>○ As part of the training and awareness plan, employees must be provided with the below photographs to assist them in recognizing the potential fossil plants that may exist in the proposed THM.</li> </ul> <p><i>Examples of fossil bone fragments from a Quaternary pan</i></p>  <p><i>Examples of silicified wood fragments from a fluvial deposit</i></p>  <ul style="list-style-type: none"> <li>• If no fossils are found and the excavations have finished then no further monitoring is required.</li> </ul>	
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>• Land disturbed during mining will be rehabilitated according to the Closure Plan (Appendix 22).</li> </ul>	Project Manager

**Table 29: Environmental Management Programme: Surface Water**

Applicable Mining Phase	Management measure	Responsible Person
Design and Construction Phase	<ul style="list-style-type: none"> <li>• Ensure that a WUL has been awarded prior to the commencement of any water uses.</li> <li>• Run the dirty water pipelines through areas already serviced by dirty water systems where possible.</li> <li>• Dirty areas should be minimised.</li> </ul>	ECO and suitably qualified consultant
Operational Phase	<ul style="list-style-type: none"> <li>• Tawana must implement the WUL conditions.</li> <li>• The runoff water management system will consist of four key elements – PCD, protection from the influx of clean storm water, containment of dirty water emanating from the mining operation and collection of storm water runoff from the haul road.               <ul style="list-style-type: none"> <li>◦ An integrated berm and trench system will be constructed around the planned mining area to prevent the ingress of storm water into the mine workings and divert the storm water generated in the external catchment area. The ring road (haul road) around the mine pit will intercept stormwater which will be channelled to the stormwater ponds.</li> <li>◦ All access and haul roads will be designed and constructed with appropriate sediment and erosion control, including cut-off berms and trenches, as necessary.</li> <li>◦ Sediment and erosion controls must be implemented to manage surface runoff from the mining and processing areas as well as the mine residue deposits.</li> </ul> </li> <li>• Dams must be designed and sized correctly according to legislated requirements.</li> <li>• Adhere to the Storm Evacuation Procedure in Table 41.</li> <li>• All process water will be contained in adequately sized dams and/or reservoirs.</li> <li>• All chemicals, diesel and oils to be stored in appropriately bunded areas that include oil traps and stormwater management measures. The Handling and Storage of Hazardous Substances procedure and the Hydrocarbon and Chemical Substance Spill and Clean-up Procedure detailed in Table 38 and Table 39 must be adhered to at all times.</li> <li>• The necessary spill response kits will be kept on site and THM staff will receive training on the use of the spill kits and the safe disposal of waste material.</li> <li>• Machinery and equipment will only be maintained at the workshops on a paved area with the necessary oil traps and stormwater management in place.</li> <li>• Any contaminated soil must be dealt with according to the Hydrocarbon and Chemical Substance Spill and Clean-up Procedure detailed in Table 38.</li> </ul>	ECO
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>• Clean and dirty water will be separated.</li> <li>• All surface water management infrastructure (including sumps, berms, dumps, dams and diversion trenches) will be removed and rehabilitated according to the Closure Plan (Appendix 22)</li> </ul>	Project Manager

**Table 30: Environmental Management Programme: Groundwater**

Applicable Mining Phase	Management measure	Responsible Person
Construction Phase	<ul style="list-style-type: none"> <li>• Ensure that a WUL has been awarded prior to the commencement of any water uses.</li> <li>• Monitor the groundwater quality and levels. It is recommended that the monitoring programme start with a monthly interval for the first year. Ideally, the monitoring programme should start a year before mining starts/ as soon as possible in order to be able to build a</li> </ul>	ECO

Applicable Mining Phase	Management measure	Responsible Person
	database that is not impacted by the mining activities.	
Operational Phase	<ul style="list-style-type: none"> <li>• Ensure that the conditions of any awarded WUL are strictly adhered to.</li> <li>• Separate clean and dirty runoff and contain dirty water.</li> <li>• Groundwater seepage and direct rainfall that collects in the active mining area must be pumped to the PCD and re-used as part of the mine water balance.</li> <li>• PCD and dams to be appropriately lined and sized, constructed correctly and maintained properly.</li> <li>• Storage of potentially hazardous material will be within properly constructed and lined or paved areas.</li> <li>• Oil traps will be sized, operated and maintained to contain all discarded oil from working areas.</li> <li>• Store fuel in sealed tanks with containing walls around tanks.</li> <li>• The vehicle yard and workshop will be paved, with appropriate oil traps and containment infrastructure in place.</li> <li>• Implement the Groundwater Monitoring Programme.</li> <li>• If monitoring boreholes are destroyed during mining, these must be replaced to ensure that monitoring continues and sufficient information is available to plan for mine closure</li> <li>• Monitor dewatering volumes.</li> <li>• Monitoring results must be reported to DWS and DMRE as required.</li> <li>• Monitor climatic aspects such as rainfall and evaporation.</li> <li>• Water that collects in the opencast pit will be sampled and analysed, according to the Surface Monitoring Programme.</li> <li>• Update the geochemical assessment once the mine is operational and fresh material is available.</li> <li>• Update the numerical groundwater flow and contaminant transport models on a 2-yearly basis based on time series groundwater level and quality data as obtained from the Groundwater Monitoring programme as well as climatic aspects such as rainfall and evaporation. Re-calibrating the models based on time series data will increase the confidence level of the predictions. Any changes in the mine design, progression plan and surface layouts can also be included and the impact simulations updated.</li> <li>• Spills and contaminated soil will be managed according Hydrocarbon and Chemical Substance Spill and Clean-up Procedure detailed in Table 38.</li> <li>• Implement the concurrent rehabilitation quickly as possible.</li> </ul>	ECO
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>• The mining area will be rehabilitated according to the Closure Plan (Appendix 22).</li> <li>• Backfill and rehabilitate the opencast pit.</li> <li>• Remove ROM pads and product stockpiles and rehabilitate footprint area.</li> <li>• The numerical groundwater flow and contaminant transport models must be updated once the closure rehabilitation has been completed.</li> </ul>	Project Manager
Post closure	<ul style="list-style-type: none"> <li>• The Groundwater Monitoring Programme must be continued for a period of at least 5 years after mine closure to monitor the contaminant migration. Based on these results remediation requirements can be identified and a remediation plan put in place.</li> </ul>	Project Manager

**Table 31: Environmental Management Programme: Soil, Erosion, Land Use and Capability**

Applicable Mining Phase	Management measure	Responsible Person
Construction and Operational Phase	<ul style="list-style-type: none"> <li>• Soil boundaries of soil types that should be stripped and stockpiled separately should be staked at 50 m intervals before any soil stripping commences.</li> </ul>	ECO



	<ul style="list-style-type: none"> <li>• Topsoil should be stockpiled separately for later rehabilitation and adequately protected from being blown or washed away or being eroded.</li> <li>• Soil pollution should be prevented at all times. Wherever material with a potential polluting ability will be dumped and handled, the footprint should be covered with at least 300 mm subsoil or soft overburden material and the edges should be elevated (berm) to prevent pollution beyond the footprint.</li> <li>• Machinery and equipment will only be maintained at the workshop on a paved area with a suitable oil trap and stormwater management.</li> <li>• Effective stormwater, sediment and erosion management must be implemented.</li> <li>• Any contaminated soil must be dealt with according to the Hydrocarbon and Chemical Substance Spill and Clean-up Procedure detailed in Table 38.</li> <li>• Minimise the area of disturbance and implement concurrent rehabilitation to minimise erosion and sediment movement.</li> <li>• Avoid the compaction of soil unnecessarily by minimising the construction of roads and other infrastructure only to that needed.</li> <li>• Undertake biannual inspections of erosion and sediment controls to ensure they are effective and to determine whether maintenance work is required.</li> <li>• Implement the measures described in Table 35 for the management of the mine residue deposits.</li> </ul>	
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>• Implement the Closure Plan (Appendix 22).</li> <li>• Carry out a soil contamination assessment during closure.</li> <li>• Prior to placement, topsoil should be ameliorated according to soil analysis.</li> <li>• The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation), and soil amelioration should be done accordingly as recommended by a soil specialist, in order to correct the pH and nutrition status before re-vegetation.</li> <li>• Should indigenous grass cover not establish successfully after one growing season, active reseeding will be required.</li> </ul>	ECO and soil specialist
Post Closure	<ul style="list-style-type: none"> <li>• A short-term fertilizer programme should be based on the soil chemical status after the first year in order to maintain the fertility status for 2 to 3 years after rehabilitation until the area can be declared as self-sustaining.</li> <li>• Soil erosion on the rehabilitated areas should be monitored and remediate if necessary until the area can be declared as stabilized and self-sustaining.</li> </ul>	Project Manager

**Table 32: Environmental Management Programme: Air quality and Noise**

Applicable Mining Phase	Management measure	Responsible Person
Construction Phase	<ul style="list-style-type: none"> <li>• Use water bowsers on unpaved roads.</li> <li>• Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.</li> <li>• Water sprays to be used at stockpiles, handling points, crushers, and screens.</li> <li>• Stabilise wearing course of roads to prevent excessive dust entrainment. Consider a permanent road surface such as tar or paving for the access roads. Alternatively the use of chemical suppressants on the surface haul roads and access road should be considered.</li> <li>• Reduce vehicle speed on internal roads to 30 km/h during dry, windy conditions.</li> <li>• Limit construction activities to take place during day-light hours.</li> <li>• Evaporators in the pit to be positioned such as to minimize noise and dust fallout, taking account of prevailing wind direction and pit topography.</li> </ul>	Site Manager

Applicable Mining Phase	Management measure	Responsible Person
Operational Phase	<p><b>Air Quality</b></p> <ul style="list-style-type: none"> <li>• NAEIS registration and reporting must be established and undertaken. The assigned ACO for Tawana must register on the NAEIS system and request the addition of the THM to the system and linking of the facility to their profile by submitting the required facility information and ACO details to NAEIS admin. Tawana must undertake the registration application with DFFE after acquiring EA and reporting must be undertaken after the commencement of the operations. NAEIS reporting submissions will need to be completed annually for the previous calendar years operations by 31 March.</li> <li>• Place soil stockpiles away from the boundaries of the mine that are close to the residential areas, ensure suppression with water during dry and windy conditions, and revegetate with indigenous vegetation shortly after stockpiling.</li> <li>• Use water bowsers on unpaved roads.</li> <li>• Dust and mud should be controlled at vehicle exit and entry points to prevent the dispersion of dust and mud beyond the site boundary.</li> <li>• Water sprays to be used at stockpiles, handling points, crushers, and screens.</li> <li>• Stabilise wearing course of roads to prevent excessive dust entrainment. Consider a permanent road surface such as tar or paving for the access roads. Alternatively the use of chemical suppressants on the surface haul roads and access road should be considered.</li> <li>• Speed limits on access roads will be 30 km/hr to minimise dust and noise generation.</li> <li>• Continuously implement the Air Quality and Noise Monitoring Programmes.</li> <li>• Tawana will monitor the quality of water used for dust suppression.</li> <li>• Dust suppression may only occur within approved areas as per the WUL and as per the volumes in the WUL.</li> <li>• Dust levels will be monitored on mine personnel and the necessary PPE will be issued to workers in accordance with the requirements of the MHSA.</li> <li>• During the transfer of material to piles, drop heights should be minimised to control the dispersion of materials.</li> <li>• Tawana will monitor noise levels at its operations and issue hearing protection to all workers in accordance with the requirements of the MHSA.</li> </ul> <p><b>Noise</b></p> <ul style="list-style-type: none"> <li>• Wherever possible significant noise generating activities be limit to the daytime (06:00 to 22:00).</li> <li>• Machines (e.g., drill rigs) used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily.</li> <li>• Acoustic covers of engines should be kept closed when in use or idling.</li> <li>• Position the crushing and screening plant as far away from noise receptors as possible.</li> <li>• Machines (e.g., drill rigs) used intermittently should be shut down between work periods or throttled down to a minimum and not left running unnecessarily.</li> <li>• Equipment from which noise generated is known to be particularly directional (such as those related to the processing plant), should be orientated so that the noise is directed away from noise receptors.</li> <li>• Restrict travel during night-time.</li> <li>• Ensure regular and effective maintenance of equipment.</li> <li>• Maintain road surfaces regularly to avoid corrugations, potholes etc. and avoid steep inclines.</li> <li>• Use rubber linings in for instance chutes and dump trucks to reduce impact noise of dropped material.</li> <li>• Minimise the need for trucks/equipment to reverse.</li> </ul>	ECO

Applicable Mining Phase	Management measure	Responsible Person
	<ul style="list-style-type: none"> <li>Select equipment with lower sound power levels.</li> <li>Enclose sources of significant noise as far as is practically possible.</li> <li>A noise reduction barrier, such as an earth berm, must be constructed on the western side of the THM, between the THM operations and Hotazel town where noise receptors are located close to the operations.</li> <li>Sound insulation of nearby buildings can be considered if the above measures for source control are insufficient.</li> <li>MHSA and Occupational Health and Safety Regulations relevant to noise management must be adhered to within site boundaries and compliance thereto must be audited regularly.</li> <li>Record all complaints relating to noise, dust or emissions. Investigate and implement additional management measures to address complaints if monitoring indicates excessive noise, dust or emissions.</li> <li>In the event that noise related complaints are received it is recommended that short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints.</li> </ul>	
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>Measures specified for the construction and operational phase must continue to be implemented into the closure and decommissioning phase until such time as closure objectives for air quality and dust fallout are achieved.</li> </ul>	NA

**Table 33: Environmental Management Programme: Blasting**

Applicable Mining Phase	Management measure	Responsible Person
Pre-construction and Construction Phase	<ul style="list-style-type: none"> <li>Carry out a photographic survey of all structures up to 1500 m from the pit area to ensure a record of the pre-blasting status of the nearest structures to the pit area.</li> <li>Apply for the necessary authorisations as prescribed in the various acts, and specifically Mine Health and Safety Act Reg 4.16 as well as recommendations regarding infrastructure within the pit area.</li> <li>A final inspection of the area and structures must be done to confirm that there are no private infrastructure within 100 m from the pit area.</li> </ul>	Project designer and suitably qualified consultant
Operational Phase	<ul style="list-style-type: none"> <li>Blasting is to be undertaken according to the Blasting Design Procedures.</li> <li>Blast designs can be reviewed prior to first blast planned and done. Specific attention can be given to the possible use of electronic initiation rather than conventional timing systems. This will allow for single blast hole firing instead of multiple blast holes where necessary if ground vibration is of concern for the specific blast. Single blast hole firing will provide single hole firing – thus less charge mass per delay and less influence.</li> <li>A company will be contracted in to carry out the charging up of drilled blast holes.</li> <li>Conduct a first test blast to confirm levels and ground vibration and air blast to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not.</li> <li>The final blast designs must be used to determine the final decision on the safe blasting radius and distance to evacuate people and animals. Clearance distances must be set, and road travel managed during blasting operations.</li> <li>Any changes to the blast designs must be re-evaluated for possible influence from ground vibration.</li> <li>No blasting too early in the morning when it is still cool or when there is a possibility of atmospheric inversion or too late in the afternoon in winter.</li> <li>No blasting in fog or in the dark.</li> </ul>	Operations Manager/ Blasting Contractor  ECO / H&S Officer

Applicable Mining Phase	Management measure	Responsible Person																												
	<ul style="list-style-type: none"> <li>Refrain from blasting when the wind is blowing strongly in the direction of an outside receptor.</li> <li>Do not blast with low overcast clouds.</li> <li>The standard blasting time should be fixed and blasting notice boards set up at various routes around the project area that will inform the community of blasting dates and times.</li> <li>The occurrence of noxious fumes from blasting must be closely monitored.</li> <li>Adhere to recommended ground vibration air blast limits:</li> </ul> <table border="1"> <thead> <tr> <th>Structure Description</th> <th>Ground Vibration Limit (mm/s)</th> <th>Air Blast Limit (dBL)</th> </tr> </thead> <tbody> <tr> <td>National Roads/Tar Roads:</td> <td>150</td> <td>N/A</td> </tr> <tr> <td>Electrical Lines:</td> <td>75</td> <td>N/A</td> </tr> <tr> <td>Railway:</td> <td>150</td> <td>N/A</td> </tr> <tr> <td>Transformers</td> <td>25</td> <td>N/A</td> </tr> <tr> <td>Water Wells</td> <td>50</td> <td>N/A</td> </tr> <tr> <td>Telecoms Tower</td> <td>50</td> <td>134</td> </tr> <tr> <td>General Houses of proper construction</td> <td>USBM Criteria or 25 mm/s</td> <td rowspan="3">Shall not exceed 134dB at point of concern but 120 dB preferred</td> </tr> <tr> <td>Houses of lesser proper construction (preferred)</td> <td>12.5</td> </tr> <tr> <td>Rural building – Mud houses</td> <td>6</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Proper and appropriate communication with neighbours about blasting, monitoring and actions must be done through the stakeholder engagement plan. Third party consultation and monitoring to be undertaken for all ground vibration and air blast monitoring work.</li> <li>Communication with the Hotazel airstrip must be established in terms of blasting and air traffic clearance.</li> <li>Take videos of each blast to help define blast conditions and if fly rock occurred and the origin. Apply immediate mitigation measures if necessary.</li> <li>Cartridge explosives and detonators are to be sourced from a licensed explosive magazine provided for use by the blasting contractor, the location which will not be situated within the mining area and adjacent residential area.</li> <li>Explosives must be handled at the designated explosives handling facility under the conditions stated in the MSDS.</li> </ul>	Structure Description	Ground Vibration Limit (mm/s)	Air Blast Limit (dBL)	National Roads/Tar Roads:	150	N/A	Electrical Lines:	75	N/A	Railway:	150	N/A	Transformers	25	N/A	Water Wells	50	N/A	Telecoms Tower	50	134	General Houses of proper construction	USBM Criteria or 25 mm/s	Shall not exceed 134dB at point of concern but 120 dB preferred	Houses of lesser proper construction (preferred)	12.5	Rural building – Mud houses	6	
Structure Description	Ground Vibration Limit (mm/s)	Air Blast Limit (dBL)																												
National Roads/Tar Roads:	150	N/A																												
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Railway:	150	N/A																												
Transformers	25	N/A																												
Water Wells	50	N/A																												
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Rural building – Mud houses	6																													
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>During the closure phase no mining, drilling and blasting operations are expected.</li> <li>If any demolition blasting will be required, it must be reviewed as civil blasting and addressed accordingly.</li> </ul>	NA																												

**Table 34: Environmental Management Programme: Waste and Hydrocarbons**

Applicable Mining Phase	Management measure	Responsible Person
Construction and Operational Phase	<ul style="list-style-type: none"> <li>Include effective waste management into environmental awareness training given to all personnel and contractors during induction.</li> <li>The plant yard/ workshop must be concrete lined with a slope towards the sumps to contain oil and contaminated water.</li> <li>The refuel station must be concrete lined and bunded and a leak detection system must be installed.</li> <li>The storage of waste above the specific thresholds (in excess of 100 m<sup>3</sup> of general waste or 80 m<sup>3</sup> of hazardous waste) for a period of more than 90 days triggers a Category C activity which requires compliance with the National Norms and Standards for the Storage of Waste (GN926 of 2013).</li> <li>Waste must be managed as per the Waste Management Procedure detailed in Table 42.</li> </ul>	ECO

Applicable Mining Phase	Management measure	Responsible Person
	<ul style="list-style-type: none"> <li>• Tawana will be observe good housekeeping practice at all times.</li> <li>• All waste will be collected, separated and stored in properly constructed containers with lids and/or receptacles. Bins for sorting to include hazardous, general, paper, filters, metal, plastic and oil rags bins.</li> <li>• Waste streams must be recycled or re-used (where possible) before disposal is considered. Recyclable material must be collected by a licensed recycling contractor.</li> <li>• Skips will be made available for final removal and disposal by a contractor.</li> <li>• Once skips are full (or at a predetermined frequency) the service provider will be contacted for disposal to permitted landfill.</li> <li>• Service provider to empty skips and issue a waste manifest weigh bill and safe disposal certificate for hazardous waste.</li> <li>• No waste other than residue-related streams should be disposed of on-site.</li> <li>• All portable generators will be placed on drip trays to catch spills and leaks, while all maintenance work on equipment, vehicles, machinery, etc. will be done at the workshop or In the event of a breakdown, where maintenance of vehicles must take place <i>in situ</i>, drip trays are to be used and any spillages must be cleaned immediately.</li> <li>• The necessary spill response kits will be kept on site as per the Hydrocarbon and Chemical Substance Spill and Clean-up Procedure detailed in Table 38.</li> <li>• All scrap metal and other re-usable equipment will be stored in the vehicle yard.</li> <li>• Adequate sanitation facilities must be provided.</li> <li>• All chemicals, diesel and oils to be stored at the workshop in appropriately bunded areas that include oil traps and stormwater management measures.</li> <li>• The Handling and Storage of Hazardous Substances procedure and the Hydrocarbon and Chemical Substance Spill and Clean-up Procedure detailed in Table 38 and Table 39 must be adhered to at all times.</li> <li>• The capacity of the secondary containment/ bund must provide for at least 110% of the capacity of the container stored inside it. If more than one container is stored, the system must be capable of storing 110% of the largest container or 25% of the total container capacity within the bund, whichever is the greatest. When calculating the bund capacity any volume taken up by drum support within the bund must be taken into account.</li> </ul>	
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>• Remaining refuse, chemicals, fuels and waste materials will be removed from the site following the completion of mining. Such waste will be disposed of to a suitably licenced landfill. Disposal certificates will be kept for record-keeping purposes.</li> <li>• Soil contaminated with hydrocarbons must be moved to an allocated area where it will be rehabilitated and soil that cannot be rehabilitated must be disposed of at an appropriate disposal facility.</li> <li>• The entire disturbed area will be inspected to confirm effective removal of waste.</li> </ul>	ECO

**Table 35: Environmental Management Programme: Mine Residue Deposits**

Applicable Mining Phase	Management measure	Responsible Person
Operational Phase	<ul style="list-style-type: none"> <li>• The requirements of NEMWA / GN632 must also be adhered to.</li> <li>• Periodic inspections must be undertaken by mine personnel that are linked to the on-going risk assessment process. Inspection checklists must be drafted and agreed to between the mine, mine residue operator, professional engineer and the workers representative.</li> <li>• Quarterly audit inspections to be undertaken by professional engineer and mine residue operator.</li> <li>• Detailed annual inspection and review of the mine residue waste sites.</li> <li>• Adhere to the Emergency Preparedness and Response Plan.</li> <li>• Management measures to control windblown fines material must be put in place.</li> <li>• Water management measures to prevent unrestricted discharge of water arising from the stockpile area must be in place with silt traps as necessary to control the amount of fine material entering water facilities.</li> </ul> <p><u>Measures for the management of waste rock</u></p> <ul style="list-style-type: none"> <li>• Freshly exposed waste rock stockpiles on surface (if present) should have water management measures to ensure that unrestricted discharge to the environment does not take place.</li> <li>• Backfilling of waste rock into the opencast pit void is recommended. Backfilled waste rock should be compacted to restrict rainwater infiltration and the resulting landform shaped to promote rainwater runoff.</li> </ul> <p><u>Measures for the management of fines and ore material</u></p> <ul style="list-style-type: none"> <li>• Freshly exposed ore stockpiles on surface should have water management measures to ensure that unrestricted discharge to the environment does not take place.</li> <li>• A compacted base or concrete base must be constructed below the ore stockpiles.</li> </ul>	<p>Site Manager</p> <p>Mine Residue Operator</p> <p>ECO</p>
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>• No stockpiles of ore material will remain on the site post-closure and rehabilitation.</li> <li>• Implement the Closure Plan (Appendix 22).</li> </ul>	Project Manager

**Table 36: Environmental Management Programme: Socio-economics**

Applicable Mining Phase	Management measure	Responsible Person
Pre-construction and Construction Phase	<ul style="list-style-type: none"> <li>• Land use agreements between THM and the landowner must be finalised prior to the commencement of construction.</li> <li>• THM is to make use of local labour as far as possible in all stages and for all aspects of the project. This applies to all contractors during construction.</li> <li>• A stakeholder engagement plan (including a grievance mechanism) should be compiled and implemented to provide for two-way communication between the local communities and THM. The grievance mechanism must prescribe methods for community members to raise complaints (anonymously if they so choose). Complaints must be responded to and addressed effectively. Response methods and timeframes must be specified in the grievance mechanism. IAPs must be notified of the stakeholder engagement plan and grievance mechanism.</li> <li>• THM should ensure that employment procedure/policy is communicated to local stakeholders, especially the landowner.</li> <li>• Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company.</li> </ul>	Site Manager

Applicable Mining Phase	Management measure	Responsible Person
	<ul style="list-style-type: none"> <li>The movement of construction workers on and off the site should be closely managed and monitored by the contractors.</li> <li>All personnel (including contractors) involved in the construction of the project must undergo a training and awareness programme on health, safety, environmental and social requirements and obligations prior to commencing activities.</li> </ul>	
Operational phase	<ul style="list-style-type: none"> <li>Personal Protective Equipment (PPE) and training on appropriate use must be provided to all employees based on their role.</li> <li>The SLP must be implemented.</li> <li>The stakeholder engagement plan (including a grievance mechanism) must be implemented.</li> <li>Develop and implement a Community Health and Safety Policy which addresses communicable diseases (e.g., COVID-19, HIV/Aids, sexually transmitted infections and TB).</li> </ul>	Project Manager/ SLP Officer
Decommissioning and Closure Phase	<ul style="list-style-type: none"> <li>Conduct detailed socio-economic assessments five years before mine closure to determine the impacts and develop mitigatory measures.</li> <li>The SLP and Closure plan (Appendix 22) must be implemented.</li> </ul>	Project Manager

**Table 37: Procedure for refuelling of equipment**

<b>OBJECTIVE</b>
Formalise the practices and procedure that shall be followed when refuelling equipment and machinery
<b>Scope</b> Applicable to all refuelling practices at the THM.
<b>RESPONSIBILITIES</b>
<p><b>Diesel attendant</b></p> <ul style="list-style-type: none"> <li>• Ensure only tagged equipment is refilled when required</li> <li>• Report any damage to the Liquid Automation System (LAS) / fuel management system immediately to supervisor</li> <li>• Maintain good housekeeping at the refuel station area</li> <li>• Ensure no unauthorised diesel refuelling</li> <li>• Ensure risk assessment is done before refill</li> </ul> <p><b>Resident Engineer</b></p> <ul style="list-style-type: none"> <li>• Implement and revise this procedure as required</li> </ul> <p><b>SHE</b></p> <ul style="list-style-type: none"> <li>• Ensure the standard is controlled and issued to all employees</li> </ul> <p><b>Equipment Operator</b></p> <ul style="list-style-type: none"> <li>• Ensure equipment is properly parked, isolated and locked out</li> </ul>
<b>PPE TO BE USED</b>
<ul style="list-style-type: none"> <li>• Face shield</li> <li>• Safety goggles</li> <li>• Gloves</li> </ul>
<b>PROCEDURE</b>
<p><b>Refuel Station</b></p> <ul style="list-style-type: none"> <li>• Spill kit as well as fire extinguisher shall be placed next to truck for ease of accessibility in the event of an emergency</li> <li>• Traffic cones shall be placed to cordon of the areas</li> <li>• Put stop block on the truck</li> <li>• The driver of the bulk fuel carrier truck shall ensure that he/she is wearing the required PPE to offload fuel into the bulk fuel holding facility</li> <li>• The bulk fuel holding facility supplied by approved Original Equipment Manufacturer (OEM) for the purpose of containing diesel</li> <li>• Good housekeeping maintained at all times</li> <li>• No open flame allowed in the area</li> <li>• No combustible material allowed in the area</li> <li>• Only trained and authorised operator required to refill diesel</li> <li>• No unauthorised refuelling</li> <li>• Fuel Management system in working condition at all times</li> <li>• Only vehicles registered on Fuel Management system shall be allowed to refill</li> <li>• Override tag shall only be used with the permission of the General Manager</li> <li>• The use of PPE such as face shield, safety goggles and gloves during refuelling procedure is compulsory</li> </ul> <p><b>Diesel Bowser</b></p> <ul style="list-style-type: none"> <li>• Only diesel bowsers supplied by the original equipment manufacturer (OEM), for the purpose of containing diesel, shall be used</li> <li>• Fuel Management system, in working condition at all times</li> <li>• Reflective strips for visibility</li> <li>• Wheels and tyres maintained</li> </ul> <p><b>TMM</b></p> <ul style="list-style-type: none"> <li>• LAS Fuel Management system, in working condition at all times</li> <li>• Odometer or hour meter in working condition</li> <li>• Identify number for records</li> <li>• Operators shall ensure that the diesel capacity of the TMM does not reach below a quarter level while operating</li> </ul> <p><b>In-pit Refuelling</b></p> <ul style="list-style-type: none"> <li>• Equipment to be refilled to move to a safe area</li> <li>• Traffic cone on all equipment</li> <li>• Operator to stop at the "no-entry" sign. Make contact with the operator</li> <li>• At least 2 fire extinguishers readily available</li> <li>• Inform shift supervisor, permission shall be granted by shift supervisor</li> <li>• Shift supervisor, diesel attendant and safety representative shall perform risk assessment before refuelling</li> <li>• Use of PPE compulsory</li> <li>• Machine to be refuelled must be moved back 20 m from the face or high wall and make it safe</li> </ul> <p><b>Receiving fuel from supplier</b></p> <ul style="list-style-type: none"> <li>• Supplier to report to security</li> <li>• Supply truck drives in slowly on to the diesel bay</li> <li>• Stops at tank to be refilled, with lights and hazards on</li> <li>• Diesel bay operator shall measure the level of diesel in the tank to be filled and record it</li> <li>• Diesel bay operator will take meter readings and reads of the diesel to be filled</li> <li>• Supplier will start filling the tanks</li> <li>• Ensure hose is correctly coupled to truck and offloading point</li> </ul>



<ul style="list-style-type: none"> <li>• Move hose to next compartment carefully and make sure that the hose remains properly connected to the offloading coupling point. Repeat until all product is offloaded.</li> <li>• Disconnect hose and secure in safe position</li> <li>• Fit all required dust caps</li> <li>• Return fire extinguishers and spill kit</li> <li>• Remove all cones used to safety cordon off the area</li> </ul> <p><b>Refuelling TMM and other equipment with diesel bowser</b></p> <ul style="list-style-type: none"> <li>• Only the excavator, drill rig, TMM, generators, lighting plants, dewatering pumps and truck dozer are to be refuelled from the Diesel bowser</li> </ul>
<b>RECORDS</b>
<ul style="list-style-type: none"> <li>• Permission to refuel in the pit</li> <li>• LAS and manual records</li> <li>• Diesel delivery records</li> </ul>

**Table 38: Hydrocarbon and Chemical Substance Spill and Clean-up Procedure**

<b>OBJECTIVE</b>	
Provide a standard operating procedure for spillages of hydrocarbon substances or any chemical substance to prevent environmental pollution or soil and water contamination.	
<b>Scope</b> Applies to all personnel involved in mining operations, maintenance, and construction at the THM.	
<b>RESPONSIBILITIES</b>	
<p><b>General Manager</b></p> <ul style="list-style-type: none"> <li>• Ensure that all tools and equipment are available to implement the following procedures.</li> </ul> <p><b>Supervisors</b></p> <ul style="list-style-type: none"> <li>• Are responsible to ensure that all contaminated areas are properly cleaned and rehabilitated.</li> </ul> <p><b>ECO/ Environmental Assistant</b></p> <ul style="list-style-type: none"> <li>• To inspect and check spill kits monthly, to ensure all contents are still in place, compile a report and give feedback to supervisors.</li> <li>• Ensure that all contaminated areas are properly cleaned and all contaminated soil is disposed properly.</li> <li>• Ensure that the procedure is fully implemented and followed.</li> </ul> <p><b>Employees</b></p> <ul style="list-style-type: none"> <li>• Ensure that all spillage incidents / accidents are reported are reported to immediate supervisor and that remedial action for clean-up has been taken.</li> </ul>	
<b>PPE TO BE USED</b>	
<ul style="list-style-type: none"> <li>• Gumboots / safety boots</li> <li>• Safety gloves</li> <li>• Protective eyewear, goggles</li> <li>• Dust mask</li> </ul>	
<b>HAZARD AND RISK IDENTIFICATION</b>	
As per MSDS	
<b>HANDLING OF SPILLAGES</b>	
<ul style="list-style-type: none"> <li>• All spillages are to be contained/ dammed up immediately in the area of spill and the cause of the spill to be determined and either sealed off or captured in a safe manner.</li> <li>• Absorbent materials should be placed on top of the spill and removed to the designated waste drum for disposal.</li> <li>• If the spillage takes place on the soil, absorbent fibre should be poured over the spill and left to absorb the hydrocarbon/ oil and then removed after 2 – 3 hours.</li> <li>• After the absorption has happened the absorbent material is to be removed, including the contaminated soil, and disposed of in the allocated bin/ skip.</li> <li>• The water-based solvent is to be poured onto the spill area and brushed off with a hard broom. Water is to be poured over the area and where contaminated water settles on soil, contaminated soil should be removed and disposed of in a correct bin/skip.</li> <li>• All hazardous spill incidents require an incident report (refer to Table 43).</li> <li>• All hazardous contaminated soil disposal requires a signed waste disposal form.</li> </ul>	
<b>SPILL KITS</b>	
<p><b>Management</b></p> <p>The ECO is to check the following:</p> <ul style="list-style-type: none"> <li>• Appropriate instruction guides in kits.</li> <li>• Placement of spill kits in areas where spillages are likely to occur.</li> <li>• Ensure that employees working in areas where spill kits are placed have been trained on how to use the kits.</li> </ul>	<p><b>Maintenance</b></p> <ul style="list-style-type: none"> <li>• The ECO is to do monthly spill kit inspections and compile short report back to supervisors.</li> <li>• Supervisors are to ensure that items are replaced directly after use.</li> <li>• Supervisors are to replace broken or damaged items as soon as possible.</li> </ul>
<b>TRAINING</b>	
<ul style="list-style-type: none"> <li>• All personnel working in areas where there is a potential for hydrocarbon spillages must be trained on how to use a spill kit, and Hazchem training records must be kept.</li> <li>• A hydrocarbon spillage emergency drill must be scheduled bi-annually and records of the emergency drill must be kept.</li> </ul>	
<b>RECORDS</b>	
In order for this procedure to be effective, the following records must be taken into account:	

- Monthly spill kit inspection reports
- Waste disposal forms
- Incident reports
- Hazchem training records
- Emergency drill records

**Table 39: Handling and Storage of Hazardous Substances**

<b>OBJECTIVE</b>
To provide a standard operating procedure for the handling, storage and disposal of hazardous substances.
<p><b>Scope</b></p> <ul style="list-style-type: none"> <li>• Applies to all personnel involved in any maintenance, construction and production activities that involve hazardous substances at the THM.</li> </ul>
<b>RESPONSIBILITIES</b>
<p><b>General Manager</b></p> <ul style="list-style-type: none"> <li>• Ensure that necessary resources are made available to effectively implement and support the procedure.</li> <li>• Responsible for consulting with, and providing appropriate information, instruction training and supervision to employees who are or may be exposed to hazardous substances in the workplace.</li> </ul> <p><b>Supervisors</b></p> <ul style="list-style-type: none"> <li>• Are responsible to ensure that all hazardous substances are stored and handled as per the procedure.</li> <li>• Ensure that the procedure is fully implemented and followed.</li> <li>• Ensure employees in area of responsibility are trained and conversant with the procedure.</li> </ul> <p><b>ECO</b></p> <ul style="list-style-type: none"> <li>• Ensure that the procedure is fully implemented and followed.</li> <li>• Ensure that the hazardous substances are used and disposed of in accordance with the provisions of the Hazardous substances Act 15 of 1973, Material Safety Data Sheet (MSDS) and all other applicable environmental legislation.</li> <li>• Implement and keep up to date a Site Hazardous Substances register.</li> </ul> <p><b>Employees</b></p> <ul style="list-style-type: none"> <li>• Ensure that they follow the procedure when they are handling and storing hazardous substances.</li> </ul>
<b>PURCHASING AND USE OF HAZARDOUS SUBSTANCES</b>
<ul style="list-style-type: none"> <li>• A request for a MSDS shall be standard procedure before purchasing a hazardous substance. Check the issue date of the last MSDS as it is recommended that the MSDS be renewed every 5 years.</li> <li>• On the purchase requisition/ purchase order clearly specify the location where the substance is to be delivered to and the name of the person to be contacted at the place of delivery.</li> <li>• The substance is not to be used until a MSDS is available. The user of the hazardous substance is responsible for ensuring that updated MSDS are provided.</li> <li>• Paper copies of the MSDS are to be made available as a reference source to all employees and to be stored in a location that is easily accessible to all employees who are handling or may be exposed, to hazardous substances. They should be readily accessible to Emergency Services and Medical Personnel when required.</li> <li>• The supervisor must ensure that all employees have reads the MSDS and that they understand the correct procedures for safe use as well as the possible health effects and recommended safety precautions prior to any hazardous substance being distributed for use in the workplace.</li> <li>• Employees only to use hazardous substances when trained on the correct usage and handling of hazardous substances.</li> </ul>
<b>MINIMUM TRAINING REQUIREMENTS</b>
<p>As a minimum, the training information must include:</p> <ul style="list-style-type: none"> <li>• A current MSDS for the hazardous substances to be used.</li> <li>• Explanation to the meaning of exposure standards as detailed on the MSDS</li> <li>• The direction to and an explanation of the acute and chronic health effects as detailed on the MSDS.</li> <li>• The correct labelling of containers, and interpretation of information.</li> <li>• Safe work practices and controls to follow when handling, storing and disposing of hazardous substances.</li> <li>• The correct use and maintenance of PPE.</li> <li>• The procedures to be followed in case of an emergency and first aid procedures.</li> <li>• The nature of, and reasons for, any monitoring or health surveillance required.</li> <li>• Consultation on the introduction and use of hazardous substances, and to report any hazardous situation or processes to their supervisor.</li> </ul>
<b>LABELLING, STORAGE AND HANDLING OF HAZARDOUS SUBSTANCES</b>
<p><b>Labelling of hazardous substances</b></p> <ul style="list-style-type: none"> <li>• Ensure that manufacturer's and / or supplier's labels on original hazardous substance container are not removed, defaced or modified. The original labels may only be removed or modified if that container is no longer to be used for holding that hazardous substance and has been emptied and cleaned.</li> <li>• Where a substance is decanted from its original container to a secondary container, labelling is as follows: <ul style="list-style-type: none"> <li>○ For substances that are to be used immediately (same shift), no labelling other than the hazardous substance name is required on the secondary container, provided that after use the container is cleaned to remove all of the decanted substance;</li> <li>○ For substances that are decanted, but not used immediately, the secondary container must be clearly labelled to identify the hazardous substance and information. <ul style="list-style-type: none"> <li>▪ The label should provide a clear identification of the hazardous name, a summary of basic safety and health information, details of the supplier, risk and safety phrases that apply to the substance, name of the person decanting the substance, and the date prepared.</li> </ul> </li> </ul> </li> </ul>

- Where an unidentified substance is noted it should be reported to a supervisor immediately. If the substance cannot be identified it should be classified as hazardous waste and the appropriate warning signage and barricading tape used. The Occupational Hygiene Practitioner and Environmental Office will be responsible for contacting an approved service provider for the safe handling and disposal of the unidentified hazardous substance as to approved landfill site.

#### **Storage of hazardous substances on site**

- The storage of flammable and combustible liquids such as oils will comply with all relevant legislation and regulation.
- All hazardous substances should be stored in a container of enough strength and structural integrity to ensure that it is unlikely to burst or leak during ordinary use.
- Safety, security, access and maintenance must be considered when storing hazardous substances.
- Hazardous substances must not be stored in significant risk locations like near streams, boreholes or fire hazards.
- Storing hazardous substances above roof level should be avoided.
- The surface where hazardous substances are delivered must be impermeable and connected to surface water drainage systems, including stormwater drains.
- Hazardous substance containers may not be stored directly on unprotected soil.
- Symbolic safety signs depicting "No Smoking", "No Naked Flames" and "Danger" are to be prominently displayed in and around the hazardous substances' storage area.
- Hazardous substances should be placed on a suitable stand over a drip tray within a secondary containment area for ease of use and to minimize accidental spillages.

#### **Secondary Containment Specifications**

- All hazardous substances and ancillary equipment must be placed within a liquid tight secondary containment system like a bund.
- Minimize the risk of hazardous substances escaping the bund and contaminating the environment by:
  - Keeping the primary container as low as possible.
  - Ensuring bund walls are high enough and of enough integrity to avoid leakages.
  - Keeping all hazardous substances, dispensing mechanisms, valves or other ancillary equipment inside the bunded area.
  - Leaving a minimum of 750 mm between the container and bund wall and 600 mm between the container and base of the bunding to allow access for external inspection.
  - Not placing containers on top of each other.
  - Ensuring that the bunding is impermeable to liquids.
  - Ensuring that there is no direct outlet from the bunded area i.e. no pipework may pass through the wall of the bund.
  - Ensuring that the bunded area does not discharge to any drain, sewer or watercourse or be discharged into the yard or unprotected soil.
  - Ensuring that the bunded area is covered by a roof so that rainwater does not collect inside the bunded area.
  - Ensuring that store material or wastes are not sorted in the bunded area.
- The capacity of the secondary containment/ bund must provide for at least 110% of the capacity of the container stored inside it. If more than one container is stored, the system must be capable of storing 110% of the largest container or 25% of the total container capacity within the bund, whichever is the greatest. When calculating the bund capacity any volume taken up by drum support within the bund must be taken into account.
- All bunds, tanks and pipework should be inspected weekly for signs of damage.
- To ensure that bunds retain integrity and defects must be repaired promptly.
- The base must not be covered with sand.
- Drip trays must be in place when using hazardous substances outside of the secondary containment area.
- The conditions of the relevant storage and disposal permits/approvals must be complied with.

#### **Handling of hazardous substances**

- All hazardous substances deliveries should be supervised to help avoid spillages, prevent damage to the environment and save valuable raw materials.
- The secondary containment area should be of enough size to store all hazardous substances received within the bunded area.
- No hazardous substances such as oil or diesel may be stored outside a bunded area.
- Dispensing mechanisms like pumps or taps must be fitted to containers to prevent spillages.
- Hazardous drums like oil may not be tipped over to pour out oil.
- All spillages should be reported to the SHE Officers for further investigation.
- Spills kits should be available on site to clean up spills and leaks.
- All employees handling hazardous substances must be trained and educated on the proper usage and handling of hazardous substances.

#### **Emergency Procedure**

- Follow emergency and safety procedures as described on the MSDS unless otherwise directed by an authorised person or member of the emergency services.
- If a spilled or leaking container is discovered in a workplace, contact and advise the relevant manager/supervisor of the situation. The manager/supervisor shall set in place emergency procedures in accordance with recommended actions detailed on the relevant MSDS.
- Managers and supervisors must ensure that records on workplace hazardous substances used in their work area are maintained and readily available to emergency service personnel if requested.

### **PPE FOR HANDLING HAZARDOUS SUBSTANCES**

- Managers and supervisors are to ensure that their employees are provided with appropriate PPE relevant to hazards per the MSDS, and receive training in its use, maintenance and replacement.
- The selection of PPE should proceed through a consultative process between Occupational Hygiene Practitioners, supervisors and employees.
- Should the PPE prove to be unsuitable or cause concern to the user, a review of the work practices should be conducted.
- General PPE includes:
  - Gumboots / safety boots
  - Safety gloves
  - Protective eyewear / goggles
  - Dust mask
- Employees are required to refer to the MSDS for additional required PPE.

#### **DISPOSAL OF HAZARDOUS SUBSTANCES**

- Managers and Supervisors / Environmental Officers should ensure that all hazardous substances are disposed of in an approved manner as specified on the corresponding MSDS, the Hazardous Substances Act 15 of 1973, and the NEMWA (Act 59 of 2008).
- All hazardous waste and empty hazardous substances material will be temporarily stored at the salvage yard and will be removed from site by an approved service provider. The waste must be disposed at a suitable and registered landfill site.
- Hazardous substance contractual arrangements shall comply with legislative requirements and organisational standards.
- It is the responsibility of the Supervisor and Environmental Officer to manage the disposal of hazardous material to ensure compliance to amend standards or legislative requirements.

#### **RECORDS**

Records of further assessments are to be noted in the Hazardous Substances Register. Assessments should be reviewed whenever there is evidence to indicate that the assessment is no longer valid, or when there has been significant change in the work to which the assessment relates, or when 5 years have elapsed since the last assessment.

- Hazardous Substance Register
- Waste Disposal Forms
- Asset Control Forms
- Hazchem Training Records

**Table 40: Fire Management Plan**

<b>OBJECTIVE</b>
To ensure that the THM is prepared in the event of a fire breaking out.
<b>RESPONSIBILITIES</b>
It is the responsibility of the Site Manager to ensure that the conditions of the Fire Management Plan are adhered to and that all mining personnel and/or contractors are fully informed and trained to prevent and manage fires.
<b>FIRE MANAGEMENT ZONES</b>
A fire management zone will be created within the mining right area. Before the establishment of mining activities, the following information will be recorded: topography, vegetation, atmospheric conditions, location of firebreaks and access to water bodies.
<b>FIRE PREPAREDNESS</b>
To ensure that the mining team is prepared to respond to a fire breakout successfully, the following is applicable: <b>Fire weather and fire danger rating</b> The dry winter season and drought conditions are rated as fire weather and everyone should be alert to fire hazards during these times. <b>Fast Initial Attack</b> This concept is to quickly suppress any small fire that may start within the mining area.
<b>PREVENTION</b>
The following measures will be implemented to prevent a fire outbreak during mining: <ul style="list-style-type: none"> <li>• Collection of firewood will not be allowed.</li> <li>• Open fires will be prohibited to people involved in mining. Only contained fires (e.g. konkas) and gas cookers will be allowed on site.</li> <li>• No burning cigarettes or matches may be thrown down within the mining area. A bucket with sand will be provided in appropriate areas for the disposal of cigarettes and matches.</li> <li>• No smoking will be allowed near gas, paints or fuel storage areas.</li> <li>• Suitable welding blankets are to be used when welding or operating grinders and this equipment is to be serviced regularly.</li> <li>• A fire extinguisher must be immediately at hand if any 'hot work', like welding or grinding, is undertaken.</li> <li>• Rubbish or vegetation may under no circumstances be burnt. All waste will be removed off site and disposed of at an approved landfill.</li> <li>• Tawana will implement the necessary liability insurance in case of fire at the operations.</li> </ul>
<b>DETECTION</b>
The Site Manager will be responsible for a daily inspection of the site and to identify and rectify any fire hazards.
<b>FIRE FIGHTING EQUIPMENT</b>
<ul style="list-style-type: none"> <li>• A 10 000-litre water cart will be kept on site for dust suppression. This cart will be made available, should a fire not associated with the mining project break out on surrounding farms. Fire crews from the mining site will also be made available to fight such fires.</li> <li>• On site vehicles will be used to mobilise fire crews and transport water.</li> <li>• Hand tools to be kept on site for firefighting include a shovel, an axe, fire swatter, a water hose and a water pump.</li> <li>• PPE will be kept on site and used, including boots with fire resistant soles, gloves, hard hats and a first aid kit.</li> </ul>
<b>TRAINING</b>
The Site Manager working on the mining site will receive basic firefighting and first aid training.
<b>REVIEWS</b>
The Fire Management Plan will be reviewed annually on the anniversary of the mining license approval date, or if an incident occurs that is not adequately addressed by this Fire Management Plan.

**Table 41: Storm Evacuation Procedure**

<b>OBJECTIVE</b>
To establish safe practices to manage the risk associated with severe storms and protect personnel, equipment, and facilities.
Scope: This procedure should be understood and followed by all employees and contractors.
<b>RESPONSIBILITIES</b>
Ensure that each manager implements this procedure in their area of responsibility; Monitor the compliance of this procedure; Ensure all employees (Contractors) are trained; Ensure that all personnel on site have proper and working communications equipment, especially those working in remote areas; Ensure that the shelters close to the available work area have been identified; and Review Severe Storm procedures with staff at least once a year, and if necessary, update the procedures.
<b>Employees</b>
Abide by this procedure.
<b>Safety Department</b>
Ensure the implementation of this procedure; Schedule training sessions on the Severe Storm Procedure for all employees; Provide guidance on the protection system against severe downpours and lightning, as required; and The Emergency Response Team (ERT) will be on alert and trained to respond in a timely manner in case of an emergency.
<b>Contractors</b>
Provide the necessary resources to carry out this procedure; Instruct all contracted personnel on this procedure; and Designate a person responsible for enforcing the procedure in case of a Severe Storm.
<b>EVACUATION DRILLS</b>
Experience has shown that it can take typically 15-60 minutes to evacuate a medium to large sized mine. This time to evacuate will improve (reduce) if evacuation drills are practiced at an operation.
<b>GENERAL PROCEDURES</b>
Follow the Alert System (Yellow, Orange and Red) defined below. Each division has designated safe zones and communication methods. Alarm definitions are as follows <b>Yellow Alert:</b> Yellow Alert indicates that the storm is approximately within a range of 20 to 37 km of the detector (CRITICAL AREA). This alert means we need to be aware on the development of a potential storm. The yellow alert will be communicated every 30 minutes. <b>Orange Alert:</b> Orange Alert indicates that the storm is approximately within a range of 11 to 19 km of the detector (CRITICAL AREA). This means that all personnel must be aware to the alert being communicated by the Risk Prevention Department. The supervisor can and should decide to send their workers to the shelters during the alert particularly in sensitive areas such as outdoor activities. The orange alert will be communicated every 15 minutes. <b>Red Alert:</b> Red Alert indicates that the storm is approximately within range of 0 to 5 km from the detector (CRITICAL AREA). The red alert will be communicated every 5 minutes. DURING A RED ALERT: NO PERSONNEL ARE TO BE EXPOSED! Smoking Areas are off limits If red alert occurs during shift change in any area, proceed immediately to a safe shelter. Departing personnel may move immediately from safe shelter to departing buses.
<b>TRAINING</b>
All staff employees and contractors must be trained on an annual basis and must have a refresher course at least once per month before the beginning of the defined storm season; Site Safety Plan Training will be conducted during new hire orientation and Contractor Hazard Training; and Divisional Specific Training will be included in site specific area training.
<b>EMERGENCY RESPONSE</b>
In the event of witnessing an accident, follow these steps: Notify security via radio or phone for EMT response; Provide the location; Indicate the number of potential victims and their current status (if possible); Stay in your location until the arrival of the emergency team; and If safe to do so, take any first aid actions necessary until emergency personnel arrive.

**Table 42: Waste Management Procedure**

<b>OBJECTIVE</b>
<ul style="list-style-type: none"> <li>Set a procedure that has to be followed during handling, storage, and transportation and final disposal of waste from activities, products and services at THM.</li> <li>Cradle to grave principle requires THM as the generator of waste to ensure that waste generation is avoided and or minimized where possible and also ensure that waste is disposed of in an environmentally friendly and responsible manner.</li> </ul>

<ul style="list-style-type: none"> <li>• Provide guidelines on waste management requirements THM employees and contractors have to comply with.</li> </ul>
<p><b>Scope</b> Applicable to all departments and sections within THM, including contractors and sub-contractors performing work on behalf of THM.</p>
<p><b>RESPONSIBILITIES</b></p>
<p><b>Site Supervisor</b></p> <ul style="list-style-type: none"> <li>• Responsible to sign off on waste disposal form when the designated waste person on their site comes to dispose waste at the salvage yard.</li> </ul> <p><b>Waste disposer</b></p> <ul style="list-style-type: none"> <li>• To ensure that waste is separated at source before disposal in the salvage yard.</li> </ul> <p><b>ECO/ Environmental Trainee</b></p> <ul style="list-style-type: none"> <li>• To ensure that the waste disposal form is signed off, and to check listed waste and ensure that it is disposed in the correct skip or placed at the designated area in the salvage yard.</li> <li>• Responsible for the coordination of waste removal and temporary storage of waste.</li> </ul> <p><b>Employees</b></p> <ul style="list-style-type: none"> <li>• To ensure that this process is implemented and adhered to at all times.</li> <li>• To ensure that waste is disposed of in a responsible manner.</li> </ul>
<p><b>PROCEDURES</b></p>
<p><b>Waste Management Activities</b></p> <ul style="list-style-type: none"> <li>• To ensure that the waste at THM is managed in a manner that is compliant with legislation, and that the service provider provides an efficient service i.e. ensuring that adequate skips are provided, labelled and stored in the designated salvage yard with a fence and gate to limit access.</li> <li>• All waste generators shall sort the waste they generate according to the streams and classes of waste generated in sites before disposal in the salvage yard.</li> <li>• The waste generator shall use bins labelled in line with various types of waste.</li> <li>• The Environmental Trainee shall inspect all areas of the mine once a week to verify if all procedure rules and legislation are being followed.</li> <li>• The Environmental Trainee shall include waste management and all applicable processes into the internal audit process schedule.</li> <li>• The Environmental Trainee is accountable for notifying the contracted service provider to remove waste.</li> </ul> <p>The Environmental Trainee shall ensure that the waste service provider provides a Safe Disposal Certificate within 30 days after removing hazardous waste from the mine.</p>

Table 43: Environmental Incident Report Sheet

## ENVIRONMENTAL INCIDENT REPORT SHEET

This sheet must be completed in the event of an environmental incident and returned to the ECO. All environmental incidents must be reported immediately to the Site Manager and the ECO.

Mining area:  Incident number:

Please tick the relevant box indicating the cause of the environmental incident:

To be filled in by the ECO

Accident  Spill  Equipment failure  Other (please specify below)

Specify other:

In case of spill, please specify type of material spilled (eg. oil)

Location:  Date:  Time:

Please tick the relevant boxes describing the environment(s) on which the incident will impact upon:

River water  Storm water or rainfall runoff  Dam water  Drinking water   
Groundwater  Air quality in nearby community  Air quality in prospecting area  Soil   
Plants  Animals  Noise in prospecting area  Noise in nearby community   
Private land  Capricorn-owned property  Private property

Specify other:

Please describe the activity being undertaken at the time of or that caused the environmental incident:

Please indicate what can be done to prevent similar environmental incidents in future:

Person in charge:

Name:

Job title:  Contact number:



**Table 44: Environmental Method Statement**

<b>WHAT</b>	(Subject of MS)			
<b>WHO</b>	Site Manager			
	ECO			
	Date submitted		Date approved	
<b>WHEN</b>	Date work starts		Date completed	
	Rehabilitation period			
	Restrictions			
	<b>Work Phases</b>	<b>Item</b>	<b>Start date</b>	<b>End date</b>
	Phase 1			
	Phase 2			
	Phase 3			
<b>WHERE</b>	Area of works - submit a sketch plan, if appropriate			
<b>HOW</b>	Route/site pegged			
	Date available for inspection			
	<b>Landscape concerns (refer to EMP, as required)</b>			
	Existing features and services affected (eg. Roads, tracks, kraals, fences, etc)			
	Trees and protected vegetation (protection or removal methods)			
	Reinstatement methods			
	Maintenance required			
	Access and restricted areas			
	<b>General Environmental Considerations (refer to EMP, as required)</b>			
	Machinery, earthworks and dust			
	Stormwater control			
	Stockpiles, refuse and rubble			
Hydrocarbon control measures				
Landowner consultation				
Fire and emergency contingencies				
Special conditions or mitigation measures				
Comments				

## **h) Financial Provision**

### **i) Determination of the amount of Financial Provision**

#### **a. 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 herein**

It is anticipated that the project may result in an improved environmental condition at closure if the recommended rehabilitation measures are implemented, as the proposed THM is currently considered significantly impacted by historical mining activities with vegetation not being representative of the natural indigenous vegetation. If the mine were to improve the environment through rehabilitation measures and the removal of invasive species it could potentially improve the functioning of the ecosystems and reinstate indigenous and healthy environments that would be of benefit to the surrounding communities from an ecosystem services and beneficial / suitable end land-use perspective. The backfilling and rehabilitation of the currently open pit void would also improve the safety of the area, for both livestock and people.

The current vision for closure of the mine is to rehabilitate the areas disturbed by mining activities to an acceptable end land use that is resilient, self-sustaining and comparable to the surrounding areas and in agreement with commitments to stakeholders. Refer to Part B Section 1 d) i), p180 for the closure objectives.

The Closure Plan has been prepared which further details the closure objectives, strategy, measures and relinquishment criteria; refer to Appendix 22.

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

The EIAR, EMPr, and the Closure Plan (including the environmental objectives) will be made available to IAPs during the EIA phase public commenting period (from 10 January to 9 February 2022).

The main objective will be to return the area to an acceptable end land use in line with the prevailing landscape and planning objectives. The risks identified have been addressed to ensure that disturbed areas will not be left unsafe or contaminated and will be suitable for activities such low intensity grazing and/or wilderness land. Residual air quality, soil and visual impacts will be addressed by ensuring that the disturbed area has been shaped to be stable and free draining, revegetated and blend into the surrounding landscape when THM closes.

#### **c. 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**

The Closure Plan (Appendix 22) includes a rehabilitation plan including the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure for the THM.

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

The Closure Plan (Appendix 22) has been compiled to meet the specific closure objectives and is deemed to be satisfy the requirements of the MPRDA and GNR1147 of 2015.

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

As per GNR1147 of 2015 the holder of a right in terms of the MPRDA must determine and make financial provision for the rehabilitation and management of negative environmental impacts from operations to the satisfaction of the Minister responsible for Mineral Resources.

According to Regulation 5 a holder must make financial provision for rehabilitation and remediation; decommissioning and closure activities at the end of prospecting, exploration, mining or production operations; and remediation and management of latent or residual environmental impacts which may become known in future, including the pumping and treatment of polluted or extraneous water. Regulation 6 makes provision for the method of determining the costs of the financial provision and states that a holder must determine the financial provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for the above.

The 2005 Guideline for Evaluation of the Quantum for Closure-Related Financial Provision compiled by the then DME describes the recommended procedure for determining the quantum for financial provision in Section B thereof, entitled "Working Manual for the Determination of the Quantum". The recommended procedure was therefore followed for the purposes of evaluating the quantum for the THM. The unit rates as published by the DMRE have been escalated by inflation on a year-on-year basis. Refer to the Closure Plan (Appendix 22) for the detailed methodology used to calculate the financial provision.

Total 1, the financial provision for the final rehabilitation, decommissioning and mine closure activities at THM, has been calculated to be **R 35 947 195** (incl. P&Gs + contingencies).

Total 2, the financial provision for the residual environmental impacts at THM, has been calculated as **R 5 959 845** (incl. P&Gs + contingencies).

The total financial provision (Total 1 + Total 2 + VAT) for the THM, is therefore **R 48 193 096** (value as per date of assessment – 2021).

**f. Confirm that the Financial Provision will be provided as determined**

The required financial provision will be provided for/set aside, through a financial/ rehabilitation guarantee upon the request of the DMRE.

**i) Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon**

(Including Monitoring of impact management actions, Monitoring and reporting frequency, Responsible persons, Time period for implementing impact management actions, Mechanism for monitoring compliance)

**Table 45: Mechanisms for monitoring compliance with and performance assessment against the EMPr**

Aspect	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
Construction activities		<ul style="list-style-type: none"> <li>Adequacy of staff induction</li> <li>Visual, dust and air quality</li> <li>Soil stockpiling, soil erosion and management</li> <li>Ensuring activities confined within infrastructure footprint</li> <li>Spill response, soil contamination, water contamination and litter</li> <li>Adequacy of sanitation facilities</li> <li>Grievances (internal from workers and external from IAPs)</li> <li>Housekeeping</li> </ul>	ECO shall be responsible for undertaking inspections and reporting	<ul style="list-style-type: none"> <li>Monthly during construction</li> <li>Reports shall be provided to THM management, the construction manager / engineer and the contractor</li> </ul>
Statutory monitoring		<ul style="list-style-type: none"> <li>Audits of compliance with the EMPr to ensure compliance with the conditions of the environmental authorisation and assess the continued appropriateness and adequacy of the EMPr</li> <li>WUL audit to ensure compliance with the provisions of the WUL and assess the performance and adequacy of the IWWMP</li> </ul>	ECO	<ul style="list-style-type: none"> <li>It is recommended that EMPr is audited externally every two years or as directed in the EA, internal audits to be undertaken annually</li> <li>WUL audits undertaken as directed in the WUL (usually annually) and audit reports submitted to the DWS</li> <li>The audit reports shall identify non-compliances and provide recommendations to address these</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>Impact on human health may be impaired as a result of increased pollutant concentrations</li> <li>Impact on vegetation health and an indirect impact on</li> </ul>	<ul style="list-style-type: none"> <li>Continuous dustfall sampling at specified locations around the site</li> <li>Continuous PM<sub>10</sub> monitoring at specified location</li> <li>Continuous meteorological data monitoring using weather station</li> </ul>	ECO and appointed specialist provider	<ul style="list-style-type: none"> <li>Monthly dustfall sampling must be initiated prior to construction, continue throughout the construction phase, operational phase and decommissioning phase.</li> <li>Respond to dust-related complaints</li> </ul>

Aspect	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
	animal and human health, and amenities from increased dustfall rates and pollutant concentrations <ul style="list-style-type: none"> <li>Impact on amenities from an increase in nuisance dust fall rates</li> </ul>			
Soil and land capability	<ul style="list-style-type: none"> <li>Increase in erosion and subsequent sedimentation of watercourses, deteriorating surface water quality, decreased ecoservice provision</li> <li>Spills and contamination impacts</li> <li>Soil fertility impacts</li> </ul>	Soil Monitoring Programme	<ul style="list-style-type: none"> <li>ECO/ Site manager must conduct the required erosion and spill monitoring.</li> <li>ECO must appoint a suitably qualified service provider to conduct the required sampling (fertility and contaminated land).</li> </ul>	<ul style="list-style-type: none"> <li>Erosion and spill monitoring must form part of the monthly environmental reports prepared by the ECO.</li> <li>All areas susceptible to erosion must be monitored bi-annually, and repair, maintenance and prevention measures implemented (if erosion is noted) for a period of 2 years post-closure.</li> <li>Reports containing the results of the soil fertility monitoring must be prepared to inform the remediation and amelioration efforts required during rehabilitation to ensure that closure objectives are met.</li> </ul>
Heritage and Palaeontology	Impact to buried resources of cultural and heritage significance	<ul style="list-style-type: none"> <li>If any artifacts are uncovered, a qualified archaeologist be called in to investigate and the Heritage Protocol and Chance Find Procedure must be implemented.</li> <li>If any fossils are seen on the surface the Fossil Chance Find Protocol must be implemented.</li> </ul>	ECO and qualified archaeologist/ palaeontologist where required	<ul style="list-style-type: none"> <li>When development work commences the ECO should conduct a daily site walk through the site throughout construction.</li> <li>If no heritage resources/ fossils are found and the excavations have finished then no further monitoring is required.</li> </ul>
Noise	Increase in ambient noise levels and nuisance noise to surrounding sensitive receptors	<ul style="list-style-type: none"> <li>On-going sound level monitoring and liaison with the surrounding landowners and community.</li> <li>Noise levels at the monitoring points should not exceed the acceptable rating levels by more than 5 dB as a result of mining activities during the LoM.</li> <li>Complaints relating to noise.</li> </ul>	<ul style="list-style-type: none"> <li>ECO and appointed specialist provider</li> <li>Any complaints received must be investigated by the ECO (informed by monitoring findings) and the monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Noise monitoring must be conducted annually throughout the LoM.</li> <li>If monitoring objectives are not met the ECO must report the findings to management, who can then discuss mechanisms to reduce the impact, measure the effectiveness of the management measures which are in place,</li> </ul>

Aspect	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
			programme updated where necessary.	and where necessary, intervene further. The effectiveness of additional measures will be assessed through further monitoring.
Surface water	<ul style="list-style-type: none"> <li>Impact on surface water quality and contaminant migration away from pollution sources</li> <li>Hydrocarbon leaks and construction material such as cement leading to soil and/or water contamination</li> </ul>	Surface water runoff quality monitoring in accordance with the WUL to indicate if water resources are being influenced by the project.	ECO and a suitably qualified service provider appointed to conduct the required sampling and monitoring	<ul style="list-style-type: none"> <li>Monthly water quality sampling.</li> <li>Organic sampling should be done once a quarter in the pit and stormwater ponds.</li> <li>Should no organic pollution be discovered, the sampling frequency can be reduced to 6-monthly.</li> <li>If pollution is discovered, the frequency should be increased to monthly.</li> <li>A report must be prepared by the specialist after each monitoring survey.</li> <li>If monitoring objectives are not met, the ECO will be responsible for reporting the findings to management who must then discuss mechanisms to reduce the impact, measure the effectiveness of management measures, and where necessary, intervene further. The effectiveness of additional measures will be assessed through further monitoring.</li> <li>Data must be compared both spatially and temporally.</li> </ul>
Groundwater	Impact on groundwater volumes and groundwater quality due to dewatering and poor quality seepage from the mining area	<ul style="list-style-type: none"> <li>Source, Plume, Impact and Background Monitoring in accordance with the WUL to indicate if water resources are being influenced by the project.</li> <li>Dedicated monitoring boreholes were installed and cover relevant potential pollution sources at the proposed surface infrastructure points based on the current layout. There are no privately or community owned boreholes which are located close to the proposed mining</li> </ul>	ECO and a suitably qualified service provider appointed to conduct the required sampling and monitoring	<ul style="list-style-type: none"> <li>Monthly interval for the first year. Ideally, the monitoring programme should start a year before mining starts/ / as early as possible in order to be able to build a database that is not impacted by the mining activities.</li> <li>Once the monthly database is established the monitoring frequency can change to quarterly.</li> </ul>

Aspect	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
		area. Therefore, none of the privately owned boreholes identified during the hydrocensus have to be included.		
Biodiversity	<ul style="list-style-type: none"> <li>Loss of floral and faunal habitat</li> <li>Reduced floral and faunal diversity</li> <li>Displacement of faunal species</li> <li>Loss of species of conservation importance</li> </ul>	<ul style="list-style-type: none"> <li>Biodiversity maintenance and management monitoring to record the number of mortalities, nesting activity and determine the effectiveness of the mitigation actions taken.</li> <li>Alien and invasive plant species monitoring and eradication</li> </ul>	ECO to undertake the necessary monitoring and appoint specialist service providers (overseen by a qualified botanist or horticulturalist) where required	<p>Construction and operational phase:</p> <ul style="list-style-type: none"> <li>Biodiversity maintenance and management monitoring on a monthly basis</li> <li>Regular inspections of surface infrastructure including powerlines</li> <li>Invasive species monitoring, and eradication biannually (every six months)</li> <li>Include findings in regular reports submitted to the relevant authorities as required</li> </ul>
	<ul style="list-style-type: none"> <li>Proliferation of alien invasive species and other detrimental edge effects</li> <li>Erosion</li> <li>Vegetation reestablishment</li> </ul>	<ul style="list-style-type: none"> <li>Alien and invasive plant species monitoring and eradication</li> <li>Erosion monitoring as per the Soil Monitoring Programme</li> <li>Reestablishment and revegetation monitoring</li> </ul>		<p>Rehabilitation and post-rehabilitation phase:</p> <ul style="list-style-type: none"> <li>Invasive species monitoring, and eradication biannually (every six months) for a period of two years</li> <li>Reestablishment success of relocated species monitoring every six months (biannually) for a period of two years after relocation</li> <li>Monitor areas that have been revegetated biannually for a period of two years once rehabilitation has been completed</li> <li>A report, including photographs of the rehabilitated areas, must be prepared and signed off by the qualified ecologist / botanist</li> </ul>
Socio-economic	Establishment of informal settlements, community perception and experience of crime in the area and from air quality, noise, blasting, groundwater and traffic.	<ul style="list-style-type: none"> <li>Stakeholder engagement plan</li> <li>Community engagement and security forum</li> <li>All grievances must be recorded and dealt with as per the grievance mechanism.</li> <li>Community health and safety policy</li> </ul>	ECO / SLP officer	<p>Pre-construction to closure</p> <ul style="list-style-type: none"> <li>Provide monthly reports detailing types and levels of complaints, as well as actions taken to reduce complaints, for submission to mine management</li> </ul>

Aspect	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
		<ul style="list-style-type: none"> <li>Monitor the condition of the access roads to ensure that the road does not deteriorate or become unusable.</li> <li>A representative from the municipality should be encouraged to engage in the community engagement and security forum so that any issues related to road structure can be brought to the attention of the municipality.</li> </ul> <p>All traffic accidents and traffic related incidents at the mine, along the access roads must be recorded and monitored.</p>		<ul style="list-style-type: none"> <li>Address any outstanding issues or bring them to the attention of mine management</li> </ul> <p>An annual monitoring report is to be compiled, containing all of this information, and is to be made available to the community engagement and security forum</p>
Blasting and vibrations	Impacts associated with blasting including ground vibration, air blast impacts, and fly rock impacts	<p>Monitor the following elements:</p> <ul style="list-style-type: none"> <li>Ground vibration and air blast results</li> <li>Blast Information summary</li> <li>Meteorological information at time of the blast</li> <li>Video Recording of the blast</li> <li>Fly rock observations</li> </ul>	<ul style="list-style-type: none"> <li>The ECO is responsible for appointing a suitably qualified / trained independent specialist to carry out the monitoring and reporting</li> <li>The ECO must engage with stakeholders as per the stakeholder engagement plan and study the grievance mechanism for any complaints relating to blasting and consult with IAPs</li> </ul>	Monitor during times of blasting (including before and after blast time).
Traffic/ road conditions	<ul style="list-style-type: none"> <li>Additional traffic loading/ increased vehicle trips generated by activities at the mine</li> <li>Deterioration of pavement condition/ quality resulting in unsafe driving conditions</li> </ul>	<ul style="list-style-type: none"> <li>Queue lengths at the access intersections</li> <li>Truck loading for compliance</li> <li>Complaints laid by affected persons</li> </ul>	Site manager	<ul style="list-style-type: none"> <li>Monthly monitoring during construction</li> <li>Quarterly monitoring during operations</li> <li>Daily monitoring that trucks are not be overloaded</li> </ul>



Detailed monitoring programmes are provided below.

### **i) Air Quality Monitoring Programme**

Air quality monitoring must be conducted to determine the prevailing air quality, confirm the effectiveness of air quality management and control measures, to qualify air quality at sensitive receptors, to evaluate compliance with the NAAQS at the site boundary, and to provide effective tools for auditing of air quality management performance.

The following must be implemented as part of the Ambient Air Quality management plan (refer to Table 46 and Figure 45):

- Continuous dustfall sampling
  - To determine dustfall rates as a result of operations.
  - The dust bucket network comprises of eight single units.
  - The method to be used for measuring dustfall and the guideline for locating sampling points shall be American Standard Test Method (ASTM) D1739 (2017), or equivalent method approved by any internationally recognized body is suggested.
  - The dustfall sampling and reporting must be conducted according to the NDCR.
  - Monthly dustfall sampling must be initiated prior to construction, continue throughout the construction phase, operational phase and decommissioning phase.
  - Should the dustfall sampling show higher rates than those estimated in this study it is suggested that THM investigate and consider adopting additional mitigation and management measures. Fallout dust tends to settle relatively close to sources of emissions and thus if the dustfall sampling show significantly higher rates there is likely to be significantly higher finer particulate matter concentrations as well.
- Continuous PM<sub>10</sub> monitoring
  - To determine PM<sub>10</sub> concentrations as a result of operations.
  - The PM<sub>10</sub> monitor should be located off-site, at the closest potentially impacted sensitive receptor (house in Hotazel) or the passive PM sampling Site 2 or Hotazel Combined School or Wessels Clinic in Hotazel town.
  - The three possible instrumentations include indicative instruments, near-reference instruments and reference instruments.
  - If the monitoring equipment has gravimetric sampling abilities as well, then it is recommended that a gravimetric sample be taken quarterly.
  - Prior to and after sampling, a gravimetric analysis (weighing) must be undertaken on the PM<sub>10</sub> "filter" to determine the pre-weight and post-weight.
  - The preferred exposure (sampling) period for the "filter" would be 24-hours.
  - The PM<sub>10</sub> concentration for the "filter" can be determined based on the difference in filter weight, the exposure period and the equipment flow rate (thus with every gravimetric sample the date, start time, end time, flow rate and calibration flow must be logged as well as any notes on potential sources at the time of sampling).
  - The gravimetric analysis (post-weigh) should be followed by an ICP MS analysis to determine the manganese content.

- The manganese concentration for the sampling period can be determined based on the PM<sub>10</sub> concentration and manganese content.
- An accredited laboratory should be used for the analysis.
- Continuous meteorological data monitoring
  - The measurement of meteorological data (including but not limited to wind speed, wind direction, temperature, and rainfall) allows for a more comprehensive analysis of the PM<sub>10</sub> monitoring data.
  - A weather station is to be erected at the offices to record hourly meteorological data for the site. Should the PM<sub>10</sub> equipment selected have an associated weather station then the meteorological data monitoring can be conducted at the PM<sub>10</sub> monitoring location.
  - The station must be in an area where no infrastructure or vegetation would interfere with the anemometer (wind sensor) readings.
  - As a minimum the station should measure wind speed, wind direction, temperature and rainfall.
  - The inclusion of meteorological data (wind speed, wind direction, and rainfall) in the dustfall reports is a requirement of the NDCR.

Periodic inspections and external audits are essential for progress measurement, evaluation and reporting purposes. Site inspections and progress reporting be undertaken at regular intervals (at least quarterly), with annual environmental audits being conducted. Annual environmental audits should be continued at least until closure. Results from site inspections and monitoring efforts should be combined to determine progress against source- and receptor-based performance indicators. Progress should be reported to all IAPs, including authorities and persons affected by pollution.

**Table 46: Co-ordinates of air quality monitoring positions and parameters to be measured**

Position	Description	Parameter to be measured	Longitude	Latitude
D1	Off-site, non-residential area, along heavy vehicles access road	Dustfall	22°59'12,292"E	27°11'59,792"S
D2	Off-site, north of THM proposed operations	Dustfall	22°58'18,014"E	27°11'39,857"S
D3	Off-site, residential area	Dustfall	22°57'54,927"E	27°12'0,071"S
D4	Off-site, residential area	Dustfall	22°57'50,89"E	27°12'27,708"S
D5	Off-site, residential area, Wessels Clinic	Dustfall	22°57'51,57"E	27°12'39,375"S
D6	Off-site, location of highest calculated dustfall rates at the proposed Hotazel Solar Facility	Dustfall	22°58'36,322"E	27°13'14,713"S
D7	Off-site, at the proposed Hotazel 2 Solar Facility	Dustfall	22°59'5,415"E	27°12'47,085"S
D8	Off-site, east of THM proposed operations	Dustfall	22°58'52,358"E	27°12'16,055"S
PM10a	Residence impacted the most- Preferred location	PM <sub>10</sub>	22°57'53,911"E	27°12'30,487"S
Weather Station	On-site, proposed offices	Meteorological data	22°58'21,05"E	27°12'3,451"S

## ii) Soil Monitoring Programme

### Construction and operational phase

Erosion

- During construction and operation periodic visual erosion monitoring must be undertaken to determine erosion rates, identify areas of concern and implement soil management measures as needed.
- This is to ensure that there is no undue soil erosion that is allowed to develop before effecting repairs.
- Develop a representative reference site and undertake visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques.

#### Closure phase

##### Soil fertility survey

- A representative sample of the stockpiled soils must be analysed prior to rehabilitation to determine the nutrient status and chemistry of the utilisable materials.
- Appropriate soil ameliorants are to be applied to assist rehabilitation.

##### Contaminated land survey

- The assessment must be carried out during decommissioning, prior to rehabilitation. Soil analyses should include pH, EC and the metals, metalloids, hydrocarbons and anions as listed in terms of the "SSV from GNR 331 of 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality" must be carried out. If exceedances are found, appropriate remediation measures must be implemented such that the soil quality is in line with the planned land use for the area.

##### Erosion

- Develop a representative reference site and undertake visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques.
- All areas susceptible to erosion must be monitored bi-annually, and repair, maintenance and prevention measures implemented (if erosion is noted) for a period of 2 years post-closure.
- Reports containing the results of the soil fertility monitoring must be prepared to inform the remediation and amelioration efforts required during rehabilitation to ensure that closure objectives are met.

#### **iii) Noise Monitoring Programme**

Noise monitoring at sites where noise is an issue or may become an issue is essential. Environmental noise monitoring must be conducted annually throughout the LoM at the recommended monitoring points (refer to Table 47 and Figure 45) to determine the noise levels being generated by activities related to the operational activities, to detect deviations from predicted noise levels to be generated from activities and to enable corrective measures to be taken where warranted.

The following procedure should be adopted for all noise surveys:

- Any surveys should be designed and conducted by a trained specialist.
- Sampling should be carried out using a Type 1 or Type 2 SLM that meets all appropriate IEC standards and is subject to annual calibration by an accredited laboratory.
- The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session.

- Samples of 30 min to 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic environment should be taken.
- The following acoustic indices should be recorded and reported:  $L_{Aeq}(T)$ , statistical noise level LA90,  $L_{AFmin}$  and  $L_{AFmax}$ , octave band or 3rd octave band frequency spectra.
- The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.
- Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g., wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet.
- A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic environment of each site.

In the event that noise related complaints are received it is recommended that short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions. The investigation of complaints should include an investigation into equipment or machinery that likely result or resulted in noise levels annoying to the community.

**Table 47: Co-ordinates of noise monitoring positions**

Position	Description	Longitude	Latitude
N1	North-eastern edge of Hotazel town	22°57'47,088"E	27°11'46,284"S
N2	Hotazel town, area with predicted incremental night-time noise levels >50 dBA (IFC limit = 45 dBA) - Wesseliet Street/Kameel Doring Road	22°57'55,008"E	27°12'9,763"S
N3	Wessels Clinic	22°57'50,688"E	27°12'40,392"S
N4	Residential area near railway line	22°57'55,296"E	27°13'8,868"S
N5	Boundary of Solar Facility	22°58'47,388"E	27°13'10,2"S
N6	North of proposed HV access road	22°59'9,456"E	27°11'23,928"S

#### iv) Surface Water Monitoring Programme

Surface monitoring to be undertaken in accordance with the WUL to indicate if water resources are being influenced by the project. Water quality must not indicate a downward trend as a result of mine operations.

##### Construction and operational phase

- Organic sampling should be done once a quarter in the pit and stormwater ponds.
- Should no organic pollution be discovered, the sampling frequency can be reduced to six monthly.
- If pollution is discovered (deviation from baseline), the frequency should be increased to monthly.
- Monthly surface water quality sampling at the following locations:
  - In the pit (when available),
  - Stormwater ponds, and
  - Sedibeng Water's bulk water supply to ensure the quality of supply received.
- Surface water quality sampling parameters to be sampled:

pH	Total Hardness	Nitrate
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Electrical Conductivity (EC)	Potassium	Nitrite
Total Dissolved Solids (TDS)	Sodium	Fluoride
Total Suspended Solids (TSS)	Total Alkalinity	Turbidity
Calcium	Chloride	Manganese
Magnesium	Sulphate	Iron

#### v) Groundwater Monitoring Programme

A groundwater monitoring programme that incorporates the proposed operations, with focus on the possible sources of impact, as per the requirements of the WUL has to be implemented. These sources of impacts include the opencast pit area as well as proposed surface infrastructure areas that could potentially act as pollution sources. These include the ROM pads and processing plant as well as the product stockpile.

Dedicated monitoring boreholes were installed (TMBH1 to TMBH4, refer to Table 48 and Figure 45) covering potential pollution sources at the proposed surface infrastructure points based on the current layout. There are no privately or community owned boreholes which are located close to the proposed mining area. Therefore, none of the privately owned boreholes identified during the hydrocensus have to be included.

It is recommended that the monitoring programme start with a monthly interval for the first year. Ideally, the monitoring programme should start a year before mining starts/ as soon as possible in order to be able to build a database that is not impacted by the mining activities. Once the monthly database is established the monitoring frequency can change to quarterly. The monitoring programme should be continued for a period of at least 5 years after mine closure to monitor the contaminant migration. Based on these results remediation requirements can be identified and a remediation plan put in place.

Parameters and elements to be monitored should comply with relevant legislature, WUL requirements and also correspond to the parameters suitable to monitor manganese ore mining activities. Recommended parameters and elements are summarised below:

- Monitor groundwater levels;
- General chemistry such as pH, TDS and EC;
- Major elements such as calcium, magnesium, sodium, potassium, sulphate, nitrate, fluoride, chloride, phosphate; and
- An ICP scan of minor elements including aluminium, arsenic, cadmium, copper, chromium (total), iron, manganese, nickel, lead, antimony, selenium, vanadium and zinc.

**Table 48: Co-ordinates of groundwater monitoring boreholes**

Borehole ID	Description	Longitude	Latitude
TMBH1	Hole located to the east of north-eastern portion of the pit	22°58'27,925"E	27°12'10,865"S
TMBH2	Hole located to the north of the pit	22°58'19,788"E	27°12'2,352"S
TMBH3	Hole located to the west of south-western portion of the pit	22°58'12,763"E	27°12'48,127"S
TMBH4	Hole located down gradient of the crusher and plant area	22°58'17,085"E	27°12'59,564"S

## vi) Biodiversity Monitoring Programme

### Pre-construction phase

- A pre-construction inspection prior to the removal of the water within the open void and the construction of the mine to confirm Verreaux's Eagle nest status and to provide appropriate measures to incubate and/or relocate the chick should the nest be active.

### Construction and operational phase

- Biodiversity maintenance and management monitoring
  - Ensure that the mine development footprint areas do not exceed approved project boundaries.
  - Inspect natural areas surrounding the project area to ensure that these remain in a natural state and that no clearing, dumping or excavations that may obstruct faunal movement, occur.
  - Rescue and relocate any floral or faunal SCC under the supervision of a suitable qualified botanist or faunal specialist and with the required permits in place if necessary, and the existing management strategy must be adapted to protect such species.
  - Any protected plant species (particularly *V. erioloba* trees) located in proximity to the mining footprint area and earmarked to remain intact, must remain protected for the duration of the project.
  - Monitoring to include the successful implementation of conditions attached to permits obtained for the disturbance or removal of protected and TOPS-listed species.
  - Record any snares or traps found on or adjacent to the study area, including the GPS location and if the snare/trap has been activated, the trapped species must be noted. Identified snares must be removed and disposed of.
  - Record any fauna involved in vehicle collisions within the study area.
- Develop and implement an Alien and Invasive Plant Species Management Programme to include the following:
  - Staff training and safety requirements.
  - Prioritising control areas.
  - Development of control programme schedules.
  - Description of preferred control methods per species.
  - Follow-up control requirements.
  - Aftercare and rehabilitation requirements within areas where alien and invasive plant species have been removed.

Alien and invasive plant species monitoring and eradication of the alien floral species recorded in the project area (refer to Table 18 above) must be carried out biannually (every six months). Special attention must be paid to the control of NEMBA Category 1b alien invasive species, as well as *Prosopis glandulosa* var. *torreyana*, specifically also along the MR area boundaries to prevent the spread of such species into adjacent properties and surrounding natural habitat. The bush encroacher species, *Senegalia mellifera* subsp. *Detinens* must also be considered.

### Closure and post closure phase

- Alien and invasive plant species monitoring and eradication to continue as above.
- Monitor all rehabilitated areas for erosion.
- Monitor reestablishment success of relocated species.
- Monitor areas that have been revegetated (either through succession or reseeding) to ensure that adequate vegetation cover has been achieved.
- Where large bare areas are noted, reseeding must take place at the beginning of the following rainy season and where tree mortalities are noted, these must be replaced.
- Ensure that the post-mining landscape is self-sustaining, and in line with future land use of the project area.

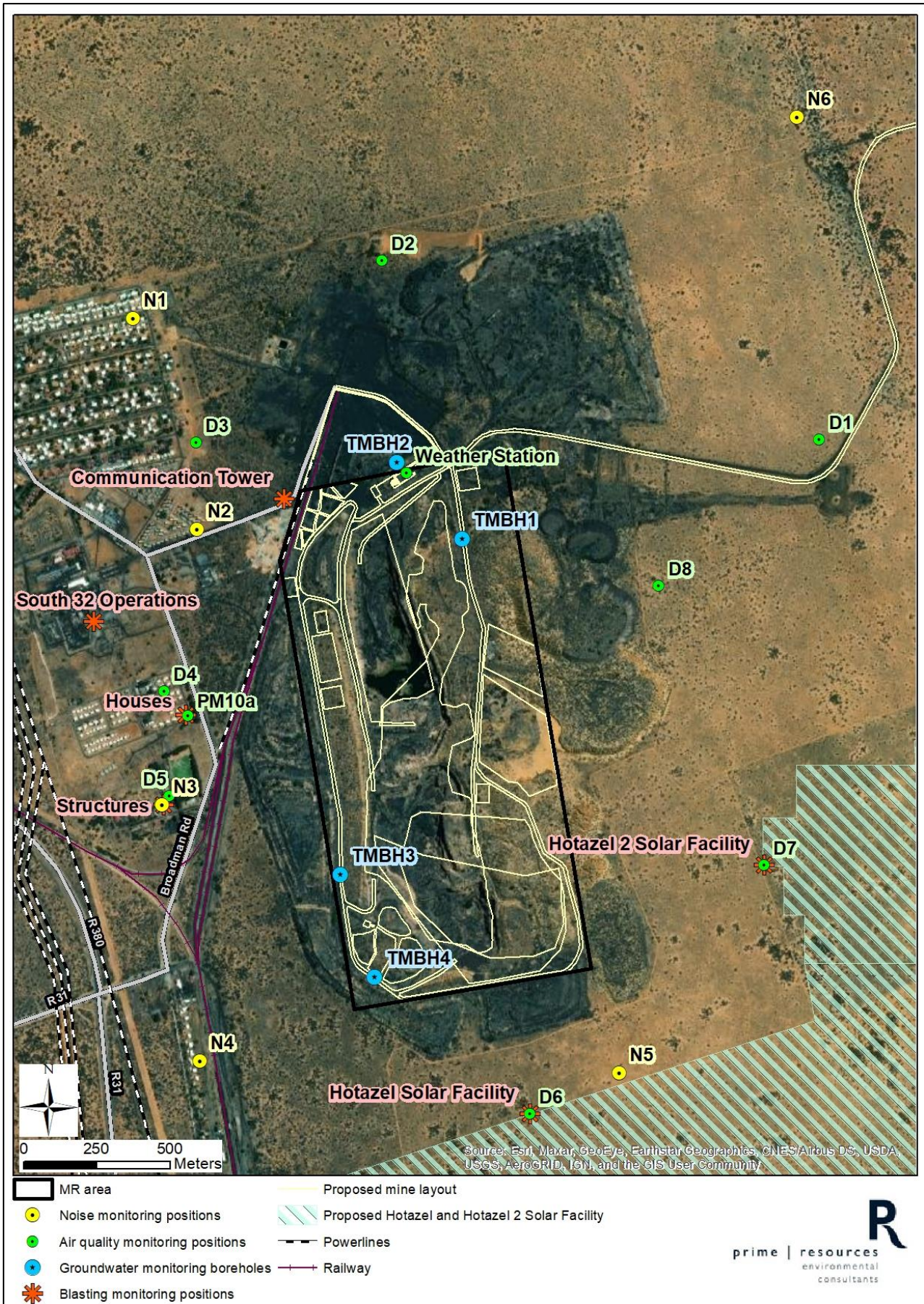
#### **vii) Blasting Monitoring Programme**

Monitoring can be done using permanent installed stations. The following elements require monitoring during times of blasting (including before and after blast time):

- Ground vibration and air blast at proposed locations (Table 49 and Figure 45 below) to ensure that the generated levels of ground vibration and air blast comply with recommendations and to qualify the expected ground vibration and air blast levels and assist in mitigating these aspects properly;
  - Not all points will be required at once but active monitoring and observation of where blasting is done will dictate the requirements for the areas around the pit.
  - Some of these points may be applicable to more than one location to be monitored.
  - Monitoring positions will need to be re-defined with an availability of a detailed mining plan and after the first blasts done and the monitoring programme defined.
- Blast Information summary;
- Meteorological information at time of the blast;
- Video Recording of the blast;
- Fly rock observations.

**Table 49: Co-ordinates of possible blasting monitoring positions**

<b>Tag</b>	<b>Description</b>	<b>Longitude</b>	<b>Latitude</b>
10	Houses	22°57'27,622"E	27°12'7,632"S
20	South 32 Operations	22°57'42,161"E	27°12'19,966"S
25	Houses	22°57'53,634"E	27°12'30,356"S
26	Structures	22°57'50,827"E	27°12'40,382"S
65	Communication Tower	22°58'5,747"E	27°12'6,347"S
73	Hotazel Solar Facility	22°58'36,322"E	27°13'14,713"S
76	Hotazel 2 Solar Facility	22°59'5,415"E	27°12'47,085"S



**Figure 45: Suggested monitoring positions**



**j) Indicate the frequency of the submission of the performance assessment report**

MPRDA Regulation 55 (of the MPRDA Regulations GNR527 of 2004) which addressed the requirements of the Performance Assessment has been repealed and auditing of compliance with the conditions of the environmental authorisation and of compliance with the approved EMPr is regulated by Regulation 34 of the NEMA EIA Regulations, GNR982 of 2014 (as amended).

As per Regulation 34.1 of the NEMA EIA Regulations, the holder of an environmental authorisation must, for the period during which the environmental authorisation, EMPr, and the closure plan in the case of a closure activity, remain valid:

- ensure that the compliance with the conditions of the environmental authorisation, the EMPr, and the closure plan in the case of a closure activity, is audited; and
- submit an environmental audit report to the relevant competent authority.

As per Regulation 34.2, the environmental audit report must determine:

- the ability of the EMPr, and the closure plan in the case of a closure activity, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis and to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility;
- the level of compliance with the provisions of the environmental authorisation, EMPr or closure plan.

Regulation 34.2.d) of the NEMA EIA Regulations requires an Environmental Audit Report to be submitted to the CA at the frequency specified within the EA (and may not exceed intervals of five years; see Regulation 26.e). Within 7 days of the date of submission of an Environmental Audit Report to the CA, the Applicant must notify all potential and registered IAPs of the submission of that report, and make the report immediately available to anyone on request and on a publicly accessible website. The EA will also specify the frequency of updating the EMPr and Closure Plan. The scope of the information provided in Environmental Audits is set out in Appendix 7 of the NEMA EIA Regulations.

**k) Environmental Awareness Plan**

An environmental awareness plan must describe the manner in which THM informs its employees of any environmental risk which may result from their work and how risks must be dealt with in order to avoid pollution or the degradation of the environment.

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

Employees will undergo environmental awareness training as per the Environmental Awareness Plan. Contractors will undergo environmental awareness training as part of induction prior to the commencement of construction and decommissioning activities, and relevant aspects of the EMPr will be extracted for use by contractors. The Environmental Awareness Plan provides for periodic awareness training throughout the LoM. Adherence to the Environmental Awareness Plan as well as provision of periodic environmental awareness training will be monitored and enforced by the ECO throughout the life of the project. The contents of the Environmental Awareness Plan are detailed below:

**Objectives**

- All personnel must be made aware of the environmental management requirements;
- All personnel, as a minimum, will undergo general environmental awareness training, which will highlight the environmental responsibility of all employees (mine employees and contractors); and
- Those personnel whose functions may have a significant impact on the environment will receive the appropriate specialised training, so that they may perform their designated tasks adequately.

### **Types of training**

There are two types of training that will be undertaken - awareness training and competency training. Awareness training refers to acquiring knowledge of general environmental protection, EMP requirements, legal requirements and key environmental issues. Awareness training is general in nature, similar in content irrespective of job description, delivered from an environmental perspective, and conducted in a classroom or boardroom setting or during site visits / toolbox talks.

Competency training is job-orientated. It refers to training that ensures that any task that may have a significant impact on the environment is performed properly. Competency training is specific in nature, dependent on individual job descriptions, aimed at ensuring that key tasks are performed correctly, and involves classroom or boardroom instruction and on-the-job training.

### **Training requirements**

Personnel may require either awareness or competency training, or both, depending on their job description. The agenda for the environmental awareness course must consist of the following:

- A definition of what the environment is;
- Environmental rights;
- Constitutional rights;
- NEMA, and the rights of a whistle blower;
- Why we must look after the environment;
- How we should look after the environment;
- Details of working areas;
- Environmental Risks;
- The possible presence of subterranean archaeological and/or paleontological sites, features or artefacts, the penalties associated with the unlawful removal of these artefacts, as set out in the NHRA as well as of the chance finds procedure;
- Management of biodiversity;
- Details regarding smoking and fires;
- Management of petrol, oil and diesel (and other chemicals);
- Dust management;
- Ablution facilities;
- Waste management;
- Traffic and road safety;
- Emergency procedures and numbers; and
- Appropriate manner of interacting with neighbouring communities.

### **Frequency of training**

All new employees, as well as contractors, will be expected to undergo environmental awareness training as part of their induction. This induction will occur within the first two weeks of employment.

New employees who undertake activities that have or may have a significant environmental impact will, upon employment, have a personalised training programme developed as part of his/her job description. This programme will include any required competencies associated with that employee's environmental management role, and the means and timeframe by which this competency is meant to be achieved. Adherence to this programme will be monitored. The employee will be required to successfully complete the programme.

Contractor employees who undertake activities that have or may have a significant environmental impact will undergo awareness training prior to the commencement of any such activities.

**ii) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment**

The EMPr details commitments in order to avoid pollution and environmental degradation. Compliance with the EMPr commitments will form part of the contractors' contract, and relevant aspects of the EMPr should be extracted for use by contractors. Employees will also be briefed regarding the EMPr commitments prior to the commencement of operations. The ECO will monitor commitments to ensure they are being adhered to by the contractors during the construction and decommissioning phases as well as by employees during the operational phase.

The EPRP must be consulted in the event an emergency condition occurs which may result in the pollution or the degradation of the environment.

**I) Specific information required by the Competent Authority**

*(among others, confirm that the financial provision will be reviewed annually)*

THM commits to reviewing the Financial Provision on an annual basis as per the requirements of Section 24(P)(3) of NEMA, which states that every holder must annually assess his or her environmental liability and, if circumstances so require, must adjust his or her financial provision to the satisfaction of the Minister responsible for mineral resources.

THM commits to conduct external environmental audits of the EMPr and EA as per the NEMA EIA Regulations, GNR982 of 2014 (as amended) according to the frequency indicated in the EA (which will not exceed intervals of five years).

## 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
- d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed

Signature of the environmental assessment practitioner

10/01/2022

Date

## UNDERTAKING UNDER OATH/ AFFIRMATION

I, Jonathan van de Wouw, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this EIAR and EMP is true and correct.

*[Digital signatures omitted for security reasons. Final reports for submission to DMRE will be duly signed]*

Signature of the environmental assessment practitioner

Prime Resources (Pty) Ltd

Name of company

10/01/2022

Date

**-END-**