ZEBEDIELA NICKEL MINE DRAFT EIA&EMPR LP30/5/1/2/2/10174MR

Technical Report: **DEIR-2020-11-18**

Prepared for: **Lesego Platinum Uitloop (Pty) Ltd**

Prepared by: **Exigo Sustainability (Pty) Ltd**

ZEBEDIELA NICKEL MINE: DRAFT EIA&EMPR

LP30/5/1/2/2/10174MR

18 November 2020

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Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

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).

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FILE REFERENCE NUMBER SAMRAD: LP30/5/1/2/2/10174MR

PLEASE NOTE:

The outline of this report was compiled in terms of the official EIA&EMPR report template provided by the Department of Mineral Resources and Energy (DMRE). Where repetition occurs as a result of the template being used, the relevant information will be cross referenced. An executive summary of the most important aspects of the report is provided in order to assist the reader.

IMPORTANT NOTICE (DMRE TEMPLATE)

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

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

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

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

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

1. OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—-

- (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
- (ii) degree to which these impacts—
  - (aa) can be reversed;
  - (bb) may cause irreplaceable loss of resources, and
  - (cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

ABBREVIATIONS

BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Area
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water & Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIA&EMPR	Environmental Impact Assessment and Environmental Management Programme Report
EIR	Environmental Impact Assessment Report
EV	Electric Vehicle
EMPR	Environmental Management Programme Report
ES	Energy Storage
ESA	Ecological Support Area
Exigo	Exigo Sustainability (Pty) Ltd
GNR	Government Notice Regulation
ha	hectare
I&APs	Interested and Affected Parties
IDP	Integrated Development Programme
IEM	Integrated Environmental Management
IPAP	Industrial Policy Action Plan
km	Kilometer
kt	Kilo tonnes
ktpa	Kilo tonnes per month
ktpm	Kilo tonnes per month
ℓ/s	Litres per second
LEDET	Limpopo Department of Economic Development, Environment & Tourism

LEMA	Limpopo Environmental Management (Act No. 7 of 2003)
LoM	Life of Mine
m	Meters
m^3	Cubic meters
m^3/d	Cubic meters per day
MAMSL	Meter Above Mean Sea Level
ML	Milliliter
mm	Millimeter
MW	Megawatt
MWhr/a	Megawatt Hours per annum
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
MRA	Mining Right Application
Mt	Megaton
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act (Act 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (Act 39 of 2004)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (Act 59 of 2008)
NFA	National Forest Act (Act 84 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
Ni	Nickel
NWA	National Water Act (Act 36 of 1998)
PCD	Pollution Control Dam
PES	Present Ecological State
PGMs	Platinum Group Metals
PM10	Thoracic Particulate Matter
PM2.5	Inhalable Particulate Matter
RAL	Limpopo Roads Agency
RoM	Run of Mine
RWD	Raw Water Dam
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency SOC Ltd
SANS	South African National Standard
SDF	Spatial Development Framework

SEA	Strategic Environmental Assessment
SoCC	Species of Conservation Concern
SLP	Social and Labour Plan
SPLUMA	Spatial Planning and Land Use Management Act (Act No. 16 of 2013)
SWMP	Stormwater Management Plan
t	Tonnes
TSF	Tailings Storage Facility
WM	With Mitigation
WOM	Without Mitigation

EXECUTIVE SUMMARY

A. PURPOSE OF THIS DOCUMENT

This document constitutes the Draft Environmental Impact Assessment and Environmental Management Programme Report (EIA&EMPR) for the proposed Zebediela Nickel Mine. Please note that in line with the legislative changes working towards the "One Environmental System" this document has been compiled in line with section 24N of the NEMA read with Appendix 3 and 4 of the Environmental Impact Assessment Regulations of 2014 (GNR 982 as amended in 2017) and in line with the official EIA&EMPR report template provided by the Department of Mineral Resources and Energy (DMRE) as per Regulation 16(3)(b) of GNR 982.

B. INTRODUCTION AND LOCATION

Lesego Platinum Uitloop (Pty) Ltd (LPU) intends to develop a nickel mining operation near Mokopane in the Limpopo Province of South Africa. The proposed Zebediela Nickel Mine project is located in the Mogalakwena Local, and Waterberg District Municipalities, approximately 9 km north-east of the city centre of Mokopane and approximately 250 km north-northeast of Johannesburg. The project area can be accessed from Johannesburg using the N1 highway to Mokopane and then utilizing the Percy Fyfe road to the project area. The proposed site is mostly located on privately owned land, but also on government owned land and is situated immediately east of the local settlements Mahwelereng and Ga-Madiba near Mokopane in the Limpopo Province. The nearest settlement is Mahwelereng B, about 0.52 km from the western mining right boundary and 1.1 km from the edge of the open pit. The proposed mining right area will be located on farms where LPU currently owns the three prospecting rights namely; Uitloop 3KS (1,925.29 ha), Amatava 41 KS and Bloemhof 4 KS (2620.34 ha), and Piet Potgietersrust Town and Townlands 44 KS (115.26 ha). The Mining Right Area covers a combined area of roughly 4,660.90 ha, measuring approximately 11.9 km from south to north and 7.3 km from east to west. Mine infrastructure is however only planned to be located on approximately 150 ha of the larger Mining Right Area. Approximate coordinates for the centre of the proposed open pit are:

Latitude: S - 24°7'17.154"

Longitude: E 29°1'5.63"

The resource limit of the identified nickel resource comprises an intrusive pyroxenite-harzburgite-dunite body, approximately 8 km by 1.5 km in extent at outcrop, previously correlated with the Lower Zone of the Bushveld Complex and called Uitloop II. The intrusion strikes north-west and dips at 40˚ to the south-west. It is truncated by the Mahopani Fault and estimated that the body attains a thickness of 600 m. The proposed mine will predominantly mine nickel (Ni) and possibly platinum group minerals (PGM's) and associated minerals (platinum, palladium, rhodium, gold, ruthenium, iridium, osmium, copper, cobalt and chromite), iron ore and vanadium from magnetite. The Zebediela Ni resource will be exploited by open pit mining methods.

Mining will be focused on the extraction of 28.8 Mt of sulphide-containing material using an open pit, conventional truck and shovel with partial backfill mining method. The top 40 m to 50 m of the disseminated sulphide material is oxidized (Oxide Zone) and will be stockpiled on an overburden facility. The overburden will be trucked out and hauled to the overburden facility. Concurrent backfilling will take place from year 10 once sufficient capacity exists in the open pit. The entire pit below the oxide zone is developed in mineralised material (Sulphide Zone) and ore would be trucked out and hauled to the processing plant of a nearby mine, between 7 and 25 km north-west of the open pit. The open pit design on surface has an approximate pit length of 800 m, with an average width of 500 m and a depth of 90 m. A 5 m high and 10 m wide berm will be constructed around the entire pit perimeter. The life of mine is planned for 30 years, but with the potential to continue mining due to the size of the deposit. The first 2 years will be used for construction of the access roads, plant infrastructure, fencing, stripping of the open pit and RoM stockpiling starting in year 1 with 100 000 tons per month.

The Scoping and Environmental Impact Assessment Process (S&EIA) is being undertaken in support of an environmental authorisation application submitted to the Department of Mineral Resources and Energy (DMRE): Limpopo Region in terms of the National Environmental Management Act (Act No 107 of 1998) (NEMA) read with the Environmental Impact Assessment Regulations, 2014 (as amended on 7 April 2017) and Environmental Impact Assessment Listing Notices 1, 2 and 3 (GNR 983, 984 and 985).

C. PROJECT DESCRIPTION

1. Mining Method

At full production, roughly 100 kilo ton per month (ktpm) Run of Mine (RoM) material will be mined with a 0.34 stripping ratio from year 3 to year 12. The first two years will mainly consist of stripping at a rate of 1,237 kilo ton per annum (ktpa), this will reduce to 480 ktpa up to year 12. Overburden stripping is limited to the Oxide Zone which is some 46.5m thick. The designed pit will be mined through conventional truck and shovel with partial backfill mining methods.

Initially, mining will only be from one area of the pit with mining commencing from the north-western sector of the mineral resource and will be develop across the full width of the pit in a south-easterly direction along strike for a total length of 800 m. The overall slope of the sides of the pit will be 50˚. The overburden and mineralised material will be loaded in pit with excavators with 26 m^3 buckets and transported by 225 t rigid body dump trucks to the overburden facility while the mineralised material will be transported by either truck or conveyor to the processing mine infrastructure footprint for primary and secondary crushing and screening. The overburden facility will be located directly adjacent and to the south-east of the open pit, whereas the RoM stockpile is proposed to be approximately 500 m from the pit ramp. A 15 m bench height and mining blocks of 50 m by 20 m is planned for the overburden and mineralised material.

2. Life of Mine

The mineral resources included in this project are extensive, giving an overall life of mine in excess of 30 years. Although for the mining right application only 30 years life of mine will be applied for. The geometry of the orebody allows for continuous mining via open pit mining up to a depth of 90 m.

Production overburden stripping of 2.47 Mt takes place in year 0 to year 2 and continues concurrent with production operations between year 3 and year 12 at a stripping ratio of 0.34:1. Overburden removal at the current pit design will only be completed in year 13, after which no further overburden stripping will be required.

3. Surface Infrastructure

The proposed Zebediela Nickel Mine is located within an area with existing mining activities, such as Anglo American's Mogalakwena Mine and Ivanplats Platreef Project which is approximately 22 km and 9 km north-west of the proposed site respectively. The infrastructure in the area is fair with the city centre of Mokopane located approximately 9 km from the project area. Mokopane is a well-serviced town near National roads, the north-south National railway line, electricity, and bulk water supply.

The area is serviced by several provincial roads as well as the N1 national road linking it to Zimbabwe and the rest of South Africa. There is one commercial airport in the region (Polokwane International) as well as a few private airstrips that are mainly used for tourism and private use.

The town of Mokopane, as well as the nearby communities of Mahwelereng, Ga-Madiba, Masodi, Tshamahansi, Phola Park, Sekgakgapeng, Mosate, Maroteng, and Masehlaneng will provide skilled and unskilled labour for future operations. All proposed access roads are mainly existing tar and gravel district roads and will need to be upgraded.

Envisaged infrastructure will comprise of the following:

- Primary and secondary crushing and screening plant
- Ore handling and storage facilities (ROM stockpiles)
- Administration building, security building, change house, messing and canteen facilities, mining and geology offices, maintenance and engineering workshops and offices, warehouse and offices, medical station, fire station, laboratory and satellite ablutions
- Potable water tank and reticulation
- Raw Water Dam
- Electricity distribution facilities (overhead powerlines, transformers and mini substations)
- Hydrocarbon storage facilities
- Waste water treatment works & sewage reticulation
- Water treatment plant
- Pollution Control Dams (PCD’s)
- Haul and access roads and bridges
- Perimeter and internal fencing
- Overburden and topsoil storage facilities
- Explosives Store

The open pit and plant footprints are proposed to be 40 Ha and 33 Ha respectively with an overburden and topsoil footprint of 44 ha and 20 ha respectively, in the larger proposed 4660.90 ha mining right area.

4. Services and Supporting Infrastructure

Water Supply

The estimated maximum water demand is 14 480 m3/mon (480 m3/d or 0.15 m3/ton milled). For the purposes of water supply, a safety factor of ±1.5 should be applied on the maximum demand scenario to secure 700 m3/d for the operations. During construction an estimated 112.5 m3 per month will be required. Various water supply options were identified and are included in section 8.2.3.1. These options were further assessed in the Water Supply Options Analysis Study (Appendix 6.6: Environmental Mine Water Balance and Water Supply Options Analysis).

Electricity

The proposed mining activities will require an estimated 2 Megawatt (MW), which equates to 15.58 Megawatt Hours per annum (MWhr/a). Part of Eskom's capacity expansion programme in Limpopo is the Medupi Base Load Coal Power station with linkages into the existing power grids. Two Eskom expansion projects would influence the Zebediela mine area, namely the Mokopane Integration Project and the Medupi Integration (Charlie) Phase 2B project.

One of the reasons for these two expansion projects is the upsurge in demand for electricity in the Mokopane area due to the increased mining activity and that the Witkop substation close to Polokwane cannot support the load growth. The Mokopane integration project includes the recently constructed transmission substation (Borutho substation) near Mokopane. The Borutho substation is located 37 km north of Mokopane and approximately 30 km north of the Zebediela project. Bulk power reticulation will consist of overhead powerlines, transformers and mini substations on site as well as diesel generators for emergency power supply. The power supply to the proposed mine will however be subject to a separate EIA process which will need to be undertaken by Eskom.

Roads

The proposed site is located approximately 12.5 km north-west of the N1 which serves as the main road between Polokwane and Johannesburg. Other roads close to the project area include the R101 (5.5 km south-east) and the N11 (6.6 km north-west). All three these roads are national roads managed by SANRAL.

Access to the mine infrastructure will be via a gravel road that connects to the Turfspruit gravel road. The proposed mine access road (max length of 1.1 km) will consist of a single lane road for traffic in both directions. Each lane is to be 3.6 m wide with a 1.4 m yellow lane shoulder. Other roads will include haul roads to the plant (approximately 500 m from pit ramp) and overburden facility (approximately 1.3 km from open pit) with a total width of 16 m for a two-lane haul road, which will form part of the internal road network.

The district roads proposed to obtain access to the mine project are managed by the Limpopo Roads Agency (RAL) and any upgrade and access to these roads need to be negotiated in conjunction with this authority.

The Percy Fyfe road connects the proposed surface infrastructure of the mine to the proposed N11 Ring Road via a proposed intersection. This would be the main route used for haulage of ore to a nearby mine.

Should the proposed N11 Ring Road not be completed by the time the mine comes into production the Turfspruit Road (D1603) will have to be used as an interim haul route. Two alternative access routes were assessed and entail the following:

1) Alternative route 1 – Turfspruit gravel road (D1306) south - this proposed access route will entail access from the mine onto the D1306 connecting to the D1231, and from there connecting to the R101 to the south of the proposed open pit connecting to the N11 in Mokopane.
2) Alternative route 2 – Turfspruit gravel road (D1306) north – this proposed access route will entail access from the mine onto the D1306 connecting to the N11 north of the proposed open pit. This route is currently used by contractors, wanting to avoid driving the N11 through the communities, working at Anglo American's Mogalakwena mine and Ivanplats' Platreef Project.

Water treatment

The water treatment plant will be a turnkey package, with a capacity of 5 ML per day. Some of the raw water as well as treated water from the waste water treatment works will be fed into the water treatment plant for further processing as per the water requirements.

The raw feed water will consist of dirty water returned from operations and of top-up water from dewatering the pit.

Treatment methods for ensuring water meet SANS 241 Class I (potable water) can be categorised as follows:

- Chemical removal by precipitation of insoluble salts by chemical treatment.
- Flocculation, coagulation and settling of insoluble and large contaminates.
- Flocculation, coagulation and filtering of smaller insoluble contaminates.
- Chlorination or another suitable sterilisation.
- Ultra-filtration to remove microscopic contaminates.
- Reverse osmosis to remove remaining undesirable dissolved contaminates.

Sewage treatment

An onsite activated sludge treatment facility will be constructed to treat sewage generated during the operational phase. The sludge treatment plant will be designed to process 1.6 ℓ/s with 10 000 ℓ combined capacity sludge tanks.. This would cater for both mining and plant personnel. All sewage drainage, feeding the sludge plant will be gravity fed. The position of the waste water treatment works close to the water treatment plant and the pollution control dam allows for easy local distribution of treated water.

Use will be made of temporary chemical sanitary facilities for sewage to be generated by construction workers during the construction phase. Third party waste removal contractors will be responsible for the supplying, servicing, and relocating of temporary chemical sanitary facilities. The contents of the temporary chemical toilets will be disposed of at a registered hazardous waste disposal facility.

Solid waste management

All waste will be collected at the mine salvage yard where it will be sorted. Dedicated bays will be provided for different wastes. Recycling initiatives from the local communities will be investigated. Solid waste will be collected by a contractor and transferred to the closest registered waste facility. Used hydrocarbons will be stored in containers within a bunded area from where it will be collected and removed by an accredited contractor.

Blasting

The bulk emulsion will be stored on the surface in the Explosives Store prior to mixing in the open pit with sensitizer. Anvex will be received at the off-loading bay on the surface. The Anvex will be logged into a register, before being transported to the open pit by the explosives transporter. The combined capacity of the Explosives Store will not exceed 500 cubic metres.

Explosives will be delivered daily and transported to the open pit to be combined with the Anvex for blasting purposes. An explosive store has been provided for on the surface.

Stormwater management

The proposed water management methodology at the mine should be based on the Best Practicable Environmental Option (BPEO) principle with responsible use and best practices. The impact of development on water quantity, quality and cost should be minimised. According to the GN R. 704 of 4 June 1999 clean and dirty water should be separated and process water recycled and re-used. The dirty water will be kept in a closed circuit and spillages minimised.

Note that the term “clean water” refers to water that has not been interfered with and “dirty water” is water that is handled in or precipitated on the mine operations. Dirty water is therefore not necessarily contaminated. The following water management aspects are included in the design of the mine infrastructure and waste facilities:

- Clean stormwater will be diverted around the mine areas so that dirty and clean water are separated.
- No infrastructure will be located below the 1:100 year river flood line.
- Dirty water will be kept in a closed circuit and be re-used in the mining processes.

Make-up process water will also be used in the following order:

- On-site stormwater
- On site Sewerage Works

The requirements of regulation GN704 will be adhered to, especially the requirement for the 19 094 m3 pollution control dam which should be designed to spill not more than once in fifty years.

Evaporation losses should be minimised, unless there is surplus water in the system (e.g. during storm events, the pollution control dam could be used to evaporate surplus water.

D. ALTERNATIVES

The Department of Environmental Affairs and Tourism’s (DEAT’s) guidelines for Integrated Environmental Management (IEM)) procedure (information Series 11) requires that an environmental investigation needs to consider feasible alternatives for any proposed development. The EIA Regulations also require that a number of possible proposals or alternatives for accomplishing the same objectives be considered.

Various alternatives have been assessed for the project and workshopped by means of specialist, applicant and engineering team interactions. The alternatives were also influenced by means of discussions with authorities, discussions with I&AP’s, considering the existing baseline environmental data and specialist input.

Alternatives relevant to this development can be categorized into the following:

1. **Site Location alternatives**
    - Location of the Overburden facility and topsoil stockpile
    - Location of Mine Infrastructure (plant, offices, workshops, etc.)
    - Location of the Tailings Storage Facility (TSF)
2. **Layout alternatives**
    - Layout of Mine Infrastructure (plant, offices, workshops, etc.)
    - Layout of the Overburden facility and topsoil stockpile

3. **Service alternatives**
    - Water Provision Alternatives
    - Access Route Alternatives
    - Energy Alternatives
    - Technology alternative
4. **The "no-go" alternative**
    - To be assessed per environmental aspect/area

Refer to section 8 for more details.

E. PUBLIC PARTICIPATION

The EIA Regulations 2014 (as amended) specify that the Draft EIA&EMPR must be subjected to a public participation process of at least 30 days. A period of more than 30 days (18 November 2020 until 8 January 2021) will be made available for public comment on the Draft EIA&EMPR as part of the EIA process. The availability of the Draft EIA&EMPR will announced via notification letters as specified above to all the identified potential and registered I&APs.

In addition, the Draft EIA&EMPR will be distributed for comment as follows:

- Electronic copies will be made available on Dropbox; and
- A hard copy will be made available at the municipal offices in Mokopane.

During the review period of the Draft EIA&EMPR, a public meeting will be held in Mokopane. The public meeting will have a limit of 250 I&APs in a double capacity venue. Every person who attends the public meeting will be required to wear a face mask and adhere to all health protocols and social distancing measures in accordance with Regulation 69(1)(a) to (d) and Regulation 69(7) of GNR 999 (published on 18 September 2020). Furthermore, I&AP's will be seated at a distance of at least one and a half metres from each other. Attendance registers and alcohol based sanitisers will be provided at the entrance to the venue. I&AP's will be required to RSVP prior to attending the public meeting. All issues raised by the I&APs during the public meeting will be included in the Final EIA&EMPR to be submitted to the DMRE.

The details of the public participation process conducted to date as well as a summary of the issues raised by interested and affected parties (I&APs) and the Environmental Assessment Practitioner's (EAP) response to the issues raised are captured in a Comments and Response Register (refer to Appendix 7.10).

Refer to section 9 for the public participation process followed to date.

The Final EIA&EMPR will be updated following the review of the Draft EIA&EMPR, to incorporate the comments received and issues raised by I&APs. The Final EIA&EMPR will be submitted to the DMRE on/or before the 15th of January 2021.

F. SUPPORTING STUDIES

The specialist studies undertaken as part of the authorisation process are provided in Appendix 6 and include the following:

- Socio-Economic Impact Assessment
- Heritage Impact Assessment
- Ecological Impact Assessment & Wetland/Riparian Delineation
- Soils, Agricultural Potential & Land Capability Impact Assessment
- Hydrogeological Impact Assessment
- Environmental Mine Water Balance & Water Supply Options Analysis
- Stormwater Management Plan
- Air Quality Impact Assessment
- Noise Impact Assessment
- Traffic Impact Assessment
- Visual Impact Assessment
- Blasting & Vibration Assessment
- Financial Closure Provision and Rehabilitation Plan

All the specialist reports comply with Appendix 6 as per Regulation 23(5) of the EIA Regulations 2014 (as amended).

G. NEED AND DESIRABILITY

Nickel is used widely in stainless steel production, manufacturing of electric vehicle batteries, as well as in many oil, gas and electricity generation operations. Nickel is also used in the nonferrous alloys, alloy steels and castings, plating, foundry and battery industries. As nickel is currently only primarily mined at one mining operation in the Mpumalanga Province, there is clearly a need for nickel mines in the country.

The Zebediela Nickel Mine stands to create employment opportunities beyond just mining, thus improving the lives of many South Africans and holistically contributing to the country's economic growth. Should the proposed mine not be developed, this will result in the benefits associated with nickel throughout its value chain not being realised.

The need and desirability of the project has been assessed and as per the DEA Guideline on Need and Desirability 2017 in terms of the Environmental Impact Assessment (EIA) Regulations with specific reference to Appendix 6.1: Socio-Economic Impact Assessment. Please refer to Section 7.

H. BASELINE DESCRIPTION OF THE AFFECTED ENVIRONMENT

The project area has a warm-temperate climate and falls within the summer rainfall region. Rainfall data analysed for the period 1931 to 2019 indicated a mean annual rainfall of 590 mm/a. The highest mean monthly rainfall occurs in December (114 mm) followed by January (109 mm). Mean annual evaporation (MAE) measured is 1734 mm/a. Evaporation exceeds precipitation by a factor of 3 (Vivier et al, 2020b). Temperatures range between 6.7°C and 29.6°C. The predominant wind direction is from the north-west.

The topography of the proposed mine footprint area varies from slightly undulating valleys, and plains to moderately undulating hills with a mountain ridge occurring in the northern section of the site.

Soils in the area consist of shallow Mispah and Glenrosa soils with low agricultural potential and moderate to low land capability. Red apedal Hutton soils in the area have a moderate agricultural potential and is viable for livestock and/or game grazing. Black or Dark Grey Clayey Soils associated with the drainage channels on site have no agricultural potential but has high grazing potential due to the palatable grasses growing on these soils.

The project area lies within the Savanna Biome and is classified as Polokwane Plateau Bushveld and Makhado Sweet Bushveld. The Witvinger Nature Reserve is located directly north (7 km) of the proposed mining right area while the Percy Fyfe Nature Reserve is located slightly north-east (12.7 km) of the mining right area. A small section of the Limpopo Central Bushveld National Protected Areas Expansion Strategy (NPAES) falls within the mining right area, although none of the footprint areas for the mining development are located close to any NPAES. According to the Limpopo Conservation Plan the study area falls within Critical Biodiversity Areas (CBA's) as well as Ecological Support Areas (ESA's).

Five vegetation units were identified on site, namely *Combretum apiculatum* woodland; *Combretum hereroense* woodland on dolomitic soils; *Vachellia - Grewia - Ziziphus mucronata* sweetveld; Old fields / cultivated land and hydrological features such as the Rooisloot River and a Riparian flat drainage channel. No red data species were found during the survey in any of the above vegetation units. Three protected tree species was documented namely *Boscia albitrunca* (shepherds tree). *Combretum imberbe* and *Sclerocarya birrea* (marula).The vegetation units have a medium to low sensitivity apart from the river and channel which are considered ecologically sensitive.

The majority of the habitat types on the respective study sites are fragmented and therefore the expected mammalian richness on these areas are considered low, although slightly higher richness values are expected from the more intact mountain habitats. Predators such as leopard, brown hyena, caracal, serval, honey badger and cape clawless otter are common throughout the area. Antelope species such as klipspringer, kudu, bushbuck and duiker roam freely through the area and are not restricted by game fences. According to Birdlife South Africa, the study area does not fall within any Important Bird Area (IBA). There is a potential presence of some toads and sand frogs in the non-perennial channels on site. Amphibian species potentially occurring in the area include Common River Frog, Natal Sand Frog, Gutteral Toad, Raucous Toad and Bubbling Kassina. The mountainous habitat and riverine woodland represent the most suitable habitat for a variety of reptile species. The reptiles of the study area include snakes, lizards, geckos and tortoises. Species such as the southern rock python, puff adder, black mamba, boomslang, vine snake, spotted bush snake and several members of the green snakes (Philothamnus spp.) is expected to occur in the study area, although the presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.). All the aforementioned amphibian and reptile species are common and widespread, and as such the development will not have any impact on reptile conservation within the region. All of the potential invertebrate habitats are well represented by a high family richness of insects and spiders. No red data fauna species were documented during the survey.

The study area is located in the Limpopo Water Management Area (WMA), and is located mainly in Quaternary Catchment Area (QCA) A61F. The Rooisloot (a National Freshwater Ecosystem Priority Areas (NFEPA) River) The Rooisloot (a NFEPA River) traverses the proposed mining right area and is located approximately 900 m to the north north-west of the proposed open pit boundary. A tributary of the Rooisloot (drainage channel) will be completely destroyed during the opencast mining. The area is dominated by deeply weathered and fractured mafic rocks where the groundwater yield potential can be regarded as low. Boreholes within the dolomitic rocks are expected to have a higher yield as evident by the municipal water supply boreholes in the project area. Groundwater is the sole source of water supply in the local area. The mean static water level was found to be 24.2 m with the shallowest water level measured at 4.9 m and the deepest at 67.9 m. In terms of groundwater quality, only four individual sampling locations exceeded two of the SANS 241:2015 determinant's limits, and the groundwater can therefore be considered a viable water source if quantities warrant it.

A small number of Middle Stone Age (MSA) artefacts were noted at three localities in the project area, consisting of lithics such as blades and scrapers with a moderate-low archaeological significance. Two Historical Period quarries and the remains of two Historical Period settlement areas in the project area might be older than 60 years and generally protected under the National Heritage Resource Act (NHRA 1999). At least 5 burial sites or possible burial sites / graves were noted on a number of farm portions in the project area and are considered of high significance for their heritage, social and cultural value. An irregular stone structures or stone cairn was noted on Portion 0 of the Farm Uitloop in densely vegetated sections of the project area. The function of the feature is not known but it might indicate prehistoric or Historical Period burials. As such, the heritage significance of the feature remains to be established and is therefore unknown.

The area is characterised by three distinct landscape types: the urban / industrial character in the west and southern areas; the farmland (including commercial chicken farms/rural landscape (within which the project sites occur), central to the study area; and the hills and mountains, which dominate the eastern and northern areas of the study area. The value of the visual resource for the study area has an overall rating of moderate, as the once natural landscape has been compromised with the intrusion of urban/industrial/infrastructure and agriculture related activities but is still potentially sensitive to change that would occur given the scale and nature of the proposed mining activities. Based on the developmental character of the area in the vicinity of the Percy Fyfe route, the site has a developmental character typical of a sub-urban area. All other areas have a rural developmental character.

I. CURRENT LAND USE AND SENSITIVE LANDSCAPES

The land uses on site are mainly commercial agricultural activities comprising of crop farming, game farming, livestock farming and poultry farming. The project site is located within an area with existing mining activities, such as Anglo American's Mogalakwena Mine and Ivanplats Platreef Project which is approximately 25 km and 9 km north-west of the proposed site, respectively. The project area is characterised by urban development (communities of Mahwelereng, Ga-Madiba, Masodi, Tshamahansi, Phola Park, Sekgakgapeng, Mosate, Maroteng, and Masehlaneng) in the west and south-west (Mokopane). There is also a preparatory school and urban township to the south-west. The Percy Fyfe tarred road transects the study area from south-west to north-east with various gravel access roads off of this road. A Transnet Railway line runs parallel to the tarred road.

In terms of the Department of Environmental Affairs and Tourism (DEAT) guidelines for Integrated Environmental Management (IEM), sensitive landscapes are a broad term applying to: Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoon, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species; Unstable physical environments, such as unstable soil and geo-technically unstable areas; Important nature reserves – river systems, groundwater systems, high potential agricultural land; Sites of special scientific interest; Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites; and Green belts or public open space in municipal areas.

Sensitive landscapes in terms of the above definition are illustrated in Figure 75 below and include:

- Heritage features
- Ecologically Sensitive areas
- Areas with Agricultural Potential

- Unstable physical environments

Refer to section 13 for more information.

J. IMPACT ASSESSMENT

A list of the impacts that could occur were identified for the activities described in section 5 together with the significance, probability, extent and duration of the impacts and the potential for residual risk with and without mitigation, and is included in Table 39. The recommended mitigation measures that could be applied are indicated in Table 43.

This report provides a detailed assessment of the predicted environmental impacts from the proposed project on specific components of the biophysical and social environment. The positive and negative impacts with a high significance are as follows:

No	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Ecological Impacts						
Construction Phase						
3	Clearing of vegetation for open pit, construction of infrastructure, access roads etc. causing direct habitat destruction / fragmentation	Habitat destruction / fragmentation of fauna habitats	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
4	Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation	Soil erosion and sedimentation	**WOM**	Negative	75	High
			WM	Negative	44	Moderate
6	Vegetation clearing / vehicle movement	Habitat degradation due to dust	**WOM**	Negative	75	High
			WM	Negative	60	Moderate
8	Clearing of vegetation for open pit through water courses as well as road crossings	Impediment of flow patterns	**WOM**	Negative	80	High
			WM	Negative	60	Moderate
Operational Phase						
10	Laydown areas of overburden facility and topsoil stockpile	Habitat destruction / fragmentation of fauna habitats	**WOM**	Negative	80	High
			WM	Negative	60	Moderate
11	Increased hardened surfaces around infrastructure and exposed areas around open pits, laydown areas of overburden facility and topsoil stockpile	Soil erosion and sedimentation	**WOM**	Negative	80	High
			WM	Negative	48	Moderate
13	Heavy machinery and vehicle movement on site	Habitat degradation due to dust	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
Soils, Agricultural Potential and Land Capability Impacts						
Construction Phase						
26	Topsoil & subsoil stripping	Soil destruction and sterilization	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
27	Heavy machinery and vehicle movement on site	Soil compaction	**WOM**	Negative	70	High
			WM	Negative	35	Low
28			**WOM**	Negative	75	High

	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses	Soil erosion and sedimentation	WM	Negative	44	Moderate
30	Topsoil & subsoil stripping	Loss of land capability	WOM	Negative	75	High
			WM	Negative	44	Moderate
Operational Phase						
31	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterilization	WOM	Negative	75	High
			WM	Negative	55	Moderate
32	Heavy machinery and vehicle movement on site, laydown areas of overburden and topsoil facilities	Soil compaction	WOM	Negative	75	High
			WM	Negative	55	Moderate
33	Laydown areas of overburden and topsoil facilities, crushing and stockpiling	Increased Soil erosion and sedimentation	WOM	Negative	80	High
			WM	Negative	48	Moderate
35	Topsoil & subsoil stripping	Loss of land capability	WOM	Negative	75	High
			WM	Negative	44	Moderate
Heritage Impacts						
Construction Phase						
49	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	64	High
			WM	Negative	16	Negligible
Operational Phase						
53	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	64	High
			WM	Negative	16	Negligible
Hydrogeological Impacts						
Operational Phase						
68	Mine dewatering	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receives very low if any groundwater inflows	WOM	Negative	75	High
			WM	Negative	26	Low
Air Quality Impacts						
Operational Phase						
82	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	WOM	Negative	75	High
			WM	Negative	48	Moderate
83	Crushing and screening	Particulate emissions; fugitive dust	WOM	Negative	75	High
			WM	Negative	48	Moderate

Blasting & Vibration Impacts						
Operational Phase						
111	Open cast mining activities: blasting	Ground Vibration impact on Chicken Broilers	WOM	Negative	75	High
			WM	Negative	52	Moderate
112	Open cast mining activities: blasting	Ground Vibration impact on Farm Buildings with various residences/sheds	WOM	Negative	75	High
			WM	Negative	52	Moderate
113	Open cast mining activities: blasting	Ground Vibration impact on Houses	WOM	Negative	75	High
			WM	Negative	52	Moderate
114	Open cast mining activities: blasting	Ground Vibration impact on Structures	WOM	Negative	75	High
			WM	Negative	52	Moderate
115	Open cast mining activities: blasting	Ground Vibration impact on SANRAL Road	WOM	Negative	75	High
			WM	Negative	36	Low
116	Open cast mining activities: blasting	Air blast Impact on Chicken Broilers	WOM	Negative	75	High
			WM	Negative	52	Moderate
117	Open cast mining activities: blasting	Air blast Impact on Farm Buildings/Structures	WOM	Negative	75	High
			WM	Negative	52	Moderate
119	Open cast mining activities: blasting	Air blast Impact on Houses	WOM	Negative	75	High
			WM	Negative	52	Moderate
121	Open cast mining activities: blasting	Air blast Impact on Informal Housing	WOM	Negative	75	High
			WM	Negative	52	Moderate
123	Open cast mining activities: blasting	Air blast Impact on Ruins	WOM	Negative	65	High
			WM	Negative	36	Low
124	Open cast mining activities: blasting	Air blast Impact on Structure	WOM	Negative	75	High
			WM	Negative	52	Moderate
125	Open cast mining activities: blasting	Fly rock Impact on Building/Structure	WOM	Negative	75	High
			WM	Negative	52	Moderate
126	Open cast mining activities: blasting	Fly rock Impact on Cement Dam	WOM	Negative	75	High
			WM	Negative	36	Low
127	Open cast mining activities: blasting	Fly rock Impact on Chicken Broilers	WOM	Negative	75	High
			WM	Negative	36	Low
128	Open cast mining activities: blasting	Fly rock Impact on Farm Buildings/Structures	WOM	Negative	75	High
			WM	Negative	52	Moderate
129	Open cast mining activities: blasting	Fly rock Impact on Gravel Road	WOM	Negative	75	High
			WM	Negative	36	Low
130	Open cast mining activities: blasting	Fly rock Impact on Heritage Site	WOM	Negative	75	High
			WM	Negative	36	Low
131	Open cast mining activities: blasting	Fly rock Impact on Houses	WOM	Negative	75	High
			WM	Negative	52	Moderate
132	Open cast mining activities: blasting	Fly rock Impact on Hydrocensus Borehole	WOM	Negative	65	High
			WM	Negative	36	Low
133	Open cast mining activities: blasting	Fly rock Impact on Informal Housing	WOM	Negative	75	High
			WM	Negative	36	Low
134	Open cast mining activities: blasting	Fly rock Impact on Pivot Irrigation	WOM	Negative	75	High
			WM	Negative	36	Low
135	Open cast mining activities: blasting	Fly rock Impact on Planned SANRAL Road	WOM	Negative	75	High
			WM	Negative	36	Low
136	Open cast mining activities: blasting	Fly rock Impact on Railway Line	WOM	Negative	65	High
			WM	Negative	36	Low
137	Open cast mining activities: blasting	Fly rock Impact on Reservoir	WOM	Negative	75	High
			WM	Negative	36	Low
138	Open cast mining activities: blasting	Fly rock Impact on Road	WOM	Negative	65	High
			WM	Negative	36	Low
139	Open cast mining activities: blasting	Fly rock Impact on Ruins	WOM	Negative	75	High

			WM	Negative	52	Moderate
140	Open cast mining activities: blasting	Fly rock Impact on Structures	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
Visual Impacts						
Construction Phase						
141	Preparation of earthworks for pit area, mine infrastructure and topsoil and overburden facility areas and the construction of the offices, plant and infrastructure.	Build access roads to site, exposure of earth to create terraces for the construction activities - the building of the plant and office infrastructure. Prestrip site to establish open pit area. The exposure of earth and rock (stark contrast with existing landscape character) results in the altering of the visual quality and sense of place of areas around the project site. These activities which will also generate dust and will be visible in foreground and middleground views from residential areas and farmstead accommodation and public roads. Night lighting during this phase.	**WOM**	Negative	70	High
			WM	Negative	48	Moderate
Operational Phase						
144	Excavation of the mining areas using drill rigs, blasting, excavators and dozers.	Exposure of rock through blasting that would contrast with the existing natural landscape in the immediate vicinity of the open pit as the mining operation advances along with the movement of trucks and excavators that would generate dust. The result is the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WOM**	Negative	75	High
			WM	Negative	60	Moderate

146	Growth of the overburden facility as the mining progresses. Concurrent backfilling and rehabilitation of open pit areas.	Physical presence of the overburden facility that alters the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	WOM	Negative	75	High
			WM	Negative	52	Moderate
Socio-economic Impacts						
Construction Phase						
157	Construction activities	Change to the sense of place	WOM	Negative	75	High
			WM	Negative	75	High
Operational Phase						
164	Mining and processing activities	Sustainable stimulation of economy	WOM	Positive	75	High
			WM	Positive	75	High
165	Mining and processing activities	Creation of employment	WOM	Positive	65	High
			WM	Positive	65	High
166	Mining and processing activities	Impact on government revenue	WOM	Positive	65	High
			WM	Positive	65	High
167	Mining and processing activities	Change to the sense of place	WOM	Negative	75	High
			WM	Negative	75	High
170	Mining and processing activities	Skills development of permanently employed workers	WOM	Positive	45	Moderate
			WM	Positive	65	High
171	Mining and processing activities	Local economic development benefits derived through mine's social responsibility programme	WOM	Positive	65	High
			WM	Positive	65	High
Traffic Impacts						
Construction Phase						
184	Vehicular operation and usage of roads	Increase in traffic	WOM	Negative	65	High
			WM	Negative	65	High
185	Construction of access roads and road upgrades	Improved access points	WOM	Positive	52	Moderate
			WM	Positive	75	High
187	Construction of access roads and road upgrades	Improved road quality	WOM	Positive	52	Moderate
			WM	Positive	75	High
Operational Phase						
190	Vehicular operation and usage of roads	Increase in traffic	WOM	Negative	75	High
			WM	Negative	70	High

K. FINANCIAL PROVISION

As per the GNR 1147 of the NEMA, the calculated provision for closing for the mining operations is as follows:

- The mine's environmental liability is estimated at R 167 801 932.32 (Incl. VAT) over an estimated 30 year Life of Mine (scheduled closure).

L. MONITORING

DEAT (2004) defines environmental auditing as “a process whereby an organisation’s environmental performance is tested against its environmental policies and objectives.” Monitoring and auditing is an essential environmental management tool which is used to assess, evaluate and manage environmental and sustainability issues.

In order to ensure that the objectives of sustainable development and integrated environmental management are met and in order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the proposed operations.

Monitoring and management actions associated with the project are contained in Table 46 of this report as well as in the various specialist reports associated with this project. Table 46 provides a summary of the critical monitoring aspects per specific environmental field.

M. CLOSING STATEMENT

The findings of the specialist studies undertaken within this EIA&EMPR provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. As mentioned in section 24.1, most specialist studies conducted for the project concur that, provided that all the mitigation and management measures and specialist recommendations are implemented, that there are no environmental fatal flaws that should prevent the proposed project from proceeding.

The Traffic Impact Assessment by Havenga (2020) identified that the increase in traffic from the proposed mine will be considered an impact of high significance even with the implementation of mitigation measures. The Traffic Impact Assessment found the positive benefits from improved access points and improved road quality to be of high significance with the implementation of mitigation measures. The Socio-Economic Impact Assessment also found that impacts due to a change in sense of place from the mine will remain high with the recommended mitigation measures. However the Visual Impact Assessment (GYLA, 2020) found that the alteration of the visual quality and sense of place of the study area will be moderate with the implementation of mitigation measures. The proposed N11 Ring Road runs through the proposed mining area close to the open mine pit and effectively cuts the southern part of the mining area in two. In discussions with SANRAL the implementation of this road is a priority and is expected to commence in the near future. It should therefore be noted that impacts in terms of traffic and a change in sense of place will still occur due to the planned N11 Ring Road.

The Socio-Economic Impact Assessment (Urban-Econ, 2020) for the project stated that creation of employment in the area, as well as the associated skills development through training of local people for the commercial and mining sectors, will be a high positive impact and will be a significant benefit of the project. The new employment opportunities created will increase household income levels and buying power which, in turn, will benefit local entrepreneurs, businesses and service providers; thereby resulting in sustainable stimulation of the economy and an increase in government revenue. The proponent’s proposed social development projects could also enhance the economic opportunities for local people.

‘n Afrikaanse opsomming is beskikbaar op versoek.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1. Details of Exigo Sustainability (Pty) Ltd

1.1.1 Details and Expertise of the EAP

Exigo Sustainability (Pty) Ltd (Exigo) assigned the environmental practioners listed in Table 1 to undertake the required environmental authorisation process.

Table 1: Environmental Assessment Practitioner Details

Consultant Name	Designation	Contract Number	Fax Number	Email
Herman Gildenhuys	Environmental Assessment Practitioner	012 751 2160	086 607 2406	herman@exigo3.com
Chantal Uys	Environmental Assessment Practitioner	012 751 2160	086 607 2406	chantal@exigo3.com
Keitumetse Mthimunye	Environmental Assessment Practitioner	012 751 2160	086 607 2406	tumi@exigo3.com

1.2. Expertise of the EAP

1.2.1 The qualifications of the EAP

Please refer to Appendix 1: EAP's Curriculum Vitae & Qualifications as well as Table 2 below.

Table 2: EAP Qualifications and Experience

Consultant Name	Qualifications	Years' Experience
Herman Gildenhuys	M.Sc. Environmental Ecology (Pr.Sci.Nat, EAPASA)	15 years
Chantal Uys	BHCS Hons Archaeology	13 years
Keitumetse Mthimunye	B.Sc. Hons. Geography	3 years

1.2.2 Summary of the EAP's past experience.

Please refer to Appendix 1: EAP's Curriculum Vitae & Qualifications and Appendix 2: Company Profile as well as Table 2 above.

2. DESCRIPTION OF THE PROPERTY

Table 3: Property Details

Farm Name:	Mining Right Application (MRA) proposed on: 1. Farm Uitloop 3 KS (Portion 0 (R/E), Portion 2, Portion 12, Portion 17, Portion 20, Portion 21, Portion 22, Portion 23, Portion 24, Portion 25, Portion 35, Portion 36, Portion 38, Portion 39, Portion 40, Portion 41,

	Portion 42, Portion 44, Portion 46, Portion 47, Portion 48, Portion 49, Portion 51, Portion 52, Portion 53, Portion 54, Portion 55, Portion 56, Portion 57, Portion 58, Portion 59, Portion 61, Portion 62, Portion 63, Portion 65, Portion 66, Portion 70, Portion 71, Portion 72, Portion 73, Portion 74, Portion 75) 2. Farm Amatava 41 KS (R/E of Portion 1, R/E of Portion 2, R/E of Portion 8 (a portion of Portion 1), R/E of Portion 9, Portion 10 (a portion of Portion 8), Portion 11, Portion 12 (a portion of Portion 4), Portion 13 (a portion of Portion 5), Portion 14 (a portion of Portion 5), Portion 15 (a portion of Portion 1), Portion 16 (a portion of Portion 1), Portion 17 (a portion of Portion 8), R/E of Portion 18 (a portion of Portion 8), R/E of Portion 23, Portion 28 (a portion of Portion 9) and Portion 29 (a portion of Portion 18)) 3. Farm Bloemhof 4 KS (Portion 1, R/E of Portion 3, R/E of Portion 4, Portion 6 (a portion of Portion 2), Portion 9 (a portion of Portion 5), Portion 11 (a portion of Portion 4), Portion 13, Portion 14 (a portion of Portion 3), Portion 15 (a portion of Portion 4), Portion 16, Portion 17 (a portion of Portion 3), Portion 18 (a portion of Portion 4), Portion 19 (a Portion of Portion 4), R/E of Portion 24, Portion 25 (a portion of Portion 24), and Portion 26) 4. Farm Piet Potgietersrust Town and Townlands 44 KS (R/E of Portion 46 (a portion of Portion 80), Portion 47, R/E of Portion 48, R/E of Portion 49 (a portion of Portion 80), Portion 50 (a portion of Portion 80), R/E of Portion 51, Portion 98, Portion 99, Portion 100, Portion 101, Portion 121)
Application area (Ha)	Approximately 4660.90
Magisterial district:	The proposed Zebediela Nickel Mine Project is located within the Mogalakwena Local Municipality (LM) within the Waterberg District Municipality (DM) in the Limpopo Province.
Distance and direction from nearest town	The city centre of Mokopane (Potgietersrus) is situated approximately 9 km south-west of the project area. The nearest settlement is Mahwelereng B, about 0.52 km from the western mining right boundary and 1.1 km from the edge of the open pit.
21 digit Surveyor General Code for each farm portion	T0KS00000000000300000; T0KS00000000000300002; T0KS00000000000300012; T0KS00000000000300017; T0KS00000000000300020; T0KS00000000000300021; T0KS00000000000300022; T0KS00000000000300023; T0KS00000000000300024; T0KS00000000000300025; T0KS00000000000300035; T0KS00000000000300036;

	T0KS00000000000300038;	T0KS00000000000300039;
	T0KS00000000000300040;	T0KS00000000000300041;
	T0KS00000000000300042;	T0KS00000000000300044;
	T0KS00000000000300046;	T0KS00000000000300047;
	T0KS00000000000300048;	T0KS00000000000300049;
	T0KS00000000000300051;	T0KS00000000000300052;
	T0KS00000000000300053;	T0KS00000000000300054;
	T0KS00000000000300055;	T0KS00000000000300056;
	T0KS00000000000300057;	T0KS00000000000300058;
	T0KS00000000000300059;	T0KS00000000000300061;
	T0KS00000000000300062;	T0KS00000000000300063;
	T0KS00000000000300065;	T0KS00000000000300066;
	T0KS00000000000300070;	T0KS00000000000300071;
	T0KS00000000000300072;	T0KS00000000000300073;
	T0KS00000000000300074;	T0KS00000000000300075.
	T0KS00000000000410001;	T0KS00000000000410002;
	T0KS00000000000410008;	T0KS00000000000410009;
	T0KS00000000000410010;	T0KS00000000000410011;
	T0KS00000000000410012;	T0KS00000000000410013;
	T0KS00000000000410014;	T0KS00000000000410015;
	T0KS00000000000410016;	T0KS00000000000410017;
	T0KS00000000000410018;	T0KS00000000000410023;
	T0KS00000000000410028;	T0KS00000000000410029.
	T0KS00000000000400001;	T0KS00000000000400003;
	T0KS00000000000400004;	T0KS00000000000400006;
	T0KS00000000000400009;	T0KS00000000000400011;
	T0KS00000000000400013;	T0KS00000000000400014;
	T0KS00000000000400015;	T0KS00000000000400016;
	T0KS00000000000400017;	T0KS00000000000400018;
	T0KS00000000000400019;	T0KS00000000000400024;
	T0KS00000000000400025;	T0KS00000000000400026.
	T0KS00000000004400046;	T0KS00000000004400047;
	T0KS00000000004400048;	T0KS00000000004400049;
	T0KS00000000004400050;	T0KS00000000004400051;
	T0KS00000000004400098;	T0KS00000000004400099;
	T0KS00000000004400100;	T0KS00000000004400101;
	T0KS00000000004400121.	

3. LOCALITY MAP

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

Please refer to Appendix 3: Locality Map.

4. 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

Please refer to Appendix 4: Site Plan

4.1. Listed and specified activities

The EIA and Waste Management Licence listed activities applicable to the project are specified in Table 4 below.

For the Site Layout Plan indicating the activities below refer to Appendix 4: Site Plan.

Table 4: Listed activities to be authorised

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
Mining of ore from open cast pit	One open pit with footprint of 40 ha	X	GNR 984 – NEMA Listing Notice 2 of 2014 Activity 15	The clearance of an area of 20 hectares or more of indigenous vegetation.		
Construction of a processing plant and associated infrastructure including mine offices and workshops & establishment of ore stockpiles	33 ha	X	GNR 984 – NEMA Listing Notice 2 of 2014 Activity 17	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), including— (a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource,		

[1] **GNR 983 GNR 984 or GNR 985, as amended on 7 April 2017**

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
				including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Notice 2 applies.		
			GNR 985 – NEMA Listing Notice 3 of 2014 Activity 14 (ii) & (a) or (c) e. i. (ff) (hh)	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs — (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse. e. Limpopo i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in Systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other		

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
				protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.		
Establishment of overburden and topsoil stockpiles & deposits	Overburden facility: 44 ha Topsoil stockpile: 20 ha		GNR 985 – NEMA Listing Notice 3 of 2014 Activity 12 e. (ii)	The clearance of an area of 300 square metres or more of indigenous vegetation. e. Limpopo ii. Within critical biodiversity areas identified in bioregional plans.	X (GNR 921 – NEMWA Category B, Activity 10, 11)	The construction of a facility for a waste management activity listed in Category B of this Schedule; and The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right in terms of the MPRDA
Construction of facilities for the storage of oil, diesel, fuel and explosives	Hydrocarbon storage: total capacity of 607 m^3 Explosives storage: 250 m^2, <500 m^3	X	GNR 984 – NEMA Listing 2 of 2014 Activity 4	The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.		
Construction of stormwater and service water dams: • Potable Water Tank • Raw Water Dam	120 m3 24793 m3	X	GNR 984 – NEMA Listing Notice 2 of 2014 Activity 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the		

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
• Pollution Control Dam (Plant) • Pollution Control Dam (Overburden) • Settling Dam (Open Pit)	19094 m3 24753 m3 2000 m3			generation or release of emissions, pollution or effluent.		
			GNR 983 – NEMA Listing Notice 1 of 2014 Activity 13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.		
Potable water reticulation	Potable water pipeline: 155 mm diameter and 725 m in length for surface pipes; 105 mm diameter and 6400 m in		GNR 983 – NEMA Listing Notice 1 of 2014 Activity 9	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or stormwater— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more.		

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
	length for buried pipes.					
Process water reticulation Sewage reticulation	Process water pipeline: 0.4 m diameter and 2350 m in length surface pipes Sewage pipeline: 0.155 m diameter and 725 m in length for surface pipes; 0.105 m diameter and 6400 m in length for buried pipes.		GNR 983 – NEMA Listing Notice 1 of 2014 Activity 10	The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more		
Construction of access roads and internal haul roads and upgrading of existing access roads (including the relevant	Access Roads: ± 1.1 km long x 10 m wide	X	GNR 983 – NEMA Listing Notice 1 of 2014 Activity 24 (ii)	The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.		

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
stormwater infrastructure)	Haul Roads: ± 2 km long x 16 m wide		GNR 983 – NEMA Listing Notice 1 of 2014 Activity 56 (ii)	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;		
			GNR 985 – NEMA Listing Notice 3 of 2014 Activity 4 e. (i) (ee) & (gg)	The development of a road wider than 4 metres with a reserve less than 13,5 metres. e. Limpopo i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas.		

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
			GNR 985 – NEMA Listing Notice 3 of 2014 Activity 18 e. i. (ee), (gg) & (hh)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. e. Limpopo i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.		
Partial backfilling of open pits	40 ha		N/A		X (GNR 921 – NEMWA Category B, Activity 10 & 11)	The construction of a facility for a waste management activity listed in Category B of this Schedule; and The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right in terms of the MPRDA.
Operation of a Sewerage Treatment Plant (STP) & Water Treatment Plant (WTP)	STP: 1.6 L/s (52 m3 per day)		GNR 983 – NEMA Listing Notice 1 of	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with		

Name of Activity	Approximate Aerial Extent of the activity ha or m²	Listed Activity	Applicable Listing Notice [1]	Description of EIA Listed Activity	Waste Management Authorisation	Description of Waste Management Listed Activity
	WTP: 5ML per day (5000 m^3/day)		2014 Activity 25	a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.		

4.2. Water Use Licence Application

A Water Use Licence Application is currently in process and will be submitted to the Department of Water and Sanitation following the submission of the Final EIA & EMPr Report and the finalisation of the detail design of the Overburden Facility. A water use licence will be required for the following water uses as per section 21 of the National Water Act (Act 36 of 1998) (NWA):

- Section 21(a) - Abstraction of groundwater
- Section 21(b) – Storage of potable water in Potable Water Tank
- Section 21 (c) - Impeding or diverting the flow of water in a watercourse (drainage line impacted by open pit and overburden facility)
- Section 21 (g) – disposing of waste in a manner which may detrimentally impact on a water resource (Overburden Facility, Dust suppression, Raw Water Dam, Sludge Tanks, PCD at mine infrastructure (plant) area and PCD at Overburden Facility)
- Section 21 (i) - Altering the bed, banks, course or characteristics of a watercourse (drainage line impacted by open pit and overburden facility)
- Section 21(j) Dewatering of open pit

5. DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

Lesego Platinum Uitloop (Pty) Ltd (LPU) intends to develop a nickel mining operation near Mokopane in the Limpopo Province of South Africa. The proposed Zebediela Nickel Mine project is located in the Mogalakwena Local, and Waterberg District Municipalities, approximately 9 km north-east of the city centre of Mokopane and approximately 250 km north-northeast of Johannesburg. The project area can be accessed from Johannesburg using the N1 highway to Mokopane and then utilizing the Percy Fyfe road to the project area. The proposed site is mostly located on privately owned land, but also on government owned land and is situated immediately east of the local settlements Mahwelereng and Ga-Madiba near Mokopane in the Limpopo Province. The nearest settlement is Mahwelereng B, approximately 0.52 km from the western mining right boundary and 1.4 km from the edge of the open pit. The proposed mining right area will be located on farms where LPU currently owns the three prospecting rights namely; Uitloop 3KS (1,925.29 ha), Amatava 41 KS and Bloemhof 4 KS (2620.34 ha), and Piet Potgietersrust Town and Townlands 44 KS (115.26 ha). The Mining Right Area covers a combined area of roughly 4,660.90 ha, measuring approximately 11.9 km from south to north and 7.3 km from east to west. Mine infrastructure is however only planned to be located on approximately 150 ha of the larger Mining Right Area. Approximate coordinates for the centre of the proposed open pit are:

Latitude: S - 24°7'17.154"

Longitude: E 29°1'5.63"

The resource limit of the identified nickel resource comprises an intrusive pyroxenite-harzburgite-dunite body, approximately 8 km by 1.5 km in extent at outcrop, previously correlated with the Lower Zone of the Bushveld Complex and called Uitloop II. The intrusion strikes north-west and dips at 40˚ to the south-west. It is truncated by the Mahopani Fault and estimated that the body attains a thickness of 600 m. The proposed mine will predominantly mine nickel (Ni) and possibly platinum group minerals (PGM's) and associated minerals (platinum, palladium, rhodium, gold, ruthenium, iridium, osmium, copper, cobalt and chromite), iron ore and vanadium from magnetite. The Zebediela Ni resource will be exploited by open pit mining methods.

Mining will be focused on the extraction of 28.8 Mt of sulphide-containing material using an open pit, conventional truck and shovel with partial backfill mining method. The top 40 m to 50 m of the disseminated sulphide material is oxidized (Oxide Zone) and will be stockpiled on an overburden facility. The overburden will be trucked out and hauled to the overburden facility. Concurrent backfilling will take place from year 10 once sufficient capacity exists in the open pit. The entire pit below the oxide zone is developed in mineralised material (Sulphide Zone) and ore would be trucked out and hauled to the processing plant of a nearby mine, . between 7 and 25 km north-west of the open pit. The open pit design on surface has an approximate pit length of 800 m, with an average width of 500 m and a depth of 90 m. A 5 m high and 10 m wide berm will be constructed around the entire pit perimeter. The life of mine is planned for 30 years, but with the potential to continue mining due to the size of the deposit. The first 2 years will be used for construction of the access roads, plant infrastructure, fencing, stripping of the open pit and Run of Mine (RoM) stockpiling starting in year 1 with 100 ktpm.

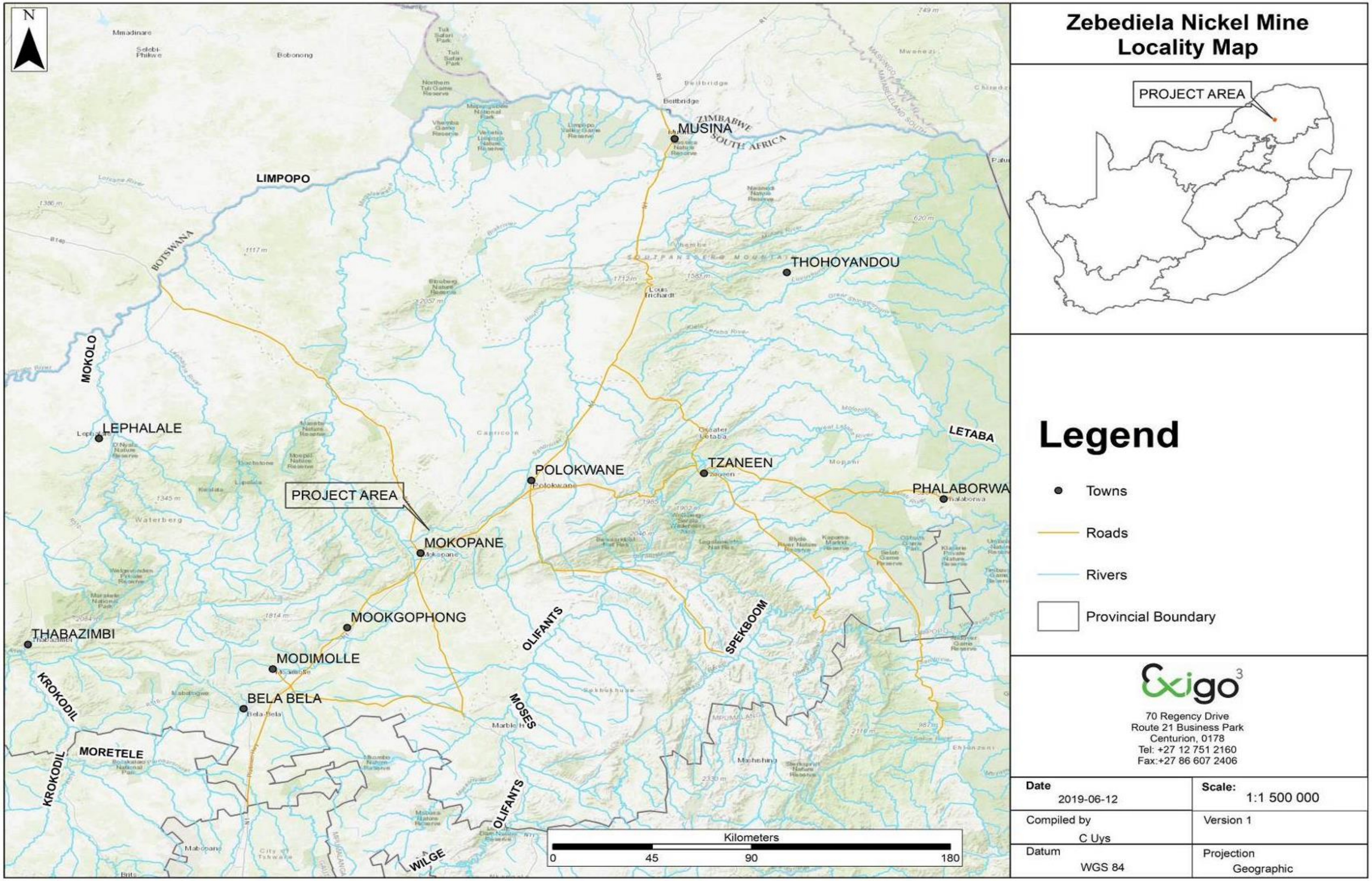

Figure 1: Regional Locality Map of the project area

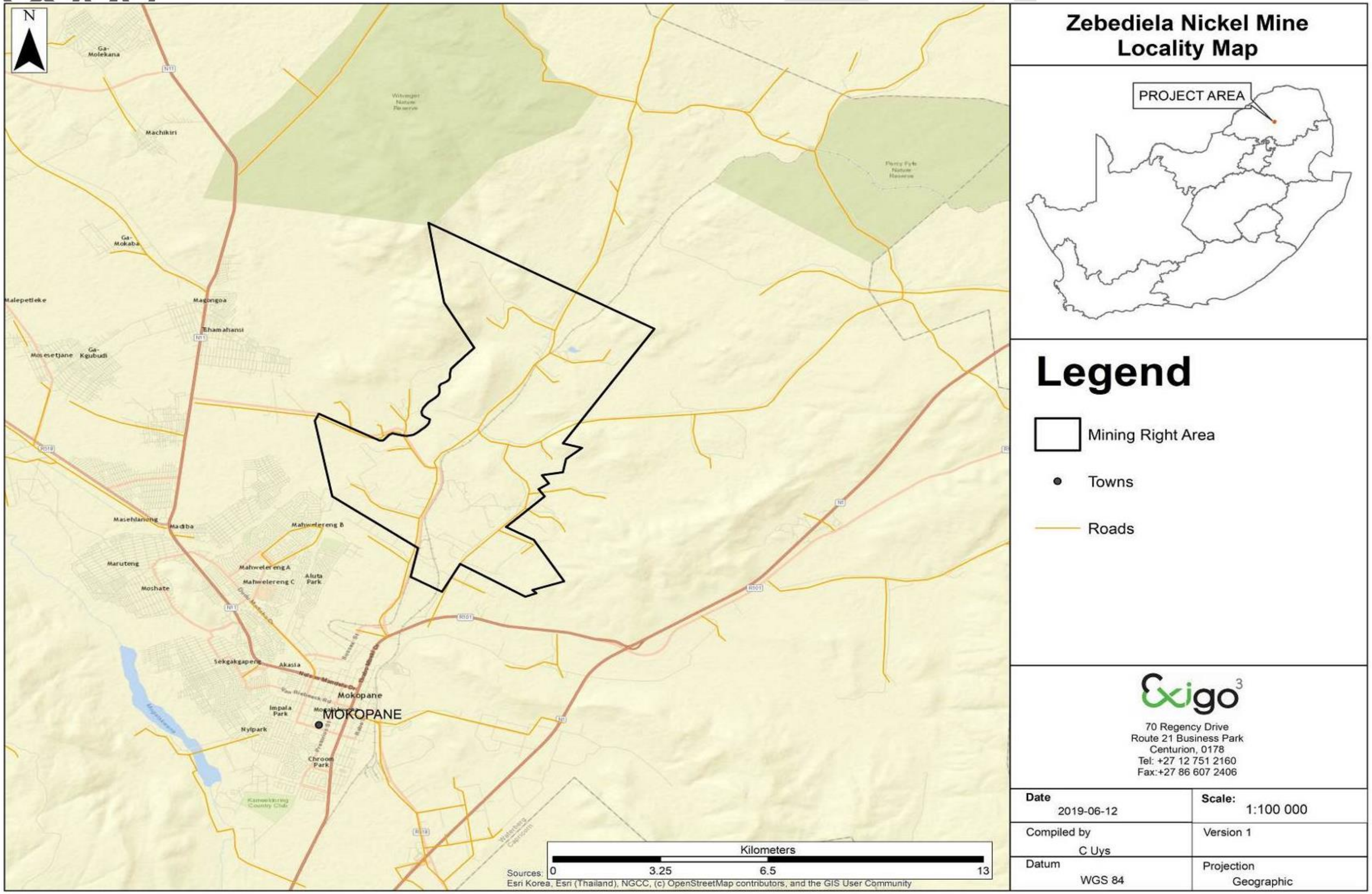

Figure 2: Locality Map of Mining Right Application (MRA) area

5.1. Mining Method

At full production, roughly 100 kilo ton per month (ktpm) RoM material will be mined with a 0.34 stripping ratio from year 3 to year 12. The first two years will mainly consist of stripping at a rate of 1,237 kilo ton per annum (ktpa), this will reduce to 480 ktpa up to year 12. Overburden stripping is limited to the Oxide Zone which is some 46.5m thick. The designed pit will be mined through conventional truck and shovel with partial backfill mining methods. It is estimated that 11 hectares (ha) of initial clearing and grubbing of vegetation is required for the establishment of the mining operations.

Initially, mining will only be from one area of the pit with mining commencing from the north-western sector of the mineral resource and will be develop across the full width of the pit in a south-easterly direction along strike for a total length of 800 m. The overall slope of the sides of the pit will be 50°. The overburden and mineralised material will be loaded in pit with excavators with 26 m^3 buckets and transported by 225 t rigid body dump trucks to the overburden facility while the mineralised material will be transported by either truck or conveyor to the processing mine infrastructure footprint for primary and secondary crushing and screening. A 15 m bench height and mining blocks of 50 m by 20 m are planned for the overburden and mineralised material. Ore will be processed at an on-site crushing and screening plant before being loaded on trucks for transport to a nearby mine for further processing.

5.2. Life of Mine

The mineral resources included in this project are extensive, giving an overall life of mine in excess of 30 years. Although, for the mining right application only 30 years life of mine will be applied for. The geometry of the orebody allows for continuous mining via open pit mining up to a depth of 90 m.

Production overburden stripping of 2.47 Mt takes place in year 0 to year 2 and continues concurrent with production operations between year 3 and year 12 at a stripping ratio of 0.34:1. Overburden removal at the current pit design will only be completed in year 13, after which no further overburden stripping will be required.

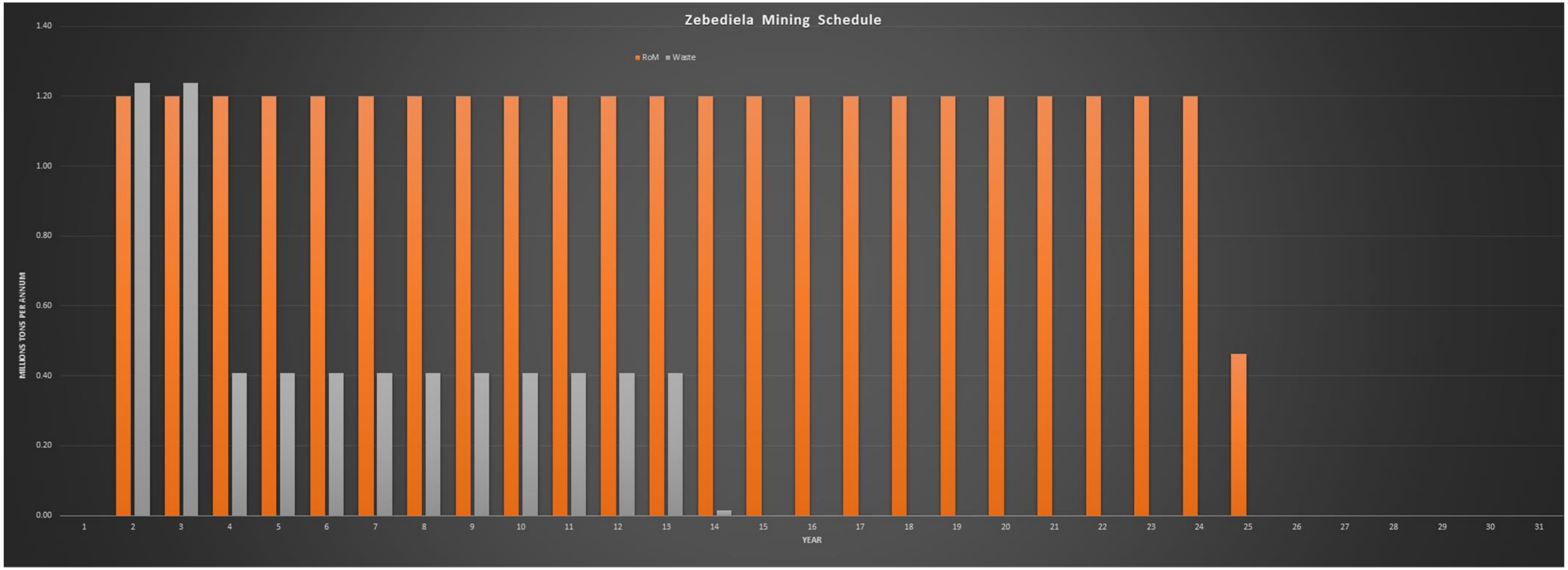

Figure 3: Proposed Mining Schedule

5.3. Surface Infrastructure

The proposed Zebediela Nickel Mine is located within an area with existing mining activities, such as Anglo American's Mogalakwena Mine and Ivanplats Platreef Project which is approximately 22 km and 9 km north-west of the proposed site respectively. The infrastructure in the area is fair with the city centre Mokopane located less than 10 km from the project area. Mokopane is a well-serviced town near National roads, the north-south National railway line, electricity, and bulk water supply.

The area is serviced by several provincial roads as well as the N1 national road linking it to Zimbabwe and the rest of South Africa. There is one commercial airport in the region (Polokwane International) as well as a few private airstrips that are mainly used for tourism and private use.

The town of Mokopane, as well as the nearby communities of Mahwelereng, Ga-Madiba, Masodi, Tshamahansi, Phola Park, Sekgakgapeng, Mosate, Maroteng, and Masehlaneng will provide skilled and unskilled labour for future operations. All access roads are mainly existing tar and gravel district roads and will need to be upgraded.

Envisaged infrastructure will comprise of the following:

- Primary and secondary crushing and screening plant
- Ore handling and storage facilities (RoM stockpiles)
- Administration building, security building, change house, messing and canteen facilities, mining and geology offices, maintenance and engineering workshops and offices, warehouse and offices, medical station, fire station, laboratory and satellite ablutions
- Potable water tank (120 m^3 combined capacity) and reticulation
  - Pipelines for the Potable water tank are designed for:
    - 155 mm diameter and 725 m length for surface pipes
    - 105 mm diameter and 6400 m for buried pipes.
- Raw Water Dam (24 793 m^3)
- Sewage reticulation
  - Pipelines for the Sewage reticulation are designed for:
    - 155 mm diameter and 725 m length for surface pipes
    - 105 mm diameter and 6400 m for buried pipes.
- Electricity distribution facilities (overhead powerlines, transformers and mini substations)
- Hydrocarbon storage facilities (Total Capacity of: 607 m3);
- Waste water treatment works;
- Water treatment plant;
- Pollution Control Dam (PCD) for the plant area (19 094 m3 capacity);
- PCD for the overburden facility (24 753 m3 capacity);
- Haul and access roads and bridges;
- Perimeter and internal fencing;
- Overburden and topsoil storage facilities;
- Explosives Store

The open pit and mine infrastructure (plant, offices, workshops, etc.) footprints are proposed to be 40 ha and 33 ha respectively with an overburden and topsoil footprint of 44 ha and 20 ha respectively, in the larger proposed 4660.90 ha mining right area.

5.4. Services and Supporting Infrastructure

Water Supply

The estimated maximum water demand is 14 480 m^3/mon (480 m^3/d or 0.15 m^3/ton milled). For the purposes of water supply, a safety factor of ±1.5 should be applied on the maximum demand scenario to secure 700 m3/d for the operation. During construction an estimated 112.5 m3 per month will be required. Various water supply options were identified and are included in section 8.2.3.1. These options were further assessed in the Water Supply Options Analysis Study (Appendix 6.6: Environmental Mine Water Balance and Water Supply Options Analysis).

Electricity

The proposed mining activities will require an estimated 2 Megawatt (MW), which equates to 15.58 Megawatt Hours per annum (MWhr/a). Part of Eskom's capacity expansion programme in Limpopo is the Medupi Base Load Coal Power station with linkages into the existing power grids. Two Eskom expansion projects would influence the Zebediela mine area, namely the Mokopane Integration Project and the Medupi Integration (Charlie) Phase 2B project.

One of the reasons for these two expansion projects is the upsurge in demand for electricity in the Mokopane area due to the increased mining activity and that the Witkop substation close to Polokwane cannot support the load growth. The Mokopane integration project includes the recently constructed transmission substation (Borutho substation) near Mokopane. The Borutho substation is located 37 km north of Mokopane and approximately 30 km north of the Zebediela project. Bulk power reticulation will consist of overhead powerlines, transformers and mini substations on site as well as diesel generators for emergency power supply. The power supply to the proposed mine will however be subject to a separate EIA process which will need to be undertaken by Eskom.

Roads

The proposed site is located approximately 12.5 km north-west of the N1 which serves as the main road between Polokwane and Johannesburg. Other roads close to the project area include the R101 (5.5 km south-east) and the N11 (6.6 km north-west). All three these roads are national roads managed by SANRAL.

The district roads proposed to obtain access to the mine project are managed by the Limpopo Roads Agency (RAL) and any upgrade and access to these roads need to be negotiated in conjunction with this authority.

Two alternative access roads were assessed and entail the following:

1) Access route 1 – Amatava gravel road - this proposed access route will entail access from an existing gravel district road serving the surrounding communities with access to the R101 as well as the proposed N11 Ring Road.
2) Access route 2 – Turfspruit gravel road – connects the Percy Fyfe to the N11 north of the proposed open pit. This route is currently used by contractors, wanting to avoid driving the N11 through the communities, working at Anglo American's Mogalakwena mine and Ivanplats' Platreef Project.

The Percy Fyfe road connects the proposed surface infrastructure of the mine to the proposed N11 Ring Road via a proposed intersection. This would be the main route used for haulage of ore to a nearby mine.

Water treatment

The water treatment plant will be a turnkey package, with a capacity of 5 ML per day. Some of the raw water as well as treated water from the waste water treatment works will be fed into the water treatment plant for further processing as per the water requirements.

The raw feed water will consist of dirty water returned from operations and of top-up water from dewatering the pit.

Treatment methods for ensuring water meet SANS 241 Class I (potable water) can be categorised as follows:

- Chemical removal by precipitation of insoluble salts by chemical treatment.
- Flocculation, coagulation and settling of insoluble and large contaminates.
- Flocculation, coagulation and filtering of smaller insoluble contaminates.
- Chlorination or another suitable sterilisation.
- Ultra-filtration to remove microscopic contaminates.
- Reverse osmosis to remove remaining undesirable dissolved contaminates.

Waste water treatment works

An onsite activated sludge treatment facility will be constructed to treat sewage generated during the operational phase. The sludge treatment plant will be designed to process 1.6 ℓ/s with 10 000 ℓ combined capacity sludge tanks.. This would cater for both mining and plant personnel. All sewage drainage, feeding the sludge plant will be gravity fed. The position of the waste water treatment works close to the water treatment plant and the pollution control dam allows for easy local distribution of treated water.

Use will be made of temporary chemical sanitary facilities for sewage to be generated by construction workers during the construction phase. Third party waste removal contractors will be responsible for the supplying, servicing, and relocating of temporary chemical sanitary facilities. The contents of the temporary chemical toilets will be disposed of at a registered hazardous waste disposal facility.

Solid waste management

All waste will be collected at the mine salvage yard where it will be sorted. Dedicated bays will be provided for different wastes. Recycling initiatives from the local communities will be investigated. Solid waste will be collected by a contractor and transferred to the closest registered waste facility. Used hydrocarbons will be stored in containers within a bunded area from where it will be collected and removed by an accredited contractor.

Blasting

The bulk emulsion will be stored on the surface in the Explosives Store prior to mixing in the open pit with sensitizer. Anvex will be received at the off-loading bay on the surface. The Anvex will be logged into a register, before being transported to the open pit by the explosives transporter. The combined capacity of the Explosives Store will not exceed 500 cubic metres.

Explosives will be delivered daily and transported to the open pit to be combined with the Anvex for blasting purposes. An explosive store has been provided for on the surface.

Stormwater management

The proposed water management methodology at the mine should be based on the Best Practicable Environmental Option (BPEO) principle with responsible use and best practices. The impact of development on water quantity, quality and cost should be minimised. According to the GN R. 704 of 4 June 1999 clean and dirty water should be separated and process water recycled and re-used. The dirty water will be kept in a closed circuit and spillages minimised.

Note that the term “clean water” refers to water that has not been interfered with and “dirty water” is water that is handled in or precipitated on the mine operations. Dirty water is therefore not necessarily contaminated. The following water management aspects are included in the design of the mine infrastructure and waste facilities:

- Clean stormwater will be diverted around the mine areas so that dirty and clean water are separated.
- No infrastructure will be located below the 1:100 year river flood line.
- Dirty water will be kept in a closed circuit and be re-used in the mining processes.

Make-up process water will also be used in the following order:

- On-site stormwater
- On site Sewerage Works

The requirements of regulation GN704 will be adhered to, especially the requirement for the 19 094 m3 pollution control dam which should be designed to spill not more than once in fifty years.

Evaporation losses should be minimised, unless there is surplus water in the system (e.g. during storm events, the pollution control dam could be used to evaporate surplus water.

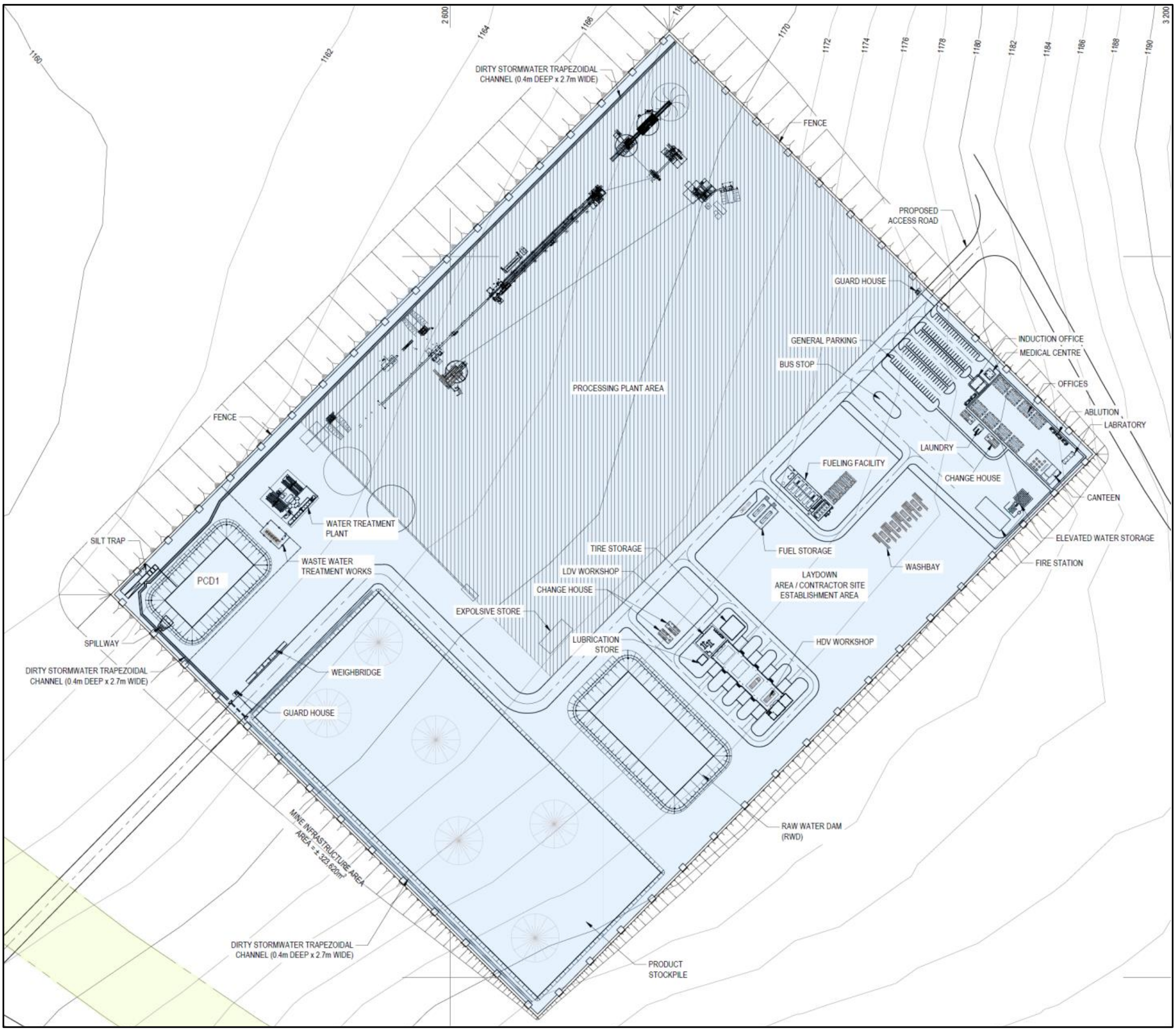

Figure 4: Mine Infrastructure (Processing Plant and associated infrastructure) Layout.

6. POLICY AND LEGISLATIVE CONTEXT

The following legislation, policies and guidelines were considered during the compilation of this EIA&EMP Report and the relevant specialist studies conducted and was heeded throughout the EIA process:

- The Constitution of the Republic of South Africa (Act No. 108 of 1996)
- The National Environmental Management Act (Act No. 107 of 1998) read with the Environmental Impact Assessment Regulations, 2014 (as amended on 7 April 2017) and Environmental Impact Assessment Listing Notices 1, 2 and 3
- Limpopo Environmental Management Act No. 7 of 2003 (LEMA)
- DEA Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010 (GNR 891 of October 2014)

- National Environmental Management Act, 1988 (Act No. 107 of 1998) – Financial Provisioning Regulations, 2015 - GNR 1147/2015, as amended
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)
- Mineral and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) - Minerals and Petroleum Resources Development Regulations, GNR 527/2004
- National Water Act (Act No 36 of 1998) (NWA)
- Regulations regarding the procedural requirements for Water Use Licence Application and Appeals, GNR 267/2017
- National Water Act, (Act No. 36 of 1998) Section 26(1)(h) & (l) read together with GNR 2834/1985 Regulations 2 promulgated under the Water Act, (Act No. 54 of 1956)
- The Water Services Act (Act No. 108 of 1997)
- National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
- National Forest Act (Act 84 of 1998) (NFA)
- National Environmental Management: Biodiversity Act (Act 10 of 2004)
- Alien and Invasive Species Lists, GNR 599/2014 read with Alien and Invasive Species Lists, 2016 – GNR 864/2016
- Threatened or Protected Species Regulations, 2007 – GNR 152/2007
- Protected Areas Act (Act No. 57 of 2003)
- National Veld and Forest Fire Act, (Act No. 101 of 1998)
- Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA)
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)
- National Greenhouse Gas Emission Reporting Regulations – GNR 336/2016
- National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA)
- Hazardous Substances Act (Act No. 15 of 1973)
- Spatial Planning and Land Use Management Act (Act No. 16 of 2013) (SPLUMA)
- Waterberg District Municipality Final Draft Spatial Development Framework (SDF) 2009
- Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20

For more detail on the specific legislation, policies and guidelines considered, as well as reference to where it was applied, please refer to Appendix 8: Policy and Legislative Context.

7. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

International conventions, national plans and programmes as well as the relevant Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Strategic Environmental Assessments (SEA) were taken into account in assessing the development in a spatial context. Trends in the South African and international nickel markets have also been taken into consideration in this assessment of the need and desirability of the project.

7.1. Need

General

Nickel is a naturally occurring metallic element with a silvery-white, shiny appearance. It has excellent physical and chemical properties (Figure 5), which makes it essential in hundreds of thousands of products (Nickel institute, 2018). It is the finest of the alloy metals and is used in a number of products for consumer, military, transport/aerospace, marine and architectural applications. It is predominantly used in industrial and consumer products, which includes stainless steel, magnets, coinage, and other steel and non-ferrous (including "super") alloys, plating, batteries, foundry and other (INSG, 2016).

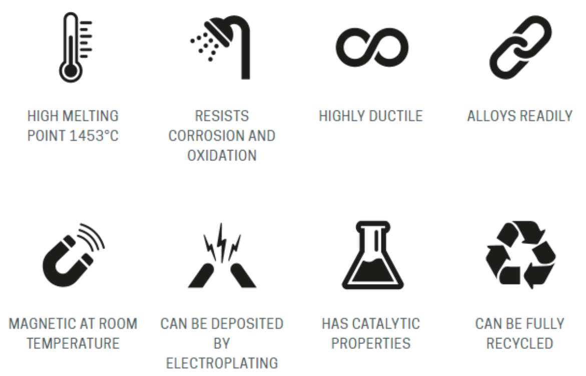

Figure 5: Nickel physical and chemical properties (Nickel institute, 2018)

Nickel occurs naturally, mainly as oxides, sulphides and silicates. Over two million tonnes of new nickel are used annually and mined in more than 25 countries worldwide (Nickel institute, 2018). Currently, the majority of nickel is mined from laterite and magmatic sulphide deposits. In the laterite deposits the nickel is released from weathering of ultramafic rocks and the primary ore minerals are nickeliferous limonite (Fe,Ni)O(OH), and garnierite (Ni-Mg hydrosilicate), whereas in the sulphide deposits, the main ore mineral is pentlandite $(Ni,Fe)_9S_8$ (Balmoral resources, n.d.),

Uses

Nickel is a US$20+ billion per year industry with over two thirds of the metal today going into stainless steel production. Nickel use in electric vehicle (EV) batteries is forecast to grow significantly over the next 10 years and this new nickel use will result in a structural change in the nickel market (Horizonteminerals.com, 2019).

Globally, the nickel value chain supports large numbers of jobs many of which are high-skill manufacturing occupations. The stainless-steel industry demands 70% of the world's nickel resources. Nonferrous alloys, alloy steels and castings consume 15% of the world's nickel resources while the plating industry uses 7%, the foundry and battery industries use 3% each and the other industry uses about 2%.

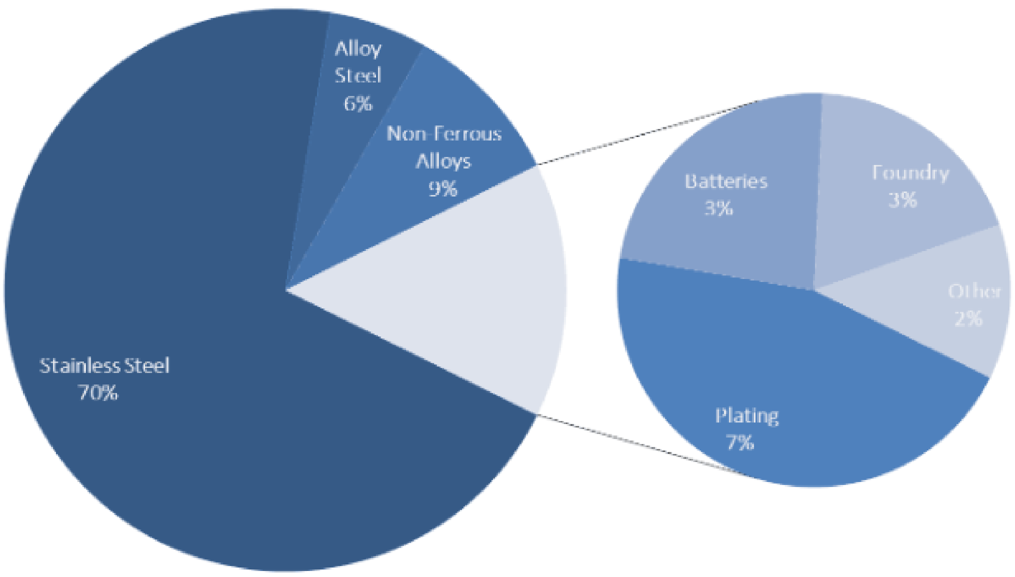

Figure 6: Nickel Usage (INSG, 2016)

Products from the aforesaid industries are widely used across many sectors globally such as engineering, building and construction, transport, metals and electronic sectors *inter alia* (Nickel Institute, 2018). Furthermore, nickel is used in many oil, gas and electricity generation operations and overall reduces the impacts caused by these operations, more so in the electricity generation industry which is driven by the use of coal, oil and natural gases (Nickel Institute, 2018). Nickel-containing materials are frequently selected for their corrosion and heat resistance in electricity generation industries and reduce the impacts of using coal and oil in such industries.

Supply

Currently Africa is not a major contributor to global nickel production. The main producers are the Nkomati mine in South Africa; the Ambatovy mine in Madagascar; and mines in Zimbabwe operated by Africa focused Asa Resources Group and platinum group metals (PGMs) mines on the country's Great Dyke, the world's second largest PGM resource after the Bushveld Igneous Complex in South Africa (Creamer Base Metals Report, 2017).

Nickel is also obtained from other mines in South Africa where it is mined as an associated mineral. Nickel has been obtained from 21 mining operations which include Platinum Group Metals (PGM) operations and Copper mines in South Africa since 2006 (DMR, 2009). Approximately 87% of South Africa's total nickel output is produced from PGM mining operations while 1% arises from copper mining. Primary nickel is mined at only one mining operation in the Mpumalanga Province which indicates a gap in the market for the primary mining of nickel in the country (DMR, 2009).

In South Africa, nickel is considered to be a sought-after mineral in the battery material market, and given the country's good resources of this mineral, several manufacturing job opportunities exist (DTI, 2018). Nickel products such as batteries can also be recycled which indicates the durability of this mineral throughout its life cycle. Ferrous metals, including nickel, vanadium and manganese are consumed primarily by the steel and stainless-steel industry (DMR, 2011). According to the Department of Trade and Industry (DMR, 2018), the Industrial Policy Action Plan (IPAP) 2018/19-2020/21 focuses on the: "promotion of beneficiation and value-addition to the country's minerals and other natural resources and the strengthening of important economic linkages between the primary agriculture, mining and manufacturing sectors. As such, the 2011 Beneficiation Strategy for the Minerals Industry of South Africa thus provides a framework that will enable an orderly development of the country's mineral value chains. Investment into minerals such as nickel therefore is expected to create employment, contribute towards skills development and technology (DMR, 2011). Such investments into the nickel industry ultimately contribute to the country's economic growth.

As nickel is currently only primarily mined at one mining operation in the Mpumalanga Province, there is clearly a need for nickel mines in the country. A 2018 trend analysis by BMI Research explains that the proposed Zebediela Nickel Mine has an estimated 1.5-billion tonnes of both inferred and indicated resources and will be able to produce 20 000 tonnes of nickel annually (Moolman, 2018). The Zebediela Mine stands to create employment opportunities beyond just mining, thus improving the lives of many South Africans and holistically contributing to the country's economic growth. Should the proposed mine not be developed, this will result in the benefits associated with nickel throughout its value chain not being realised.

Demand

Wood Mackenzie estimates the non-stainless steel industry to increase its demand by approximately 5 % a year, from 750 kt in 2019 to 980 kt in 2019 to 980 kt in 2025 and 2.11 Mt in 2040. This sustained period of strong growth is driven by the forecasts of nickel consumption in Li-ion batteries for electric vehicles (EVs) and energy storage (ES), which is anticipated to accelerate from the mid to late 2020s (Figure 7) (Horizonteminerals.com, 2019). Reuters also reported that the demand for nickel is expected to soar as governments, companies, and individual consumers aim to reduce air pollution caused by fumes emitted by fossil-fuelled vehicles (Desai, 2019).

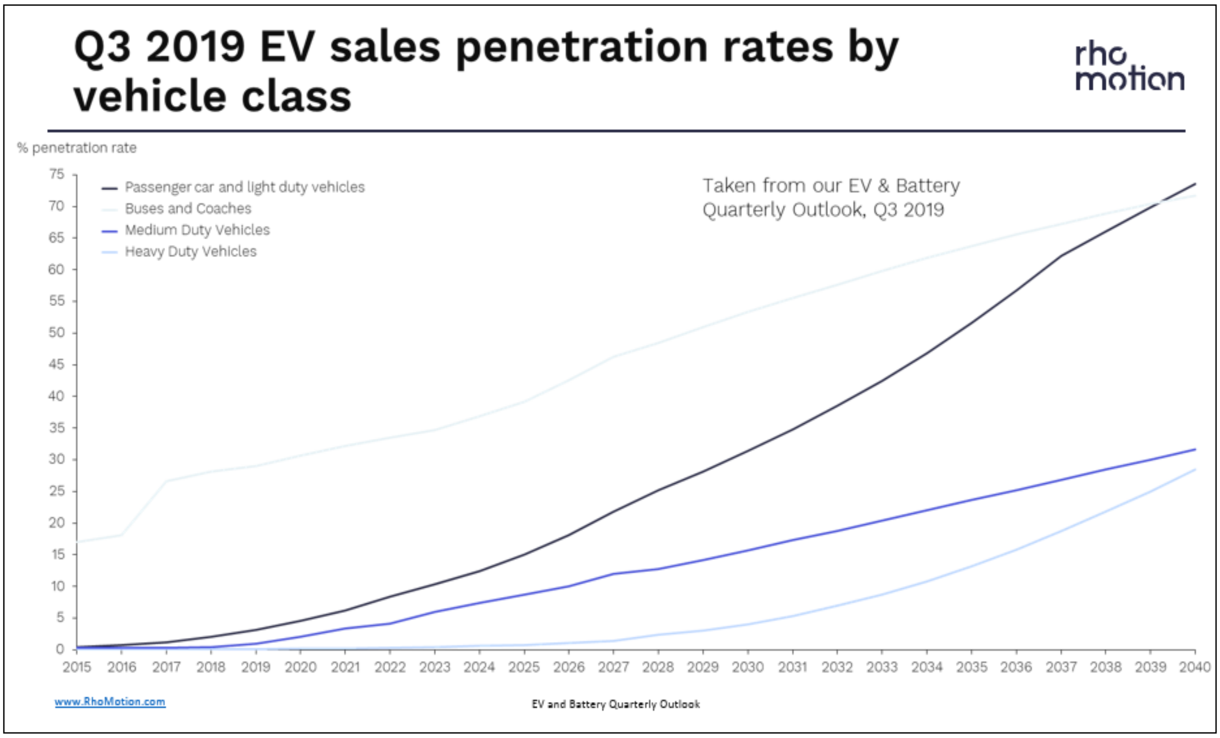

Figure 7: EV Sales penetration rates by vehicle class (Reuters, 2019)

Wood Mackenzie predicts that the increase in nickel demand from EVs will equate to an increase in nickel use from 128 kiloton (kt) in 2019, to 265 kt in 2025 and 1.23 Megaton (Mt) in 2040. Over this period the share of global nickel demand taken by EV/ES will increase from only 4% in 2018 to 31% in 2040 (Horizonteminerals.com, 2019).

Price

Nickel has been one of the best performing base metals of 2019. The price of nickel has increased with more than 70% since the start of the year, moving above $18,000/tonne on the London Metal Exchange (LME) in September and has subsequently retraced back to $16,500/tonne (Figure 8) (Horizonteminerals.com, 2019). Other factors fuelling the price increase are the low stock levels at the LME (Figure 9), some analysts perceive it as critically low, and the increase in demand for EV’s. Wood Mackenzie forecasts that a deficit of 60 kt through 2027 will most likely bring nickel prices closer to US$ 25,000/t by 2025 and US$28,000/t by 2027.

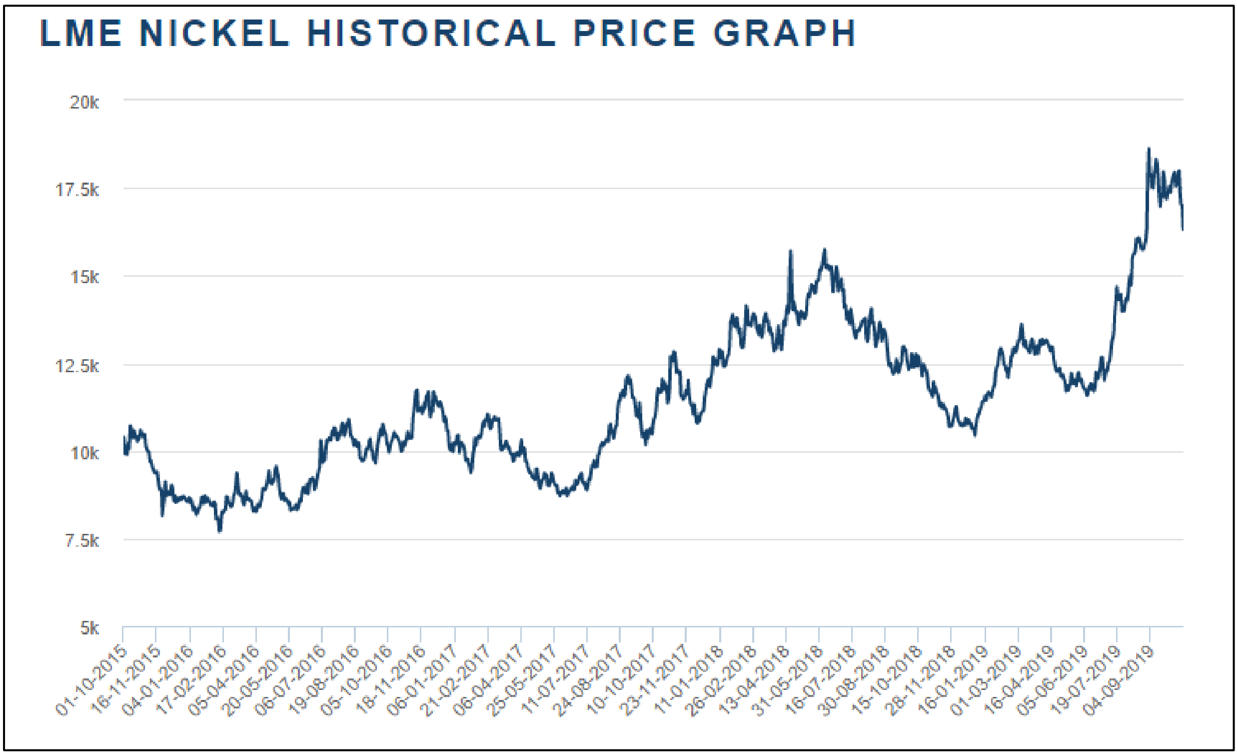

Figure 8: LME Nickel Historical Price Graph (LME, 2019)

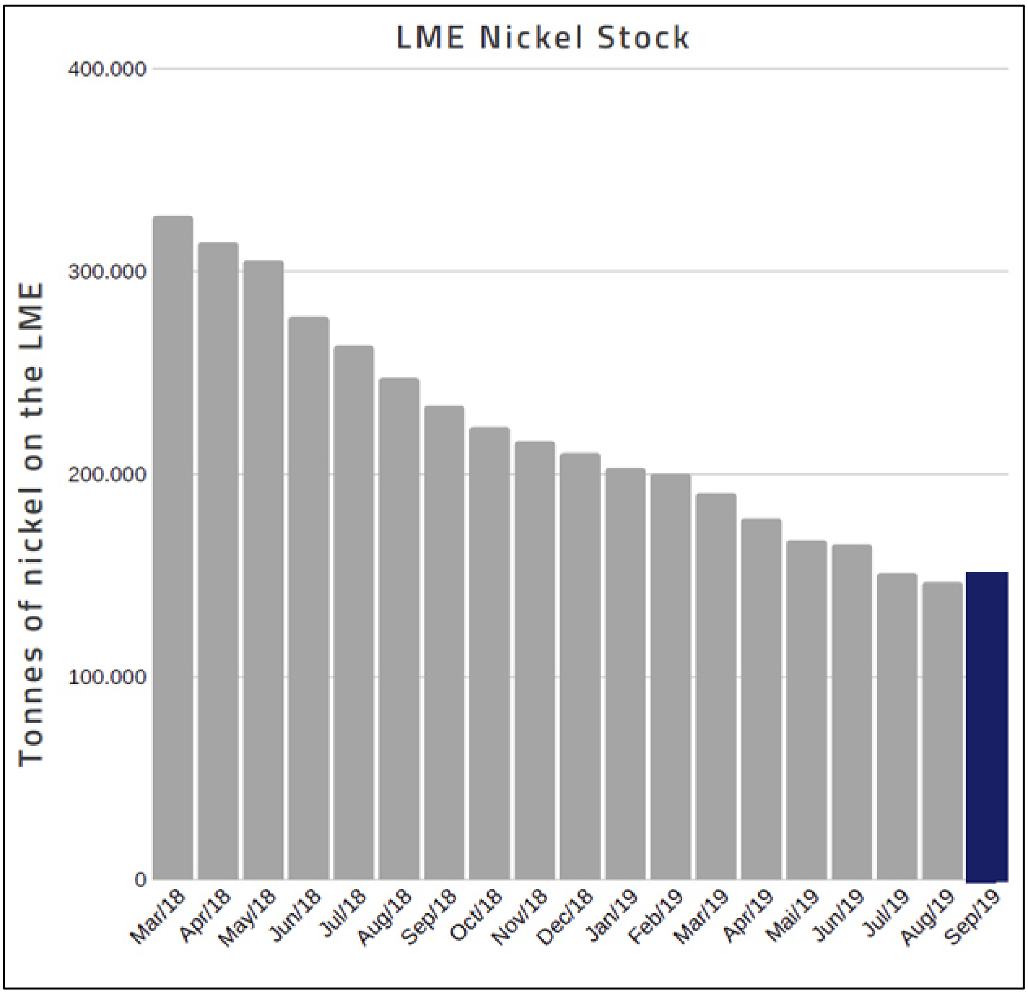

Figure 9: LME Nickel Stock level (LME, 2019)

7.2. Desirability

The national policies and strategies reviewed in the Socio-economic Report (Appendix 6.1: Socio-Economic Impact Assessment) speak to creating decent work and economic development and these visions further trickle down to the local level. The reviewed national documents illustrate that the Zebediela Nickel mining project is in alignment with the strategic government priorities because it is a means of creating new employment opportunities. Furthermore, the national policies suggest that stimulation of mining investments along with the development of agriculture and tourism will significantly contribute to the development of rural economies. Nonetheless, the national policies also acknowledge that there remains a divide between regulating development and the environment while fostering economic investment which result from “a design flaw in the planning system, making it difficult to strike a reasonable balance” (National Planning Commission, 2011). This design flaw tends to lead to land-use/spatial conflicts especially between mining, agriculture and tourism.

At a provincial scale, the Limpopo Provincial Government strives to reduce unemployment and inequality and upsurge income levels and economic growth, and the mining sector is one of the sectors that has been identified to assist in achieving these priorities. The proposed project therefore correlates with provincial policy in that the mine will create job opportunities which will contribute to increased income levels in households and economic growth. Nonetheless, The

Limpopo Provincial Government also encourages the diversification of the economy to avoid risks associated with mine closures.

Both district and local municipality strategic documents perceive the promotion of mining alongside agriculture and tourism as priorities for the economy. Nonetheless, mining is believed to cause air pollution and offer limited benefits to communities.

The reviewed documents from national to local level reveal that South Africa holds a comparative advantage and further holds large global shares in mineral and natural endowments. The country therefore needs to capitalize on such comparative advantage through projects such as the Zebediela Mine project. Since mining companies are required to participate in local development by means of a Social and Labour Plan (SLP), they tend to contribute to host economies and the nation at large. Therefore, the proposed project is in alignment with the reviewed documents, particularly with regards to job creation (Urban-econ, 2019).

Mining developments are extractive and generally non-renewable in nature. They also result in the loss of natural vegetation (and the associated biodiversity, ecological and ecosystem services) and generates dust and emissions that have additional harmful impacts on the local natural and social environment. On the other hand, the extraction and use of minerals is a fundamental element for socio-economic development processes. The minerals extracted provide some of the primary inputs used and produced by a number of industries as mentioned above. There are therefore tensions and trade-offs between the conservation of the natural environment and the promotion of economic development within the current global technological and economic system.

8. 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

8.1. Process to assess alternatives

The Department of Environmental Affairs and Tourism's (DEAT's) guidelines for Integrated Environmental Management (IEM)) procedure (information Series 11) requires that an environmental investigation needs to consider feasible alternatives for any proposed development. The EIA Regulations also require that a number of possible proposals or alternatives for accomplishing the same objectives be considered.

Various alternatives have been assessed for the project and workshopped by means of specialist, applicant and engineering team interactions. The alternatives were also influenced by means of discussions with authorities, discussions with I&AP's, considering the existing baseline environmental data and specialist input.

Alternatives relevant to this development can be categorized into the following:

5. **Site Location alternatives**
    - Location of the Overburden facility and topsoil stockpile
    - Location of Mine Infrastructure (plant, offices, workshops, etc.)
    - Location of the Tailings Storage Facility (TSF)
6. **Layout alternatives**
    - Location of Mine Infrastructure (plant, offices, workshops, etc.)
    - Layout of the Overburden facility and topsoil stockpile
7. **Service alternatives**
    - Water Provision Alternatives
    - Site Access Alternatives
    - Energy Alternatives
    - Technology alternative
8. **The "no-go" alternative**
    - To be assessed per environmental aspect/area

8.2. Details of all alternatives considered

The following alternatives were investigated in the EIA Phase of the project:

8.2.1 Site Location Alternatives

The opencast section of the mine is fixed due to the presence of the nickel resource and therefore no site alternatives could be considered. **However the open pit footprint has been reduced from the original 74 ha to 40 ha and the depth from 220 m to 90 m.**

Site location alternatives were however considered for the following:

A. The Overburden Facility (including the topsoil stockpile area);
B. The Mine Infrastructure (crushing and screening plant; workshop, offices, etc.) and
C. The Tailings Storage Facility (TSF).

The location alternatives have been assessed against the following criteria:

- Soil and Agricultural Potential
- Biodiversity
- Surface and Groundwater
- Heritage & palaeontology
- Geological aspects
- Ecological sensitivity
- Nuisance factors (including air quality, noise and visual impacts) and subsequent socio-economic impacts
- Engineering considerations, e.g. distance to resource areas and cost implications (economic impact)

A site selection matrix is provided in **Table 5** below.

A. OVERBURDEN FACILITY SITE LOCATION ALTERNATIVES:

Four site (location) alternatives were investigated for the Overburden Facility (refer to Figure 10):

1. Overburden Facility Site Alternative Option 1

This site is located directly to the north-east of the proposed Open Pit on Portion 0, 54, 56 and 57 of Uitloop 3 KS. The advantages of this site location alternative are:

- Mining will commence from the north-western sector of the open pit and will develop in a south-easterly direction. This site is situated to the north-east and adjacent to the open pit (approximately 650 m away from the north-western corner of the open pit) which will ensure that the overburden and topsoil won't need to be hauled long distances, which will lower the operational cost, but will also lower the cost of backfilling and rehabilitation during the later stages of the project. It will also result in a lower carbon footprint.
- The footprint located in close proximity to the open pit will also allow for a more manageable noise solution.
- A large part of the footprint of the proposed overburden location alternative is in a degraded state with low ecological sensitivity.
- Overburden option 1 is not located on any faults, drainages or domestic water supply boreholes.

The disadvantages of this site location alternative are:

- Impacts on natural vegetation with protected trees.
- The proposed overburden footprint option falls within the 1:100-year floodline of the Rooisloot River.
- Impacts on land capability and fertile soils with high compaction potential.
- Overburden option 1 is located on dolomite as well as 2 water supply boreholes used for production and/or irrigation.

- Option 1 impacts on Iron Age sites (sites Exigo-ZNM-IA01 - Exigo-ZNM-IA04) of moderate archaeological significance; and Historical Period sites (sites Exigo-ZNM-HP01 - Exigo-ZNM-HP05) of low heritage significance.
- Option 1 also impacts on burials (burials Exigo-ZNM-BP01 - Exigo-ZNM-BP08) with a high heritage significance.
- Overburden facility site alternative 1 falls over the proposed SANRAL N11 Ring Road.

2. Overburden Facility Site Alternative Option 2

This site is located to the south-west of the proposed Open Pit on Portion1, 15 and 16 of Amatava 41 KS. The advantages of this site location alternative are:

- The footprint of the proposed overburden location alternative is outside any areas of high ecological sensitivity.
- Lower impact on land capability.
- Overburden option 2 is not located on any drainages or water supply boreholes used for production and/or irrigation.

The disadvantages of this site location alternative are:

- The overburden will have to be hauled a long distance from the proposed Open Pit (approximately 3 km from the north-western corner of the open pit), which is not preferred at the beginning of a project. This will significantly increase the operational cost, but will also increase the backfilling and thus rehabilitation cost, and result in a higher carbon footprint.
- Impacts on natural vegetation with protected trees.
- Impacts on fertile soils with high compaction potential.
- Overburden option 2 is located on dolomite, geological faults as well as 3 domestic water supply boreholes.
- Option 2 impacts Historical Period sites (sites Exigo-ZNM-HP01 - Exigo-ZNM-HP05) of low heritage significance.
- Option 2 also impacts on burials (burials Exigo-ZNM-BP01 - Exigo-ZNM-BP08) with a high heritage significance.
- Overburden facility site alternative 2 falls over the proposed SANRAL N11 Ring Road.

3. Overburden Facility Site Alternative Option 3

This site is located directly to the south-east of the proposed Open Pit on Portion 35, 36, 46, 47, 51, 52, 53 and 63 of Uitloop 3 KS. The advantages of this site location alternative are:

- This site is situated to the south-east and adjacent to the open pit (approximately 1,3 km away from the north-western corner of the open pit) which will ensure that the overburden and topsoil won’t need to be hauled far, which will lower the operational cost, as well as the cost of backfilling and rehabilitation during the later stages of the project. It will also result in a lower carbon footprint.

- A large part of the footprint of the proposed overburden location alternative is in a degraded state with a medium to low ecological sensitivity.
- Impact on land capability is very low.
- This alternative option is preferred from an air quality impact perspective as this provides for the shortest haul distance and subsequent lower impact from particulate matter on sensitive receptors.
- The footprint located in close proximity to the open pit will also allow for a more manageable noise solution.
- Overburden option 3 is not located on any drainages or geological faults and only partially intersects the dolomite.
- Overburden facility site alternative 3 is not situated over the proposed SANRAL N11 Ring Road or the road reserve.

The disadvantages of this site location alternative are:

- Impacts on natural vegetation with protected trees.
- The proposed location alternative slightly impacts on drainage channels.
- Impacts on fertile soils with high compaction potential. A small section also impacts on high erosion soils in the drainage channel.
- Overburden option 3 is located partially on dolomite and over 2 domestic boreholes as well as 1 water supply borehole for production and/or irrigation.
- Option 3 impacts on Stone Age scatters (site Exigo-ZNM-SA02) of moderate to low archaeological significance.

4. Overburden Facility Site Alternative Option 4

This site partly overlies the footprint of Overburden Option 2 and is located to the south-east of the proposed Open Pit on Portion 12, 20 and 61 of Uitloop 3 KS and Portion 1 and 16 of Amatava 41 KS. The advantages of this site location alternative are:

- The footprint of the proposed overburden location alternative is outside any areas of high ecological sensitivity.
- This overburden facility site alternative option is preferred from a visual impact perspective as it avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities.
- Impact on land capability is very low.
- Overburden option 4 is not located on any drainages or water supply boreholes used for production and/or irrigation.

The disadvantages of this site location alternative are:

- The overburden will have to be hauled a long distance from the proposed Open Pit (approximately 3 km from the north-western corner to the open pit), which is not preferred at the beginning of a project. This will significantly increase the operational cost, but will also increase the backfilling and thus rehabilitation cost; and result in a higher carbon footprint.

- Impacts on natural vegetation with protected trees.
- Impacts on fertile soils with high compaction potential.
- Overburden option 4 is located partially on dolomite and geological faults as well as 1 domestic water supply borehole.
- Option 4 impacts Historical Period sites (sites Exigo-ZNM-HP01 - Exigo-ZNM-HP05) of low heritage significance.
- Option 4 also impacts on burials (burials Exigo-ZNM-BP01 - Exigo-ZNM-BP08) with a high heritage significance.
- Overburden facility site alternative 4 falls over the proposed SANRAL N11 Ring Road.

Overburden Facility Preferred Site:

A site selection matrix summarising the specialist recommendations and other practical considerations of the different sites are indicated in Figure 10 below.

All the alternative sites have positive and negative aspects associated with them. Overburden Facility Site Alternative Option 3 is preferred from a soil, land capability and agricultural potential; ecological; heritage, air quality and noise perspective. From a hydrogeological viewpoint, the location is only partially underlain by dolomite and does not occur over any geological faults. Overburden Alternative 3 is also preferred due to practical engineering considerations (e.g. shorter hauling distance, lower operational and rehabilitation costs and carbon footprint) and as it is located outside the proposed SANRAL N11 Ring Road and reserve.

Therefore Overburden Facility Site Alternative 3 is the preferred alternative option. The footprint of this alternative was further refined during the EIA Phase taking into account site sensitivities and this has resulted in a reduced footprint of 44 ha instead of the original 49 ha.

B. MINE INFRASTRUCTURE SITE LOCATION ALTERNATIVES:

Three location alternatives were investigated for the proposed crushing and screening plant and associated infrastructure (offices, sewage and water treatment plants, tanks and dams, and ROM stockpiles) (hereafter referred to as “Mine Infrastructure Site Location Alternatives”) (refer to Figure 12).

1. Mine Infrastructure Site Alternative Option 1

Mine Infrastructure Location Alternative 1 is located approximately 1,3 km to the east of the proposed Open Pit on Portion 0, 20, 23, 48, 49 and 65 of Uitloop 3 KS. The advantages of this site location alternative are:

- This infrastructure site alternative option is preferred from a visual impact perspective.
- This alternative option is located furthest from the community of Mahwelereng in terms of the noise impact.
- Infrastructure site option 1 is not located over any drainages, geological faults or water supply boreholes used

for production and/or irrigation.

- This infrastructure site alternative option is preferred from a visual impact perspective as it avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities.
- Infrastructure site alternative 1 is not situated over the proposed SANRAL N11 Ring Road and only partially overlaps the road reserve.

The disadvantages of this site location alternative are:

- The ore will have to be hauled a long distance from the proposed Open Pit (approximately 2,5 km from the north-western corner of the open pit), and across the Percy Fyfe Road which will necessitate the construction of a bridge across the road and railway line. Hauling the material over a long distance will increase the operational cost significantly and result in a higher carbon footprint.
- Impacts on natural vegetation with protected trees.
- Impacts on land capability and fertile soils with high compaction potential.
- This alternative option has a larger number of surrounding receptors in terms of the noise impact.
- Infrastructure site option 1 is located on dolomite and also occurs over 3 domestic water supply boreholes.

2. Mine Infrastructure Site Alternative Option 2

Mine Infrastructure Location Alternative 2 is located to the east-north east of the proposed Open Pit on Portion 0 of Uitloop 3 KS. The advantages of this site location alternative are:

- This site is situated closest to the open pit (approximately 900 m away from the north-western corner of the open pit) which will ensure that the ore won't need to be hauled far, which will lower the operational cost and carbon footprint of the project.
- The footprint of the proposed infrastructure site alternative has a slightly lower impact on ecological sensitivity compared to the other 2 options.
- This alternative option is preferred from an air quality impact perspective due to the lower number and location of potential sensitive receptors to this option.
- The location of this alternative option has the least number of surrounding receptors and has enough distance (over 1000 m) from the town of Mokopane and is located close to road D1231 (Percy Fyfe Road) which will enable a higher noise level rating. The location of the alternative closer to the open pit may also assist in noise management.
- Infrastructure site option 2 is not located over any drainages, geological faults or domestic water supply boreholes.
- Infrastructure site alternative 2 is not situated over the proposed SANRAL N11 Ring Road and only partially overlaps the road reserve.

The disadvantages of this site location alternative are:

- Impacts on natural vegetation with protected trees.
- The proposed mine infrastructure footprint option falls within the 1:100-year floodline of the Rooisloot River.
- Impacts on land capability and fertile soils under irrigation with high compaction potential.
- Infrastructure site option 2 is located partially on dolomite and also occurs on 1 water supply borehole used for production and/or irrigation.

3. Mine Infrastructure Site Alternative Option 3

Mine Infrastructure Location Alternative 3 is located directly to the south-east of the proposed Open Pit on Portion 8, 9, 10, 15, 17 and 18 of Amatava 41 KS and Portion 49, 50, 98 and 100 of Piet Potgietersrust Town and Townlands 44 KS. The advantages of this site location alternative are:

- This alternative option is located further from the community of Mahwelereng than Option 2 above in terms of the noise impact.
- Infrastructure site option 3 is not located over any drainages or water supply boreholes used for production and/or irrigation.
- Infrastructure site alternative 2 is not situated over the proposed SANRAL N11 Ring Road and only partially overlaps the road reserve.

The disadvantages of this site location alternative are:

- This site is situated further away from the proposed Open Pit (approximately 3 km from the north-western corner of the open pit), and across the Percy Fyfe Road which will necessitate the construction of a bridge across the road and railway line. Hauling the material over such a long distance will increase the operational cost significantly and result in a larger carbon footprint.
- Impacts on natural vegetation with protected trees.
- Impacts on land capability and fertile soils with high compaction potential.
- This alternative option has a larger number of surrounding receptors in terms of the noise impact.
- Infrastructure site option 3 is located on dolomite and geological faults as well as 8 domestic water supply boreholes.

Mine Infrastructure Preferred Site:

A site selection matrix summarising the specialist recommendations and other practical considerations of the different sites are indicated in **Table 5** below.

All the infrastructure alternative sites have positive and negative aspects associated with them.

Mine Infrastructure Site Location Alternative 1 is preferred as it falls outside 1:100-year floodline of the Rooisloot River. This Alternative is preferred from a visual impact perspective as the site avoids ‘greenfield’ areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities. No geological faults or geological conduits are intersected on the site alternative however the site is located on dolomite. Alternative 1 is preferred from a heritage resources perspective. The site is located closest to the preferred TSF option therefore requiring a shorter pumping distance for tailings and return water which will have a lower economic cost. Although further away from the proposed open pit, haulage of ore with a conveyor belt to the processing plant to limit the operational cost is being considered and was further investigated during the EIA Phase.

Both alternative options impact on land capability and fertile soils and are located in areas of medium to low ecological sensitivity, however Infrastructure Site Alternative 2 has a slightly lower ecological impact compared to the other alternatives. Both alternative 1 and 2 are not situated over the proposed SANRAL N11 Ring Road and only partially overlaps the road reserve. Alternative site 2 is preferred from an air quality and noise perspective due to the least number of surrounding receptors and distance (over 1000 m) from the town of Mokopane. The location closest to road D1231 (Percy Fyfe Road) will also enable a higher noise level rating. This site is situated closest to the open pit which will shorten the hauling distances, resulting in a lower operational cost and carbon footprint, and allowing for a more manageable noise solution. Both alternative site options 1 and 2 are preferred and were further assessed during the EIA phase (refer to section 8.2.2).

The option to process the ore via primary and secondary crushing and screening on site before transporting the crushed ore to a nearby processing plant on the Northern Bushveld Limb, such as Anglo's Mokopane Mine or Ivanplats' Platinum Mine was also further investigated. It was decided that ore will be processed at an on-site crushing and screening plant before being loaded on trucks for transport to one of the above nearby mines for further processing. Therefore the footprint of the mine infrastructure has been reduced from 53 ha to 33 ha and the layout has been further refined taking into account the site sensitivities.

C. TAILINGS STORAGE FACILITY (TSF) SITE LOCATION ALTERNATIVES:

Four site (location) alternatives were investigated for the Tailings Storage Facility (TSF) (refer to **Figure 11**):

1. Tailings Storage Facility Site Alternative Option 1

This site is located directly to the south-east of the proposed Open Pit on Portion 12 and 20 of Uitloop 3 KS and Portion 1 of Amatava 41 KS. The advantages of this site location alternative are:

- Moderate impact on land capability.
- TSF Alternative Option 1 is not located over any drainages or production and/or irrigation water supply boreholes.
- TSF site alternative 1 is not situated over the proposed SANRAL N11 Ring Road or the road reserve.

The disadvantages of this site location alternative are:

- Impacts on natural vegetation with protected trees.
- The footprint of this location alternative impacts on a rocky ridge with a high ecological sensitivity.
- Impacts on fertile soils under irrigation with high compaction potential as well as rocky ridge with high erosion potential.
- TSF Alternative Option 1's location overlies dolomite, geological faults as well as 1 domestic water supply

borehole.

- Option 1 impacts on Iron Age sites (sites Exigo-ZNM-IA01 - Exigo-ZNM-IA04) of moderate archaeological significance.
- Option 1 also impacts on a single burial (Exigo-ZNM-BP01) with a high heritage significance.

2. Tailings Storage Facility Site Alternative Option 2

This site is located directly to the south-east of the proposed Open Pit on Portion 12, 13 and 14 of Amatava 41 KS. The advantages of this site location alternative are:

- Impact on land capability is very low.
- TSF Alternative Option 2 is not located over any domestic or production and/or irrigation water supply boreholes.

The disadvantages of this site location alternative are:

- Impacts on natural vegetation with protected trees.
- The footprint of this location alternative impacts on a watercourse with a high sensitivity.
- Impacts on soils with high compaction potential; as well as potential impact on sensitive drainage channel soils.
- TSF Alternative Option 2's location overlies dolomite, geological faults and drainages.
- Option 2 impacts on Iron Age sites (sites Exigo-ZNM-IA01 - Exigo-ZNM-IA04) of moderate archaeological significance; and Historical Period sites (sites Exigo-ZNM-HP01 - Exigo-ZNM-HP05) of low heritage significance.
- Option 2 also impacts on a single burial (Exigo-ZNM-BP02) with a high heritage significance.
- TSF site alternative 2 falls over the proposed SANRAL N11 Ring Road and reserve.

3. Tailings Storage Facility Site Alternative Option 3

This site is located directly to the south-east of the proposed Open Pit on Portion 1, 10, 12, 14, 15 and 16 of Amatava 41 KS. The advantages of this site location alternative are:

- Impact on land capability is low.
- TSF Alternative Option 3 is not located over any production and/or irrigation water supply boreholes.

The disadvantages of this site location alternative are:

- The footprint of this location alternative impacts on a watercourse with a high sensitivity.
- Impacts on fertile soils with high compaction potential; with a small section impacting on soils with high erosion potential located in the drainage channel.
- TSF Alternative Option 3's location overlies dolomite, geological faults, drainages and 1 domestic water supply borehole.

- Option 3 impacts Historical Period sites (sites Exigo-ZNM-HP01 - Exigo-ZNM-HP05) of low heritage significance.
- Option 3 also impacts on multiple burials (Exigo-ZNM-BP02 - Exigo-ZNM-BP08) with a high heritage significance.
- TSF site alternative 3 falls over the proposed SANRAL N11 Ring Road and reserve.

4. Tailings Storage Facility Site Alternative Option 4

This site is located directly to the south-east of the proposed Open Pit on Portion 12 of Uitloop 3 KS and Portion 1 of Amatava 41 KS. The advantages of this site location alternative are:

- The footprint of the proposed TSF facility site alternative is preferred from a visual impact perspective as it avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities.
- TSF Alternative Option 4 is not located over any drainages and only partially intersects faults and dolomite which dips to the south-west.
- TSF site alternative 4 is not situated over the proposed SANRAL N11 Ring Road or the road reserve.

The disadvantages of this site location alternative are:

- Impacts on natural vegetation with protected trees.
- The footprint of this location alternative impacts on a rocky ridge with a high ecological sensitivity.
- The footprint of the proposed TSF falls within 100 m from the tributary to the Rooisloot River.
- High impact on land capability and soils with high compaction potential, as well as impacting on a rocky ridge with high erosion potential.
- TSF Alternative Option 4 is partially located over dolomite and geological faults and over 2 domestic boreholes and 2 production and/or irrigation water supply boreholes.
- Option 4 impacts on Iron Age sites (sites Exigo-ZNM-IA01 - Exigo-ZNM-IA04) of moderate archaeological significance and historical period homestead (site Exigo-ZNM-HP06) of moderate heritage significance.
- Option 4 also impacts on a single burial (Exigo-ZNM-BP01) with a high heritage significance.

All the options considered have a similar impact in terms of air quality.

Tailings Storage Facility Preferred Site:

A site selection matrix summarising the specialist recommendations and other practical considerations of the different sites are indicated in **Table 5** below.

All of the TSF alternative sites have positive and negative aspects associated with them. Tailings Storage Facility Site Alternative Option 4 is preferred from a hydrogeological perspective as it only partially overlies dolomite and geological faults. This site does not impact on any drainage lines. The alternative is also not situated over the proposed SANRAL N11 Ring Road or the road reserve. From a visual impact perspective, the site avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities. The current layout can also be further optimised in order to avoid the rocky ridge where possible.

Another alternative option is to have no TSF on site and to process the ore at a nearby processing plant on the Northern Bushveld Limb, such as Anglo's Mokopane Mine or Ivanplats' Platinum Mine, and make use of the mine's TSF. This alternative option was further investigated during the EIA Phase, and it was decided that ore will be processed at an on-site crushing and screening plant before being loaded on trucks for transport to one of the above nearby mines for further processing. Therefore a <u>TSF on site will not be required and the project description has been updated to exclude the TSF</u>.

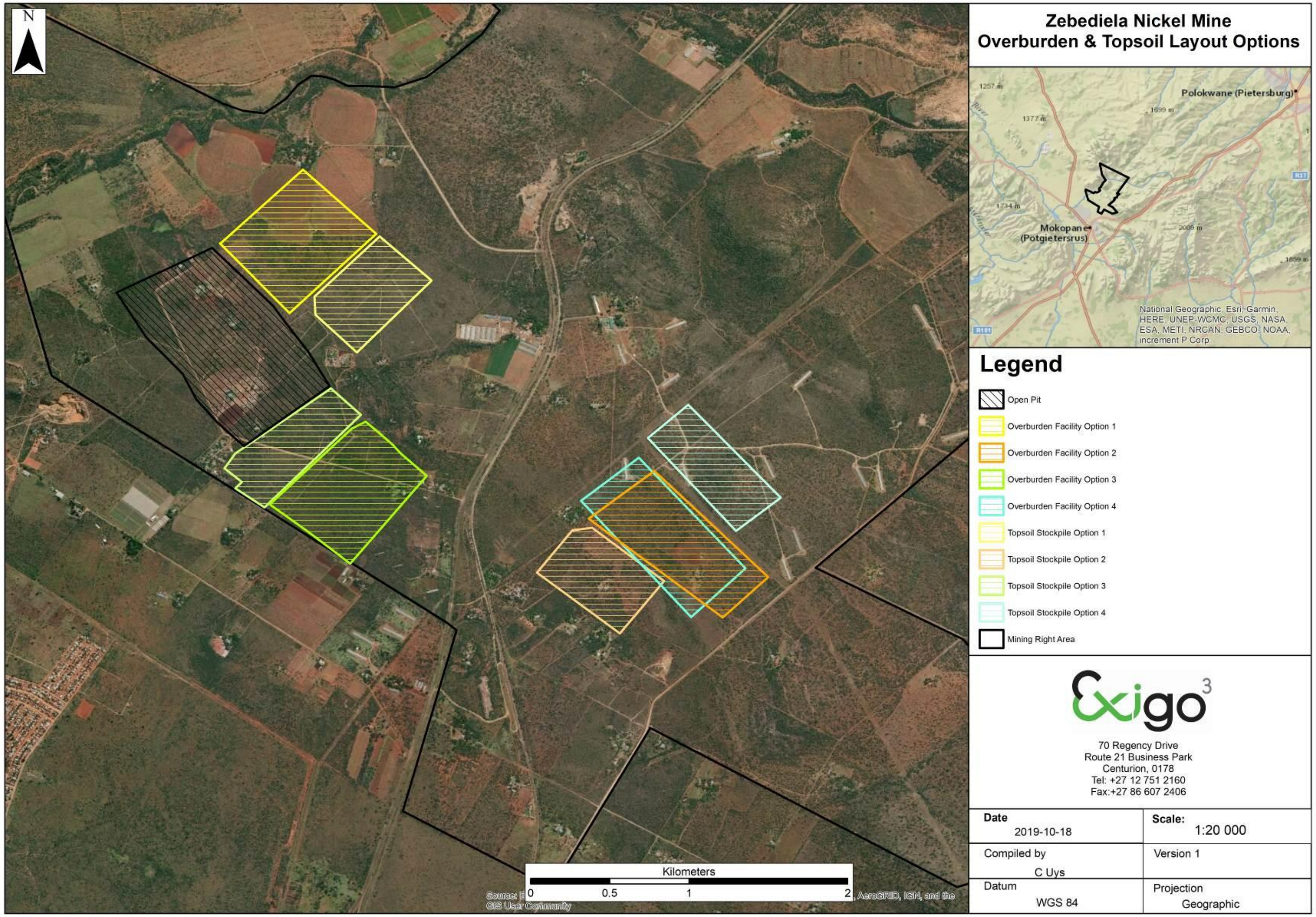

Figure 10: Overburden Facility Site Location Alternatives Map

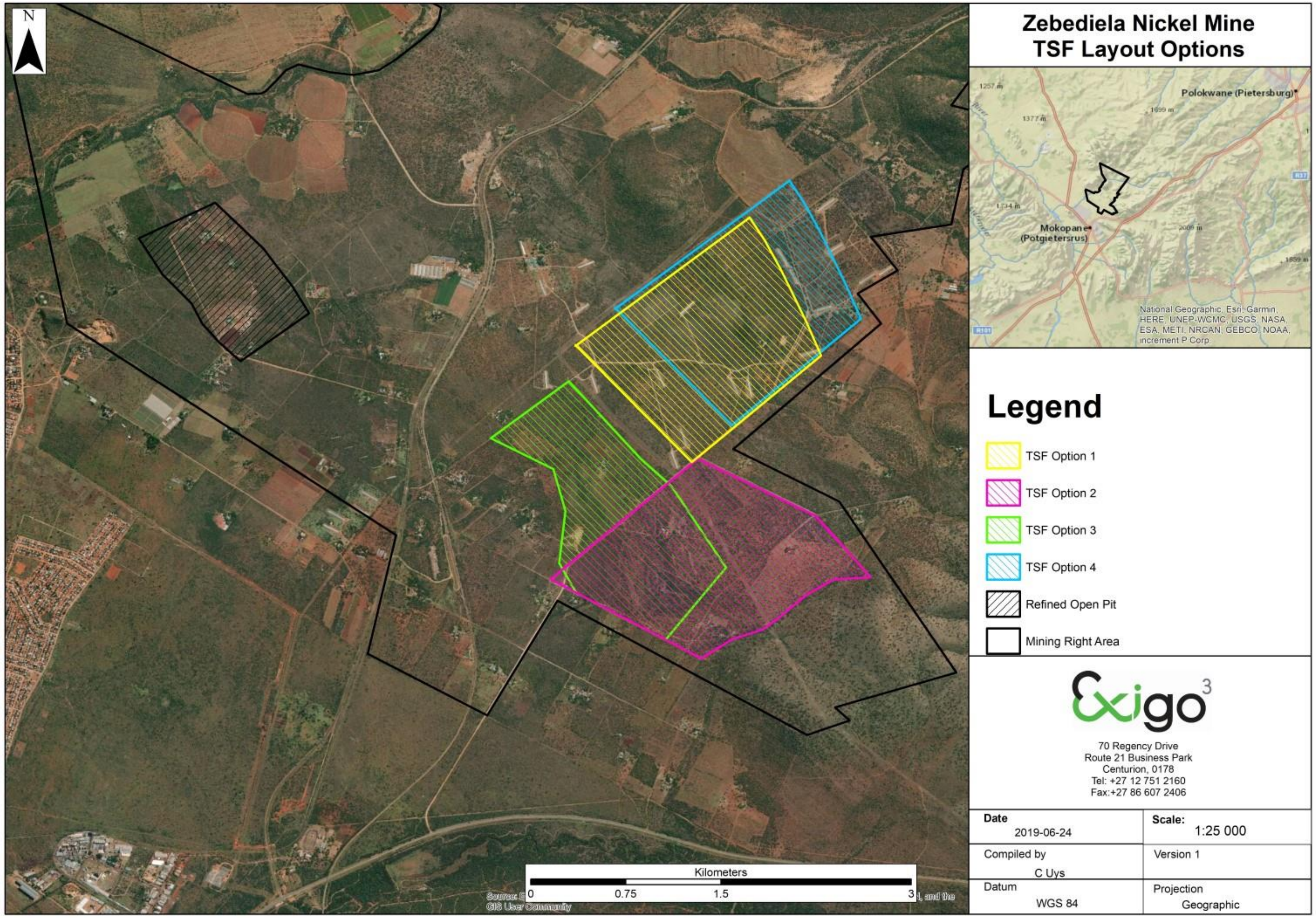

Figure 11: TSF Site Location Alternatives Map

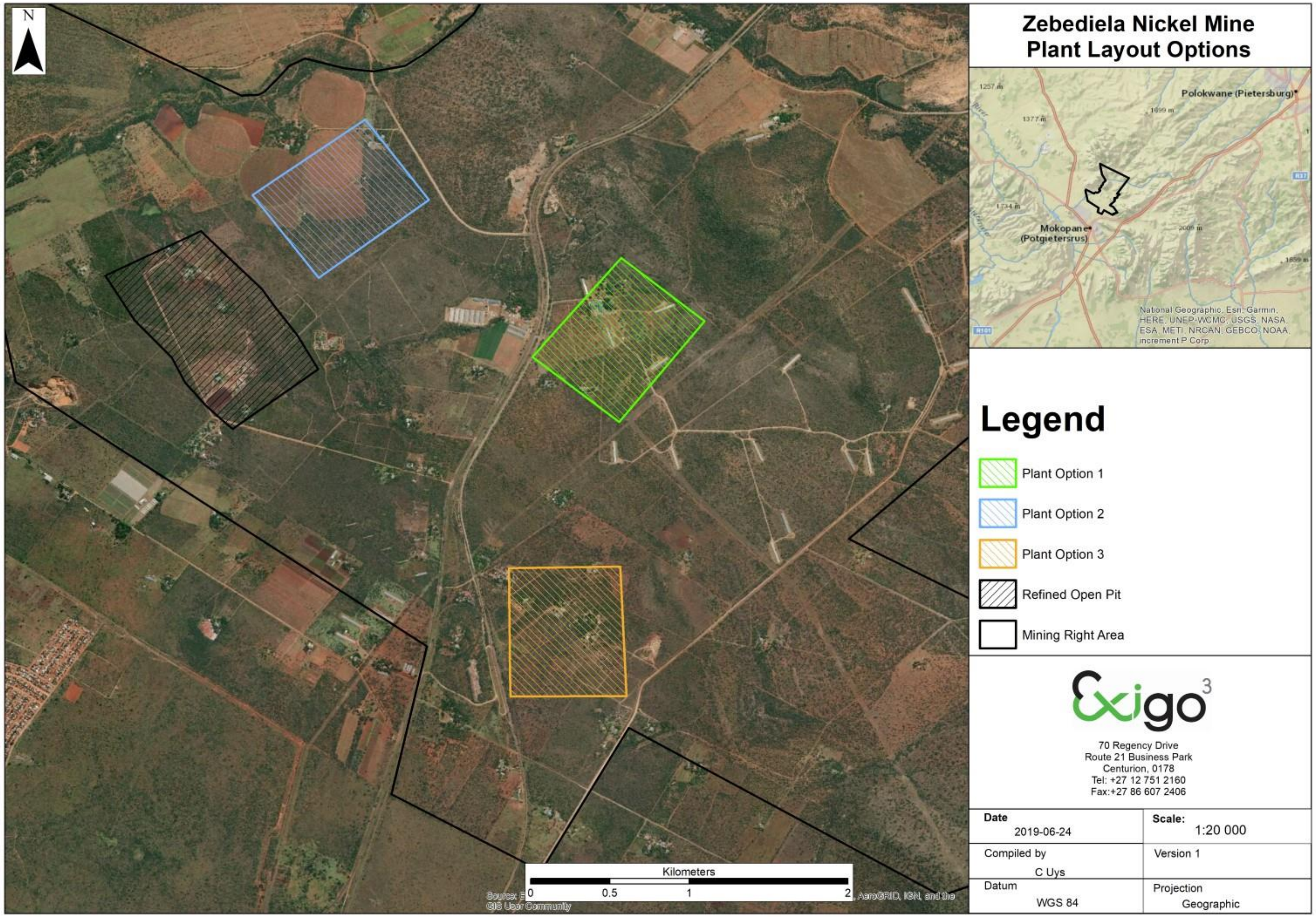

Figure 12: Infrastructure Site Location Alternatives Map

Table 5: Site selection matrix

SITE SELECTION MATRIX	Soil and Agricultural Potential	Biodiversity	Surface and Groundwater	Heritage	Air Quality	Noise	Visual	Geological aspects	Engineering Aspects	Other
Overburden Facility Site Alternative 1 (Not preferred)	*2nd preferred option* Impacts on land capability and fertile soils with high compaction potential (higher compared to Option 2 and 4). 2nd most suitable option from a soil impact point of view.	*2nd preferred option* Site is located in an area with a degraded state and low ecological sensitivity. Impacts on natural vegetation with protected trees. 2nd most suitable option from ecological impact and location point of view.	***Not preferred*** No drainage or domestic water supply boreholes on site. Footprint falls within the 1:100-year floodline of the Rooisloot River and impacts 2 production and/or irrigation water supply boreholes.	*2nd preferred option* Impacts on Iron Age sites of moderate archaeological significance; and Historical Period which can be mitigated.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Preferred*** The site located in close proximity to the open pit which will allow for a more manageable noise solution.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	*No preference* The site is located on dolomite but not located on any faults.	***Preferred*** This site is situated to the north-east and adjacent to the open pit (approximately 650 m away from the north-western corner of the open pit) which will ensure that the overburden and topsoil won't need to be hauled long distances, which will lower the operational cost, but will also lower the cost of backfilling and rehabilitation and result in a lower carbon footprint.	***Not preferred*** The site overlaps the proposed SANRAL N11 Ring Road.
Overburden Facility Site Alternative 2 (Not preferred)	*4th preferred option* Fertile soils with high compaction potential. Lower impact on land capability. 4th option from a soil impact & location point of view.	*3rd preferred option* Site is located outside any areas of high ecological sensitivity, but impacts on natural vegetation with protected trees. 3rd most suitable option from ecological & location point of view.	***Not preferred*** No drainages or production and/or irrigation water supply boreholes on site, however impacts on 3 domestic water supply boreholes.	***Not preferred*** Impacts Historical Period sites of low heritage significance and burials with high heritage significance.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** The site is located further from the open pit.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** Located on dolomite and intersects geological faults.	***Not preferred*** Overburden will have to be hauled a long distance from the proposed Open Pit (3 km) increasing the operational cost, backfilling and rehabilitation cost, and result in a higher carbon footprint.	***Not preferred*** The site overlaps the proposed SANRAL N11 Ring Road.
Overburden Facility Site Alternative 3 (Preferred)	***Preferred*** Very low impact on land capability. Impacts on soils with high compaction potential with small section impacting on high erosion soils associated with drainage channel. Overburden layout could be moved slightly more south	***Preferred*** Site is located in an area with a degraded state with medium to low ecological sensitivity. Impacts on natural vegetation with protected trees and slightly on drainage channel.	***Not preferred*** No drainages but impacts 2 domestic boreholes as well as 1 water supply borehole for production and/or irrigation.	***Preferred*** Option 3 impacts on Stone Age scatters (site Exigo-ZNM-SA02) of moderate to low archaeological significance.	***Preferred*** Taking cognisance of the location of sensitive receptors and the shorter length of the haul routes associated with this option and the subsequent influence on the extent of PM impacts.	***Preferred*** The site located in close proximity to the open pit which will allow for a more manageable noise solution.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Preferred*** No geological faults and only partially intersects the dolomite.	*2nd preferred option* This site is situated to the south-east and adjacent to the open pit (approximately 1,3 km away from the north-western corner of the open pit) which will ensure that the overburden and topsoil won't need to be hauled long distances, which will lower the	***Preferred*** The site is not located over the proposed SANRAL N11 Ring Road.

SITE SELECTION MATRIX	Soil and Agricultural Potential	Biodiversity	Surface and Groundwater	Heritage	Air Quality	Noise	Visual	Geological aspects	Engineering Aspects	Other
	to avoid drainage channel.								operational cost, but will also lower the cost of backfilling and rehabilitation and result in a lower carbon footprint.	
Overburden Facility Site Alternative 4 (Not preferred)	*3rd preferred option* Very low impact on land capability. Impacts on soils with high compaction potential. 3rd option from a soil impact & location point of view.	*4th preferred option* Site is located outside any areas of high ecological sensitivity, but impacts on natural vegetation with protected trees. 4th most suitable option from ecological & location point of view.	***Preferred*** No drainages or production and /or irrigation water supply boreholes but impacts 1 domestic water supply borehole.	***Not preferred*** Impacts Historical Period sites of low heritage significance and burials with high heritage significance.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** The site is located further from the open pit.	***Preferred*** Preferred from a visual impact perspective as site avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities.	***Not preferred*** Located partially on dolomite and geological faults.	***Not preferred*** Overburden will have to be hauled a long distance from the proposed Open Pit (3 km) increasing the operational cost, backfilling and rehabilitation cost, and result in a higher carbon footprint.	***Not preferred*** The site overlaps the proposed SANRAL N11 Ring Road.
Mine Infrastructure Site Location Alternative 1 (Preferred)	*2nd preferred option* Impacts on land capability and fertile soils with high compaction potential. 2nd option from a location point of view.	*2nd preferred option* Impacting on natural vegetation with protected trees. 2nd option from an ecological impact point of view.	***Preferred*** No drainages or production and/or irrigation water supply boreholes on site, but impact on 3 domestic water supply boreholes.	***Preferred*** No heritage resources have been identified within the footprint of this infrastructure component.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** The site is located furthest from the community of Mahwelereng but has a has a larger number of surrounding receptors.	***Preferred*** Preferred from a visual impact perspective as site avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities.	***Preferred*** No geological faults on site but located on dolomite. Does not intersect any geological conduits.	***Not preferred*** Ore will have to be hauled a long distance from the proposed Open Pit (2,5 km) and across the Percy Fyfe Road necessitating construction of a bridge across the road and railway line increasing the operational cost and resulting in a higher carbon footprint.	***Preferred*** Site is located closest to preferred TSF option therefore requiring a shorter pumping distance for tailings and return water which will have a lower economic cost. The site is not located over the proposed SANRAL N11 road.

SITE SELECTION MATRIX	Soil and Agricultural Potential	Biodiversity	Surface and Groundwater	Heritage	Air Quality	Noise	Visual	Geological aspects	Engineering Aspects	Other
Mine Infrastructure Site Location Alternative 2 (Preferred)	***Preferred*** Impacts on land capability and fertile soils under irrigation with high compaction potential. Most suitable option from soil impact point of view provided that layout is amended to avoid any land under irrigation.	***Preferred*** Slightly lower impact on ecological sensitivity compared to other options.	*Not preferred* No drainages or domestic water supply boreholes on site, but impact on 1 production and/or irrigation water supply boreholes. The proposed mine infrastructure footprint option falls within the 1:100-year floodline of the Rooisloot River.	*2nd Preferred Option* Burials with high significance occur within 100m to 200m of the infrastructure footprint alternative.	***Preferred*** Taking cognisance of the location of sensitive receptors and the shorter length of the haul routes associated with this option and the subsequent influence on the extent of PM impacts.	***Preferred*** Least number of surrounding receptors and has enough distance (over 1000 m) from the town of Mokopane and is located close to road D1231 (Percy Fyfe Road) which will enable a higher noise level rating. He site located in close proximity to the open pit will allow for a more manageable noise solution.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** No geological faults on site but located partially on dolomite. Banded ironstone acts as a conduit for potential mass migration.	***Preferred*** This site is situated closest to the open pit (approximately 900 m away from the north-western corner of the open pit) which will ensure that the ore won't need to be hauled long distances, which will lower the operational cost, and result in a lower carbon footprint.	***Not preferred*** Site is located furthest from preferred TSF option therefore requiring a longer pumping distance for tailings and return water which will have a higher economic cost. ***Preferred*** The site is not located over the proposed SANRAL N11 Ring Road.
Mine Infrastructure Site Location Alternative 3 (Not preferred)	*3rd preferred option* Impacts on land capability and fertile soils with high compaction potential. 3rd option from a location point of view.	*3rd preferred option* Impacting on natural vegetation with protected trees. 3rd option from an ecological impact point of view.	***Not preferred*** No drainages or production and/or irrigation water supply boreholes on site, but impact on 8 domestic water supply boreholes.	*2nd Preferred Option* Burials with high significance occur within 100m to 200m of the infrastructure footprint alternative.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** The site is located further from the community of Mahwelereng than Option 2 but has a larger number of surrounding receptors.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** Geological faults on site and located on dolomite. Does not intersect any geological conduits. Faults act as a conduit for potential mass migration.	***Not preferred*** Ore will have to be hauled a long distance from the proposed Open Pit (3 km) and across the Percy Fyfe Road necessitating construction of a bridge across the road and railway line increasing the operational cost and resulting in a higher carbon footprint.	***Not preferred*** Site is located further from preferred TSF option than Option 1 therefore requiring a longer pumping distance for tailings and return water which will have a higher economic cost. ***Preferred*** The site is not located over the proposed SANRAL N11 Ring Road.

SITE SELECTION MATRIX	Soil and Agricultural Potential	Biodiversity	Surface and Groundwater	Heritage	Air Quality	Noise	Visual	Geological aspects	Engineering Aspects	Other
TSF Site Alternative 1 (Not preferred)	*4th preferred option* Low impact on land capability and fertile soils under irrigation with high compaction potential as well as impacting on rocky ridge with high erosion potential. Partial impact on dolomitic soils.	*4th preferred option* Impacts on natural vegetation with protected trees as well as rocky ridge with high sensitivity.	***Not preferred*** No drainages or production and/or irrigation water supply boreholes but impacts 1 water supply borehole.	***Preferred*** Impacts on Iron Age sites of moderate archaeological significance and a single burial with a high heritage significance.	*No preference* The site is located in close proximity of potential sensitive receptors.	***Preferred*** Location minimises haul routes to preferred processing plant.	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** Site is located on dolomite and geological faults.	*2nd preferred option* Located close to preferred plant option 1.	***Not preferred*** From a topographical point of view due to rocky ridge. ***Preferred*** The site is not located over the proposed SANRAL N11 Ring Road.
TSF Site Alternative 2 (Not preferred)	*2nd preferred option* Low impact on land capability, soils with high compaction potential and impacting on sensitive drainage channel soils. Partial impact on dolomitic soils.	*2nd preferred option* Impacts on natural vegetation with protected trees as well as high sensitivity watercourses. 2nd option from an ecological & location point of view.	***Not preferred*** Located on drainages. No impact on domestic or production and/or irrigation water supply boreholes.	*2nd preferred option* Impacts on Iron Age of moderate archaeological significance; and Historical Period sites of low heritage significance as well as a single burial with a high heritage significance. Will required mitigation of moderate sensitivity Iron Age occurrences,	*No preference* The site is located in close proximity of potential sensitive receptors.	*No preference* Tailings storage facilities are easier to manage (in terms of noise) than other project areas (e.g. pump enclosures for pumping of tailings).	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** Overlies dolomite and geological faults.	***Not preferred*** Located furthest from preferred plant option 1.	***Not preferred*** The site overlaps the proposed SANRAL N11 Ring Road.

SITE SELECTION MATRIX	Soil and Agricultural Potential	Biodiversity	Surface and Groundwater	Heritage	Air Quality	Noise	Visual	Geological aspects	Engineering Aspects	Other
TSF Site Alternative 3 (Not preferred)	***Preferred*** Low impact on land capability and impacting on fertile soils with high compaction potential with small section impacting on high erosion soils in drainage channel. Partial impact on dolomitic soils. Location of TSF could be moved slightly more north and west to avoid drainage channel.	***Preferred*** Site is located within low sensitivity old fields in between woodland. Impacts on high sensitivity watercourse, however layout of TSF could be moved slightly north in order to avoid drainage channel.	***Not preferred*** Located on drainages and 1 domestic water supply borehole. No impact on production and/or irrigation water supply boreholes.	***Not preferred*** Impacts Historical Period sites of low heritage significance and multiple burials with a high heritage significance.	*No preference* The site is located in close proximity of potential sensitive receptors.	*No preference* Tailings storage facilities are easier to manage (in terms of noise) than other project areas (e.g. pump enclosures for pumping of tailings).	***Not preferred*** The site is located in close proximity of potential sensitive receptors.	***Not preferred*** Overlies dolomite and geological faults.	*3rd preferred option* Located closer to preferred plant option 1 than Option 2.	***Not preferred*** The site overlaps the proposed SANRAL N11 Ring Road.
TSF Site Alternative 4 (Preferred)	*3rd preferred option* Moderate to low impact on land capability and soils with high compaction potential, as well as rocky ridge with high erosion potential. Partial impact on dolomitic soils.	*3rd preferred option* Impacts on natural vegetation with protected trees as well as rocky ridge with high sensitivity. Lower impact on woodland areas compared with option 1. 3rd option form ecological and location point of view.	***Preferred*** No drainages. Impacts 2 domestic and 2 production and/or irrigation water supply boreholes.	***Preferred*** Impacts on Iron Age of moderate archaeological significance; and Historical Period homestead of moderate heritage significance as well as a single burial with a high heritage significance.	*No preference* The site is located in close proximity of potential sensitive receptors.	***Preferred*** Location minimises haul routes to preferred processing plant option 1.	***Preferred*** Preferred from a visual impact perspective as site avoids 'greenfield' areas and allows for a substantial visual buffer (i.e. 500 m) from sensitive viewing areas to the facilities.	***Preferred*** Only partially intersects dolomite and faults which dips to the south-west.	***Preferred*** Located closest to preferred plant option 1.	***Not preferred*** From a topographical point of view due to rocky ridge. ***Preferred*** The site is not located over the proposed SANRAL N11 Ring Road.

8.2.2 Layout alternatives

Layout alternatives to optimise the following preferred site location alternatives (Figure 13 and Figure 14) were further investigated during the EIA phase:

1. Overburden and Topsoil Site Location Alternative 3
2. Mine Infrastructure Site Location Alternative 1 and 2

The preferred layout of the overburden and topsoil facilities as well as the mine infrastructure was influenced by the detail engineering designs, specialist input during the EIA phase, as well as comments by Interested and/or Affected Parties (I&APs).

1. Overburden Facility and Topsoil Stockpile Layout Alternative Option 3 - Optimised

The location of the Overburden facility was optimised to be located directly adjacent and to the south-east of the proposed Open Pit on Portion 35, 36, 46, 47, 51 and 63 of Uitloop 3 KS, while the Topsoil stockpile will be located on Portion 46, 52 and 53 of Uitloop KS. The proximity of the Overburden facility directly adjacent to the open pit (approximately 1 km away from the north-western corner of the open pit) will ensure shorter haulage distances of the overburden during the construction and closure phase which will result in lower operational costs, as well as lowering the costs of backfilling and rehabilitation during the later stages of the project. It will also result in a lower carbon footprint.

The footprint of the Overburden facility was further reduced from the original 49 ha to 44 ha thus impacting on less natural vegetation with protected trees. The height of the Overburden facility has also been reduced from 30 m to 10 m thus resulting in lower visual, air quality and noise impacts. The footprint of the Topsoil stockpile has also been reduced to 20 ha from the original 25 ha. The Overburden footprint was further optimised in order to impact less on the drainage channel. The optimised Overburden facility and Topsoil stockpile do not intersect any geological faults and are not underlain by any dolomite.

2. Mine Infrastructure Layout Alternative Option 2 - Optimised

Alternative Option 2 is preferred over Alternative Option 1 as this location is situated closest to the open pit (approximately 500 m to the north-east of the proposed Open Pit on Portion 0 of Uitloop 3 KS). This will ensure that the ore won’t need to be hauled far, which will lower the operational cost and carbon footprint of the project. This alternative option is also preferred from an air quality impact perspective due to shorter haul distance and lower number and location of potential sensitive receptors to this option. The location of the alternative being closer to the open pit may also assist in noise management and as the mine infrastructure is located close to road D1231 (Percy Fyfe Road), this will enable a higher noise level rating.

The location of Mine Infrastructure Location Alternative 2 was further optimised to reduce the footprint from the original 53 ha to 33 ha, thereby lessening the impact on natural vegetation and protected trees. The layout of Option 2 was also optimised to fall outside the 1:100-year floodline of the Rooisloot River and avoid impacting on fertile soils under irrigation as far as possible.

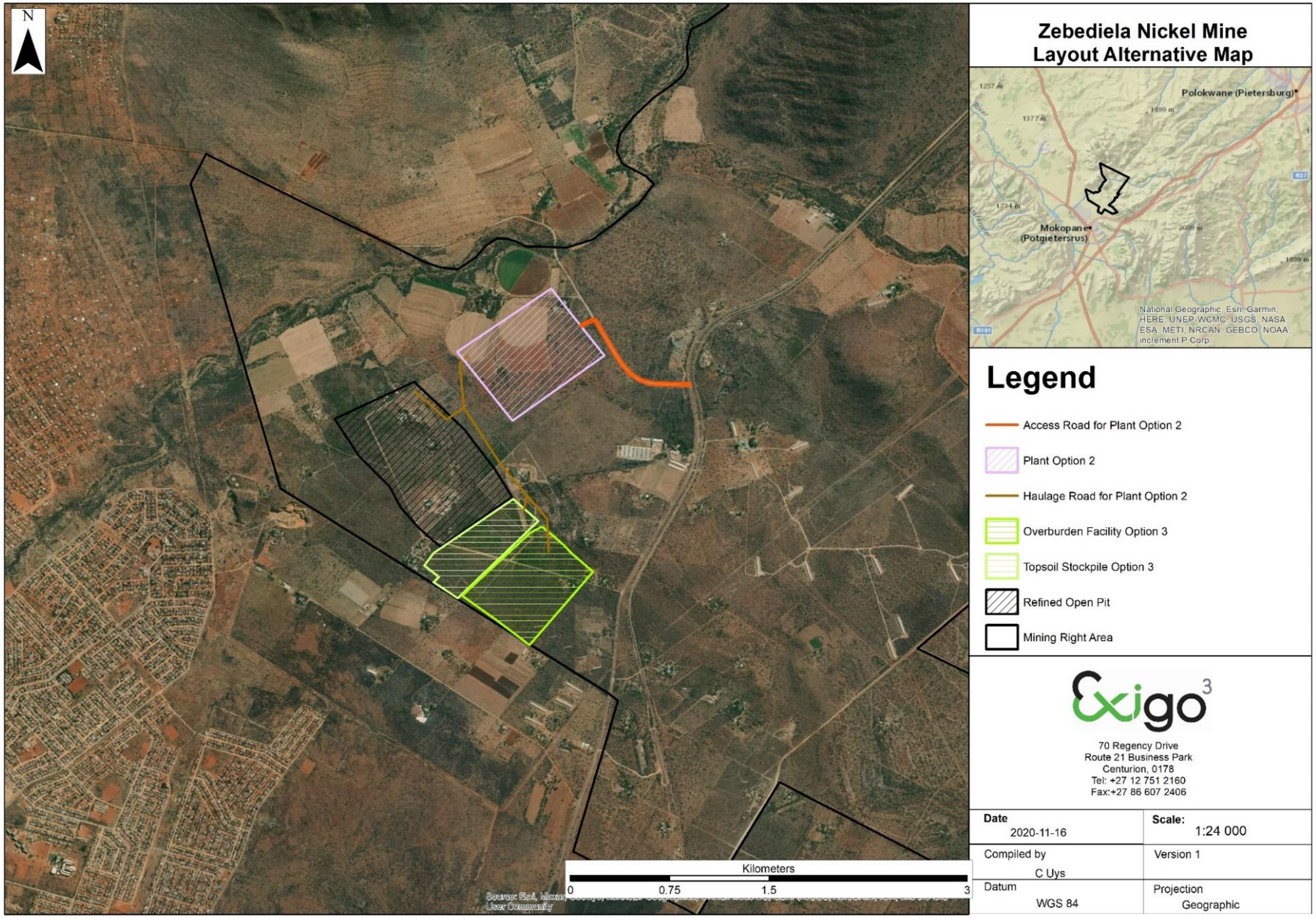

Figure 13: Layout Alternative Map

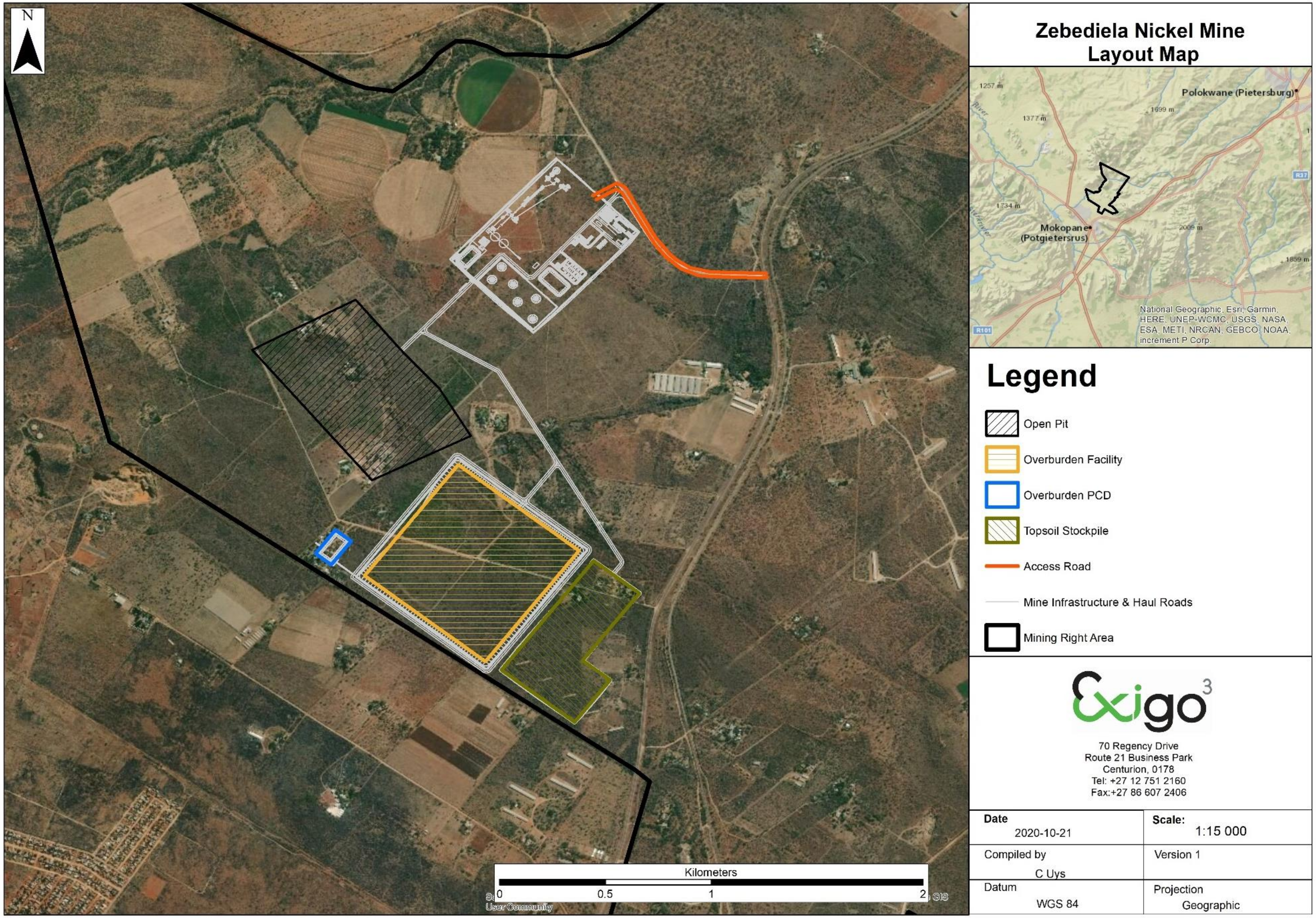

Figure 14: Preferred Site Layout

8.2.3 Service Alternatives

8.2.3.1 Water Provision

For the purposes of water supply, a safety factor of ±1.5 should be applied on the 500 m3/d maximum demand scenario to secure 700 m3/d for the operation. A water supply options analysis decision matrix was compiled from a technical perspective. Nine options were identified for potential water supply (Table 6). All options can only be considered with due consideration that the local surface water and groundwater balance is maximised and/or oversubscribed.

Table 6: Water Supply Options Decision Matrix

Option No	Water supply option	Water demand (m^3/d)	Direct Distance (km)	Comment
1	Local aquifer (water from existing agricultural uses)	700	2	Water trading is a pre-requisite to offset the water balance. This option includes pit dewatering
2	Regional agricultural irrigation schemes		15	This includes trading of water from existing allocated water rights which could be groundwater and/or Doorndraai Dam scheme water
3	Surface water resource (local) - rainfall runoff containment		10	Also viable as part of Option 4
4	Enhanced recharge		NA	Option to be implemented in combination with Options 1,2 and 3
5	Net water from clearing of alien vegetation		NA	To be implemented in combination with Options 1,2 and 3
6	Mokopane water saving through repairing of infrastructure losses		5	Good and viable option if local government procedures can be managed
7	Sewage water offtake Mokopane		15	Not probable unless significant improvements can be made to the treatment works
8	Doorndraai Dam		35	Not probable as system is oversubscribed
9	Flag Boshielo Dam		100	Not probable very expensive and system already oversubscribed

It should be possible to obtain the 700 m3/d water demand from local groundwater resources on the principle of an offset or water exchange with a net benefit as the groundwater balance is already negative (Exigo, 2020a). This could be achieved by:

(i) spreading of abstraction from boreholes to prevent localised steep depression cones,
(ii) enhancement of recharge and
(iii) (iii) control of alien plants, or a combination of these options.

It would be advantageous if one entity is responsible for the sustainable management of groundwater as opposed to several entities where abstraction is uncontrolled. This aspect should be investigated in more detail in the post EIA phase.

Options 1, 2 and 3 indicated in Table 6 are all preferred, provided that the recommended management and mitigation measures are implemented.

Option 3 (containment of surface runoff) was further evaluated to qualify the potential for surface water containment and storage for both mine water supply and potential to supplement the water supply to Mokopane. It is known that the farm to the north of the mine (Uitloop 3 Portion 39) is used to supplement the water supply to Mokopane from groundwater resources at 1000 m3/d and that the water levels are dropping at a rate of 0.75 m/a, which is not a sustainable option. A surface water dam in the upper reaches of catchment A61F would be suitable for use in the wet seasons and would alleviate the pressure on the local aquifers.

The local catchment has a surface area of 295 km^2. The present day mean runoff coefficient is 3.5% (WR2012) and would produce a mean runoff of 515 000 m3/mon. To supplement the mine water demand in a conjunctive use with groundwater, would require a dam size of 100 000 to 400 000 m^3.

The annual mine water demand of 0.3 mil m^3/a, is only 1.8% of the MAR of 16.72 mil m^3/a, which is a manageable impact.

8.2.3.2 Access Route Alternatives

Ore will be processed at an on-site crushing and screening plant before being loaded on trucks for transport to a nearby mine, such as the Ivanplats Platreef Project or the Mogalakwena Mine along the N11, for further processing. The proposed N11 Ring Road is indicated as the preferred route from the proposed mine to the above operations. Access to the N11 is via planned interchanges with the Percy Fyfe Road (D1231) or the Turfspruit Road (D1603). From a traffic impact point of view, it is proposed that the shortest route from the mine access to the proposed N11 Ring Road be used, therefore the D1231 interchange.

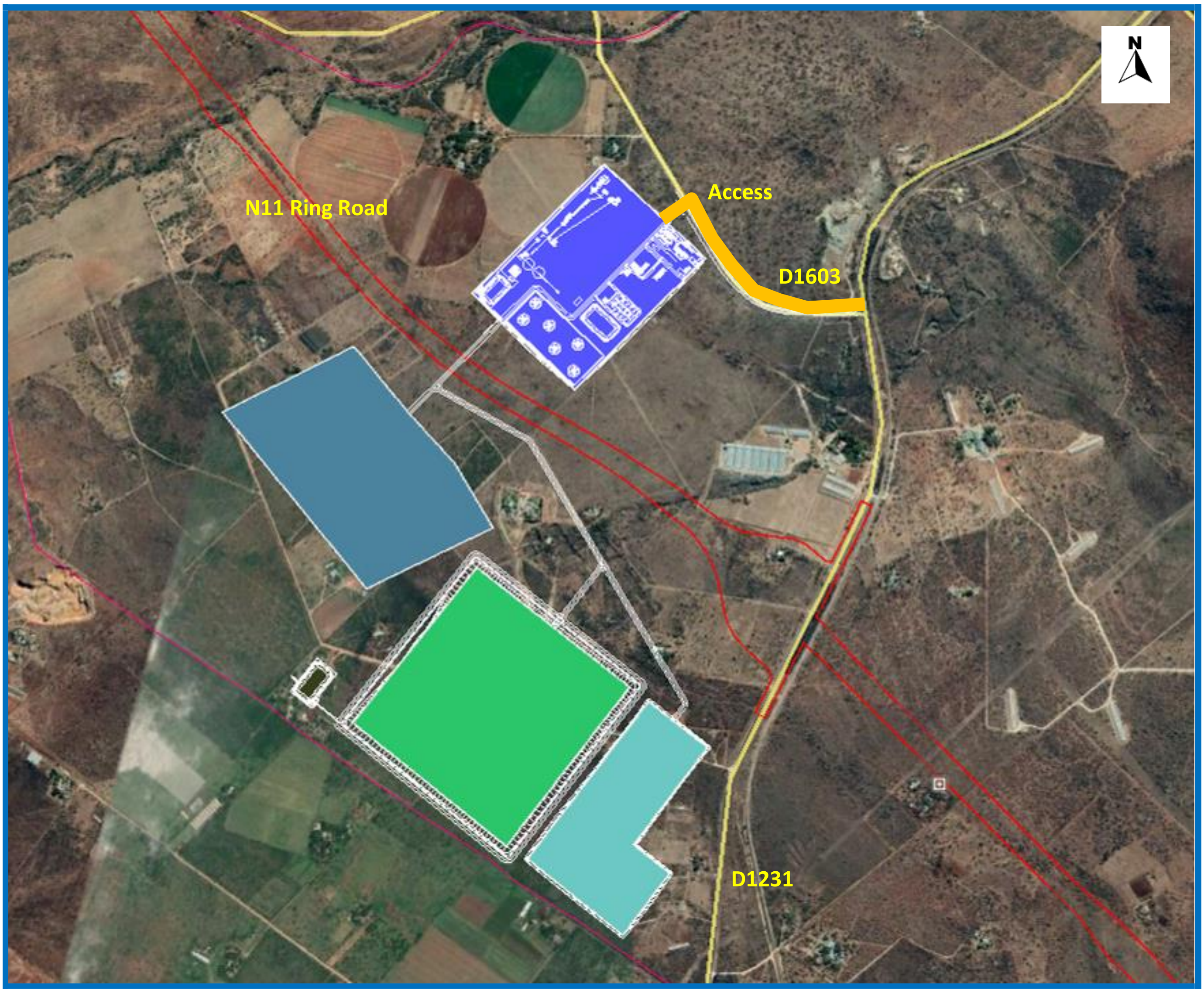

Figure 15: Proposed access from D1603 (yellow line) to the D1231 interchange onto the proposed N11 Ring Road

Should the proposed N11 Ring Road not be completed by the time the mine comes into production, the Turfspruit Road (D1603) will have to be used as an interim haul route. Two alternative access routes were assessed and entail the following:

3) Alternative route 1 – Turfspruit gravel road (D1306) south - this proposed access route will entail access from the mine onto the D1306 connecting to the D1231, and from there connecting to the R101 to the south of the proposed open pit connecting to the N11 in Mokopane.
4) Alternative route 2 – Turfspruit gravel road (D1306) north – this proposed access route will entail access from the mine onto the D1306 connecting to the N11 north of the proposed open pit. This route is currently used by contractors, wanting to avoid driving the N11 through the communities, working at Anglo American's Mogalakwena mine and Ivanplats' Platreef Project.

The following aspects informed the assessment of the route alternatives for the D1603:

Aspect	D1603 South (Alternative Route 1)	D1603 North (Alternative Route 2)
Gravel Road Distance	Approximately 800 m	Approximately 7 km
Total Haulage Distance to existing N11	Approximately 8 km	Approximately 7 km
Environmental sensitivities	Lesser air quality (dust) impact due to shorter gravel road	Narrow river crossing, larger air quality (dust) impact due to longer gravel road
Safety concerns	Route goes through town of Mokopane and local communities	Section of the route goes through local communities
Economic concerns	Less expensive to upgrade 800 m of gravel road	More expensive to upgrade 7 km of gravel road and narrow river crossing may require upgrades

Due to the longer gravel route and narrow river crossing associated with Alternative Route 2 and the economic cost associated with the upgrade of this route, Alternative Route 1 is preferred. However, it should be noted that the proposed N11 Ring Road is still the preferred route from the proposed mine to the nearby mining operations. In discussions with SANRAL the implementation of this road is a priority and is expected to commence in the near future. Exact time frames are not yet available but we can assume it will be in the next 5 years. Trucks from the mine could therefore use this road in the near future and will therefore not have to use Road D1603 to the existing N11 (Alternative Route 1).

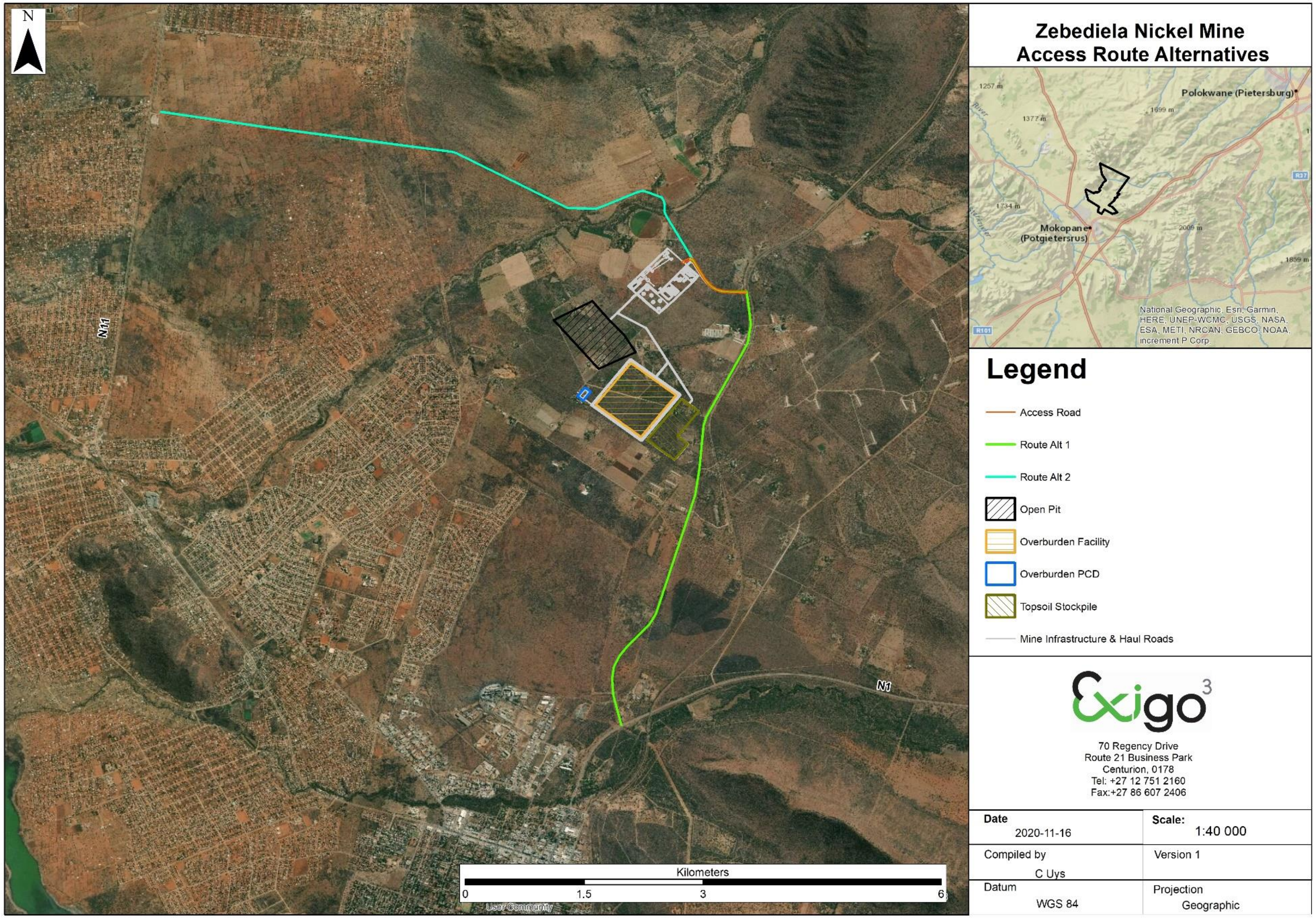

Figure 16: Route Alternatives

8.2.3.3 Energy Alternatives

Wind energy was considered as an energy alternative for the proposed project. The construction of a wind farm generating renewable energy could be considered using various funding models including 100% ownership or co-ownership. The option of embedded energy generation entails the generation of wind energy without ESKOM transmission facilities on site and should be considered as an alternative to ESKOM power.

The potential of bio energy as well as solar energy as alternative energy sources was also investigated. The combination of renewable energy sources such as wind, solar and bio energy in combination could offer cost effective energy generation in the future, but at present the cost-benefit analysis is still in favour of conventional ESKOM supply. The power requirements of the mine (estimated at 2 MW), means that the high capital and operational cost associated with renewable energy make it prohibitively expensive at present.

8.2.4 **Technology Alternatives**

8.2.4.1 Blasting

Electronic detonators were compared to conventional pyrotechnic detonators and assessed. Electronic detonators provide more accurate timing than the conventional pyrotechnic detonators which rely on the combustion speed of a pyrotechnic composition (Botes, 2001). Due to the proximity (1,500 m) of a built-up neighbourhood it has been decided to use electronic detonators instead of the conventional pyrotechnic initiation systems (shock tube). The benefits of electronic detonators over standard pyrotechnic delay elements are as follows:

- Detonator accuracy;
- Reduced vibration and airblast;
- Improved rock fragmentation and size uniformity;
- Increase in excavation productivity; and
- Reduced explosives cost and cost saving in primary processing, i.e. crushing (Botes, 2001).

In addition, possible reduction of blasthole diameters will further assist in reducing the levels of impact. Smaller diameter blastholes will reduce the charge mass per blasthole and electronic initiation can be used to reduce the number of blastholes firing to single blasthole detonation. The whole drilling and charging process was reviewed in a detail blast design taking into consideration the blast area distance to points of concern to manage levels of influence (refer to Appendix 6.12: Blasting and Vibration Assessment).

8.2.4.2 Overburden deposition alternatives

Two alternatives for the deposition of overburden exist:

The first involves the deposition of overburden in layers, where the outer wall will be rehabilitated as the dump becomes higher. However, an alternative overburden construction method was identified. An “outer shell method” can be employed for the construction of the overburden dump, which would involve the construction of an outer berm for the dump during daytime hours with a 5 meter high noise reduction starter berm. The outer shell construction method thereby acts as a noise barrier, and the construction of a berm would be very effective in screening off noise generated by trucks and earth-moving equipment operating behind the screen (as viewed from the closest receptors). The height of the berm must be approximately 5 m above the highest point on the screened work area. Refer to Figure 17 below:

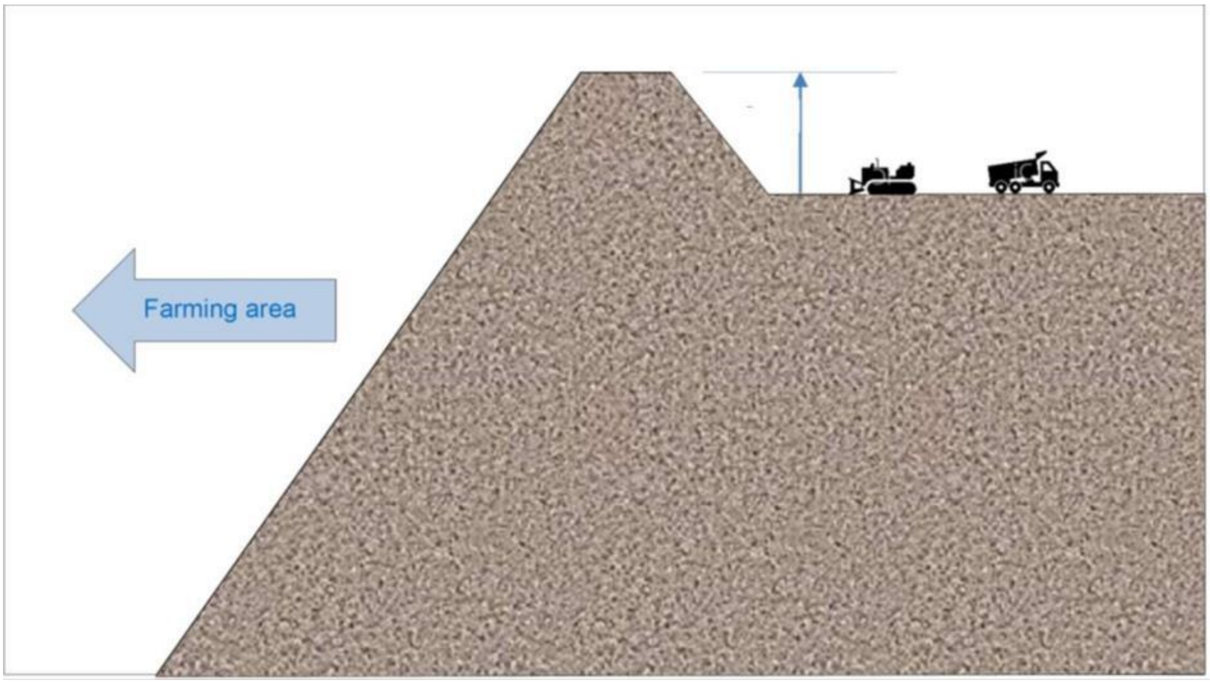

Figure 17: Outer Shell Method of Construction

The proposed outer shell dumping methodology, as opposed to the conventional dumping method, will result in the reduction of a number of environmental impacts such as the following:

- Air Quality – impacts will be lower due to the concurrent rehabilitation which will take place with the outer shell dumping methodology.
- Visual – impacts will be lower due to the concurrent rehabilitation undertaken during the outer shell dumping methodology.
- Noise –impacts will be far lower as the outer shell dumping methodology results in the screening of noise from the nearby receptors.
- Social – Social impacts will be lower due to the lower noise, air quality and visual impacts.

The outer shell dumping method was therefore chosen as the preferred method.

8.2.4.3 Transportation of ore (trucks vs conveyors)

The transportation of Run of Mine (RoM) from the open pit via trucks or via conveyor was considered. From an air quality perspective, the particulate matter (PM10 and PM2.5) concentrations and total daily dust deposition is less with the use of conveyors for the transport of RoM. Therefore, the use of conveyors between the open pit and crushing and screening plant is the preferred option.

8.2.5 **Conclusion**

The following is a summary of the preferred alternatives:

1. Overburden Site Location Alternative 3 is preferred above Alternative 1 and 2.
2. Mine Infrastructure Site Location Alternative 2 is preferred over Alternative 1 and 3.
3. A number of water supply options have been evaluated and the preferred options are as follows:
    a. Option 1: Local aquifer (water from existing agricultural uses). Water trading is a pre-requisite to offset the water balance. This option includes pit dewatering
    b. Option 2: Regional agricultural irrigation schemes. This includes trading of water from existing allocated water rights which could be groundwater and/or Doorndraai Dam scheme water.
    c. Option 3: Surface water resource (local) Rainfall runoff containment.
    d. Option 4: Enhanced recharge in combination with Option 1, 2 and 3.
4. The proposed N11 Ring Road is indicated as the preferred route from the proposed mine to nearby existing mining operations vie the D1231 as this is the shortest route from the mine access to the proposed N11 Ring Road. Should the N11 Ring Road however not yet be constructed when the proposed mine operations commence, two alternative routes via the D1306 were identified. Of these, Alternative Route 1 (D1306 South) is preferred due to the longer gravel route and narrow river crossing associated with Alternative Route 2 and the economic cost associated with the upgrade of this route.
5. The preferred energy alternative is Eskom power supply.
6. The preferred technology alternative with regards to blasting is the use of electronic detonators.
7. The preferred technology alternative with regards to overburden deposition is the outer shell method.
8. The preferred technology alternative with regard to transport of RoM to the crushing and screening plant is the use of conveyors.

8.2.6 **“No-Go” Alternative**

The assessment of the “no-go” alternative is a legal requirement according to NEMA and the EIA Regulations. In this scenario no development would take place. The environment would be left as is and the impact on the area and potential benefits would remain unchanged.

The no-go alternative was assessed against the following categories, *inter alia*:

- Socio-Economic Impacts
- Ecological Impacts
- Groundwater Impacts
- Air Quality Impacts
- Impacts on non-renewable resources
- Traffic Impacts and change in sense of place

These categories will be referred to in the sections below.

Socio-economic Benefits Lost

The no-go alternative will imply that virtually none of the identified impacts of proceeding with the project will be incurred. Investment into minerals such as nickel is expected to create employment, contribute towards skills development and technology (DMR, 2011). Such investments into the nickel industry ultimately contribute to the country’s economic growth. As nickel is currently only primarily mined at one mining operation in the Mpumalanga Province, there is clearly a need for nickel mines in the country.

The Limpopo Government strives to reduce unemployment and inequality and upsurge income levels and economic growth, and the mining sector is one of the sectors that has been identified to assist in achieving these priorities. The proposed project, therefore, correlates with the provincial policy in that the mine will create job opportunities which will contribute to increasing income levels in households and economic growth. Since mining companies are required to participate in local development through a Social and Labour Plan (SLP), they tend to contribute to host economies and the nation at large. Therefore, the proposed project is in alignment with national and provincial policies and strategies. The Zebediela Mine stands to create employment opportunities beyond just mining, thus improving the lives of many South Africans and holistically contributing to the country's economic growth. Should the proposed mine not be developed, this will result in the benefits associated with nickel throughout its value chain not being realised. In addition to the global socio-economic benefits associated with the mine, the Zebediela Nickel Mine will also provide the local communities with various benefits relating mainly to job creation and skills development. Without the implementation of this project, the mentioned benefits would not be realised.

This will impact the realization of the outcome of the Mining Charter (2018), within the context of the MPRDA (2002. The Mining Charter's main objects, which the Zebediela Nickel Mine will assist to reach, are:

- To deracialise ownership patterns in the mining industry through redress of past imbalances and injustices;
- To substantially and meaningfully expand opportunities of Historically Disadvantaged Persons to enter the mining and minerals industry and to benefit from the exploitation of the nation's mineral resources;
- To utilise and expand the existing skills base for the empowerment of Historically Disadvantages Persons;
- To advance employment and diversify the workforce to achieve competitiveness and productivity of the industry;
- To enhance the social and economic welfare of South Africans so as to achieve social cohesion;
- To promote sustainable growth and competitiveness of the mining industry;
- To enable growth and development of the local mining inputs sector by leveraging the procurement spend of the mining industry; and
- To promote beneficiation of South Africa's mineral commodities (Mining Charter, 2018).

The Socio-Economic Impact Assessment for the project provides the positive social and economic impacts of the proposed project, which will not be realised should the No-Go Option be chosen.

Current and Future Impacts

It is the opinion of the majority of specialists that in the event that the Zebediela Nickel Mine Project does not proceed, that the status quo will be maintained. However some of the environmental aspects will continue to be impacted upon even though the mine is not developed due to existing impacts currently taking place. The current ecosystem of the site is already impacted upon, with the state of the vegetation of the project area varying from being natural to completely degraded with large sections of the project area having been modified for crop cultivation in the past.. Current impacts are as a result of rubble dumping, littering and the area being used as a pass through by local people. The soils are also highly erodible due to these anthropogenic disturbances. The impacts associated with the rehabilitation of the mining development are positive considering that the rehabilitated land will improve habitats in the area, even though it still represents degraded land.

The land where the proposed activity is planned to be developed is currently mostly used for commercial agricultural activities comprising of crop farming, game farming, livestock farming and poultry farming. The key pollutants recognized in the airspace of livestock buildings are particles including dust, micro-organisms and their toxins, and gases such as ammonia, carbon dioxide and trace gases such as volatile organic compounds (VOCs). The production of poultry results in hatchery wastes, manure (bird excrement), litter (bedding materials such as sawdust, wood shavings, straw, etc.), and on-farm mortalities. The processing of poultry results in additional waste materials, including offal (feathers, entrails and organs of slaughtered birds), processing wastewater and biosolids. These processes and activities all have the potential for air emissions with ammonia being the most environmentally significant air pollutant.

The proposed N11 Ring Road runs through the proposed mining area close to the open mine pit and effectively cuts the southern part of the mining area in two. In discussions with SANRAL the implementation of this road is a priority and is expected to commence in the near future. Therefore, should the Zebediela Nickel Mine Project not proceed, impacts in terms of traffic and a change in sense of place will still occur due to the planned N11 Ring Road.

Environmental Benefits associated with Nickel

Nickel use in electric vehicle (EV) batteries is forecast to grow significantly over the next 10 years (Horizonteminerals.com, 2019). Reuters also reported that the demand for nickel is expected to soar as governments, companies, and individual consumers aim to reduce air pollution caused by fumes emitted by fossil-fuelled vehicles (Desai, 2019). Furthermore, nickel is used in many oil, gas and electricity generation operations and overall reduces the impacts caused by these operations, more so in the electricity generation industry which is driven by the use of coal, oil and natural gases (Nickel Institute, 2018). Nickel-containing materials are frequently selected for their corrosion and heat resistance in electricity generation industries and reduce the impacts of using coal and oil in such industries.

9. DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

The following process was undertaken to facilitate the public participation for the proposed project:

9.1. Newspaper Advertisement

An Advertisement, notifying the public of the submission of the Integrated Environmental Authorisation (EA) and Waste Management Licence Application and the Mining Right Application (MRA) as well as the Water Use Licence (WUL) Application to be applied for; the process to be followed; and requesting I&AP's to register as I&AP's with Exigo, were placed in two local newspapers; namely the Daily Sun (English advertisement) and the Bosvelder (Afrikaans advertisement). The advertisements were placed on the 31st of October 2019, in accordance with regulation 41(2)(c) and (d) of the EIA Regulations of 2014 (as amended).

In addition, the availability of the Draft Scoping Report (DSR) for public review as well as the Public Open Day held during the review period of the DSR was also advertised.

9.2. Site notices

In order to inform surrounding communities and adjacent landowners of the proposed development, notice boards (in accordance with regulation 41(2) (a) of the EIA Regulations 2014 (as amended)) were erected at key locations surrounding the project site as well at the Mogalakwena Municipal Offices and public libraries in Mokopane and Mahwelereng on the 31st of October 2019.

9.3. Direct Notification of Identified I&AP's

Identified stakeholders, who included the following sectors, were directly informed by post, email, fax or SMS of the proposed development on the 31st of October 2019:

- The owners and occupiers of the site where the activity is or is to be undertaken or to any alternative site;
- The owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site;
- Waterberg District Municipality;
- Mogalakwena Local Municipality;
- Limpopo Department of Economic Development, Environment and Tourism (LEDET);
- Department of Water and Sanitation (DWS) Limpopo;
- Department of Agriculture, Forestry and Fisheries (DAFF) Limpopo;
- Department of Agriculture and Rural Development: Limpopo;
- Department of Rural Development and Land Reform: Limpopo;
- Limpopo Department of Roads and Transport;
- South African Heritage Resources Agency (SAHRA);
- Limpopo Heritage Resources Authority;
- SANRAL;
- Eskom;
- Transnet;
- Other mines and industries in the area, e.g. Ivanhoe Platreef Project, Anglo Mokopane Mine; and

- Other stakeholders.

A period of 30 days (from 30 August to 30 September 2019) was made available for stakeholders to register on the project as I&AP's and provide initial comments. Comments and registrations forms were still accepted until the Draft Scoping Report was made available for review.

9.4. Public Open Day

A public open day was held during the review period of the DSR on 14 November 2019, to provide I&APs with the opportunity to raise issues and comments and ask specific questions in the presence of the relevant consultants on the project as well as to explain the authorisation process and associated timelines. The public open day was advertised in two local newspapers as per section 9.1 above. All issues raised by the I&APs following the public open day were included in the Final Scoping Report (FSR) submitted to the DMRE.

The public open day took place on the following date:

- **Thursday, 14 November 2019 from 09h00 to 13h00 and 14h00 to 18h00** at the Park Hotel in Mokopane

The public open day presentations as well as an attendance register of all the I&AP's who attended the open day are included in Appendix 7.8: Open Day Presentation and Attendance Register.

9.5. Consultation

Focus Group meetings (one on one consultation meetings and telephonic consultation) were held with specific landowners, as well as the relevant Government Departments in order to further ongoing consultations and to consult with key parties, as follows:

1. Landowners who are directly affected by the activity (proposed mine infrastructure footprints) (refer to Appendix 7.10: Comments and Response Register
2. Waterberg District Municipality (DM) and Mogalakwena Local Municipality (LM) Ward Councillors;
3. Department of Rural Development and Land Reform (DRDLR);
4. SANRAL.

Please refer to Appendix 7.8: Open Day Presentation and Attendance Register for more details of the key issues discussed as well as Appendix 7.6: Consultation meeting results and Attendance Registers and Appendix 7.7: Focus Group Meeting Minutes for results of the consultation meetings.

9.6. Draft Scoping Report

The EIA Regulations 2014 (as amended) specify that the Draft Scoping Report (DSR) must be subjected to a public participation process of at least 30 days. A period of more than 30 days (31 October till 2 December 2019) was made available for public comment on the DSR. The availability of the DSR was announced via adverts, site notices and notification letters as specified above to all the identified potential I&AP's.

In addition, the DSR was distributed for comment as follows:

- Electronic copies were made available on Dropbox; and
- Hard copies were made available at the public libraries in Mokopane and Mahwelereng.

A letter requesting extension to the timeframe for submission of the Final Scoping Report (FSR) as provided for in Regulation 3(7) of the EIA Regulations 2014 (as amended) was submitted to the DMRE on 26 August 2019. On 10 September 2019 the Department granted extension for submission of the FSR on/or before 10 December 2019.

9.7. Final Scoping Report

The Draft Scoping Report (DSR) was updated following the draft review to incorporate the comments received and issues raised by I&APs. The FSR was submitted to the DMRE by the 10th of December 2019.

A letter requesting extension to the timeframe for submission of the EIA&EMPR as provided for in Regulation 3(7) of the EIA Regulations 2014 (as amended) was submitted to the DMRE on 13 August 2020. On 24 August 2020 the Department granted extension for submission of the Final EIA&EMPR on/or before the 15th of January 2020.

9.8. Draft EIA&EMPR

This Draft EIA&EMPR will be subjected to a public participation process of at least 30 days. A period of more than 30 days (18 November 2020 until 8 January 2021) will be made available for public comment on the Draft EIA&EMPR as part of the EIA process. The availability of the Draft EIA&EMPR will announced via notification letters as specified above to all the identified potential and registered I&APs.

In addition, the Draft EIA&EMPR will be distributed for comment as follows:

- Electronic copies will be made available on Dropbox; and
- A hard copy will be made available at the municipal offices in Mokopane.

9.9. Public meeting

During the review period of the Draft EIA&EMPR, a public meeting will be held in Mokopane. The public meeting will have a limit of 250 I&AP's in a double capacity venue. Every person who attends the public meeting will be required to wear a face mask and adhere to all health protocols and social distancing measures in accordance with Regulation 69(1)(a) to (d) and Regulation 69(7) of GNR 999 (published on 18 September 2020). Furthermore, I&AP's will be seated at a distance of at least one and a half metres from each other. Attendance registers and alcohol-based sanitisers will be provided at the entrance to the venue.

9.10. Online Q&A Session

The public meeting presentation with the key EIA findings will also be made available on the Dropbox website for those I&AP's who wish to watch the presentation online instead of attending the public meeting. In addition, an online question and answers (Q&A) session will be held on the Zoom platform. Registered I&AP's will be notified of the details of the public meeting and Zoom Q&A session via notification letters.

9.11. Final EIA&EMPR

The Final EIA&EMPR will be updated following the review of the Draft EIA&EMPR, to incorporate the comments received and issues raised by I&APs and submitted to the DMRE.

10. SUMMARY OF ISSUES RAISED BY I&APS

The comments raised by I&APs thus far are specified in the Comments and Response Register table attached as Appendix 7.10: Comments and Response Register. Assessing the comments received during the public participation process, it is evident that the main comments or concerns raised by I&AP's relate to the following issues:

General:

1. Timeline for commencement of mine.
2. Life of mine.
3. Uses of nickel and its value in comparison to PGM's.
4. Whether or not other minerals besides nickel will be mined.
5. How much of the mining right area (MRA) has been explored.
6. Company Directors of URU Limited & BEE companies.
7. Plans for existing houses/demolishing of houses.
8. Consultation with community with regards to Social and Labour Plan (SLP).
9. Ongoing consultation must be undertaken with all I&AP's.
10. Types of mine waste dumps.
11. Location of the tailings storage facility (TSF).
12. Depth and exact location of opencast pit, overburden facility and other mine infrastructure.
13. Whether an additional open pit will require additional licencing.
14. Municipal consultations.
15. Location of nickel deposit.
16. Properties which have not been actively prospected on which no ore body is described and delineated must be removed from the mining right application.
17. Land claims on certain properties.
18. Whether or not the project entails the exploration for water or just minerals.

Services:

19. Proposed SANRAL N11 Ring Road realignment crosses over MRA. SANRAL has already purchased some farms for the development of the N11.Impacts on the N11 road and whether it will be diverted.
20. Access arrangements to and from national roads R101 and N11 and the position(s) thereof to be agreed to with SANRAL.
21. Eskom powerlines run through the area.
22. Electricity supply.
23. The Eskom Transmission (Tx) Warmbad-Witkop 1 275kV powerlines will be affected by the proposed mine and as such Eskom's terms and conditions must be complied with.
24. Traffic and proposed access routes. Existing roads are in a poor condition.
25. Heavy traffic in the area, especially the Percy Fyfe road.
26. Heavy traffic will increase dust levels during the drier months of the year and in the wet season, the road becomes very difficult to navigate due to mud and these pose safety risks.
27. Strain on existing infrastructure.

Environment (biophysical):

28. Concerns with regard to the proposed sewerage facility.
29. Water supply for the mine as the water resources in the area are already limited.
30. Some boreholes are not documented in hydrocensus.
31. Impact on groundwater and surface water: water quality and quantity, water levels.
32. Water pollution will take place even if the required mitigation measures are implemented.
33. Local irrigation schemes will be impacted.
34. Stormwater control measures.
35. Hydrocarbon contamination. Impact on fauna (cattle, sheep, goats and game) and flora (Moringa trees and grazing land).
36. Dust pollution from mining activities and stockpiles.
37. Impact on soils.
38. Littering and illegal dumping.
39. Preservation of the environment.
40. Sustainability of mine.
41. Rehabilitation to avoid the void, alternative to fill up remaining void with another mine's mine residue.
42. Impacts of blasting on boreholes as aquifers/veins move and change.
43. Pollution of the environment and river.
44. Encroachment of human settlements will affect fauna and flora.
45. The mining company must be committed to ensuring a sustainable and ecologically friendly environment.

Socio-economic:

46. Impact on labour and job creation for locals and unemployment.
47. Employment opportunities.
48. Directly affected properties will have to be purchased. Market related value for properties and property valuations.
49. Landowner negotiations and compensation for owners.
50. Land expropriation and relocation.
51. Tension regarding property sales and infrastructure in the local community.
52. Reluctance to relocate.
53. Uncertainty to whether to invest further or develop properties if a mine will be established.
54. Loss of income and de-valuing of properties.
55. Economic impact of selling and moving
56. Health impacts and living conditions.
57. Health impacts from TSF due to dust, chemicals.
58. Blasting resulting in houses cracking.
59. Blasting will affect chicken and rabbit production.
60. Impacts on graves.
61. Impact on heritage and buildings which have cultural historical value (some buildings are older than 100 years).
62. Depopulation of area and increased influx of people and establishment of informal settlements.

63. Safety and security risks.
64. Crime and theft.
65. Concern over living conditions.
66. Noise impacts
67. Impact on aesthetics of area and sense of place.
68. Impacts on local poultry farm/hatchery.
69. Impacts on people who rent houses in the area.
70. Impacts on the plans to construct a school and 5-star hotel in the area.
71. Use of local businesses for drilling services.
72. Xenophobia and Influx of illegal immigrants.
73. Public participation process must include consultations with all I&AP's and with the Ga-Madiba community in Mahwelereng.
74. Impacts on the Moringa farming in the area as the moringa trees have medicinal uses and could be contaminated.
75. Impacts on local businesses.
76. Pollution impacts on ecotourism destinations and gaming and farming activities impacting on livelihoods.
77. Infrastructure incapacity in the overall municipality.
78. Impacts on crop farming in the area.
79. Impacts on the indigenous tree nursery and an instant lawn business.
80. Visual impacts as the mine will degrade the natural beauty of the area.
81. Impacts on the local community during the transporting of mineral products.
82. Water for communities is needed.

11. THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES

11.1. Type of environment affected by the proposed activity

11.1.1 Climate

Climate refers to the summation of the daily, weekly and monthly changes of weather over a long period and it is influenced by latitude, altitude, direction and intensity of wind and the presence of large bodies of water such as the ocean, lakes, dams and rivers. Since the industrial revolution, humans have been changing the global climate by emitting high amounts of greenhouse gases into the atmosphere, resulting in higher global temperatures, affecting hydrological regimes and increasing climatic variability. Climate change is projected to have significant impacts on agricultural conditions, food supply, and food security.

The main climatic factors analysed for the site were temperature, wind and rainfall. The climate for the region can be described as warm-temperate. South African Weather Service (SAWS) data from the meteorological station located in Mokopane for the period 2016 to 2018 was used to complete the following sections.

11.1.1.1 Temperature

Data retrieved from the Mokopane Weather Station (2016 - 2018)2 showed that temperatures ranged between 6.7°C and 29.6°C. During the day, temperatures increase to reach a maximum at about 15:00 in the late afternoon. Ambient air temperature decreases to reach a minimum at between 06:00 and 07:00 in the morning. Monthly mean, maximum and minimum temperatures are provided in Table 7 below.

Table 7: Monthly temperature summary (SAWS (Mokopane) data, January 2016 to December 2018)

Month	Temperature (°C)		
	Minimum	Maximum	Average
Jan	18.88	29.58	24.12
Feb	19.20	29.10	23.91
Mar	17.07	29.43	22.87
Apr	14.80	27.15	20.43
May	10.01	24.23	16.41
Jun	7.29	23.10	14.33
Jul	6.89	22.60	14.07
Aug	10.33	25.95	17.67
Sep	14.72	29.61	21.85
Oct	16.15	29.29	22.39
Nov	17.47	28.98	23.03
Dec	19.24	29.61	24.27

[2] Source: *South African Weather Service*

11.1.1.2 Rainfall

Mokopane falls within a summer rainfall region and receives most of its rain during October to March. The rainfall provided by the SAWS (Mokopane) data set for the period 2016 to 2018 ranged between 331 mm and 439 mm per annum (Airshed, 2020). For average monthly rainfall figures refer to Figure 18.

Rainfall data analysed from station no: 06338827 (Lat: -24.1960 Lon: 29.0060) for the period 1931 to 2019 indicated a mean annual rainfall of 590 mm/a. The highest mean monthly rainfall occurs in December (114 mm) followed by January (109 mm). The maximum rainfall event recorded from the data was 327 mm (Dec 1975).

Mean annual evaporation (MAE) measured is 1734 mm/a. Evaporation exceeds precipitation by a factor of 3 (Vivier et al, 2020b)

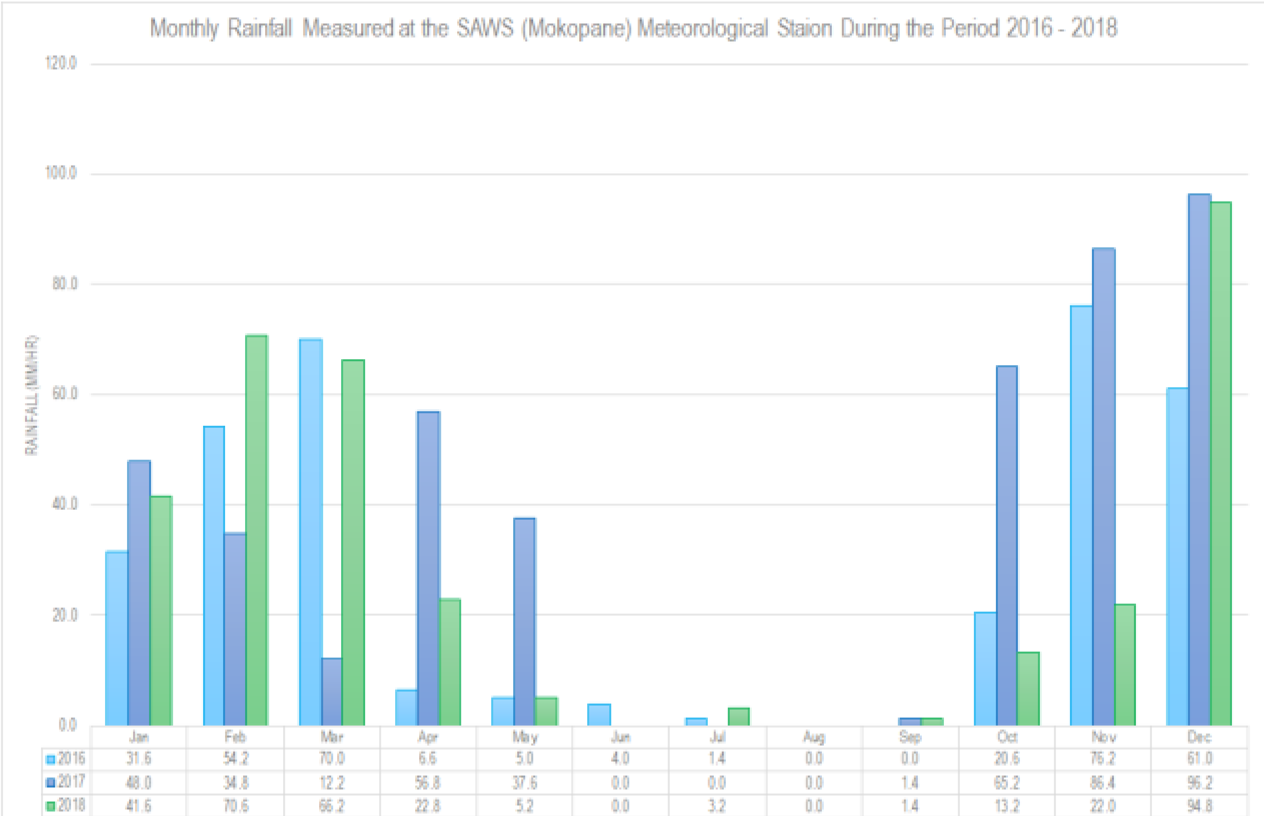

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Figure 18: Monthly rainfall as obtained from the SAWS (Mokopane) meteorological station for the period 2016-2018

11.1.1.3 Wind

Data for the period January 2016 to December 2018 indicates that the predominant wind direction is from the north-west with calm conditions of approximately 23.9% of the period summarised. During both daytime and night-time, north-westerly winds are common with calm conditions of approximately 15.5% during the day and increasing to approximately 33.9% during night-time.

The period wind roses are shown in Figure 19.

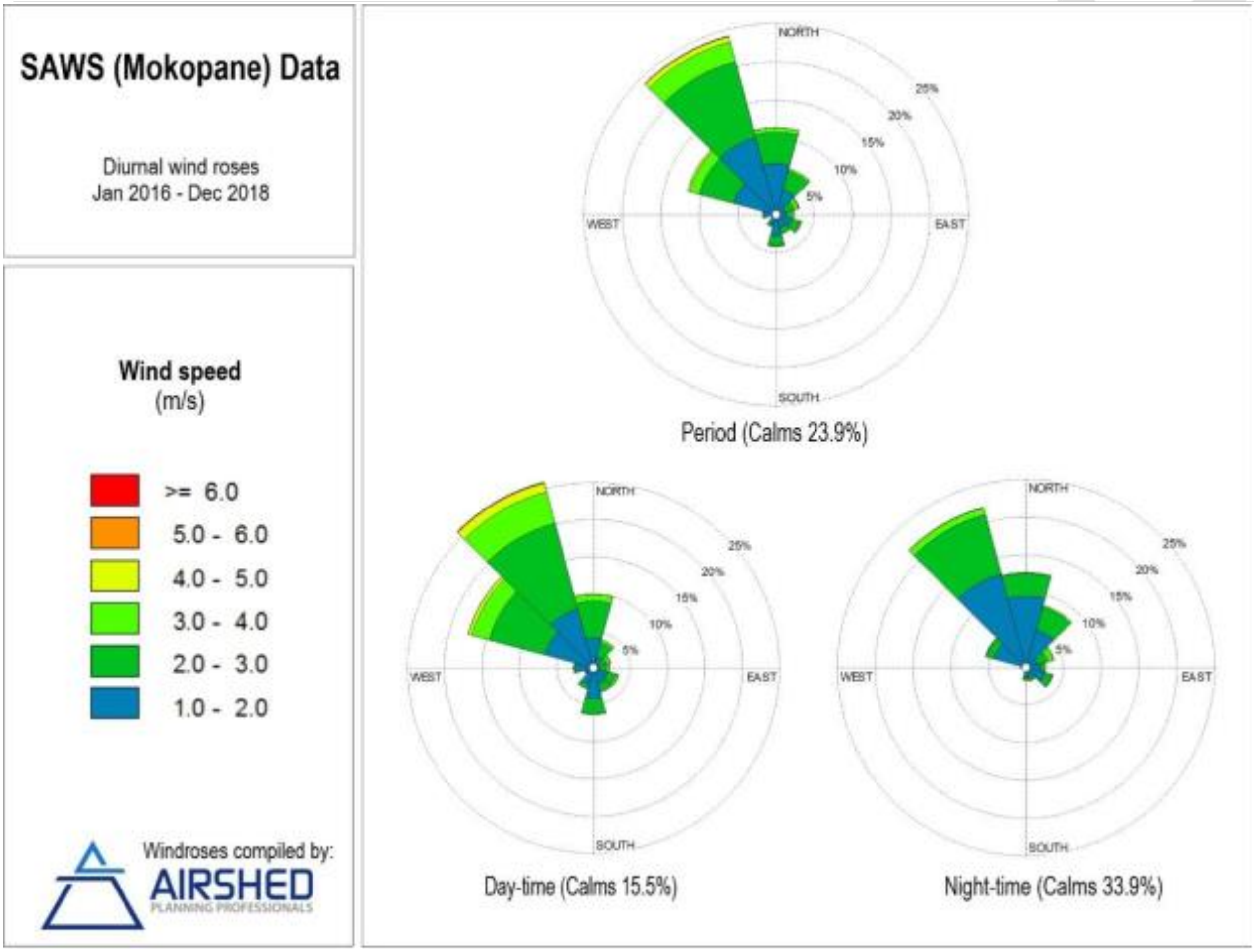

Figure 19: Period, day-, and night-time wind roses (SAWS (Mokopane) data, January 2016 to December 2018)

11.1.1.4 Ambient Air Quality

The South African Air Quality Information System (SAAQIS) aims to make information available to stakeholders, provide a common system for managing air quality in South Africa (SA) and provide uniformity in the way data; information and reporting are managed in SA. Providing near-real time ambient air quality data is one of the objectives of SAAQIS. This system was consulted for recent ambient air quality measurements in the project area. The nearest air quality monitoring station is in Mokopane managed by the Department of Environmental Affairs (DEA). The data from this station was accessed for 2017 to 2020, as an indication of the air quality of the study area.

No exceedances of the NAAQS were recorded for Nitrogen Dioxide (NO2) or Sulfur Dioxide (SO2) for all applicable averaging periods. Daily PM2.5 exceeded the allowable frequency of exceedance of the daily limit concentration in 2017, however compliance with the NAAQS is noted in 2018, 2019 and 2020. PM10 concentrations were in non-compliance with the NAAQS over the period 2017 to 2020. Refer to Table 8.

The sources of SO2 and oxides of nitrogen (NOx) that occur in the region include veld burning, vehicle exhaust emissions and household fuel burning. Various local and far-a-field sources are expected to contribute to the suspended fine particulate concentrations (which would include PM10 and PM2.5) in the region. Local sources include wind erosion from exposed areas, fugitive dust from agricultural operations, vehicle entrainment from roadways and veld burning. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute significantly to background fine particulate concentrations over the interior (Andreae, et al., 1996) (Garstang, et al., 1996) (Piketh, et al., 1996).

Table 8: Summary of ambient air quality monitoring data at Mokopane (concentration units for SO2 and NO2 are in ppb and for PM10 and PM2.5 in µg/m³)

Period	Annual Data Availability	Hourly Maximum Concentrations	Daily Maximum Concentrations	Annual Average	No of recorded hourly exceedances	No of recorded daily exceedances
			NO_2			
2017	86%	96.9		13.0	-	
2018	98%	104.5		13.4	-	
2019	89%	123.9		12.6	-	
2020 (Jan-Oct)	73%	102.8		8.6	-	
			SO_2			
2017	86%	65.8	29.4	4.4	-	-
2018	90%	87.6	25.7	4.6	-	-
2019	80%	99.0	28.9	4.5	-	-
2020 (Jan-Oct)	70%	57.4	13.5	2.8	-	-
			PM_{10}			
2017	82%		212.3	**61.6**		**93**
2018	96%		343.0	**66.1**		**116**
2019	93%		183.4	**63.4**		**117**
2020 (Jan-Oct)	75%		216.6	**43.3**		**31**
			$PM_{2.5}$			
2017	80%		74.2	19.3		**12**
2018	94%		46.7	16.0		4
2019	85%		42.8	15.8		3
2020 (Jan-Oct)	74%		196.7	11.7		1

11.1.1.5 Other sources of air quality pollution in the study area

The key pollutants recognized in the airspace of livestock buildings are particles including dust, micro-organisms and their toxins, and gases such as ammonia, carbon dioxide and trace gases such as volatile organic compounds (VOCs). Processed and activities associates with the production of poultry has the potential for air emissions. Ammonia is probably the most environmentally significant air pollutant. In addition, hydrogen sulfide and other trace gases such as VOCs and volatile fatty acids can result from the metabolic breakdown of chicken waste products, generally under low-oxygen (i.e. anaerobic) conditions such as when manure is allowed to ferment (anaerobically digest) in a pit beneath the birds, in an earthen lagoon or in other open-air containment. These pollutants can typically cause odour nuisance and in high concentrations ammonia and hydrogen sulphide can be dangerous to chickens and humans alike.

Airborne PM can contain dried faecal matter and may include bacteria, endotoxins, moulds, mites and insect parts. The airborne particulates may contain a mixture of biological material from a range of sources, with bacteria, toxins, gases and volatile organic compounds adsorbed to them. A more descriptive term for these airborne particles is bio-aerosol (Cargill and Banhazi, 1998). The typical character of bio-aerosols is that they may affect living things through infectivity, allergenicity, toxicity, pharmacological or other processes. Their sizes can range from aerodynamic diameters of 0.5 to 100 µm (Hirst, 1995).

Chicken houses may also be associated with combustion gases, including SO2, NOx, CO and soot (unburnt carbon) which would be emitted from hot air generator/boilers.

The main fuels with air pollution potentials used by households within the study region are coal, wood and paraffin. Coal burning emits a large amount of gaseous and particulate pollutants including SO2, heavy metals, total and respirable particulates including heavy metals and inorganic ash, CO, polycyclic aromatic hydrocarbons (PAH), and benzo(a)pyrene. PAH are recognised as carcinogens. Pollutants arising due to the combustion of wood include respirable particulates, NO2, CO, PAH, particulate benzo(a)pyrene and formaldehyde. The main pollutants emitted from the combustion of paraffin are NO2, particulates, CO and PAH.

Biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity, crop-residue burning and wildfires (locally known as veld fires) may represent significant sources of combustion-related emissions. In addition to the impact of biomass burning within the vicinity of the proposed mining activity, long-range transported emissions from this source can be expected to impact on the air quality between the months of August to October. It is impossible to control this source of atmospheric pollution loading; however, it should be noted as part of the background or baseline condition before considering the impacts of other local sources.

Air pollution from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere, and secondary, those pollutants formed in the atmosphere as a result of chemical reactions, such as hydrolysis, oxidation, or photochemical reactions. The significant primary pollutants emitted by motor vehicles include carbon dioxide (CO2), CO, hydrocarbon compounds (HC), SO2, NOx and PM. Secondary pollutants include NO2, photochemical oxidants (e.g. ozone), hydro carbons (HC), sulfur acid, sulfates, nitric acid and nitrate aerosols.

Fugitive dust emissions may occur as a result of vehicle entrained dust from local paved and unpaved roads, wind erosion from open areas and dust generated by agricultural activities (e.g. tilling). The extent of particulate emissions from the main roads will depend on the number of vehicles using the roads and on the silt loading on the roadways. Windblown dust generates from natural and anthropogenic sources. Erodible surfaces may occur as a result of agriculture and/or grazing activities.

11.1.1.6 Atmospheric Dispersion Modelling

The main findings from the Air Quality Impact Assessment due to the proposed project operations are described below (refer to Appendix 6.8: Air Quality Impact Assessment). Two scenarios were assessed:

- Transporting the Run of Mine (ROM) from the pit to the crusher plant by means of haul trucks
- Transporting the ROM from the pit to the crusher plant by means of conveyor

Particulate emissions were calculated for various source types. Simulations were undertaken to determine particulate matter (PM10 and PM2.5) concentrations and total daily dust deposition from project activities. Both unmitigated and mitigated (applying 75% (water suppression) and 90% (chemical suppression) control efficiency on unpaved haul and access road surfaces) operations were assessed.

For compliance, reference was made to the National Ambient Air Quality Standards (NAAQS) and National Dust Control Regulations (NDCR). PM10 and PM2.5 ground level concentrations exceed the NAAQS at numerous sensitive receptors within the study. The area of exceedance reduces with mitigated operations, but various sensitive receptors will still be impacted. Maximum daily dust fallout is within close proximity to the unpaved haul road and access road, and is within the NDCR for residential areas at all sensitive receptors in the study area for mitigated operations.

Vehicle entrainment on unpaved roads represents the most significant source of total particulate emissions from the project operations. The impacts from vehicle entrainment are directly linked to vehicle activity. The impacts from unpaved road surfaces may be mitigated with water sprayers (assuring ~75% control efficiency). However, due to the close proximity of sensitive receptors (within the mining right area) to the proposed activities, it is recommended that chemical suppressants be applied to unpaved roads that are in close proximity to the sensitive receptors to reduce the impacts from this source with more than 75% control efficiency in these sensitive areas.

The crushing operations are shown to be a significant source of emissions if unmitigated. It is recommended that as a minimum, mitigation by means of water sprayers (providing a 50% control efficiency) at the crushing and screening plant be implemented to minimise impacts from this source. Due to the close proximity of sensitive receptors to the operations, additional mitigation such as hooding and scrubbers should be implemented if feasible.

Due to the number of poultry broilers in the project area, the particulate impacts were assessed to concentration guidelines for chickens as discussed in section 2.3.2.2 of the Air Quality Impact Assessment Report (Appendix 6.8: Air Quality Impact Assessment). The hourly PM10 concentrations were compared against the maximum level of 700 $\mu g/m^3$.

Maps simulating the air quality impacts are attached as Appendix 11: Atmospheric Dispersion Modelling. In the assessment of mitigated operations, proposed project activities were simulated assuming 75% and 90% control efficiency for vehicle entrainment using water and chemical suppression respectively, and 50% control efficiency on the crushing activities using water sprays.

Due to the close proximity of sensitive receptors to the proposed project activities, mitigation measures on the main sources of fugitive dust (as recommended in Table 6-2 of the AQIA) will need to be implemented to minimise impacts. Dust fallout monitoring must be undertaken as outlined in section 6.2.3.2 of the Air Quality Impact Assessment (AQIA), in order to monitor the impacts from the proposed project activities. It is recommended that receptors within the impacted area (i.e. exceedance of the NAAQS (see section 4.2.2.3 of the AQIA)) be relocated. If this is not possible, it is recommended that a PM10 sampling campaign be undertaken (once mitigated activities commence) at the closest receptors to the operations in order to ensure that NAAQS are being met.

11.1.2 **Topography**

The topography of the proposed mine footprint area varies from slightly undulating valleys, and plains to moderately undulating hills with a mountain ridge occurring in the northern section of the site.

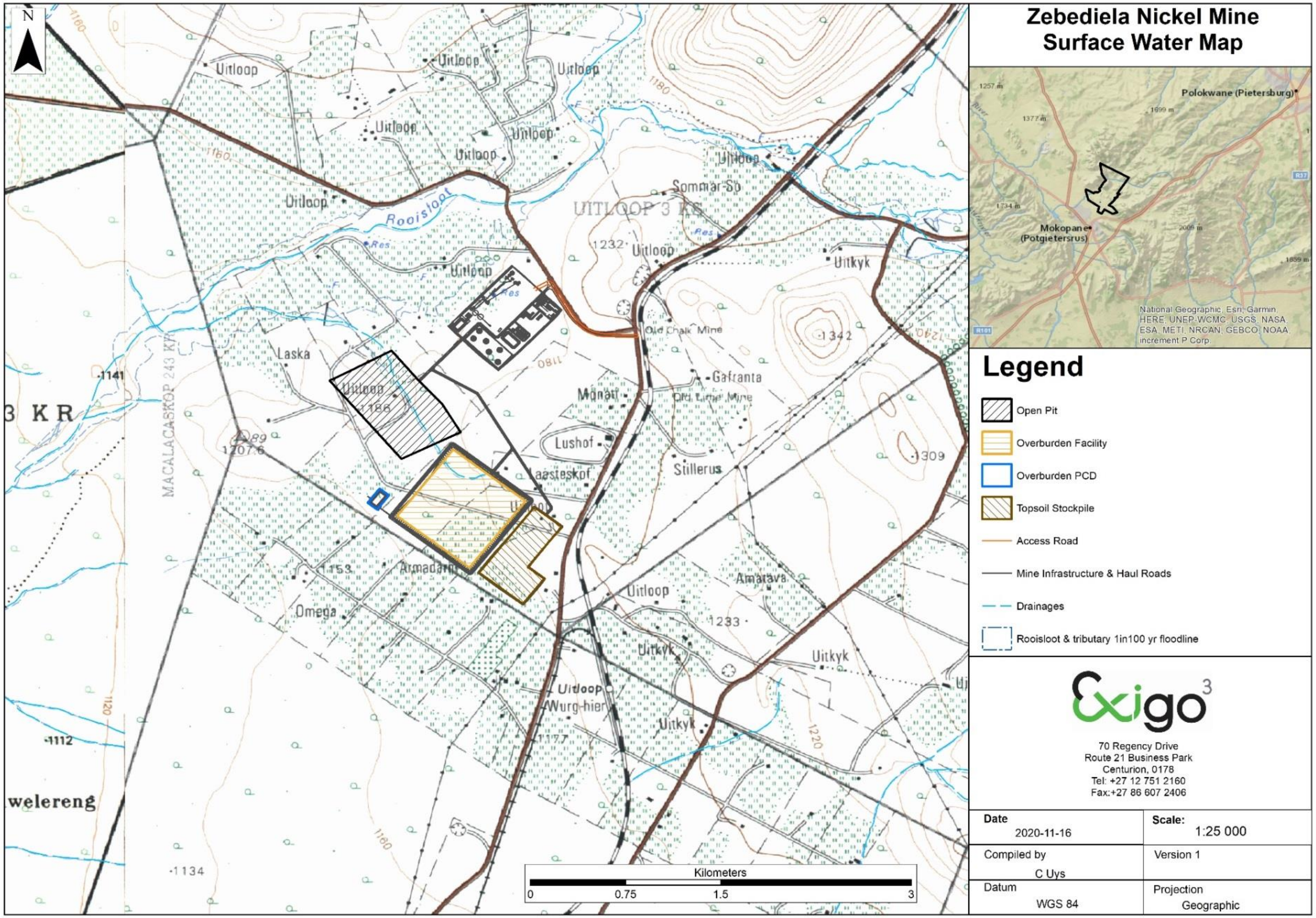

Figure 20: **Terrain and surface water drainage map**

11.1.3 Geology

MSA (2012) describe the geological setting surrounding the proposed mine as mafic-ultramafic Bushveld Complex which are the metasedimentary floor rocks of the Transvaal Supergroup and crystalline granites of the basement complex.

The project area is underlain by the Bushveld-related, serpentinized ultramafic (dunites, harzburgites, and pyroxenites) Uitloop intrusion which discordantly intruded the floor rocks. The majority of the orebody is overlain by a brucite-enriched calcrete cap which extends up to 7m. This calcrete cap has developed from the weathering of the underlying ultramafic body. The main orebody is underlain by calcareous metasediments and overlain by hornfelsed shales which both belong to the Chuniespoort Group. The orebody in the north-east of the project area is underlain by Archaean granitoids and overlain by the dolomites that form the footwall to the main south-western orebody.

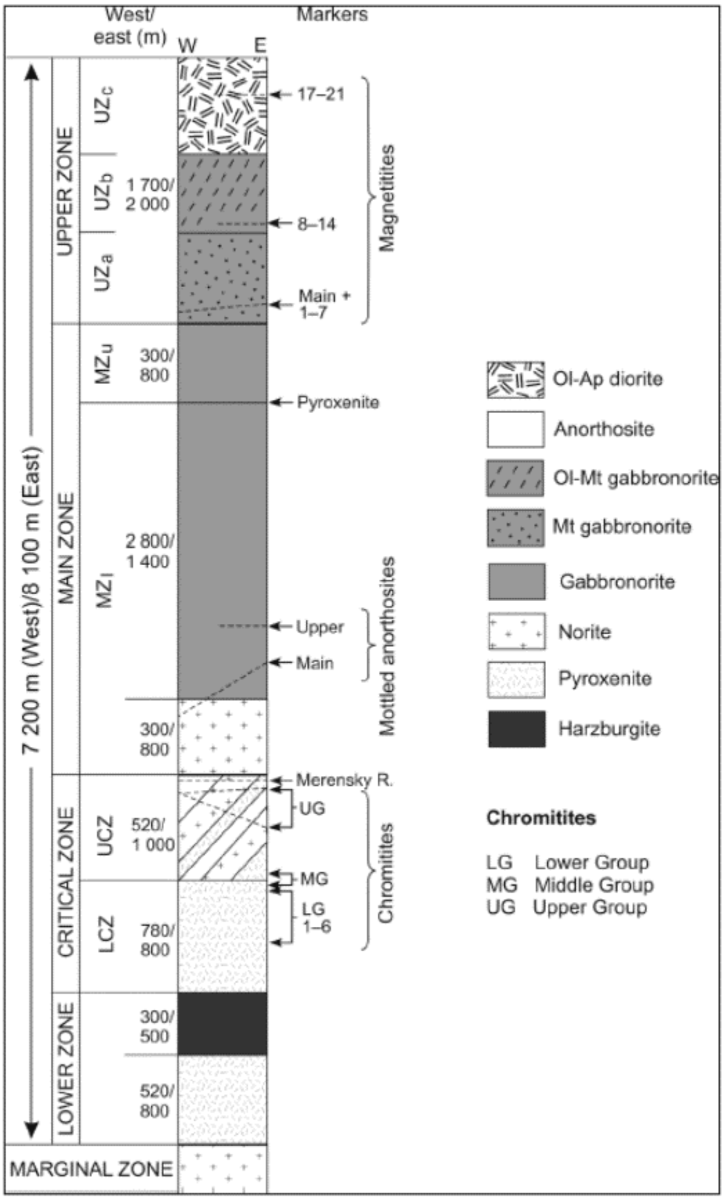

Figure 21: Schematic stratigraphic column for the main Bushveld Complex, showing key geological layers and thicknesses in the Western and Eastern Limbs. (MSA, 2012)

Surface geological mapping, exploration drilling, ground based geophysics and geochemistry has allowed for the relatively mapping of the geology in the mine development area. The bulk of the infrastructure is located on Uitloop II Lower Zone dunites, harzburgites and pyroxenites, and only the surface mine infrastructure is located on the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup. The Malmani Subgroup consists of an interlayered sequence of dolomite, interbedded chert-rich dolomite and minor quartzite and mudstone. Subdivision into the lowermost Oaktree, succeeding Monte Christo, Lyttelton, Eccles and uppermost Frisco Formation is based mainly on stromatolite types and interbedded cherts and shales. Given the proximity to the Penge formation, it is likely that the rocks underlaying the planned mine surface infrastructure are of the Frisco Formation, which typically consists of a chert-free brown dolomite. Tuffite and shale beds occur in the lower part of the unit. The unit is characterised by a subdued topography and ill-defined bedding traces on aerial and satellite imagery. The upper contact is an erosional unconformity (Buurman, 2020).

A summary of the geology underlying various surface infrastructure components is presented in the table below:

Table 9: Summary of the Geology underlying various surface infrastructure components (Buurman, 2020)

Infrastructure	Underlying Formation	Rock type
PCD Overburden	Lower Zone	Dunite, Harzburgite, Pyroxenite
Topsoil Stockpile	Lower Zone	Dunite, Harzburgite, Pyroxenite
Overburden Stockpile	Lower Zone	Dunite, Harzburgite, Pyroxenite
Open Pit	Lower Zone	Dunite, Harzburgite, Pyroxenite
Mine Infrastructure	Malmani Subgroup	Interlayered sequence of dolomite, interbedded chert-rich dolomite and minor quartzite and mudstone

11.1.4 Soils and Land Capability

A field survey was conducted by Dr Buks Henning in July 2019 in order to assess current soil conditions, agricultural potential and land capability of the site. The land type units represented within the footprint areas of the proposed mining infrastructure are as follows:

Landtype	Soils	Geology
Ah28	Red-yellow apedal, freely drained soils; red and yellow, high base status, usually < 15% clay	Granite and lava of the Randian Erathem.
Ae224	Red-yellow apedal, freely drained soils; red, high base status, > 300 mm deep (no dunes)	Complex; hornfels, shale, quartzite, and conglomerate of the Pretoria Group; basalt Granite, granophyre, ferrogabbro, gabbro, norite and anorthosite of the Bushveld and sandstone of the Karoo Sequence; river alluvium.

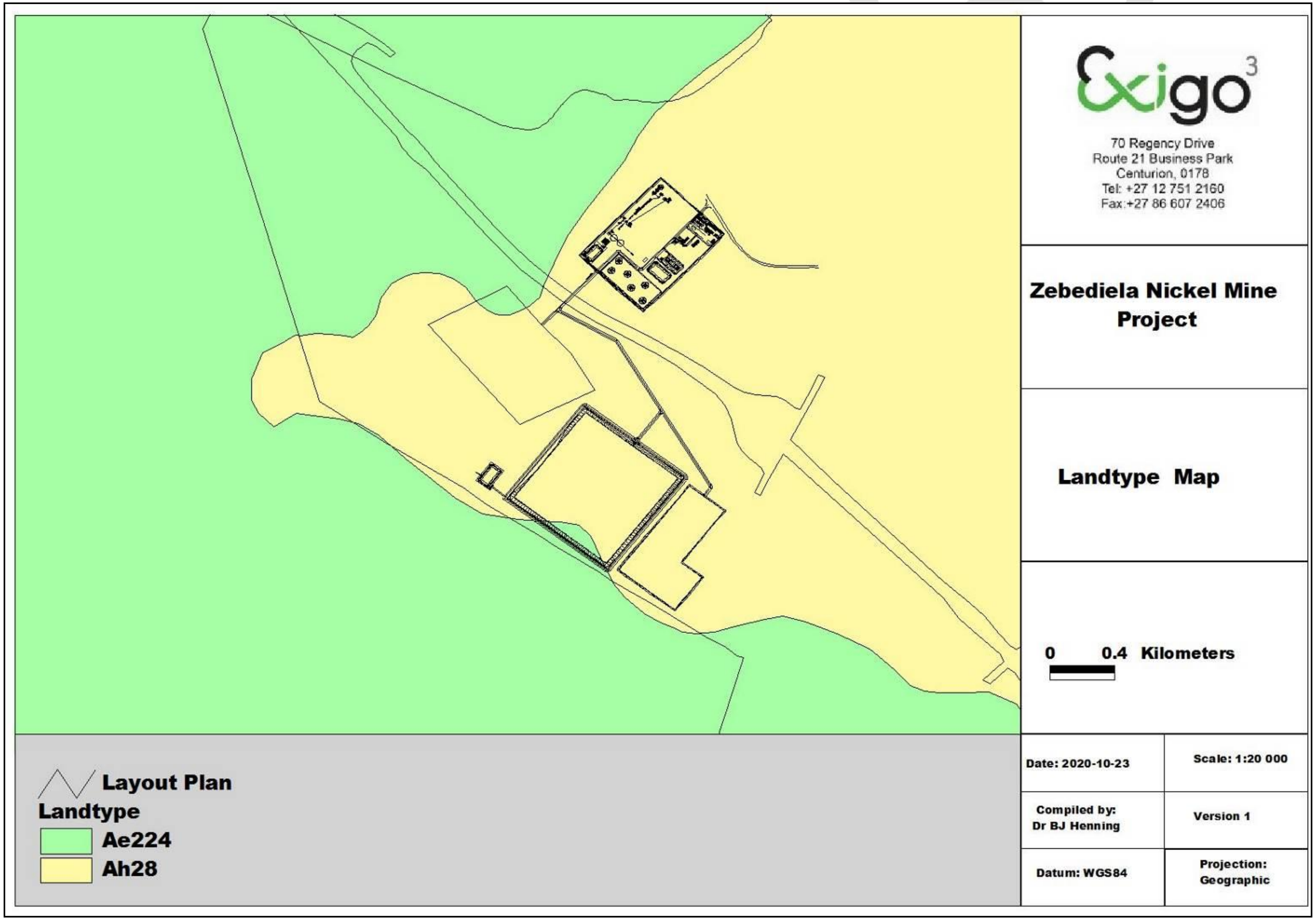

Figure 22: Landtype Map of the proposed mine development

11.1.4.1 Soil Types

The soils on site were classified into broad classes according to the dominant soil form and family as follows (the soil forms for the study area are indicated in Figure 23):

11.1.4.1.1 Shallow Gravelly Soils of the Mispah / Glenrosa Soil Form on slightly undulating hills and plains

- **Binominal Classification S.A.:** Mispah / Glenrosa / bedrock soil form
- **Description:** The soils are generally shallow and derived from dolomite or quartzite in the project area. All three these soil forms can be categorised in the international classification group of lithic soil forms. In lithic soil forms the solum is dominated by rock or saprolite (weathered rock). These soils have sandy to sandyloam texture, while topsoil structure is apedal and the profiles are very shallow. Exposed rocks and boulders are spread on the soil surface throughout the area. Where dolomitic soils occur the soil clay content is higher compared to quartsitic soils.
- The soil in this area is often weakly structured, sandy to loamy and forms a mosaic of shallow Glenrosa soils and very shallow rocky soils (Mispah soil form). The Mispah and Glenrosa soils found on this section of the site are widespread and shallow in depth, although it has a medium clay content.
- **Landscape:** undulating plains / hills
- **Depth:** 50-200mm
- **Texture:** Sandy to sandy loam soils
- **Average Clay Content:** 8-20%
- **Agricultural Potential:** Low potential soils, due to the shallow nature of the soils and sloping terrain, making these areas not suitable for crop cultivation under arable conditions. The orthic A-horizon of the lithic soil group is unsuitable for annual cropping or forage plants (poor rooting medium since the low total available moisture causes the soil to be drought prone). These topsoils are not ideal for rehabilitation purposes for they are too shallow and/or too rocky to strip. Topsoil stripping and stockpiling of the “shallow” soils should only be attempted where the surface is not too rocky.
- **Land capability:** The grazing potential of these areas is moderate-low. The most suitable and optimal utilization of the area would be grazing by small livestock or game species.

11.1.4.1.2 Shallow Red Apedal Soils of the Cartref / Hutton / Glenrosa Soil Form

- **Binominal Classification S.A.:** Hutton soil form; Glenrosa soil form / Cartref soil form (dolomite)
- **Description:** The Hutton soils found on the site occur in pockets throughout the study area on plateaus and slightly undulating plains. The shallow Hutton soil forms are especially dominant in the central and eastern section of the study area where the underlying bedrock is dolomite or quartsite. The Hutton soil form on site varies from shallow to deeper and has a medium to high

clay content. The relatively high magnesium and iron content of the parent rocks from which these soils are derived, impart the strong red colours noted. Where it becomes very shallow the soils are classified as Glenrosa soil form.

- **Landscape:** Plains / Plateaus
- **Depth of soil forms:** 100-400 mm
- **Texture:** Sandyloam
- **Average Clay Content:** 10-15% (Hutton); 6-15% (Glenrosa)
- **Agricultural Potential:** Moderate potential soils depending on soil depth and size of land available for sustainable arable agriculture. Soils vary from shallow and sandy in some areas (Glenrosa, Hutton soil form) to deeper with a higher clay content (Hutton soil form). The red apedal Hutton soils with a higher clay content in the topsoil has a high-water holding capacity. Under the climatic conditions these soils would sustain arable crop production, although as isolated pockets that cannot be considered economically viable units. The areas with deeper soils represent the most viable options for crop production under arable conditions considering the rainfall and moisture availability in the topsoil. Considering that the amount of land that is needed to economically sustain arable agriculture, the soil type described above cannot be considered as viable for crop production. The many old cultivated fields confirm that crop cultivation over the longer term is not a financially viable option under the prevailing climatic conditions.
- **Land capability:** Livestock and / or game grazing are viable due to the slightly higher nutrient and organic content of the topsoil in grassland areas that support a mixture of palatable and unpalatable species.

11.1.4.1.3 Deep, Red Apedal Soils of the Hutton Soil Form

- **Binominal Classification S.A.:** Hutton soil form
- **Description:** The Hutton soil form on site is deep and has a medium to high clay content. The Hutton soil forms consist of an orthic A horizon on a red apedal B horizon overlying unspecified material. The red apedal soils B1-horizon has more or less uniform "red" soil colours in both the moist and dry states and has weak structure or is structureless in the moist state. The range of red colours that is a key identification tool in differentiating between a red apedal and yellow-brown apedal is defined by the Soil Classification Working Group Book, 1991. Some of the defining red soil colours identified on the sites are bleached (10R 3/6), while some are bright red. The relatively high magnesium and iron content of the parent rocks from which these soils are derived, impart the strong red colours noted.
- **Landscape:** Plains
- **Depth of soil forms:** 600-1200mm+
- **Texture:** Sandyloam to Loam
- **Average Clay Content:** 10-20%

- **Agricultural Potential:** Soils not under irrigation (arable agriculture) have a Moderate Agricultural Potential, while the soils in the north-western section of the project area are under irrigation (pivots) and classified as having a High Agricultural Potential. The Hutton soils are deep and often have a sandyloam structure that causes a medium water holding capacity, although the clay content of the soils is sufficient. However, under the prevailing climatic conditions these soils would not sustain arable crop production. The most viable option for crop production on the soil form is under irrigation considering the variable rainfall and moisture availability due to higher day temperatures. Irrigation is practiced in the north-western section of the site, although for other farm portions to utilize crop cultivation under irrigation, it will require the installation of a number of surface water impoundments as storage during the dry months. The availability of groundwater on the dolomitic bedrock is considered High, although high evaporation rates and high water demands by crops would render crop cultivation still a risky venture on some of the farm portions in the study area, with the size of the farm portion in combination with soil form (deep Hutton soils) and water availability for irrigation being the main factors contributing to soils being classified as High Potential Soils under irrigation or not. The many old cultivated fields confirm that crop cultivation without irrigation on small pockets of land over the longer term is not a financially viable option under the prevailing climatic conditions. Sustainable crop cultivation can only be supported on large portions of land under irrigation as seen in the western section of the site.
- **Land capability:** Livestock and / or game grazing are viable due to the slightly higher nutrient and organic content of the topsoil in woodland areas that support a mixture of palatable and unpalatable species. Arable crop cultivation under the current climatic conditions is not considered a viable option.

11.1.4.1.4 Black or Dark Grey Clayey Soils associated with the drainage channels and floodplains of the Oakleaf, Cartref and Valsrivier Soil Forms

- **Binominal Classification S.A.:** Oakleaf, Cartref and Valsrivier soil forms
- **Description:** The soils are generally dark grey to black in the topsoil horizons, and high in transported clays. These soils occur within the zone of groundwater influence. The soils are alluvial and are deep (>1,2m) with an orthic A and neocutanic B with signs of wetness in the horisons. Brown A horizon and red-brown B horizon. The soils are slightly sensitive to erosion. The subsoil is more sensitive to erosion and should preferably not be exposed.
- **Landscape:** Bottomlands (drainage channel and floodplains)
- **Depth:** >1200mm
- **Texture:** Sandyclay to Sandyclayloam
- **Average Clay Content:** 10-30%
- **Agricultural Potential:** Zero potential soils, due to the soil wetness these areas are not suitable for crop cultivation under arable conditions.

- **Land capability:** The grazing potential of these low-lying areas is high due to the palatable grasses growing throughout the year on these soils. The only limiting factor may be that livestock movement is limited during the wet season when the clay expands, causing livestock to get stuck in the muddy conditions. Soils are very sensitive and prone to erosion. A specific strategy is needed to prevent damage to these soils considering that overgrazing and trampling has already caused some degradation of the floodplains.

11.1.4.2 Land Capability

11.1.4.2.1 Climatic conditions

The area is expected to receive an annual total rainfall between 400 and 500mm, of which most fall from October to April. This amount is considered Moderate, although in combination with the high evaporation rate and sandy soil conditions in this section of the Limpopo Province, the climatic conditions are considered unsuitable for crop cultivation under arable conditions (WWF, 2004). Furthermore, the high variability in rainfall distribution within the area could however render dry land farming a risky venture, even under irrigated conditions considering the sandyloam nature of the soils which has a low water holding capacity.

The study area is thus dry which would contribute to moisture stress conditions during crop growth and development. The potential of groundwater is high considering the dolomitic bedrock throughout large parts of the study area, and therefore irrigated cropping is considered a viable option.

11.1.4.2.2 Crop production

The typical landscape of the study area is dominated by shallow, gravelly to rocky soils associated with rocky ridges or very sandy / gravelly soils associated with plateaus, ridges and footslopes. These soils have a low clay content and water holding capacity, and their shallow nature in combination with the climatic conditions render this section of the proposed development site unfavourable for effective crop production which could result from high moisture demands by planted crops. The isolated pockets of moist grassland and ravines have shallow sandy-clay or clay soils that are seasonally flooded or have a perched water table. These areas are unsuitable for crop cultivation.

The study area is expected to receive an annual total rainfall of about 450 mm which is relatively low and highly variable. In addition, the farms are considered to be located in an area which is marginal for rain-fed arable crop production.

Economically viable farming is thus restrictive to irrigated cropping due to the high risk that could be associated with dry-land farming. Higher day temperatures in summer months may hamper soil moisture storage for crop use. Irrigation is practiced on the Remainder of the Farm Uitloop in the north-western section of the site under pivots.

The land capability classes for the study area are indicated in Figure 24.

11.1.4.2.3 Livestock production / wildlife grazing

The natural vegetation in the study area has a grazing capacity that varies from low (shallow, rocky or sandy soils) to medium (seasonally wet soils, deeper loamy soils). The different sections of the study area can support grazing according to the soil nutrient content as follows:

- The deep sandy and gravelly soils associated with the footslopes, valley floors and plateaus have low quality grazing with limited potential for livestock farming. These areas are however suitable grazing for specialized grazers such as sable antelope.
- The red-yellow apedal soils associated with the study area has a medium potential for livestock grazing due to the slightly higher nutrient content of the soil supporting a mixture of palatable and unpalatable grasses. Grazing value decreases as the season changes from summer to winter though, with the lowest grazing potential available to livestock at the end of the season.
- The seasonally wet soils of the study area support palatable grass species and these areas have a medium to high suitability for livestock or game grazing. These soils have a good water holding capacity and grass species that grow in these areas vary from having a medium to high palatability depending on the seasonal changes.

The grazing capacity map of the Department of Agriculture for the study area is presented in Figure 25.

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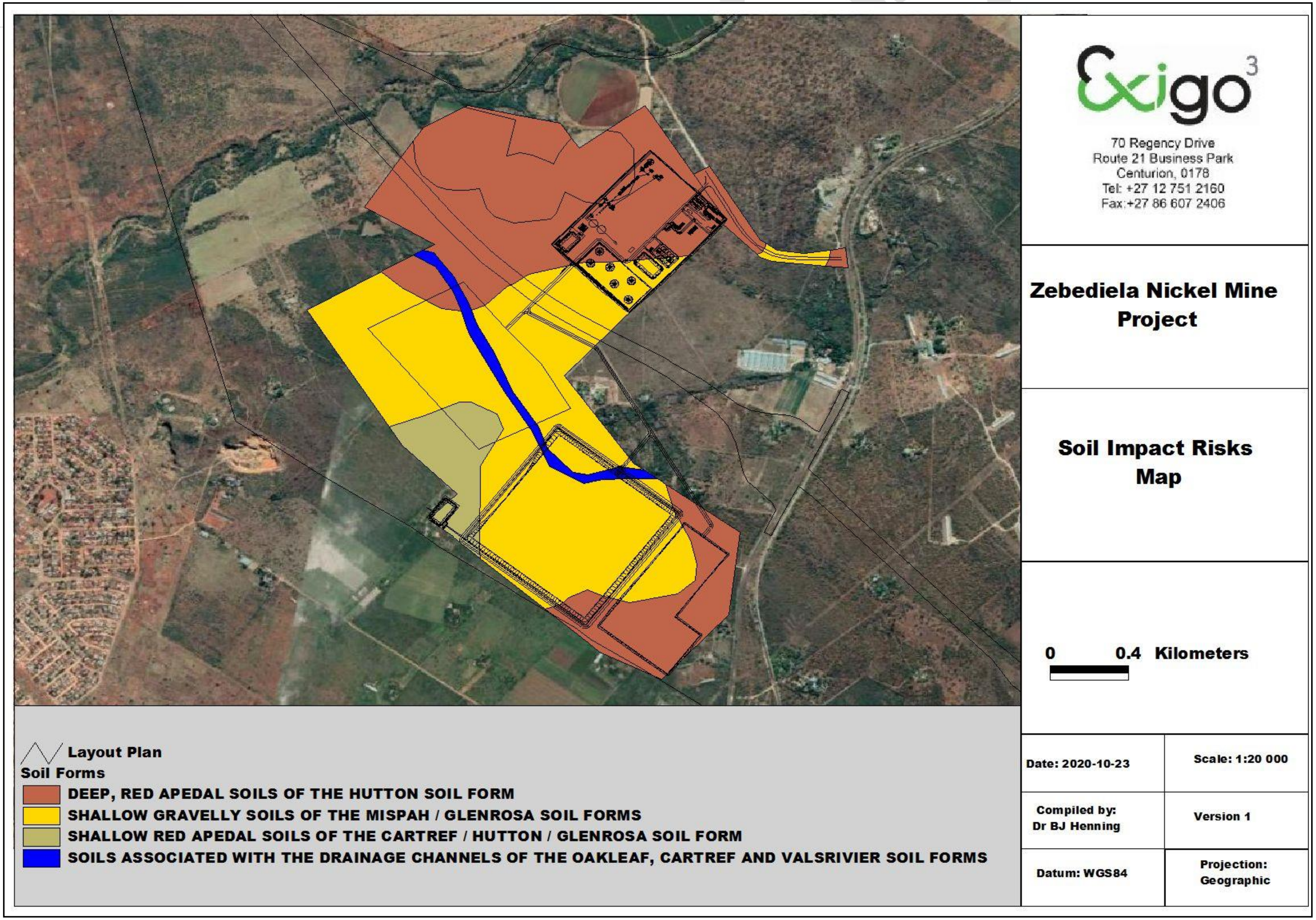

Figure 23: Soil form map for the study area

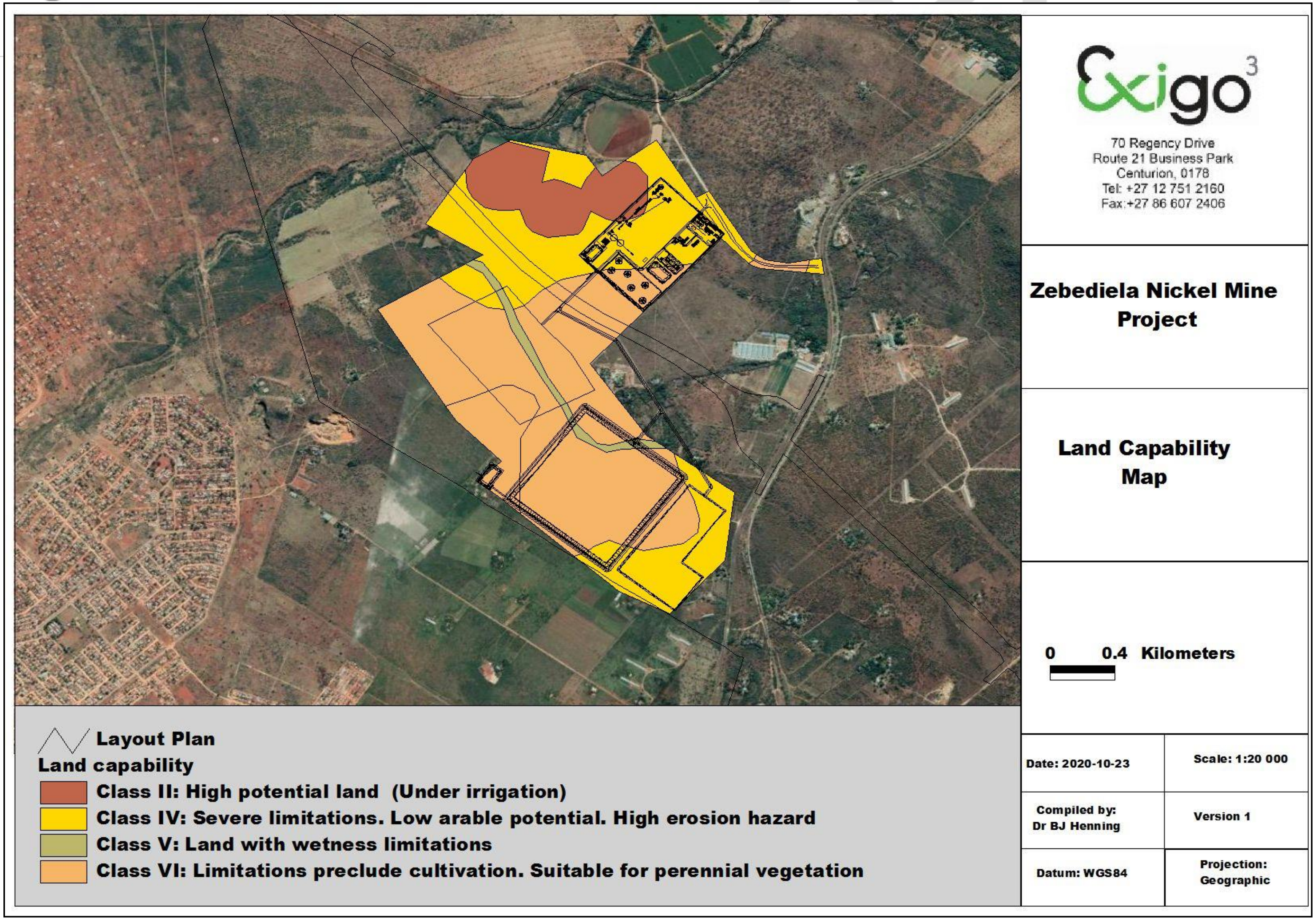

Figure 24: Land capability map for the study area

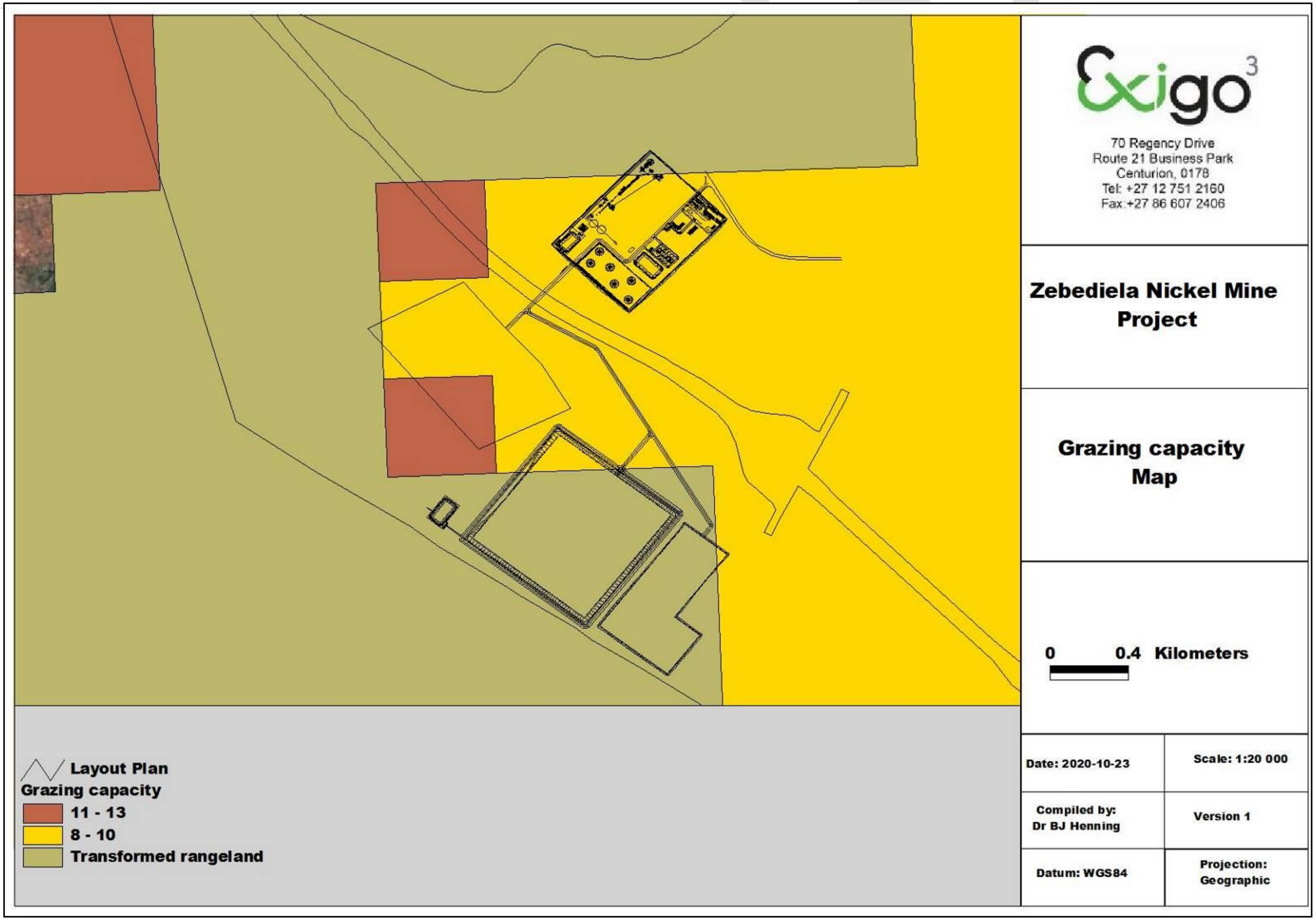

Figure 25: Grazing capacity map of the study area 1993 database Source: [Web] http://www.agis.agric.za/agismap_atlas/AtlasViewer).

11.1.5 **Hydropedology**

Considering that the flow path of the water through the soil along the hillslope and in the water course (no wetlands occur in the project area) that will be impacted by the opencast mining, is largely restricted to surface flow, the need to conduct a hydropedological assessment was not considered a high priority for the Zebediela Nickel Mine project. The focus should be on the management of stormwater around the open pit and other mining infrastructure to ensure no impacts on the main drainage feature that occur to the north of the site, namely the Rooisloot. A detailed stormwater management plan was compiled in this regard (refer to Environmental Stormwater Management Plan (SWMP)).

11.1.6 **Biodiversity**

Dr. Buks Henning, a qualified ecologist and wetland specialist, visited the site in July 2019. The following section has been completed based on the Ecological and Wetland/Riparian Impact Assessment (refer to Appendix 6.3: Ecological Impact Assessment and Wetland/Riparian Delineation).

11.1.6.1 Vegetation Overview

The project area lies within the Savanna Biome, the largest biome in Southern Africa. The biome is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs).

The most recent classification of the area by Mucina & Rutherford shows that the proposed development site is classified as Polokwane Plateau Bushveld and Makhado Sweet Bushveld.

The Polokwane Plateau Bushveld occurs on moderately undulating plains with short open tree layer with a well-developed grass layer to grass plains with occasional trees at higher altitudes. Hills and low mountains of the Mamabolo Mountain Bushveld are embedded within this unit. This vegetation type has a Least Threatened conservation status with less than 2% statutorily conserved and some 17% transformed, including about 10% cultivated and 6% urban built up.

The Makhado Sweet Bushveld vegetation type is characterized by slightly to moderately undulating plains sloping to the north, with some hills in the south-west and a short and shrubby bushveld with a poorly developed grass layer. This vegetation type has a vulnerable conservation status with about 1% statutorily conserved and some 27% transformed.

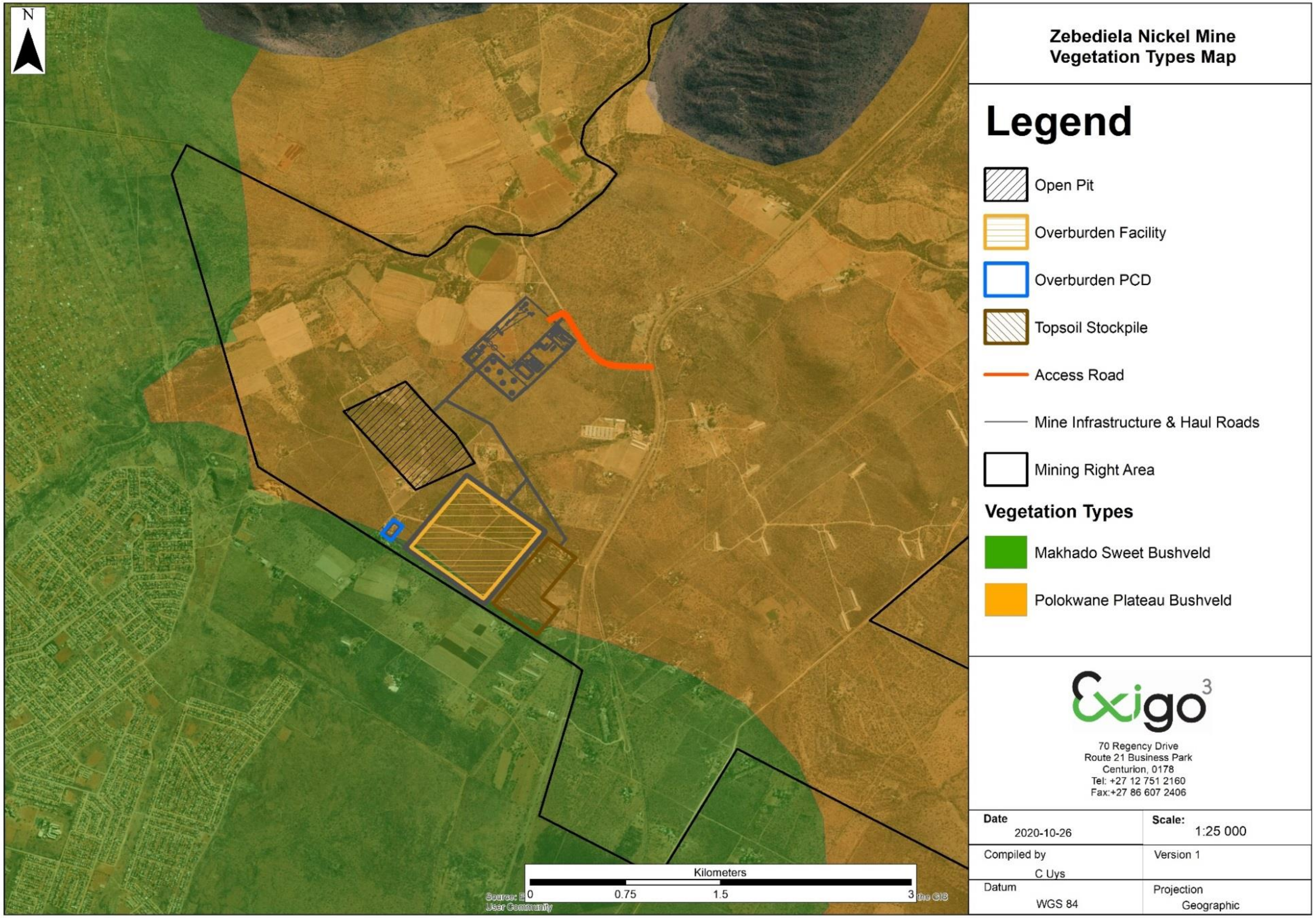

Figure 26: Vegetation Types of the study area (Mucina & Rutherford, 2006)

11.1.6.2 Vegetation Units

Vegetation units were identified according to plant species composition, previous land-use, soil types and topography. The state of the vegetation of the proposed mining sites varies from being natural to completely degraded. The properties are currently zoned for agriculture.

The following vegetation units were identified on site:

1. *Combretum apiculatum* woodland:
    - Open *Combretum apiculatum* woodland;
    - Denser *Combretum apiculatum – Senegalia caffra* - *Grewia monticola* woodland
    - *Combretum apiculatum – Combretum hereroense* woodland;
    - *Combretum apiculatum – Dodonaea viscosa* woodland;
2. *Combretum hereroense* woodland on dolomitic soils:
    - *Combretum hereroense – Ozoroa spaerocarpa* woodland;
    - *Comberetum hereroense – Grewia vernicosa – Euclea undulata* woodland;
3. *Vachellia - Grewia - Ziziphus mucronata* sweetveld;
4. Old fields / cultivated land
    - Primary old fields;
    - Secondary old fields
    - Cultivated land;
5. Hydrological features:
    - River & riparian woodland (Rooisloot);
    - Riparian flat channel.

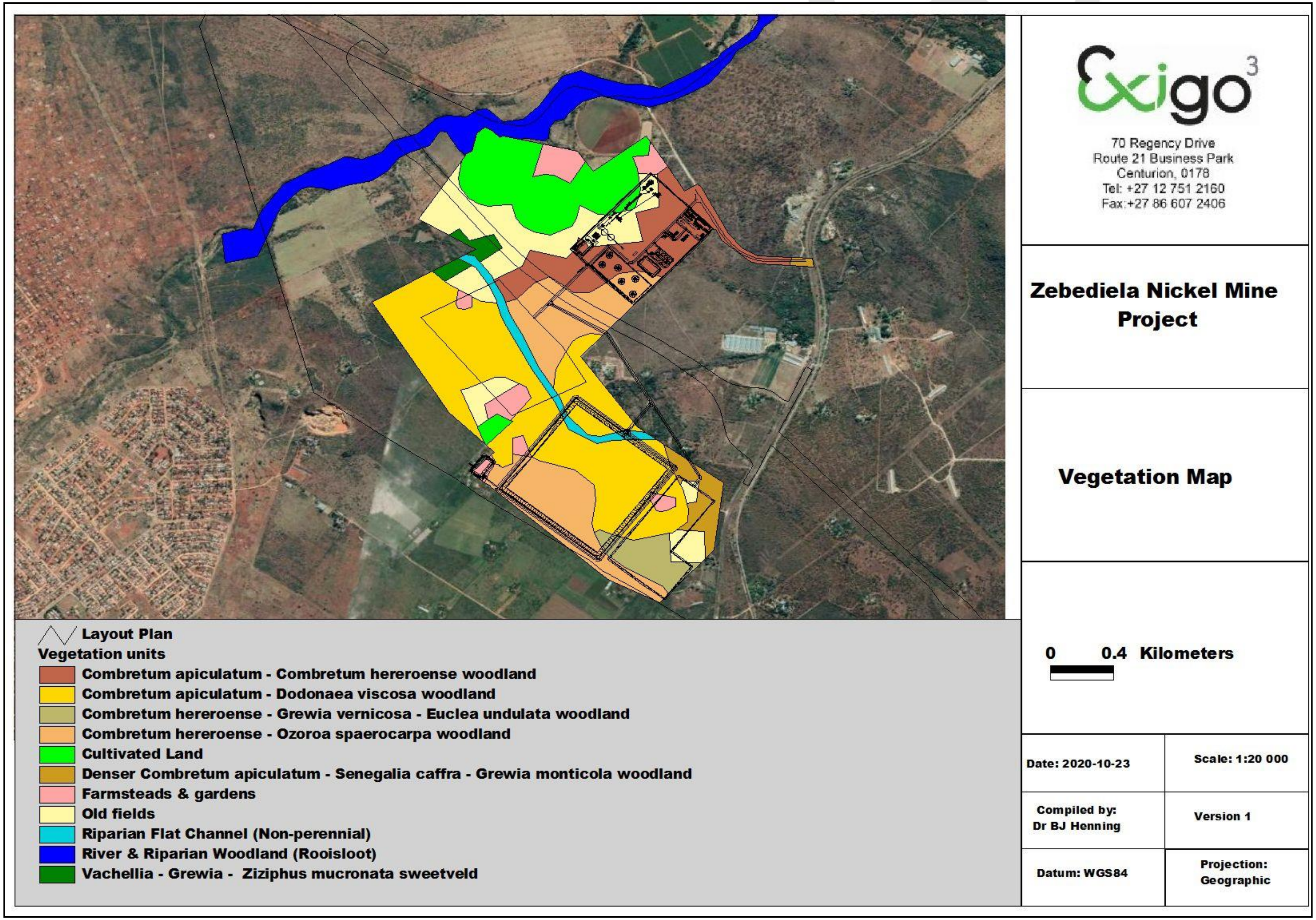

Figure 27: Vegetation Map of the study area

11.1.6.2.1 Combretum apiculatum woodland

The *Combretum apiculatum* woodland has several variations as identified during the survey. The variations were identified according to the soil depth, soil type and the state of degradation.

The denser *Combretum apiculatum – Senegalia caffra - Grewia monticola* woodland variation (Photo 1) occurs on shallow red-yellow apedal soils of the Hutton or Glenrosa soil forms. The woody layer forms a mosaic of denser and more open structure with a mixture of sweetveld and sourveld woody species observed. The woody layer is dominated by *Combretum apiculatum, Grewia monticola, Euclea undulata, Senegalia caffra, Dichrostachys cinerea* and *Dombeya rotundifolia*. The grass layer is slightly denser due to the more fertile soils and dominated by species such as *Heteropogon contortus* and *Eragrostis rigidior*. The habitat type can be considered slightly degraded and classified as having a Medium Sensitivity.

The *Combretum apiculatum – Combretum hereroense* woodland variation (Photo 2) occur mostly on dolomitic soils with a higher clay content, although the shallow nature of the soils causes a more open, stunted woody structure. Dolomite bedrock is often exposed on the surface. *Combretum hereroense* is a definite indicator species of more fertile soils, while *Combretum apiculatum* is indicative of shallow, gravelly soils. The landscape is slightly undulating plains acting as an ecotone between the quartzite and dolomitic soils. The habitat type can be considered slightly degraded and classified as having a Medium Sensitivity.

The *Combretum apiculatum – Dodonaea viscosa* woodland variation (Photo 3) occurs largely in the western section of the proposed mine infrastructure footprint area on moderately undulating plains and hills. The woody layer forms dense stands of *Dodonaea viscosa* in between the broadleaf components. The dominance of *Dodonaea viscosa* is a clear indication of habitat disturbance, probably as a result of overgrazing in the past. The habitat type can be considered degraded and classified as having a Medium-low Sensitivity.

No red data species were found during the survey in this vegetation unit. Two protected tree species was documented namely *Boscia albitrunca* (shepherds tree) and *Sclerocarya birrea* (marula).

Photo 1: Denser *Combretum apiculatum – Senegalia caffra - Grewia monticola* woodland

Photo 2: *Combretum apiculatum – Combretum hereroense* woodland in the study area

Photo 3: *Combretum apiculatum – Dodonaea viscosa* woodland in the study area

11.1.6.2.2 Combretum hereroense woodland on dolomitic soils

The *Combretum hereroense* woodland occurs mostly on dolomitic soils and therefore the soils have a slightly higher clay content compared to other vegetation units. The two variations were identified according to the soil depth.

The *Combretum hereroense – Ozoroa spaerocarpa* woodland variation (Photo 4) occurs on shallow, rocky soils in the western and eastern sections of the site and show clear dominance of species such as *Combretum hereroense, Ozoroa sphaerocarpa; Euclea crispa* and *Senegalia caffra*. The vegetation unit occurs on a slightly undulating landscape and the habitat type can be considered slightly degraded, classified as having a Medium Sensitivity. The woody layer forms an open woodland structure.

The *Comberetum hereroense – Grewia vernicosa – Euclea undulata* woodland variation (Photo 5) occurs on deeper, dolomitic soils and the woody layer is dominated by sweetveld species such as *Combretum hereroense, Euclea undulata, Searsia lancea, Grewia vernicosa* and *Vachellia tortilis*. The vegetation unit occurs on a slightly undulating landscape and the habitat type can be considered slightly degraded due to encroachment and overgrazing in the past, while being classified as having a Medium Sensitivity. The woody layer forms a closed woodland structure with a well-developed shrub layer.

No red data species were found during the survey in this vegetation unit.

Photo 4: *Combretum hereroense – Ozoroa spaerocarpa* woodland variation in the study area

Photo 5: *Combretum hereroense – Grewia vernicosa – Euclea undulata* woodland variation in the study area

11.1.6.2.3 Vachellia – Grewia - Ziziphus mucronata sweetveld

This vegetation unit forms dense woodland in low-lying areas and dominated by various sweetveld species in the western section of the site. Typical woody species include *Vachellia karroo, Vachellia tortilis, Euclea undulata, Ziziphus mucronata* and *Dichrostachys cinerea*. The area is underlain by red apedal Hutton soils or greyish clayey soils of the Cartref soil form with medium to high clay content. The herbaceous layer is characterised by grass species such as *Heteropogon contortus, Panicum maximum, Urochloa mosambicensis* and *Eragrostis curvula*. The state of the vegetation is indicated in Photo 6. The vegetation unit is classified as having a Medium sensitivity due its widespread occurrence in the Savanna Biome.

Photo 6: *Vachellia – Grewia - Ziziphus mucronata* sweetveld in the study area

11.1.6.2.4 Old fields / Cultivated land

The areas that are currently in a largely degraded state as a result of crop cultivation or old fields in different stages of succession are discussed as one vegetation unit based on the low sensitivity of the area and common state of degradation. The degraded areas occur throughout large areas of the low-lying plains and valleys of the study area and are characterised by three main variations namely:

- Cultivated land (Photo 7)
- Primary old fields (Photo 8)
- Secondary old fields (Photo 9)

The cultivated land occurs as pockets of commercial farming, especially in the irrigated land in the western section of the site. These areas do not represent a vegetation entity other than homogenous stands of crops and some exotic weeds and pioneer grasses. Therefore, no further discussion follows on the cultivated land considering that these areas represent low sensitivity areas that is highly suitable for any development from an ecological perspective.

The old cultivated fields occur throughout the area and vary between primary and secondary old fields. When cultivated fields are left fallow, it results in a landscape mosaic of patches of secondary vegetation varying in age and dominated by various grass species (Moll, 1965). Different stages of succession occur in the old fields, and the most common old fields in the Savanna Biome and surroundings are the young old fields of 1-5 years old (Smits et al., 1999) dominated by the pioneer grass species of disturbed areas, *Cynodon dactylon* (Van Oudtshoorn, 1999). Secondary grassland communities may develop from this old field variation, dominated by the secondary grassland species directly related to man-made disturbances, *Hyparrhenia hirta*. These fields are still in an early successional state, although somewhat older (older than 5 years) with several grass species like *Hyperthelia dissoluta, Aristida junciformis, Aristida congesta s. congesta* and *Eragrostis rigidior.* The landscape and vegetation features of the primary old on the proposed mining development site include slightly undulating plains with a low tree cover (< 1%) and dense (60-70%) grass layer. The dominant species include *Aristida* species, *Heteropogon contortus, Eragrostis lehmanniana* and *Cenchrus ciliaris*, indicating previous agricultural/utilising activities within these areas, while typical herbs/weeds include *Tagetes minuta* and *Bidens bipinnata*. The shrub layer (1 - 1,5m.) on the primary old fields covers 1 – 2%, while the forb layer covers 15-20% of the area. The soil in the area is red Hutton soils.

The outer successional stage of old fields only starts after several years of abandonment when woody species start to invade. These secondary old fields are usually dominated by species such as *Dichrostachys cinerea, Vachellia tortilis, Combretum apiculatum* and *Ziziphus mucronata*. Where overgrazing occurs the encroacher *Dichrostachys cinerea* becomes dominant as is evident on certain areas of the site. The landscape and vegetation features of this unit include slightly undulating plains with Hutton soils. The tree layer (> 3m) covers 5 -10%, while the shrub layer covers 20-30% (different variants) of the area. The grass layer is moderately developed with a 40-50% cover, while the forb layer (0.2m) covers 5 – 10% of the area. This vegetation unit is defined as a secondary old field variant/modified land which is evident from the higher tree cover/diversity as well as the higher shrub cover/diversity.

No red data species were found as a result of the degraded state of the vegetation. The old fields and cultivated land have a low sensitivity due to the modified state of the vegetation; unlimited development can be supported in these areas.

Photo 7: Cultivated land in the study area

Photo 8: Primary old fields in the study area

Photo 9: Secondary old fields in the study area

11.1.6.2.5 Drainage channel & riparian woodland

All channels and streams with their associated riparian vegetation in the project area are considered to be ecologically sensitive, forming important, limited and specialised habitats for several flora and fauna species. The species composition is unique and relatively limited in distribution and coverage. These habitats also form linear corridors linking different open spaces. The riparian zone varies from being completely removed in some areas, to approximately 30-40m wide as identified from the aerial photograph. A more open riparian zone of thornveld is locally associated with some of the smaller non-perennial systems in the western section of the site and classified as a floodplain flat drainage channel. Here the vegetation is dominated by tall *Vachellia karroo* and *Searsia lancea* trees with some scattered grasses and weeds (Photo 10).

Most of the drainage channels are non-perennial. The narrow band of trees that occurs along the channel can be classified as riparian vegetation. This vegetation is very important for connectivity with adjacent vegetation as well as a migratory route for riparian animals. The most abundant and most conspicuous trees in the tall riparian woodland are *Vachellia nilotica, Vachellia karroo, Searsia lancea, Berchemia zeyheri* and *Gymnosporia senegalensis*. Typical grasses include *Panicum maximum*, *Eragrostis rotifer* and *Cenchrus ciliaris*. Unfortunately, the channel provides a distribution route for weeds and invading trees. Many of the usual exotic weeds were recorded together with *Xanthium strumarium* (Large cocklebur) *Ricinus communis* (Caster-oil) and *Datura stramonium*. Weeds and invaders should be removed, as well as destruction of such plants in a safe place and manner. The riparian woodland still plays many essential roles in the functioning of the ecosystem, including:

- Flow regulation: the riparian vegetation slows the flow of water, both by physically blocking the passage of water, and by absorbing the water into its root systems. This moderates the impacts of flooding on surrounding areas.
- Water quality regulation: the riparian vegetation acts as a buffer or filter between nutrients, sediments, contaminants, and bacteria from the surrounding land and air, and the river channel itself. The riparian vegetation therefore prevents soil, pesticides, fertilizers and oil from entering the river and impacting on in-stream communities.
- Habitat provision: The riparian zone is an important habitat for many plants and animals, because it is an area of transition between the land and the channel. These relatively steep environmental gradients (moisture, temperature, topography, and soil) generally support higher levels of biodiversity than more homogeneous areas.
- Corridor functions: because it follows the channel, the riparian zone serves as a corridor, connecting two or more habitats that may otherwise be isolated by land transformation of areas in between. Many species of animals use corridors to disperse, and find food and mates.

Photo 10: Riparian Flat Drainage Channel in the western section of the study area

11.1.6.3 Plant Species of Conservation Concern

A list of red data plant species previously recorded in the study area in which the proposed development is planned was obtained from the Plants of Southern Africa (POSA) database of SANBI. The following red data species are listed for the specific Quarter Degree Grid Square (QDS):

Table 10: Red data species potentially occurring in the project area according to the POSA database

Genus	Sp1	IUCN

Drimia	*elata*	Data deficient
Aloe	*vryheidensis*	Data deficient
Indigofera	*leendertziae*	Data deficient
Aloe	*bergeriana*	Data deficient
Myrothamnus	*flabellifolius*	Data deficient
Adenia	*fruticosa*	Near Threatened
Brachystelma	*hirtellum*	Near Threatened
Aloe	*reitzii*	Near Threatened
Dicliptera	*fruticosa*	Near Threatened
Argyrolobium	*velutinum*	Vulnerable

None of these species were documented during the survey considering that the habitat is completely different from that which these species usually occur in. In addition, no listed protected plant species occur on the proposed development sites. However, the following protected trees occur on the proposed development sites:

- *Sclerocarya birrea* (marula);
- *Boscia albitrunca* (shepherds tree);
- *Combretum imberbe.*

11.1.6.4 Fauna

A survey was conducted during July 2019 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid. During the site visits mammals, birds, reptiles, and amphibians were identified by visual sightings through random transect walks. In addition, mammals were also recognized as present by means of spoor, droppings, burrows or roosting sites.

The area has been settled for an extensive period of time, and the fauna are therefore considered impoverished due to the degradation caused by mining activities, built-up land and other man-induced impacts. Four major fauna and bird habitats were observed in the area namely:

- Degraded grasslands / old fields / cultivated land;
- Savanna woodland (mixed);
- Riparian woodland and open water habitats;

The majority of the habitat types on the respective study sites are fragmented. Therefore, the expected mammalian richness on these areas are considered low, although slightly higher richness values are expected from the more intact mountain habitats. Predators that still roam freely in the area include larger predators such as leopard and brown hyena, while smaller predators such as caracal, serval, honey badger and cape clawless otter are common throughout the area. Antelope species such as klipspringer, kudu, bushbuck and duiker will roam freely through the area and are not restricted by game fences. Smaller mammal species such as honey badgers and serval can become habituated to anthropogenic influences, while other species such as brown hyena will rather move away from the construction activities and will seldom use the area. Many of the bat species of conservation concern in the study area are cave-dependant for roosting. Any individuals that utilize the area would therefore either be foraging or migrating and would not be affected by the localized loss of habitat due to the development. The dominant species composition therefore comprises of widespread taxa with unspecialised life history traits. The most important corridors that need to be preserved for free-roaming mammal species in the area include the natural vegetation associated with the woodland and riparian zones.

According to Birdlife South Africa, the study area does not fall within any Important Bird Area (IBA), identified within South Africa (www.birdlife.org.za). The following avifaunal species may occur in the different habitat types:

Table 11: Avifaunal species that may occur per habitat types

Habitat Type	Bird species
Degraded grassland (old fields)	Crowned plovers, Crested guineafowls, Francolin species as well as the birds of prey that prey on smaller bird species
Grassland	Bald Ibis, Redwing Francolin, Whitewinged Flufftail, Blackwinged Plover, Rudd's Lark, Botha's Lark, Blue Swallow, Buffstreaked Chat, Palecrowned Cisticola and Yellowbreasted Pipit. Melodious Lark and South African Cliff Swallow
Woodland	Rollers, bee eaters and waxbills, as well as large birds of prey such as vultures and eagles.
Rocky habitats	Chats, Pipits and Larks
Riparian woodland	Icterine Warbler, Olivetree Warbler, Garden Warbler, Whitethroat and African Finfoot

Some bird species such as the redbilled oxpeckers and vulture species that occur in the area are primarily dependant on the presence of their food source.

There is a potential presence of some toads and sand frogs in the non-perennial channels on site, as they only need temporary pools for reproduction and the watercourses may provide suitable habitat. Amphibian species potentially occurring in the area include Common River Frog, Natal Sand Frog, Gutteral Toad, Raucous Toad and Bubbling Kassina. These species are non-threatened and widespread species, and as such the development will not have any impact on amphibian conservation within the region.

The general habitat type for reptiles consists of open to dense bushveld, with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. Arboreal species are the more prominent components of the local herpetofauna.

The mountainous habitat and riverine woodland represent the most suitable habitat for a variety of reptile species. The reptiles of the study area include snakes, lizards, geckos and tortoises. Species such as the southern rock python, puff adder, black mamba, boomslang, vine snake, spotted bush snake and several members of the green snakes (Philothamnus spp.) is expected to occur in the study area, although the presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.). All the aforementioned reptile species are common and widespread, and as such the development will not have any impact on reptile conservation within the region.

An insect and spider desktop survey were done in addition to the field observations. All of the potential invertebrate habitats are well represented by a high family richness of insects and spiders.

11.1.6.4.1 Red data fauna species

According to the existing databases and field survey the following number of fauna species included in the IUCN red data lists can potentially be found in the study area (Table 12):

Table 12: Red data list of potential fauna for the study area

English Name	Conservation Status	Probability of occurrence
MAMMALS		
Roan Antelope	Endangered (2016)	Zero – restricted to game reserves
Rusty Pipistrelle	Near Threatened	Moderate
Brown Hyena	Near Threatened (2016)	Moderate
Serval	Near Threatened (2016)	High
Smithers' Horseshoe Bat	Near Threatened (2016)	Moderate
Tsessebe	Vulnerable (2016)	Zero – restricted to game reserves
Leopard	Vulnerable (2016)	Moderate
BIRDS		
Roller, European	Near Threatened	High
Falcon, Lanner	Vulnerable	Moderate
Vulture, White-backed	Endangered	Moderate – dependant on carcasses
Vulture, Cape	Endangered	Moderate – dependant on carcasses
Eagle, Martial	Endangered	Moderate
Secretarybird	Vulnerable	Moderate
HERPETOFAUNA		
Northern Crag Lizard	Near Threatened (SARCA 2014)	Low
Granite Dwarf Gecko	Near Threatened (SARCA 2014)	Low
Giant Bull Frog	Near Threatened	Moderate

None of the above red data species were documented during the survey.

11.1.6.5 Protect Areas and National Protected Areas Expansion Strategy (NPAES)

The Witvinger Nature Reserve is located directly north (7 kilometres) of the Mining Right Area, while the Percy Fyfe Nature Reserve is located slightly north-east of the area (12.7 kilometres). The mining footprint area is located south-west of the Limpopo Central Bushveld NPAES (4.8 kilometres). None of the proposed mining footprint are however located close to any of the reserves or NPAES. Refer to Figure 28 below.

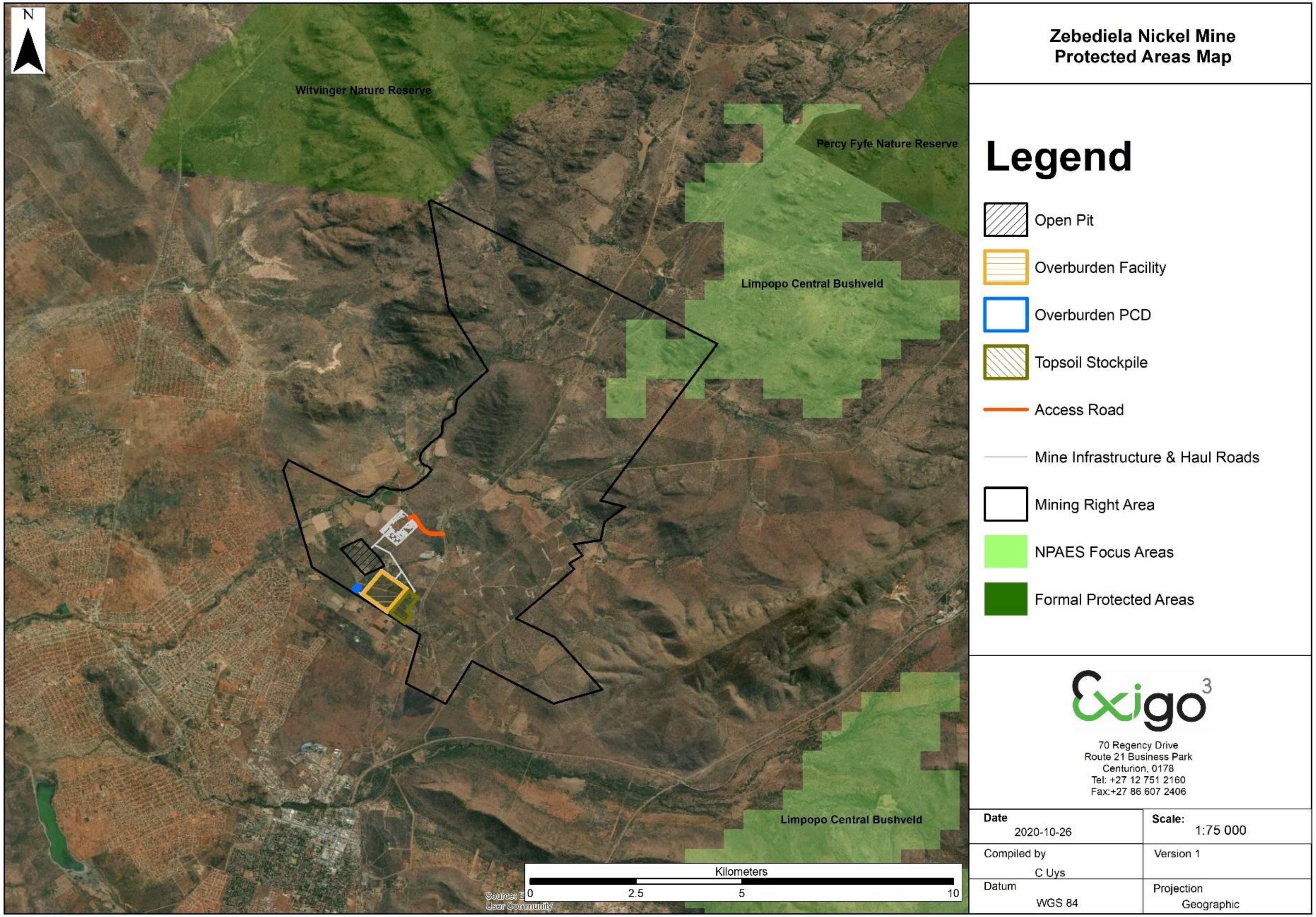

Figure 28: Protected areas in close proximity to the project area

11.1.6.6 *Critical Biodiversity and Ecological Support Areas*

The Limpopo Conservation Plan categories for the proposed mining area are presented in Figure 29 below. Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) are found on site. The mining project study area is located in the following areas identified in the Limpopo Conservation Plan:

- CBA2;
- ESA2.

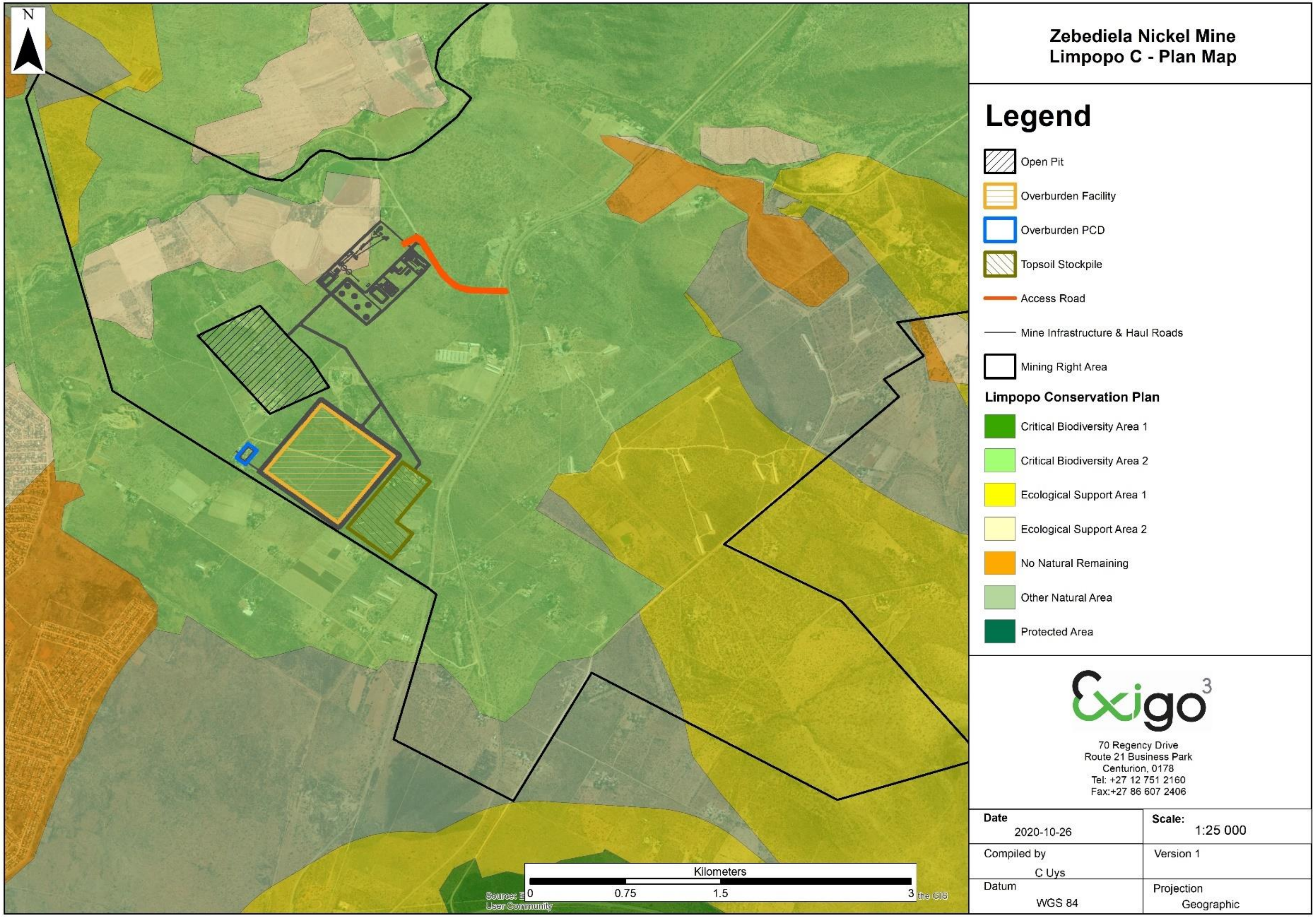

Figure 29: Terrestrial CBA areas of the study area (Desmet et al. 2013)

11.1.7 Surface Water

The study area is located in the Limpopo Water Management Area (WMA), and is located mainly in the Quaternary Catchment Area (QCA) A61F. The study area is drained by means of surface run-off (sheetflow) with stormwater collecting along roads and footpaths cutting through the area, to drain into the non-perennial channels and subsequently into the Rooisloot and its tributaries.

The Rooisloot (a NFEPA River) traverses the proposed mining right area and is located approximately 900 m to the north north-west of the proposed open pit boundary. A tributary of the Rooisloot (drainage channel) will be completely destroyed during the opencast mining.

The 1:50 and 1:100 floodlines were determined for the above Rooisloot using Civil 3D and HEC-Ras (2D) 5.0.7 watercourse analysis programs (Bence, 2020). A 100 m restriction line from the centre point of the watercourses was also established. Refer to Figure 20 and Figure 75.

Two types of hydrological systems were identified on the mine footprint sites as follows:

- River & riparian woodland (Rooisloot);
- Riparian flat drainage channel & riparian woodland (tributary of the Rooisloot).

These systems constitute channels which are not “true” wetlands as stipulated in the National Water Act due to the soils not indicating wetness in the top 50cm and therefore represent watercourses.

The water course on the site is a non-perennial channel representing a tributary of the main river, e.g. the Rooisloot. The non-perennial channel on the site forms a flatter area around the drainage channel and can be classified as a riparian flat drainage channel. In the case of the study area, the area has some areas with patchy riparian woodland dominated by the woody species *Vachellia karroo* and *Searsia lancea*, as well as the alien species *Melia azedarach*.

The riparian flat channel on the Farm Uitloop (tributary of the Rooisloot) is still considered functional and has a PES of Class C (Moderately modified). The EIS of the drainage channel is ‘Moderate’ and considered to be ecologically important and sensitive at least on a local scale. The biodiversity of these water courses is not usually sensitive to flow and habitat modifications and may play a small role in moderating the quantity and quality of water entering downstream areas.

Table 13 indicate the PES and EIS as determined for the watercourses on site. The state of degradation from its original state was caused by impacts such as alien invasion, sedimentation, erosion and flow impediment caused by roads.

Table 13: Present Ecological State and Ecological Importance & Sensitivity of the watercourses and riparian systems on the proposed development site

Hydrogeomorphic Unit	PES	EIS
Western Riparian Flat Drainage Channel & Rooisloot	Class C: Moderately modified	Moderate

11.1.8 Groundwater

A Hydrogeological Impact Assessment and two hydrocensus survey were conducted in 2019 and 2020 to obtain all of the groundwater information for the area surrounding the proposed open pit mine and mine infrastructure. The data from the hydrocensus was analysed statistically for the purposes of the environmental baseline and impact assessment.
The sections below are derived from the Hydrogeological Impact Assessment (referenced below as Vivier et al, 2020a).

11.1.8.1 Hydrogeological setting

The study area falls within the Mogalakwena river catchment (A61F). The area is dominated by deeply weathered and fractured mafic rocks where the groundwater yield potential can be regarded as low with 81% of boreholes recording yields < 2 ℓ/s (DWAF, 2000). Boreholes within the dolomitic rocks are expected to have a higher yield as evident by the municipal water supply boreholes drilled in this unit. The Rooisloot River to the north of the proposed mining area may also contribute to the groundwater environment.

The project area is underlain by fractured norite and pyroxenite and covered by a thin (1 – 35 m thick) black silt clay cover which is weathered from the bedrock (SRK, 2019). There are southwest-northeast trending faults to the north-west and south-east of the proposed pit which offset the dolomitic zone located to the east of the proposed pit. Springs are not prevalent in the area surrounding the proposed mine.

The semi-confined weathered aquifer id located above the weathered pyroxenite which extends to a depth of approximately 20 m (SRK, 2019). The presence of open fractures within the main portion of the weathered zone indicates that this zone is more permeable than the upper zone. Deep weathering, appears to create unconfined zones as the dolerite dykes cannot confine the system containing major fault blocks which are hydraulically connected.

Fresh fractured norites and pyroxenites have similar hydrogeological characteristics with a low primary porosity and permeability. Major shear zones, that have a higher permeability, would provide higher yields with some groundwater seepage contribution from the overlying weathered zone (SRK, 2019).

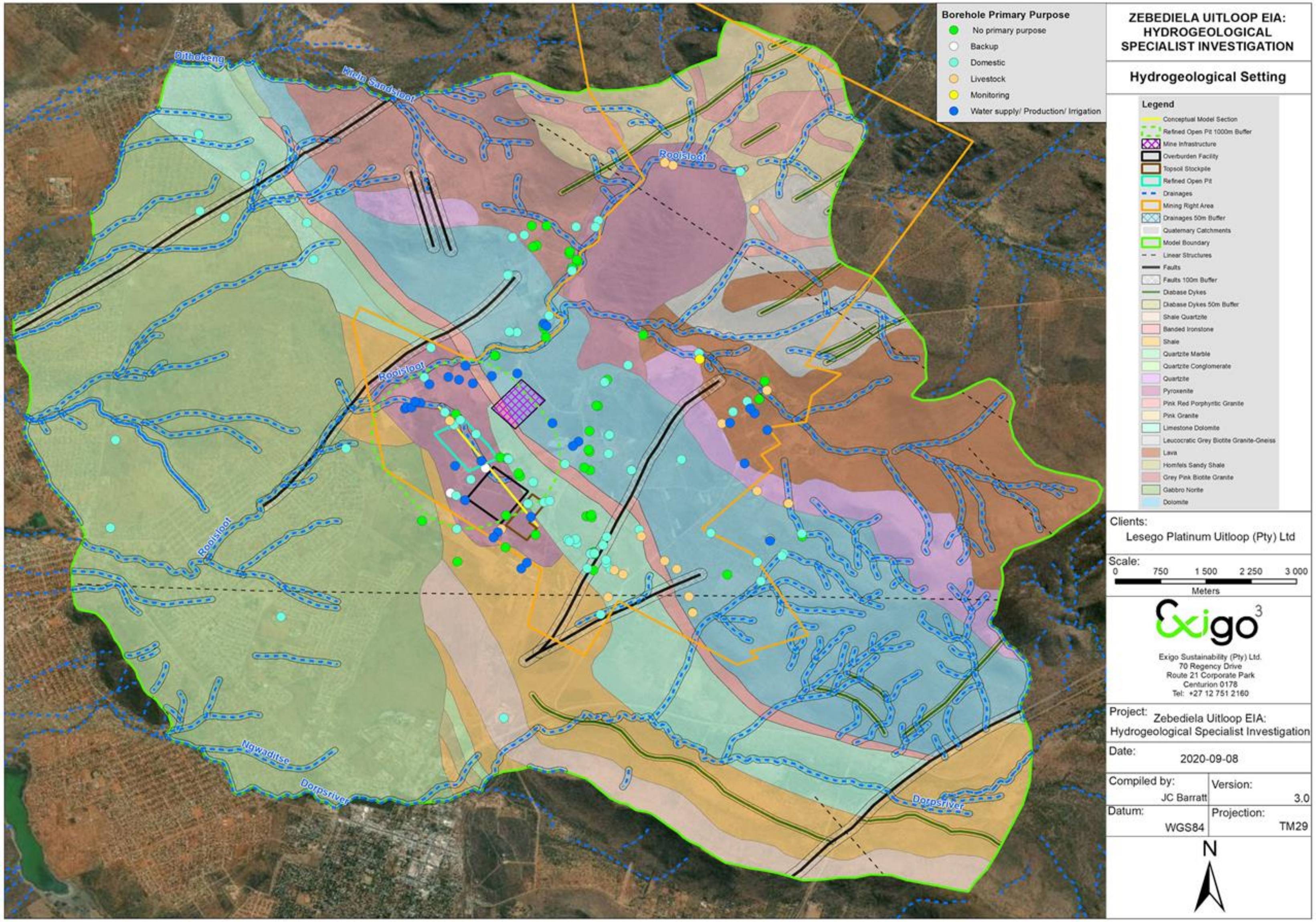

Figure 30: Hydrogeological setting and quaternary catchments

11.1.8.2 Boreholes and groundwater users

The 2019 and 2020 hydrocensus yielded the following findings on groundwater levels:

- 178 boreholes were visited during the surveys. Groundwater is the sole source of water supply in the local area.
- 125 (70%) of the boreholes have a primary purpose as listed in Table 14 which illustrates the area's inhabitants have a high dependency on groundwater.
- The dependency on groundwater is not limited to domestic purposes and is evident for economic purposes including livestock watering and irrigation.
- Boreholes are mainly located adjacent to the identified major and minor aquifer zones as mentioned in the section above.
- There are approximately 34 boreholes within a 1000 m radius from the proposed open pit (Figure 30).
- 25 (74%) of the boreholes within a 1000 m radius from the proposed open pit are utilised for either domestic, livestock, water supply, production, or irrigation boreholes indicating a high availability and reliance on groundwater in the vicinity of the proposed open pit.

Table 14: Boreholes purposes during hydrocensus user survey

Boreholes Purpose	Total Boreholes	Total Boreholes (%)
Water supply/ Production/ Irrigation	31	17%
Domestic	71	40%
Livestock	20	11%
Back-up	2	1%
Monitoring	1	1%
No primary purpose	53	30%

11.1.8.3 Groundwater levels

11.1.8.3.1 2019 Hydrocensus groundwater levels

The hydrocensus yielded the following findings on groundwater levels (Figure 32 to Figure 34):

1. Water levels were obtained from 58 (47%) boreholes as the remaining boreholes were equipped or locked.
2. The mean static water level is 27.1 m with the shallowest water level being measured at 11.7 m and the deepest at 51.8 m.

3. 90% of the static water levels measured range between 14.5 and 40.2 m for the hydrocensus area. The deep mean static water level of 27 m is 12m to 20 m deeper than the historic baseline.
4. 90% of the static water levels measured within 1000 m of the proposed pit range between 19.1 and 51.0 m while the mean water level for the same area was calculated at 32.8 m (Figure 34).

Statistical analysis of the hydrocensus's water levels is presented in Table 15.

Table 15: Statistical analysis of the measured static 2019 hydrocensus water levels

Statistical Parameter	Water Level (mbgl)
Boreholes with SWL	48
Mean	27.1
Min	11.7
Max	51.8
P5	14.5
P50	26.0
P95	40.2

An analysis was completed of the correlation between topography and hydraulic head. In order to determine whether static groundwater levels follow the topography, a correlation had to be determined between elevation and static water level by plotting the variables on a graph. Data from the hydrocensus was plotted as is shown in Figure 31 below. The graph indicates a very good correlation (R2=0.91), which reflects a good relationship between regional static groundwater levels and topography. Locally, there are deviations where large scale abstractions (±1000 m3/d) occur. The groundwater flows from north-east to south-west (Figure 32).

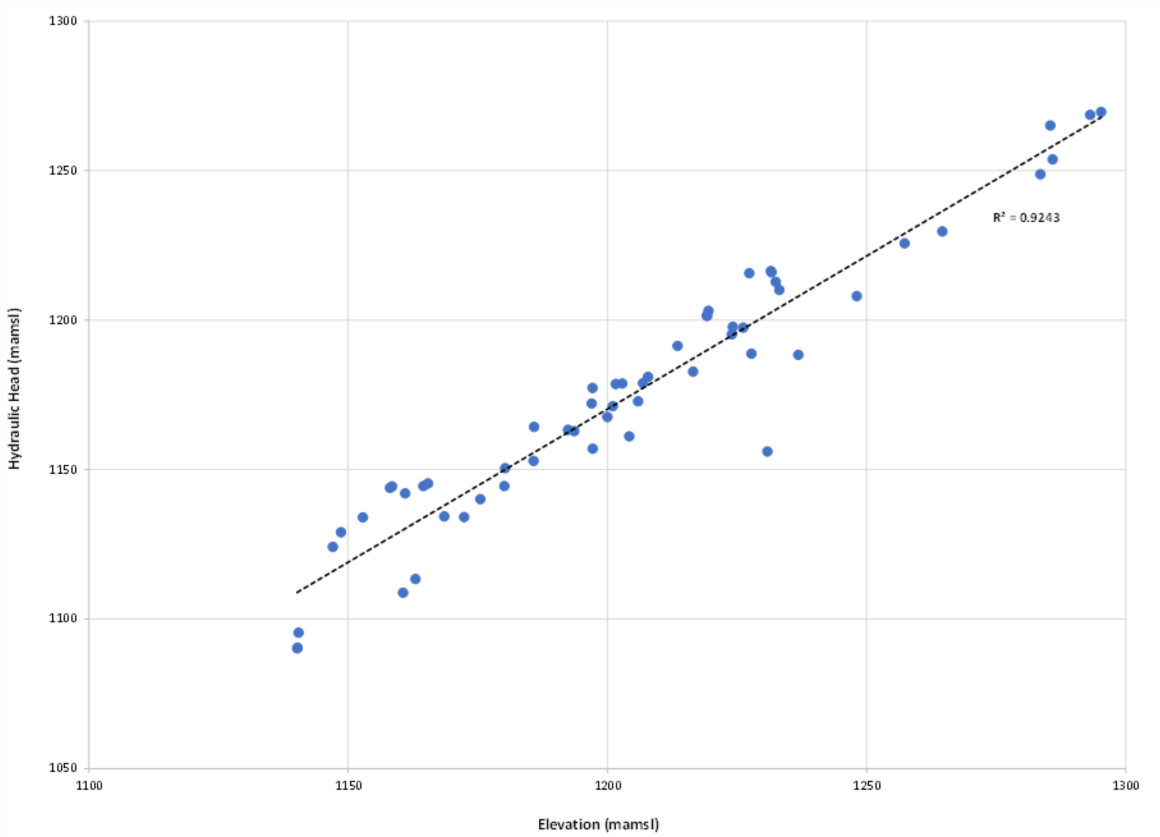

Figure 31: Linear relationship between surface topography and hydraulic head of measured 2019 boreholes

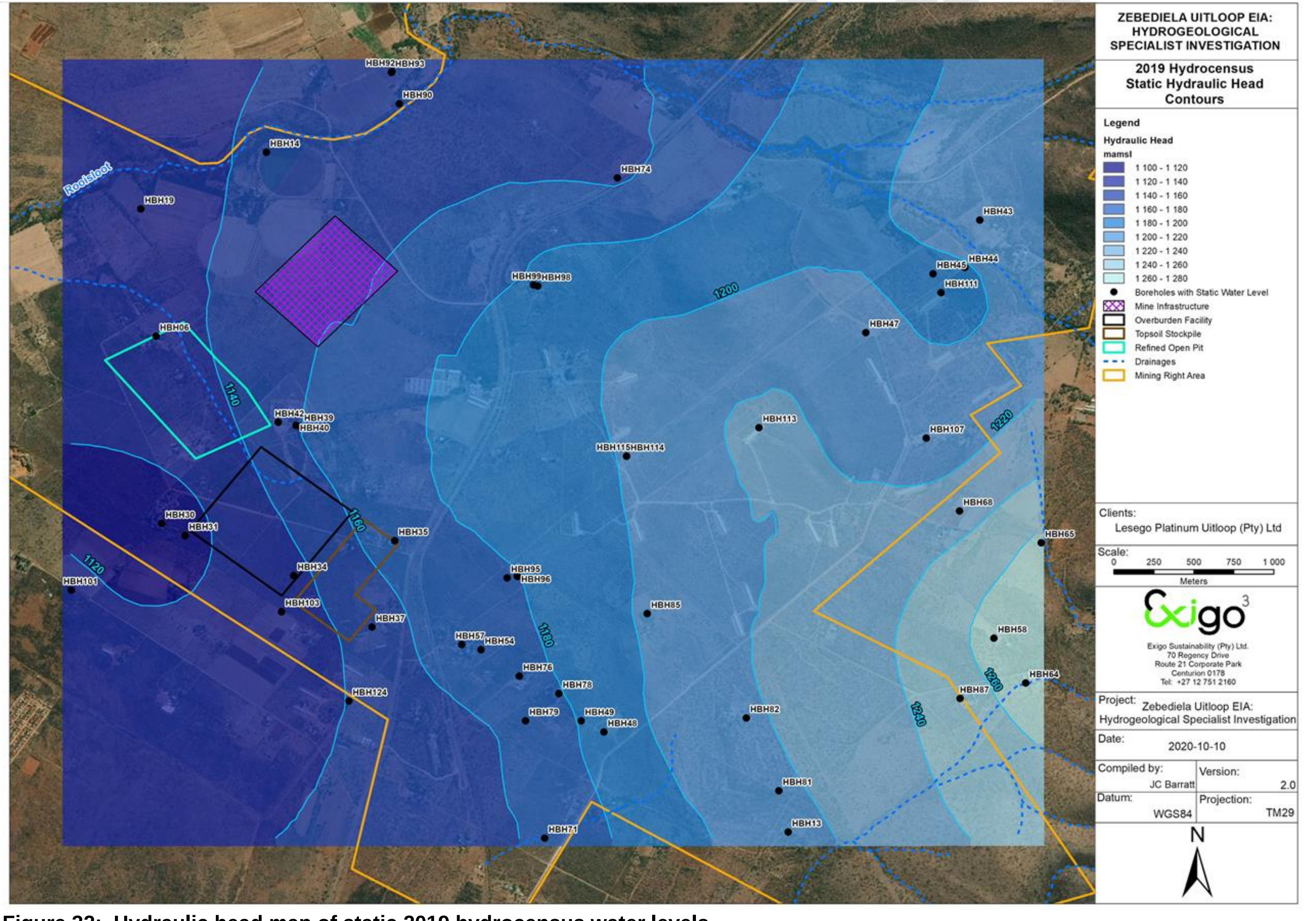

Figure 32: Hydraulic head map of static 2019 hydrocensus water levels

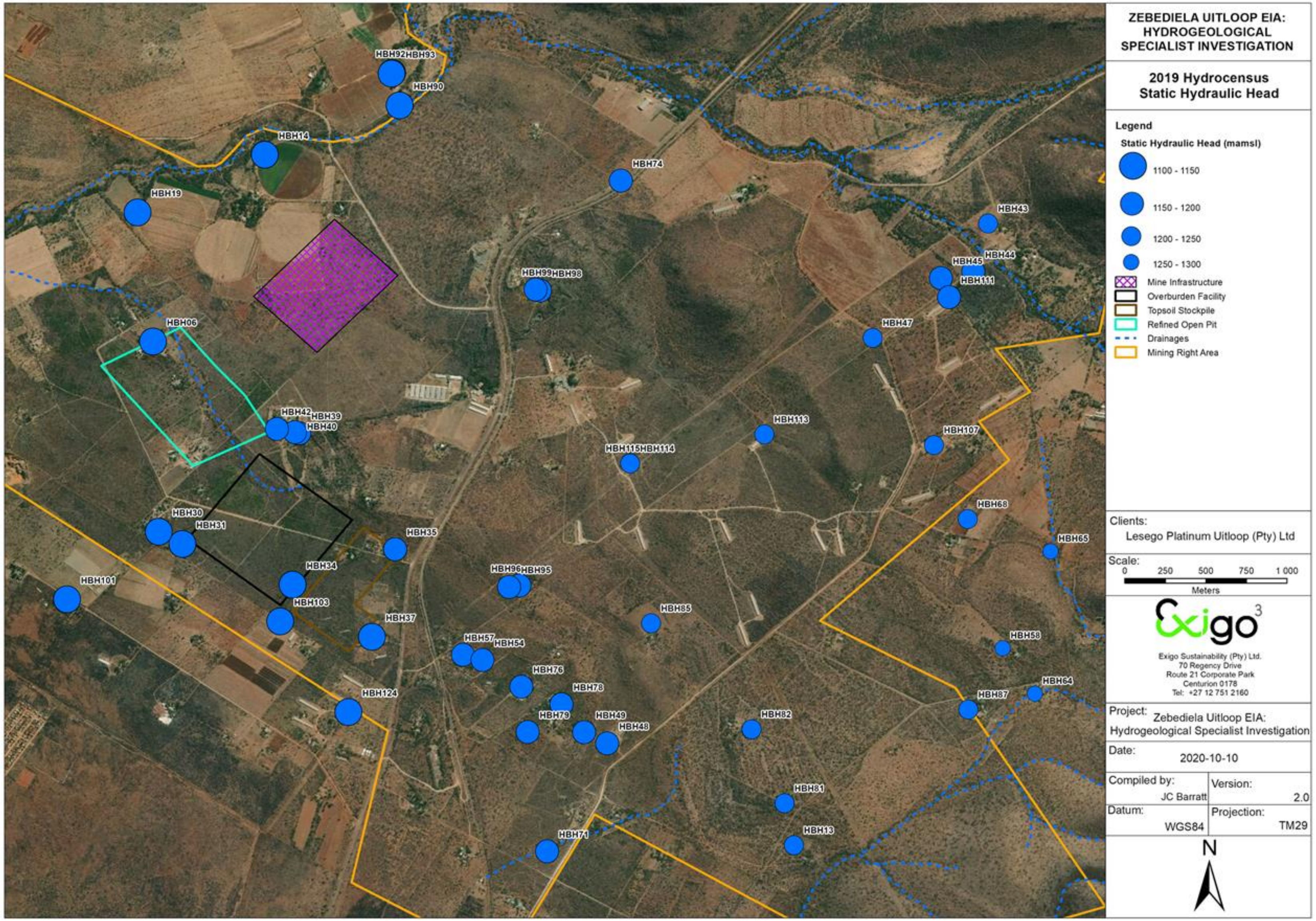

Figure 33: 2019 Hydrocensus static hydraulic head

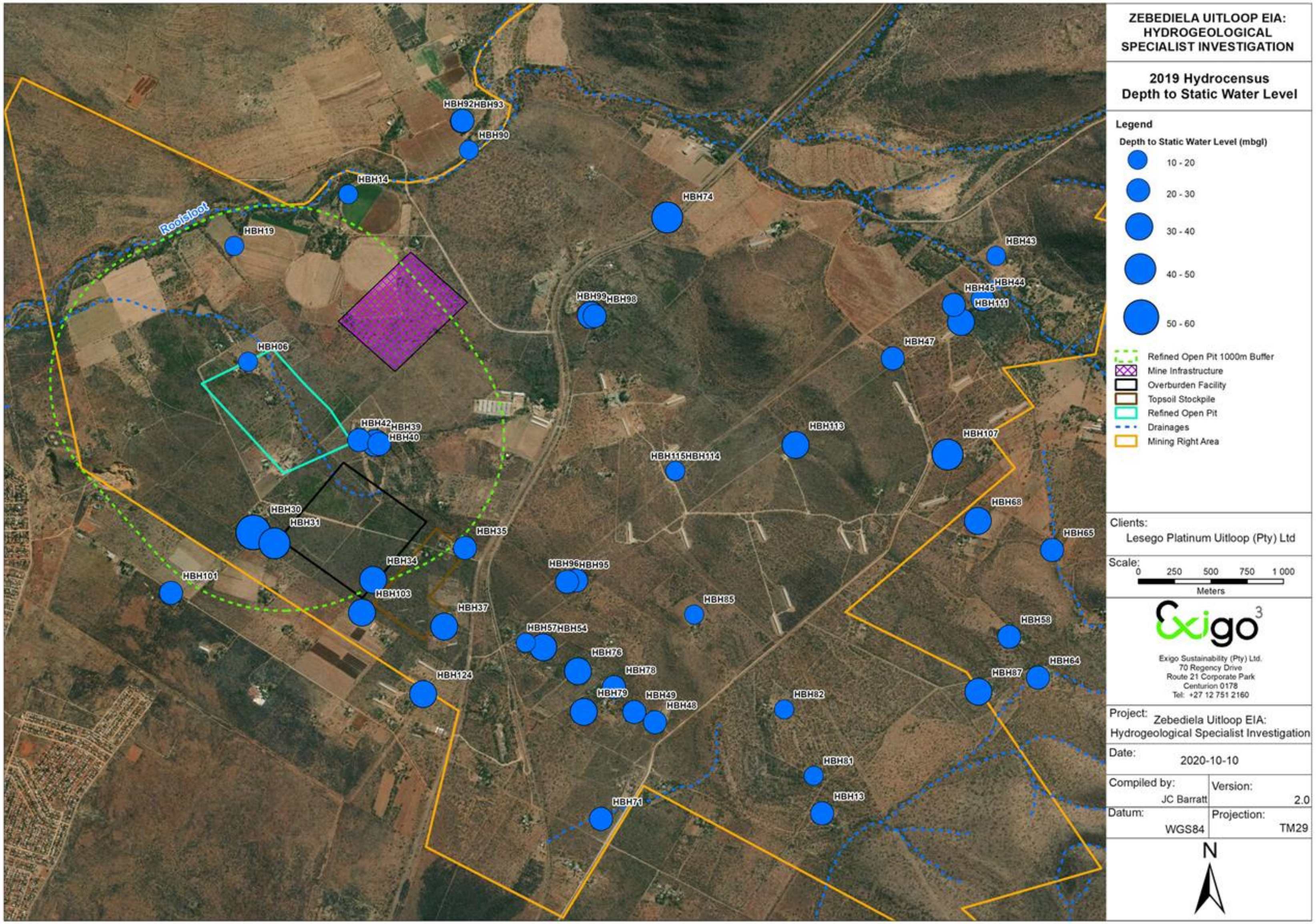

Figure 34: Depth to static 2019 hydrocensus groundwater depth levels

11.1.8.3.2 2020 Hydrocensus groundwater levels

The 2020 hydrocensus yielded the following findings on groundwater levels (Figure 39):

1. Water levels were obtained from 96 (78%) boreholes as the remaining boreholes were equipped or locked.
2. The mean static water level was 24.2 m with the shallowest water level measured at 4.9 m and the deepest at 67.9 m.
3. 90% of the water levels measured range between 8.7 and 43.7 m for the hydrocensus area.
4. 90% of the water levels measured within 1000 m of the proposed pit range between 18.1 and 52.9 m while the mean water level for the same area was calculated at 32.0 m.

Statistical analysis of the hydrocensus's water levels is presented in Table 16.

Table 16: Statistical analysis of the measured static 2019 hydrocensus water levels

Statistical Parameter	Water Level (mbgl)
Boreholes with SWL	74
Mean	24.2
Min	4.9
Max	67.9
P5	8.7
P50	21.6
P95	43.7

An analysis was completed of the correlation between topography and static hydraulic head. In order to determine whether static groundwater levels follow the topography, a correlation had to be determined between elevation and static water level by plotting the variables on a graph. Data from the hydrocensus was been plotted as is shown in Figure 35 below. The graph indicates a good correlation (R^2=0.88), which reflects a good relationship between groundwater level and topography with localised deviations where major abstraction takes place.

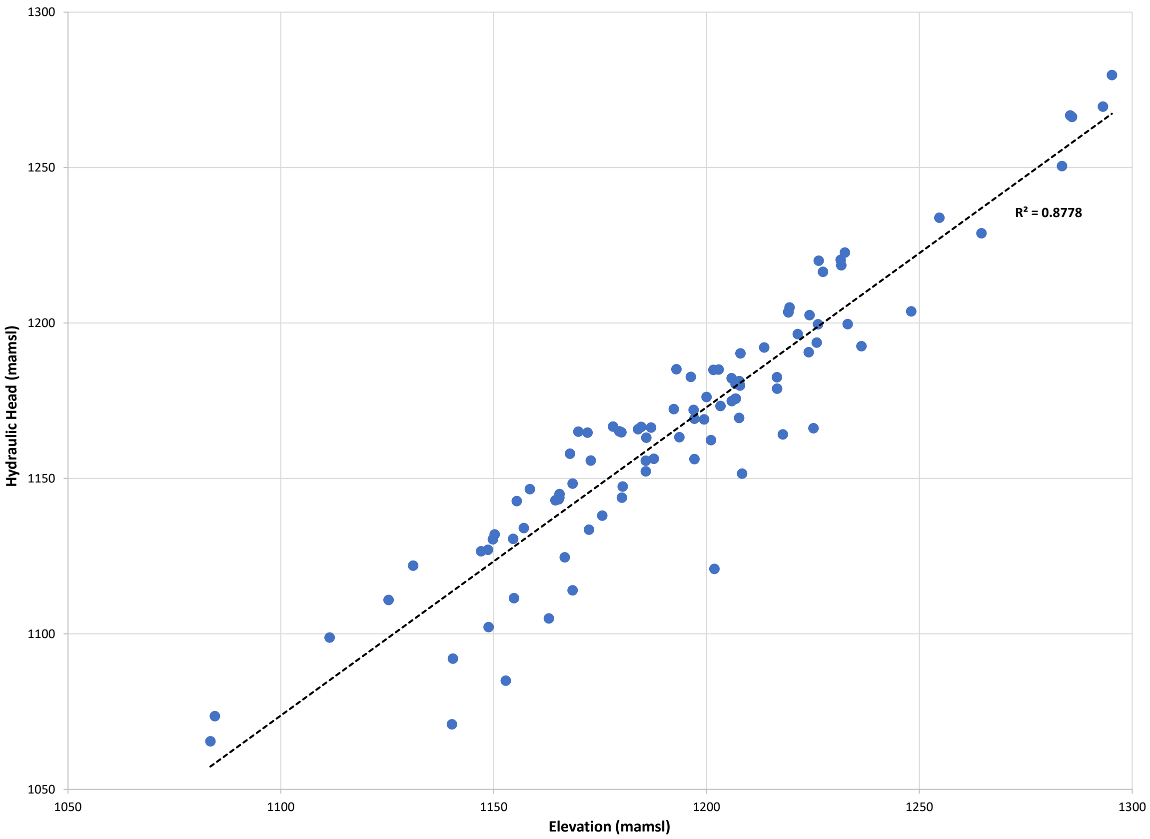

Figure 35: Linear relationship between surface topography and hydraulic head of measured 2020 boreholes

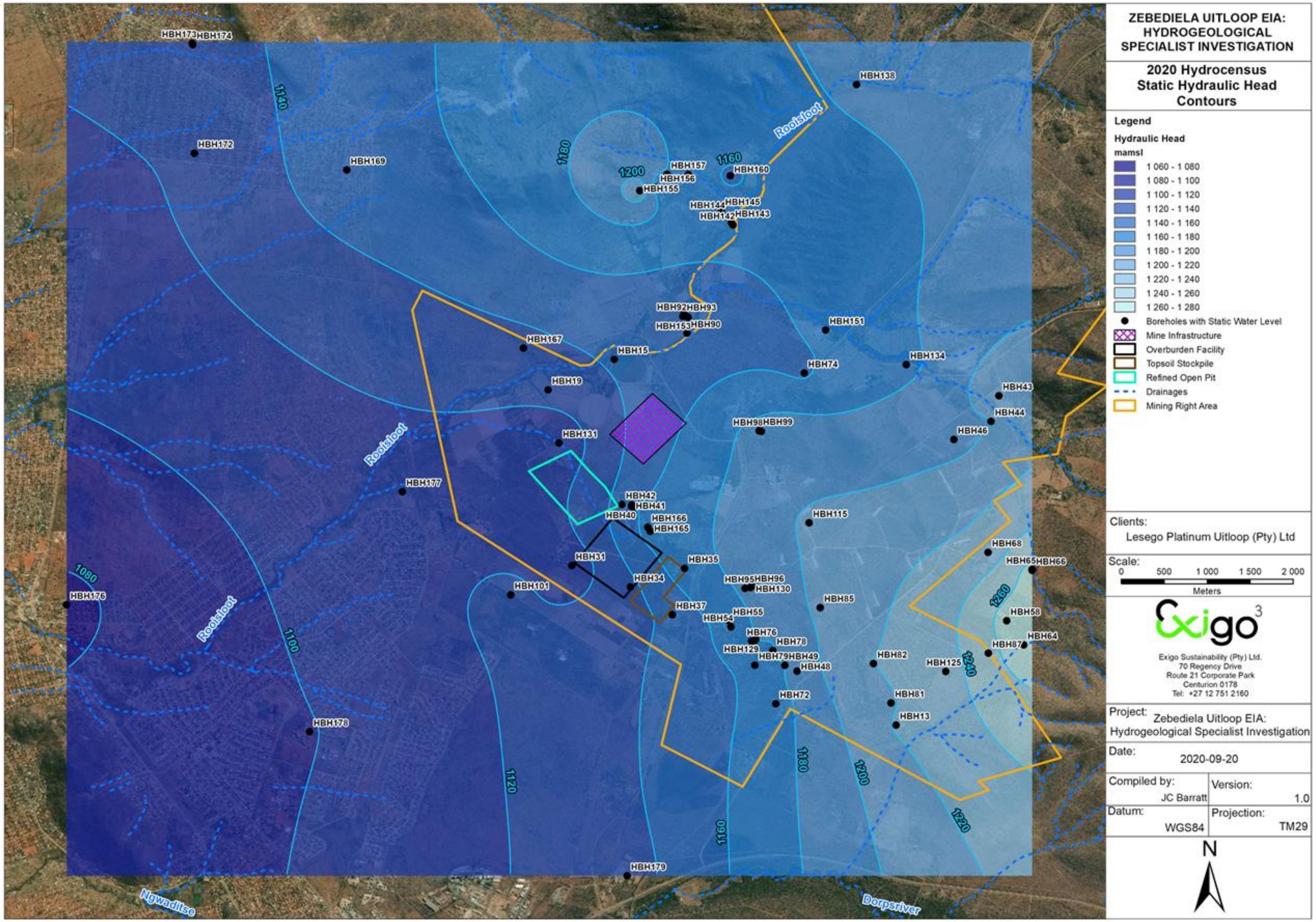

Figure 36: Hydraulic head map of static 2020 hydrocensus water levels

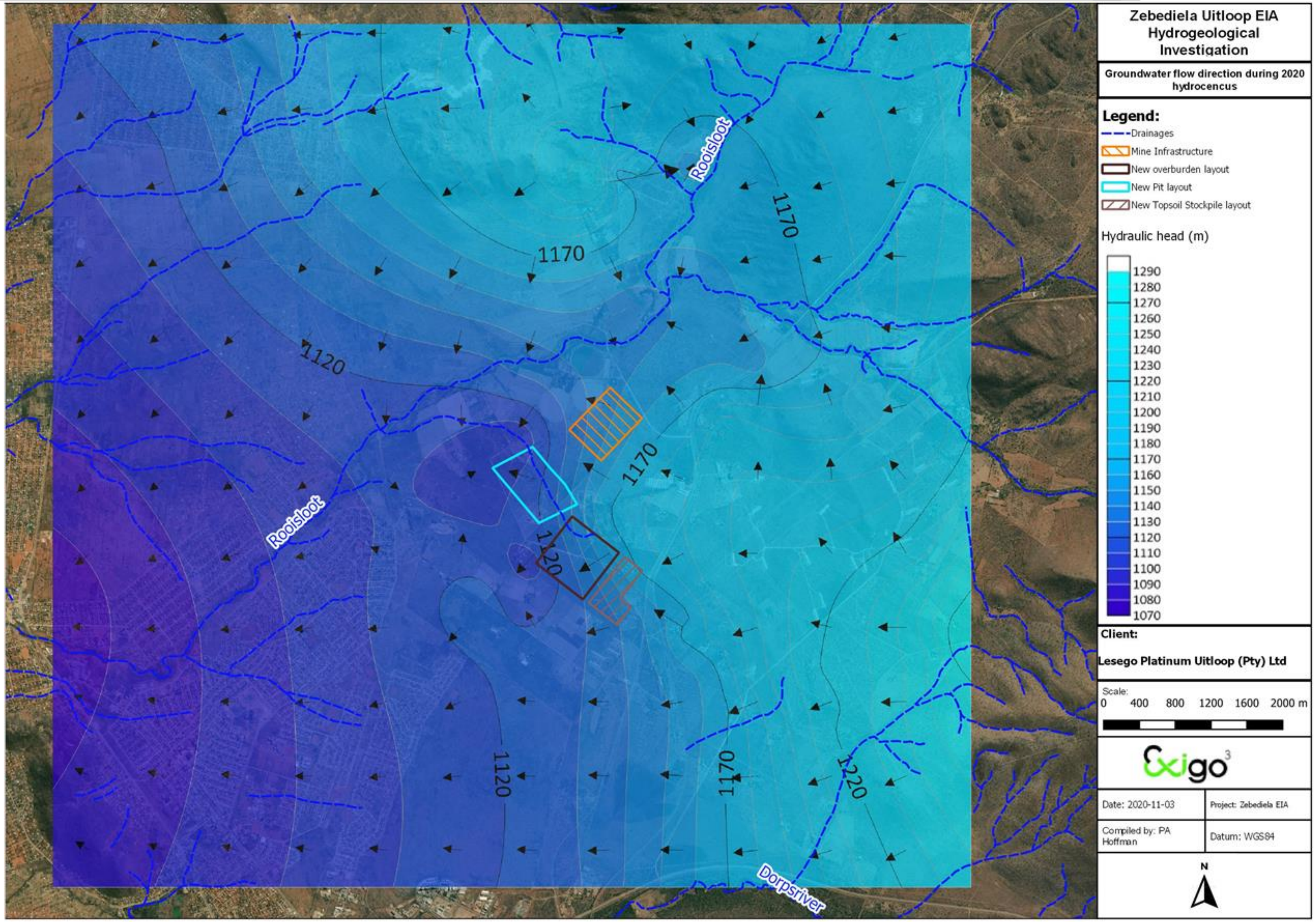

Figure 37: Hydraulic head map and flow direction from 2020 hydrocensus

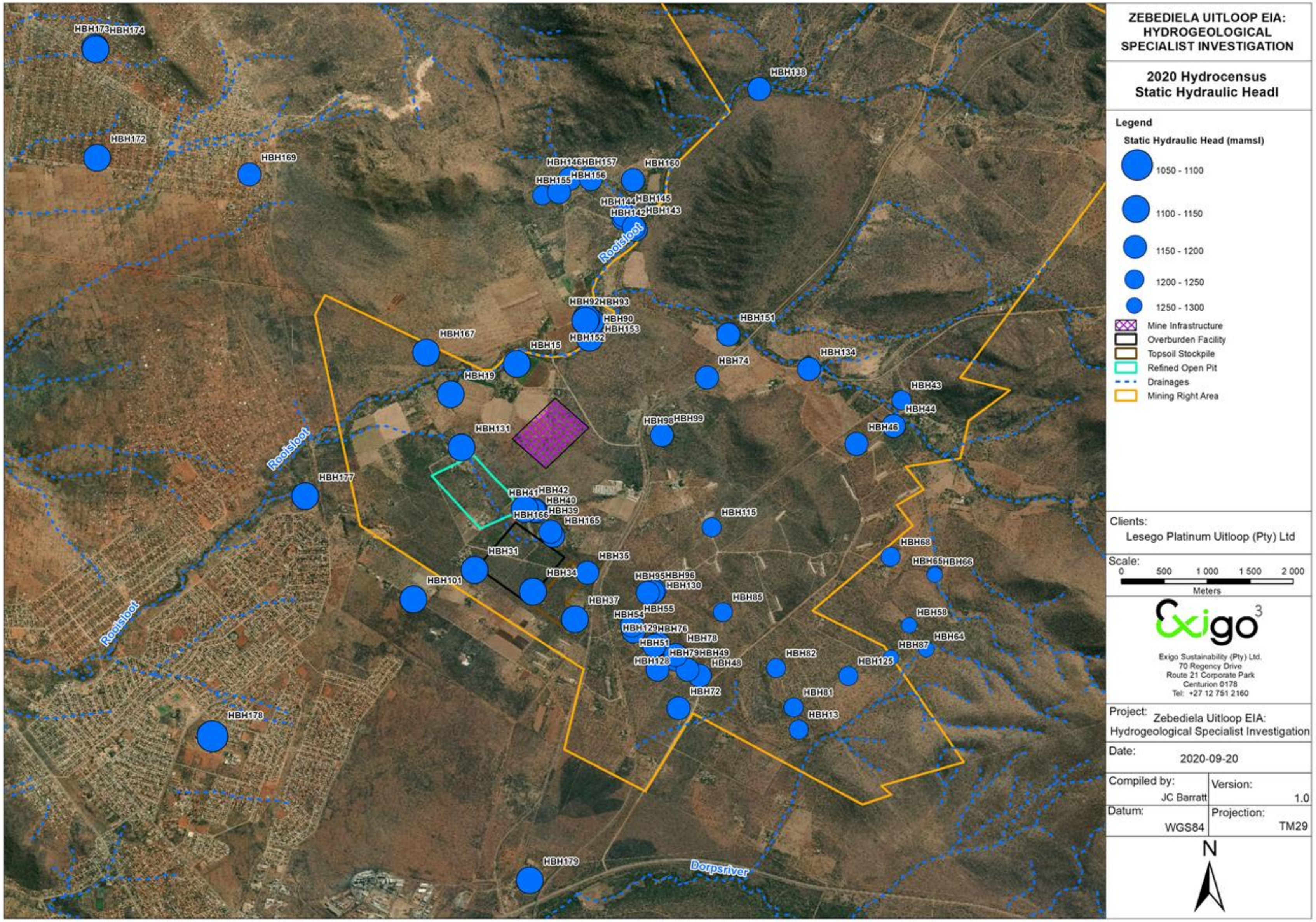

Figure 38: 2020 Hydrocensus static hydraulic head

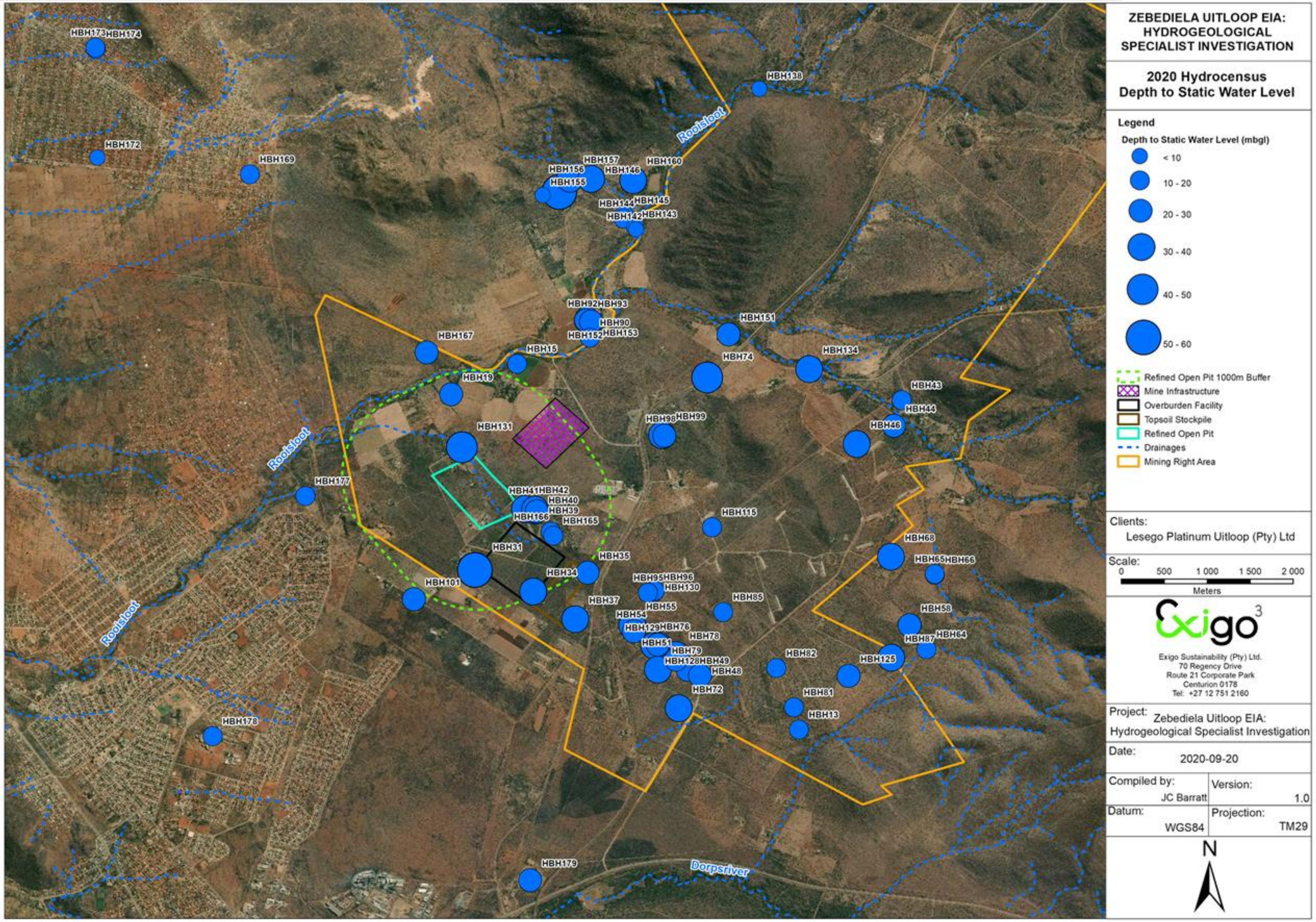

Figure 39: Depth to static 2020 hydrocensus groundwater levels

11.1.8.3.3 *Change in static groundwater levels*

During the 2019 and 2020 hydrocensus, 34 boreholes' static water levels were measured during each survey. As the 2019 hydrocensus was conducted during June 2019, these static water levels can be considered as the dry month's static water levels, and as the 2020 hydrocensus was conducted during January/February 2020, these static water levels can be considered as the wet month's static water levels.

Table 17 below demonstrated that the groundwater levels on average increased more than the level of decrease.

Table 17: Statistical analysis of the difference between static 2019 and 2020 groundwater levels

Statistical Parameter	Static Water Level Increase (m)	Static Water Level Decrease (m)
Mean	3.2	1.7
Min	0.4	0.1
Max	9.8	8.5
P5	0.7	0.2
P50	2.1	1.2
P95	8.7	4.8

Figure 40 and Figure 41 illustrate the 2019 hydrocensus static groundwater levels compared to the 2020 hydrocensus static groundwater levels. Figure 40 illustrates that 44% of the comparative static groundwater levels decreased from July 2019 to January 2020 where 56% of the comparative static groundwater levels increased during the same period.

The water levels in the study area declined by 0.5-1.5 m/a, depending on the distance of abstraction hotspots, over the past 20-30 years (Figure 39).

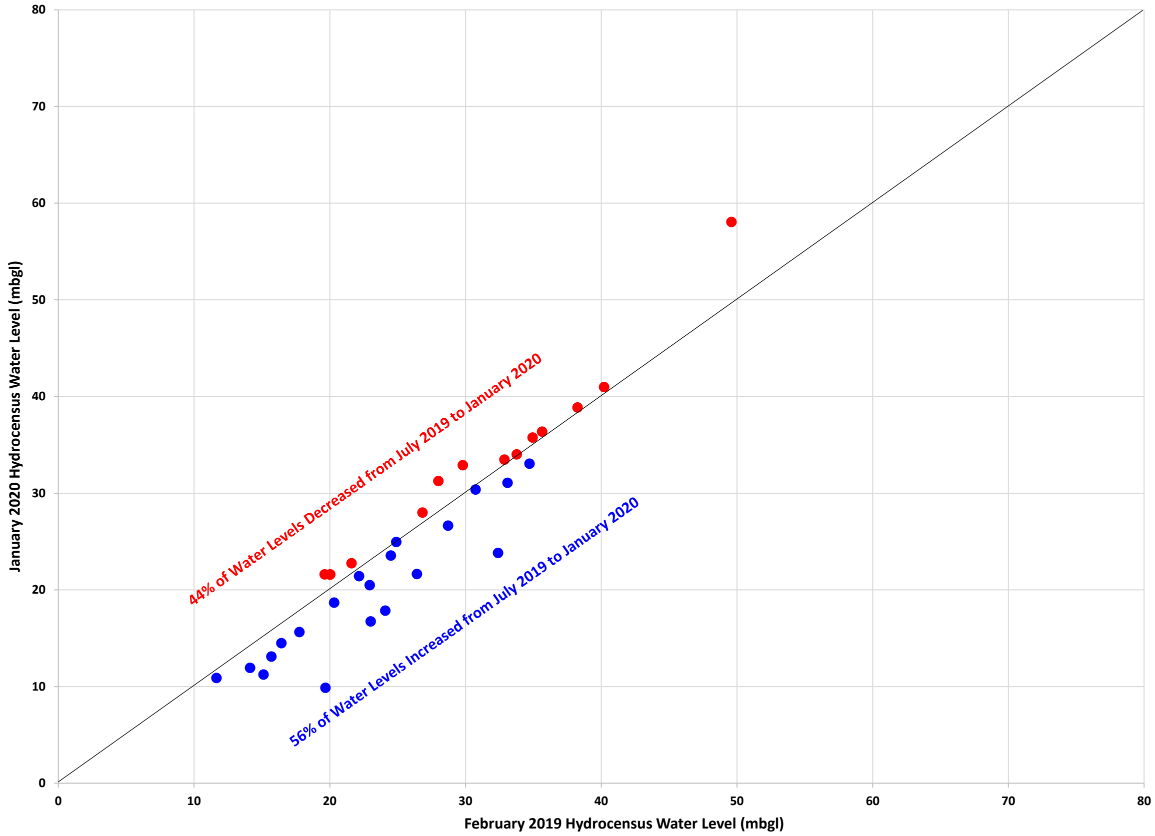

Figure 40: Graphical plot of the static 2019 and 2020 groundwater levels differences

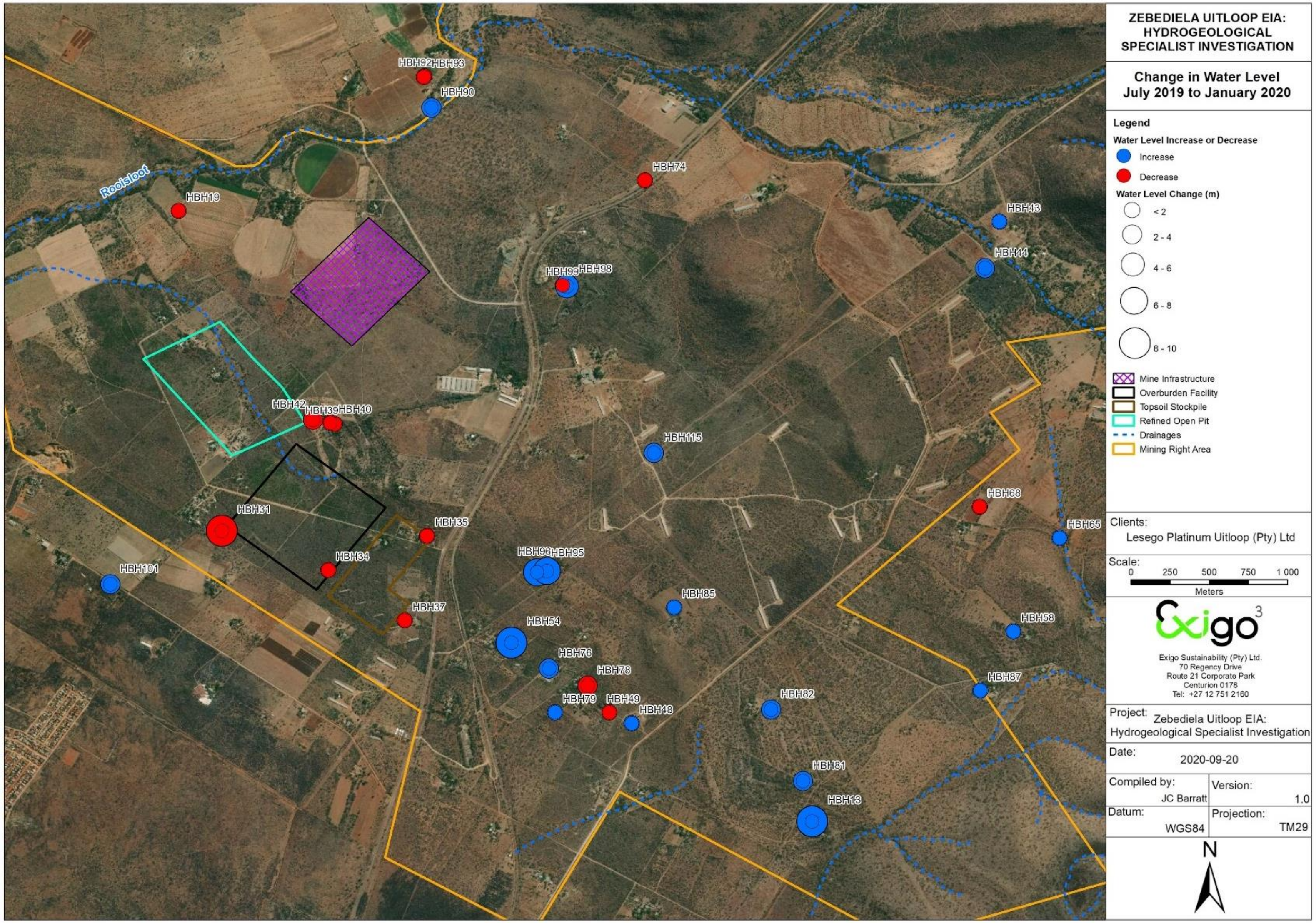

Figure 41: Difference between the static 2019 and 2020 groundwater levels

11.1.8.4 Groundwater flow and yield

Exigo conducted five (5) falling head tests during September 2020 and 3 aquifer tests during October 2020 in the vicinity of the planned open-pit in order to determine aquifer parameters.

From the 5 falling head tests conducted the aquifer parameters in the following table were determined:

Table 18: Falling head test results

BH ID	Hvorslev Method		Bower-Rice Method	
	K (m/d)	T (m^2/d)	K (m/d)	T (m^2/d)
HBH31	5.65E-02	5.65	3.32E-02	3.32
HBH42	4.23E-03	0.42	2.48E-03	0.25
HBH131	7.33E-03	0.73	4.30E-03	0.43
HBH11	6.85E-03	0.69	4.02E-03	0.40
HBH06	3.21E-03	0.32	1.88E-03	0.19

Following a surface geophysical investigation (resistivity) conducted in September 2020 within the vicinity of the planned mining infrastructure, 4 boreholes were drilled based on the results of the geophysical investigation. From the 4 boreholes drilled only 3 boreholes were deemed successful as the fourth borehole was dry.

The 3 successful boreholes were subsequently subjected to aquifer testing and aquifer parameters determined as well as the recommended safe yield from the boreholes as per Table 19 below.

Table 19: Aquifer testing results

BH ID	Cooper Jacob and Basic FC method			FC Diagnostic plot	Safe Yield (l/sec)
	Early T (m^2/d)	Mid T (m^2/d)	Late T (m^2/d)	Recovery T (m^2/d)	
Exigo 1	0.3	0.2	0.1	0.1	0.02
Exigo 2	2.1	1.2	1.2	6.6	0.47
Exigo 3 (calc. from step test data)	152.6			218.7	

11.1.8.5 *Groundwater quality*

Groundwater samples were collected at 16 sites as part of the 2019 hydrocensus. Water samples from 10 sites were spatially selected and submitted to Aquatico (a SANAS accredited laboratory) for cation and anion analysis. Based on this data, statistical analysis was done to determine the regional groundwater quality (Table 20). Only three constituents that were measured exceed the SANS 241:2015 drinking water limit. Nitrate (HBH22 on Uitloop 3/36), total chromium (HBH10 on 3/47), and arsenic (HBH61 on Amatava 41/21) exceed the SANS 214:2015 limit in only one (10%) sample each. The single nitrate exceedance exceeds the SANS 241:2015 limit by approximately 2 times. The sample exceeding the total chromium SANS 241:2015 limit exceeds this limit by approximately 50% while the sample exceeding the arsenic SANS 241:2015 limit exceeds this limit by approximately 2 times. As only three individual sampling locations exceeded three of the SANS 241:2015 determinant's limits, the groundwater environment, in comparison with only the SANS 241:2015 drinking limits, can be considered a viable water source, if quantities warrant it.

The hydrochemical data is presented on a tri-linear piper diagram (Figure 42) for the characterisation of hydrochemical facies. The piper diagram indicates that the area is predominantly characterised by calcium-magnesium-bicarbonate type waters, which is due to the dolomitic environment. Figure 42 serves as a confirmation that the groundwater reliance is due to the dolomitic environment which is characterised as high yielding areas. The major macro constituents are presented in Figure 43 where the elevated Ca- and Mg- concentrations are evident at the sampled boreholes along with each sampled borehole's TDS-concentration.

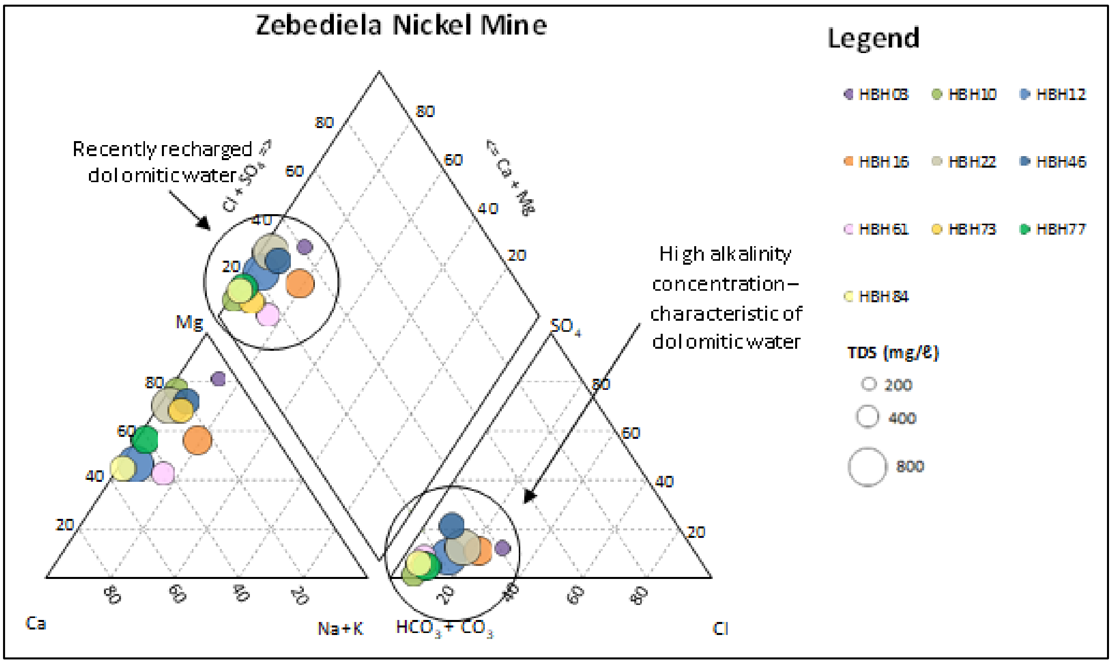

Figure 42: Tri-linear piper diagram of the hydrocensus borehole groundwater samples

Table 20: Statistical analysis of hydrochemistry of all samples with the SANS 241:2015 drinking water limit

Constituent	pH	EC	TDS	Cl	SO_4	NO_3-N	NO_2-N	NH_4-N	PO_4-P	F	Ca	Mg	Na	K	Al	Fe	Mn	Cr(total)	Cr^{6+}	Cu
Unit	[]	mS/m	mg/ℓ																	
% Detected	100%	100%	100%	100%	100%	100%		100%	0%	90%	100%	100%	100%	100%	20%	0%	0%	10%	10%	0%
SANS 241 Limit	5 - 9.7	170	1200	300	500	11	0.9			1.5			200		0.3	2	0.4	0.05		2
Mean	7.8	105	576	33	32	6.6	NA[3]	0.170	ND[4]	0.45	83	94	20	3.1	0.003	ND	ND	0.073	0.040	ND
Min	7.3	61	344	15.5	3.5	0.37	NA	0.023	ND	0.29	8.3	56.3	6.2	1.18	0.002	ND	ND	0.073	0.040	ND
Max	8.8	123	754	68	79	26	NA	0.859	ND	0.95	157	123	62	7	0.003	ND	ND	0.073	0.040	ND
P5	7.3	74	422	16	9.9	0.7	NA	0.029	ND	0.29	28.2	62	6.3	1.21	0.002	ND	ND			ND
P50	7.8	109	565	25	26	5.3	NA	0.077	ND	0.33	73	97	17	3.0	0.003	ND	ND			ND
P95	8.5	123	753	60	65	18	NA	0.590	ND	0.87	153	122	50	6	0.003	ND	ND			ND

Constituent	Ni	Zn	Co	Cd	Pb	As	Se	U	Alkalinity	Bicarbonate Alkalinity	Carbonate Alkalinity	Total Hardness
Unit	mg/ℓ								mg CaCO3/ℓ			
% Detected	0%	100%	0%	0%	0%	10%	0%	0%	100%	100%	100%	100%
SANS 241 Limit	0.07	5		0.003	0.01	0.01	0.04	0.03				
Mean	ND	0.070	ND	ND	ND	0.021	ND	ND	575	570	4.7	595
Min	ND	0.012	ND	ND	ND	0.021	ND	ND	262	247	0.909	306
Max	ND	0.226	ND	ND	ND	0.021	ND	ND	672	671	15	722
P5	ND	0.026	ND	ND	ND		ND	ND	384	375	1.09	377
P50	ND	0.053	ND	ND	ND		ND	ND	592	587	3.3	614
P95	ND	0.161	ND	ND	ND		ND	ND	671	670	11	719

[3] NA – Not analysed
[4] ND – Not detected

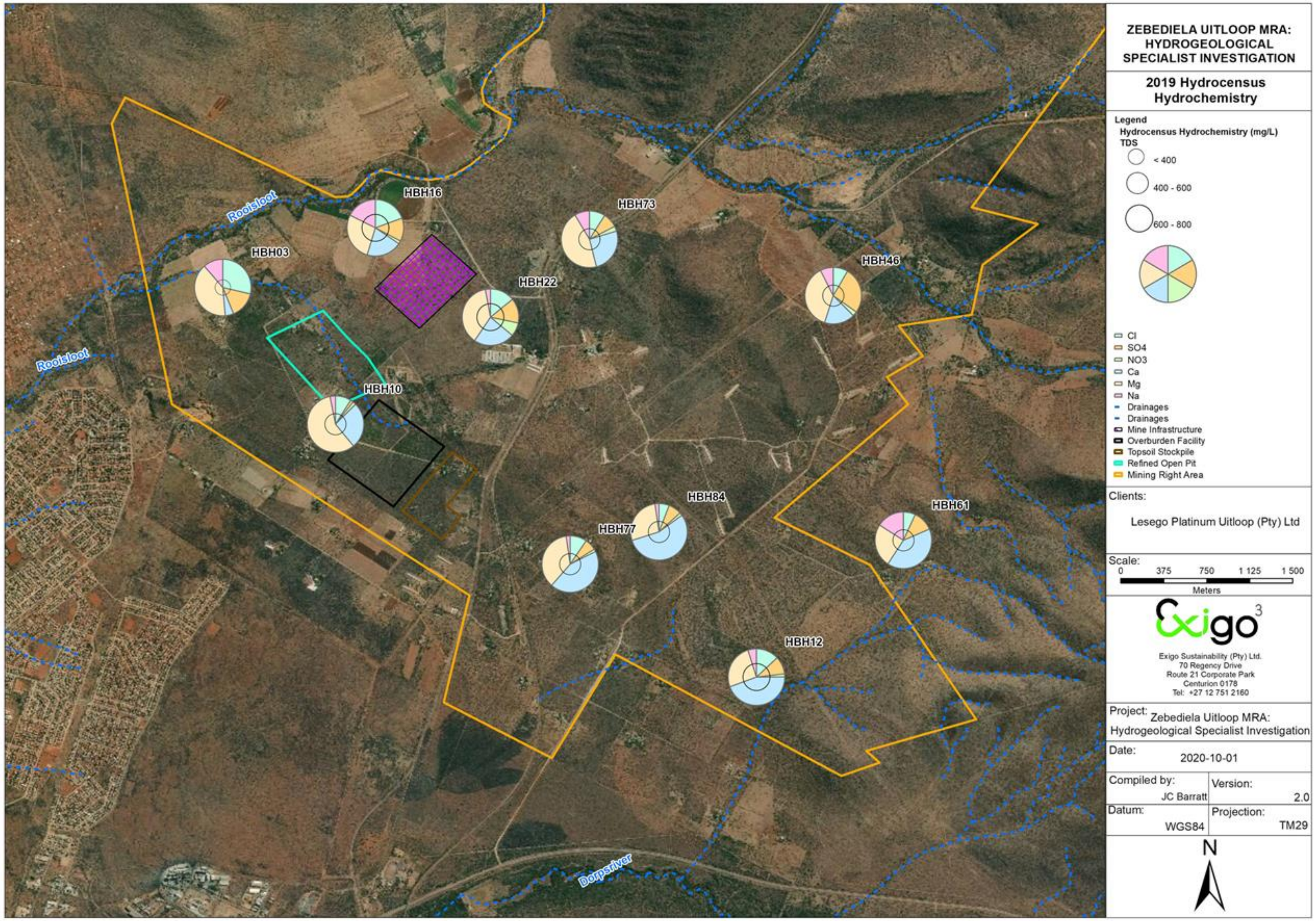

Figure 43: Spatial pie chart of selected macro constituents from the 2019 hydrocensus

11.1.8.5.1 2020 hydrocensus groundwater chemistry

Groundwater samples were collected at 14 sites as part of the 2020 hydrocensus. Water samples from all 14 sites were submitted to Aquatico in Irene, Gauteng, (a SANAS accredited laboratory) for cation and anion analysis. Based on this data, statistical analysis was done to determine the regional groundwater quality (

Table 21).

Only two constituents that were measured exceed the SANS 241:2015 drinking water limit. Nitrate and total chromium exceed the SANS 214:2015 limit in three (21%) and one (7%) measured samples. From the three samples that exceed nitrate's SANS 241:2015 limit, the exceedances ranged from 25% to 4 times the limit. The sample exceeding the total chromium SANS 241:2015 limit exceeds this limit by approximately 30%. As only four individual sampling locations exceeded two of the SANS 241:2015 determinant's limits, the groundwater environment, in comparison with only the SANS 241:2015 drinking limits can be considered a viable water source if quantities warrant it.

The hydrochemical data is presented on a tri-linear piper diagram (Figure 44) for the characterisation of hydrochemical facies. The piper diagram indicates that the area is predominantly characterised by calcium-magnesium-bicarbonate type waters, which is due to the dolomitic environment. Figure 44 serves as a confirmation that the groundwater reliance is due to the dolomitic environment which is characterised as high yielding areas. The major macro constituents are presented in Figure 45 where the elevated Ca- and Mg- concentrations are evident at the sampled boreholes along with each sampled borehole's TDS-concentration.

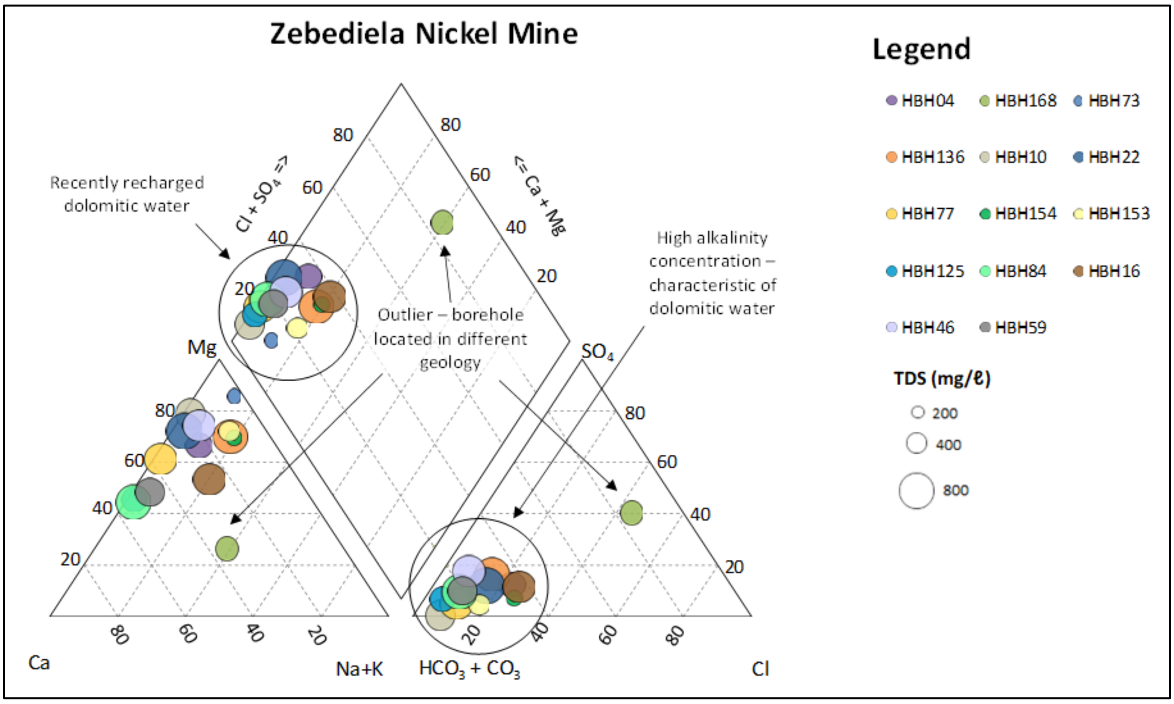

Figure 44: Tri-linear piper diagram of the 2020 hydrocensus borehole groundwater samples

Table 21: Statistical analysis of 2020 hydrocensus hydrochemistry with the SANS 241:2015 drinking water limit

Constituent	pH	EC	TDS	Cl	SO4	NO3-N	NO2-N	NH4-N	PO4-P	F	Ca	Mg	Na	K	Al	Fe	Mn	Cr(total)	Cr6+	Cu
Unit	[]	mS/m	mg/ℓ																	
% Detected	100%	100%	100%	100%	100%	100%	100%	100%	29%	93%	100%	100%	100%	100%	0%	0%	21%	7%	7%	14%
SANS 241 Limit	5 - 9.7	170	1200	300	500	11	0.9			1.5			200		0.3	2	0.4	0.05	0	2
Mean	7.5	102	623	34	32	9.5	0.086	0.024	0.014	0.48	62	82	24	2.2	ND	ND	0.007	0.080	0.053	0.050
Min	6.4	55	304	9.8	1.6	0.26	0.074	0.010	0.007	0.29	3.9	19.3	4.3	0.33	ND	ND	0.001	0.080	0.053	0.046
Max	8.8	130	836	78	67	43	0.106	0.067	0.024	0.95	146	118	59	7	ND	ND	0.011	0.080	0.053	0.053
P5	6.8	55	320	11	3.8	0.9	0.074	0.011	0.007	0.30	9.5	38	5.1	0.41	ND	ND	0.002			0.046
P50	7.5	109	659	30	36	5.9	0.085	0.019	0.012	0.36	48	79	16	1.8	ND	ND	0.009			0.050
P95	8.3	129	789	63	63	31	0.102	0.053	0.023	0.92	130	117	58	5	ND	ND	0.011			0.053

Constituent	Ni	Zn	Co	Cd	Pb	As	Se	U	Alkalinity	Bicarbonate Alkalinity	Carbonate Alkalinity	Total Hardness
Unit	mg/ℓ								mg CaCO3/ℓ			
% Detected	0%	57%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
SANS 241 Limit	0.07	5		0.003	0.01	0.01	0.04	0.03				
Mean	ND	0.047	ND	ND	ND	ND	ND	ND	470	468	2.8	494
Min	ND	0.003	ND	ND	ND	ND	ND	ND	47	47	0.011	185
Max	ND	0.225	ND	ND	ND	ND	ND	ND	656	655	17	669
P5	ND	0.004	ND	ND	ND	ND	ND	ND	170	169	0.40	216
P50	ND	0.015	ND	ND	ND	ND	ND	ND	545	543	1.5	552
P95	ND	0.169	ND	ND	ND	ND	ND	ND	635	634	9	667

ND – Not detected

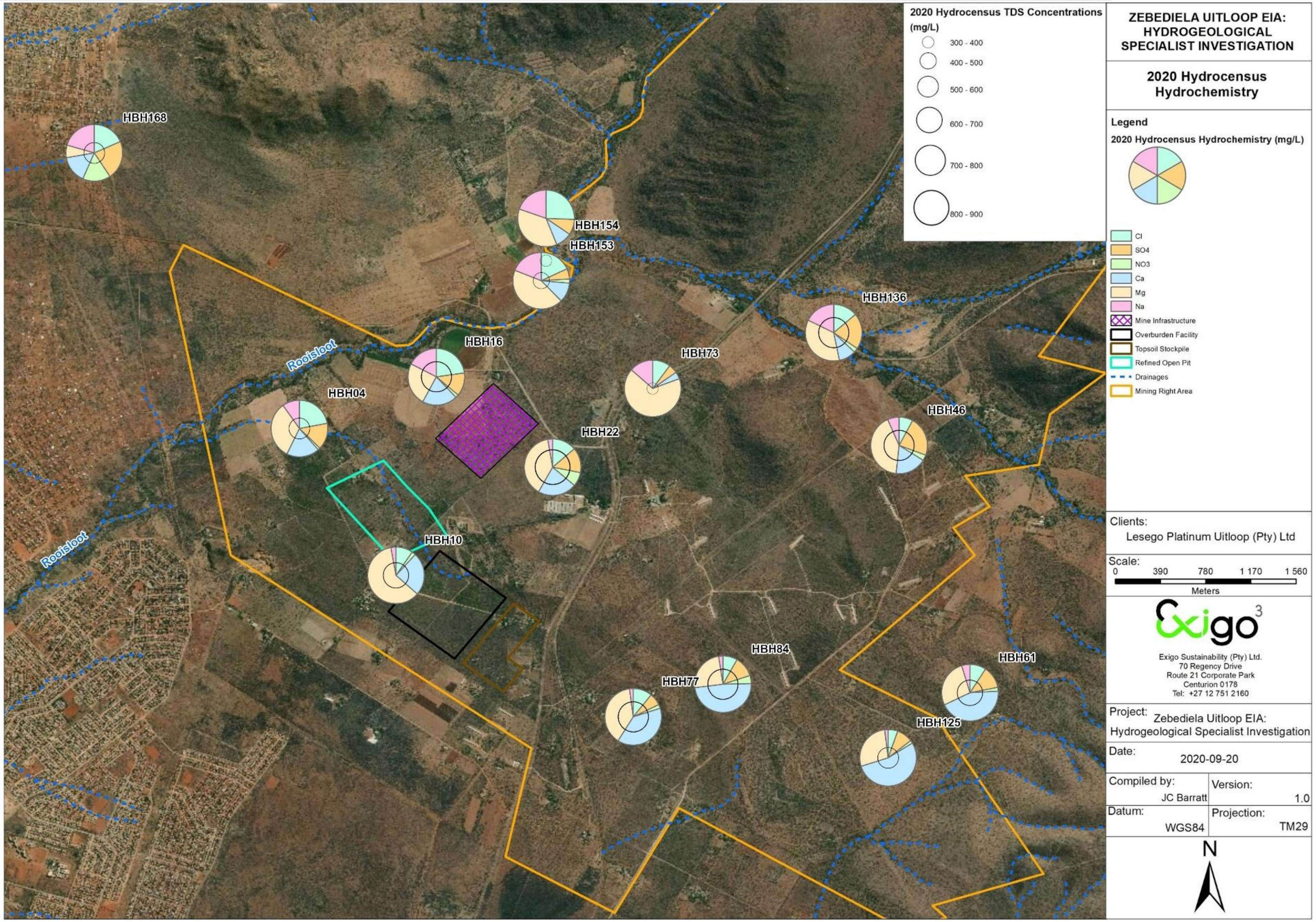

Figure 45: Spatial pie chart of selected macro constituents from the 2020 hydrocensus.

11.1.8.5.2 Change in groundwater chemistry

Figure 46 below illustrates no significant changes from the 2019 to the 2020 hydrocensus hydrochemical analysis. This demonstrates that there is only a slight differentiation between the seasonal hydrochemical characteristics of the sampled boreholes.

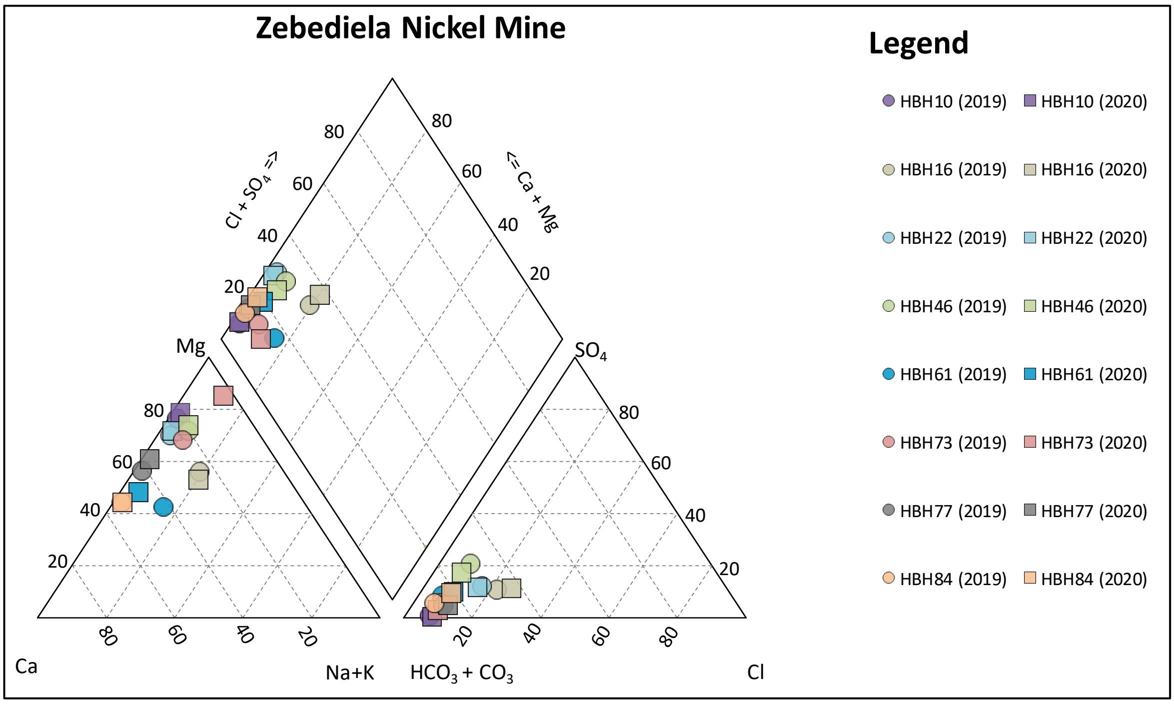

Figure 46: Tri-linear piper diagram of the difference between the 2019 and 2020 hydrocensus hydrochemistry

11.1.8.5.3 Hydrogeochemistry

Mineralogical chemical analysis done on the ore and waste material showed that the orebody consists of an oxide- (top) and a sulphide zone (base). The oxide zone consists mainly of calcite (2-50%), dolomite (20-50%), quartz (SiO2) and serpentine and the sulphide zone of serpentine (>50%) (Table 22, SGS, 2011).

The potential for acid generation is based in the pyrrhotite and pentlandite in the sulphide zone which is <3%. The whole rock (solid) phase with total sulphur at 0.25 to 0.5% sulphide sulphur at <0.01%, would make the potential for acid formation highly unlikely (MSA, 2012). The oxide zone and surface limestone have an overabundance of calcium and magnesium that would neutralise any acid formation in the overburden material.

This is supported by the high bicarbonate alkalinity (468 mg/L) and elevated median pH of the groundwater at 7.8 (

Table 21).

Table 22: Mineralogy of the Zebediela Sulphide and Oxide ore (SGS, 2011)

Mineral	Approx. Formula	Approximate Abundance		
		Zeb. Sulphide	Zeb. Oxide	Burgersfort
Serpentine	$Mg_3Si_2O_5(OH)_4$	> 50%	3 - 10%	> 50%
Olivine	$(Fe,Mg)_2SiO_4$	10 - 20%	-	20 - 50%
Chlorite	$(Mg,Fe)_6(Si,Al)_4O_{10}(OH)_8$	10 - 20%	-	-
Talc	$Mg_3Si_4O_{10}(OH)_2$	-	3 - 10%	-
Clay	$(Al,Mg)_8(Si_4O_{10})_4(OH)_8 \cdot 12H_2O$	-	3 - 10%	-
Quartz	SiO_2	-	3 - 10%	-
Calcite	$CaCO_3$	-	20 - 50%	-
Dolomite	$CaMg(CO_3)_2$	-	20 - 50%	-
Magnetite	Fe_3O_4	< 3%	< 3%	3 - 10%
Pyrrhotite	$Fe_{1-x}S$	< 3%	-	-

Metals that could leach from the mine residue, is chrome, manganese and nickel but given the elevated pH levels, these metals have a very low mobility in the subsurface and are not considered a significant risk in the surface of groundwater pathways.

Elevated nitrate concentrations are expected to leach from the open-pit and mine residue materials. The nitrate would originate from explosives and does not occur naturally in the geology.

11.1.8.6 Numerical groundwater model

Groundwater flow and mass transport models were developed to simulate the potential impacts on the groundwater quantity and quality, to provide recommendations on monitoring and management measures.

A 3D groundwater flow and mass transport model based on the site information and analogue data from surrounding mines, was developed to simulate the potential groundwater flow directions and velocities, inflow rates and the radius of influence of the mine inflows, as well as possible migration rate and direction/s mass plumes from the backfilled pit and the overburden facility.

The data obtained from the baseline-, and site characterisation investigation were used for the model input parameters along with analogue data from mines located in a similar geological environment as well as parameters obtained from on-site falling head and aquifer testing. The main hydraulic zones that influence the groundwater flow balance within the aquifer were identified from the 1 : 250 000 geological maps (Geological Survey, 1978). A major hydraulic zone within the model area is the faults located within the underlying basement rocks.

Scenarios were simulated to assist in the decision-making process regarding the management of the groundwater resource and potential impacts in this area and neighbouring groundwater users (Vivier et al, 2020).

11.1.8.6.1 Scenario 1: Pre-development steady state

Under steady-state conditions, the groundwater flow equation is reduced to exclude storativity and only transmissivity (or hydraulic conductivity) and recharge are considered in the model calibration process. Calibration is the process of adjusting model parameters (hydraulic conductivity and recharge) until a suitable error between simulated and measured hydraulic heads is achieved (Table

23; Table 24). This steady-state pre-operational calibration emulates the current groundwater conditions and forms this basis for operational simulations with the proposed open pit.

The head elevation data from 73 observation boreholes were used to calibrate the steady-state flow model (Figure 109). The calibration was satisfactory when the correlation between the measured and simulated head data was $R^2 > 0.90$ (Table 23; Figure 47) and the average Mean Error (ME) < 5m.

A good correlation ($R^2 = 0.88$) exists between the topographical elevations and the static hydraulic head elevations.

Table 23: Summary of steady-state calibration

Statistical Parameter	Water Level (mbgl)	Measured Head (mamsl)	Simulated Head (mamsl)	Mean Absolute Error (m) MAE	Mean Error (m) ME	Root Mean Square Error (m) RMS
Mean	**24.24**	**1169.81**	**1169.20**	**3.66**	**0.61**	**21.86**
Minimum	**4.85**	**1073.52**	**1074.59**	**0.09**	**-12.16**	**0.01**
Maximum	**67.90**	**1279.72**	**1280.67**	**12.16**	**9.40**	**147.99**
		Correlation (R)	**0.99**	Σ = 267.40	Σ = 44.74	Σ = 1595.64
		R^2	**0.99**	1/n = 3.663	1/n = 0.613	1/n = 21.86
						SQRT = 4.68
						RMS% of water level range = 2.27%

Table 24: Steady-state water balance

No	Component	Scenario 1: Initial steady-state pre-operational calibration (2020)		
		Inflow (m^3/d)	Outflow (m^3/d)	Balance (m^3/d)
1	Recharge from precipitation	8258	0	8258
2	Abstraction from boreholes	0	-3199	-3199
3	Baseflow and losses to drainages	0	-5059	-5059
	Total	**8258.2**	**-8258**	**0**
			Balance Error (%)	**0.00%**

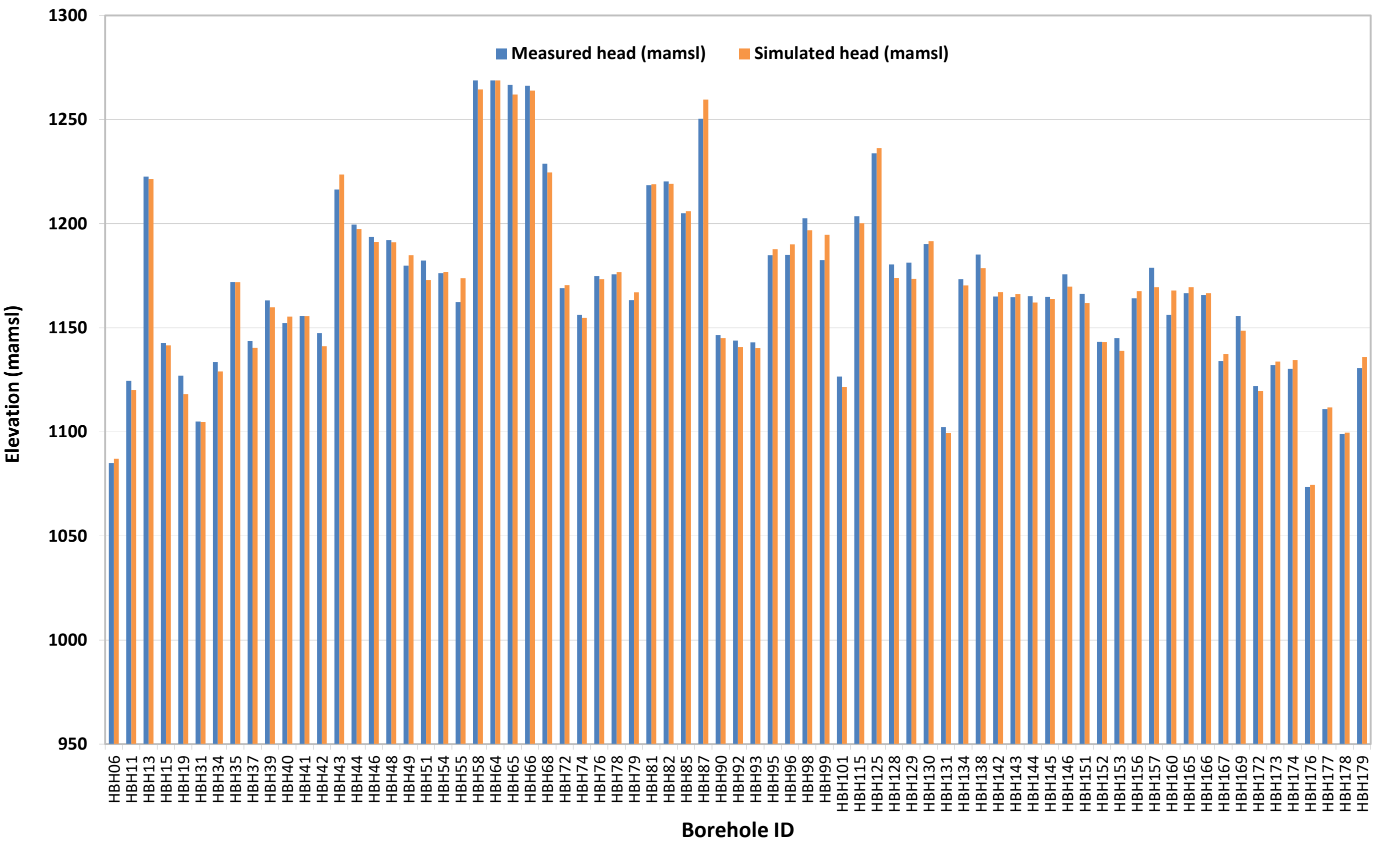

Figure 47: Graphic presentation of measured versus simulated heads

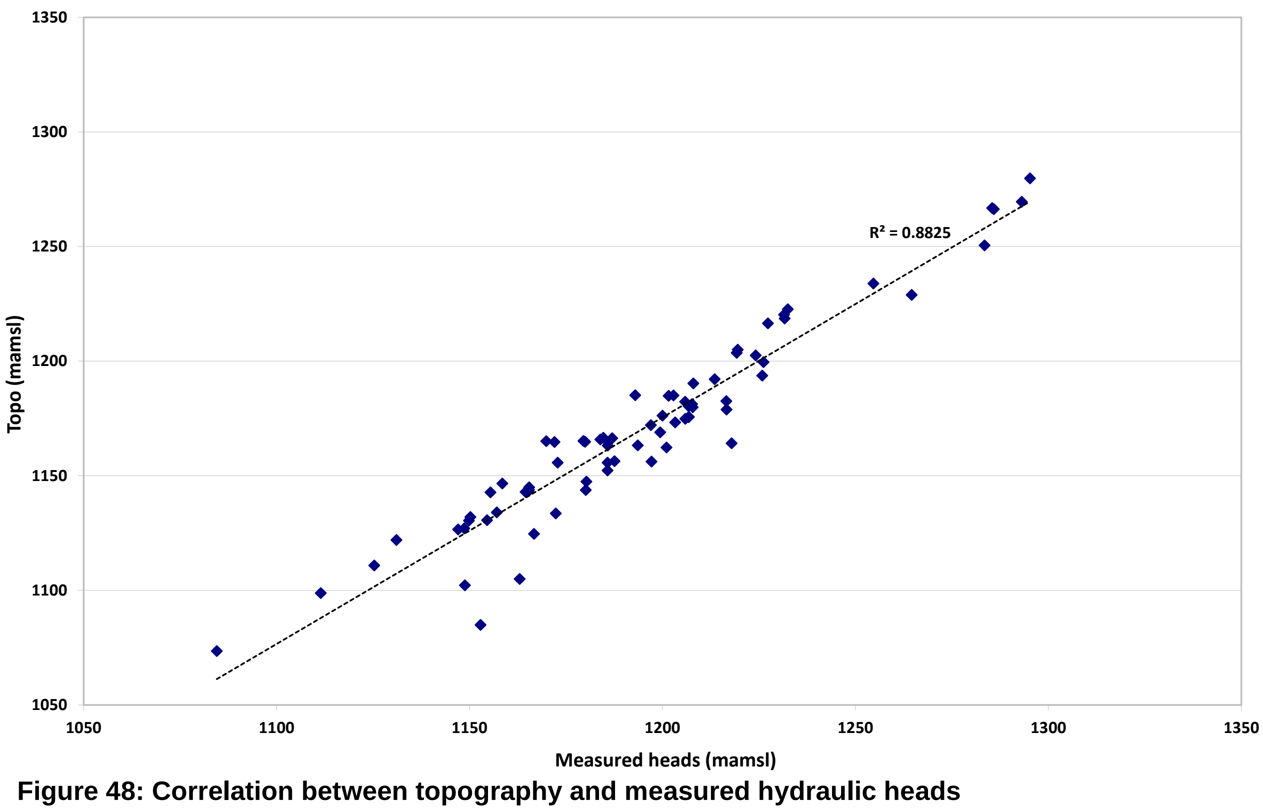

Figure 48: Correlation between topography and measured hydraulic heads

11.1.8.6.2 Scenario 2a: Operational phase – Open pit mining and backfill

dewatering impact

The proposed open pit mining at Zebediela Nickel Mine will consist of one open pit that will reach a depth of 90 m from surface. Mining will commence from the north-west towards the south-east with concurrent partial backfilling during the life of mine (LoM). An overburden facility and topsoil stockpile are proposed to be located towards the south-east of the open pit extent. The mine is planned to have an operational LoM of 30 years after which the remaining overburden material will be backfilled during the 31st year of operations (first year of post-operational phase). Mining and backfilling were simulated as linearly during the operational phase.

Mining drawdown was input into the model as hydraulic head boundary conditions that ensured the proposed mining and backfilling schedule could be applied to the model. The mining areas' boundary condition was constrained to ensure all water reporting to the mining area was removed and thus simulates the required abstraction.

The results indicated that maximum inflows of approximately 640 m³/d could be expected from mining with P95 inflows estimated at 580 m3/d (Figure 49; Table 25). Backfilling within the proposed pit will create zones of higher permeability and recharge which may lead to higher inflows towards the backfilled sections of the proposed pit. The peaks evident in the simulated inflow data is resultant from the seasonal rainfall fluctuations (Figure 50).

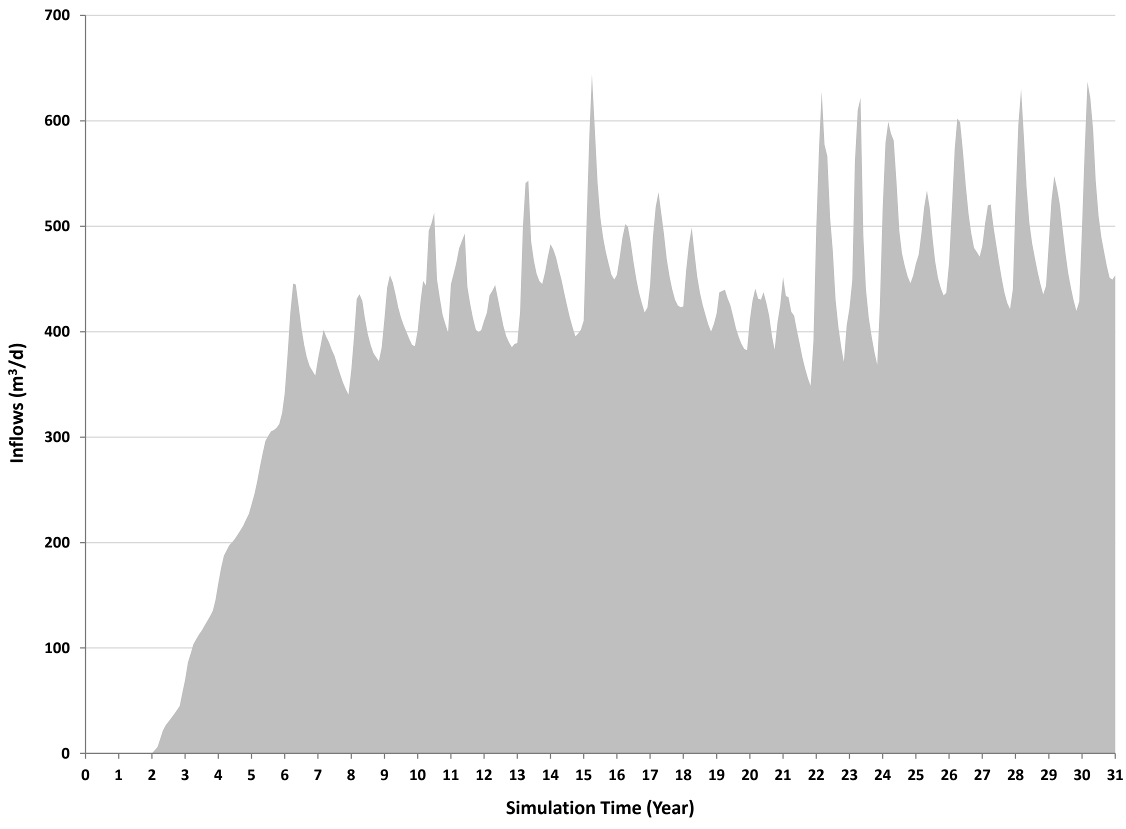

Figure 49: Scenario 2a's simulated inflows during mining operational phase

Table 25: Scenario 2a's statistical analysis of inflows

Statistical parameter	Total Inflows (m^3/d)
Mean	414
Min	3
Max	644
P5	118
P50	433
P95	579

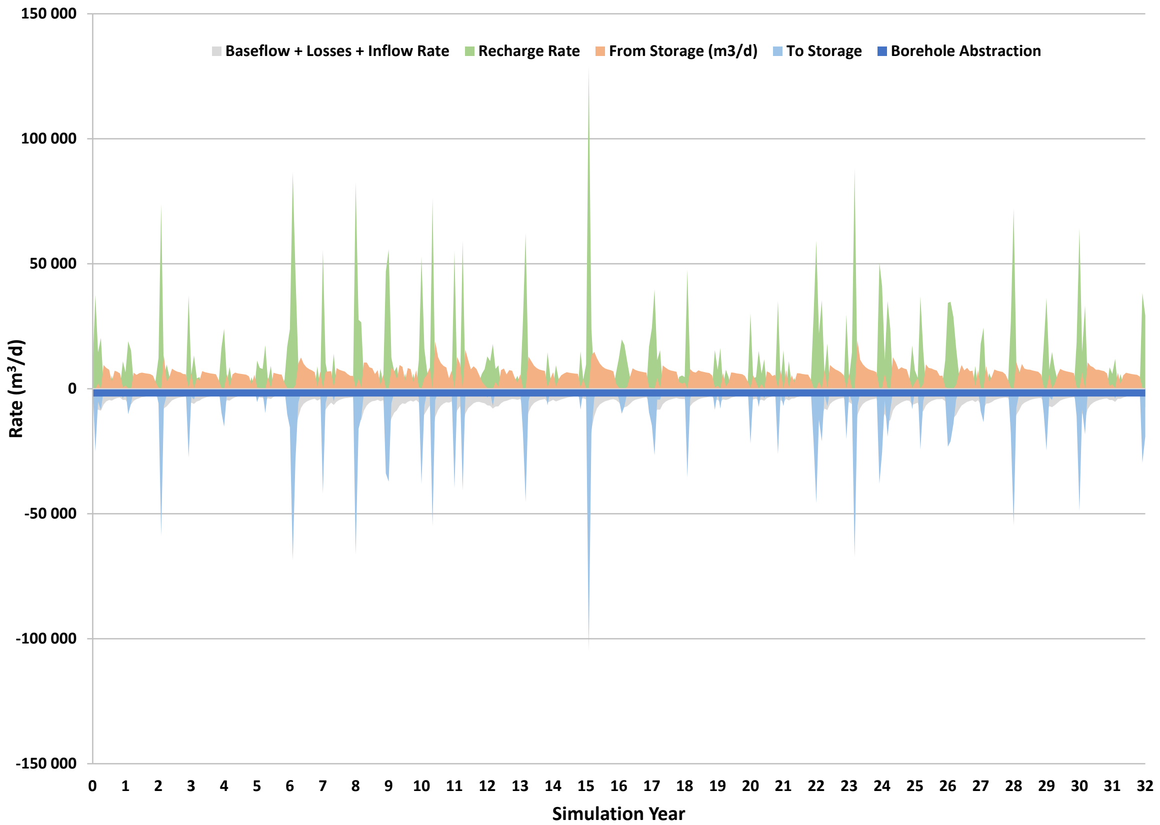

Figure 50: Scenario 2a's water balance with inflow rates, and recharge- and storage components

The radius of influence (ROI) as illustrated in Figure 111 depicts the simulated drawdown during the LoM. The maximum drawdown ranges between 40 – 45 m which is only in the vicinity of the north-western edge of the pit as mining in this area is the deepest relative to the topography. The ROI influences < 1100 ha in the vicinity of the proposed open pit with the drawdown reaching < 1.1 km south-west and south-east, < 1.5 km north-west, and < 2.5 km north-east of the proposed pit.

11.1.8.6.3 Scenario 2b: Operational phase – Open pit mining and backfill

dewatering impact with hydraulic connection to dolomite

This scenario was simulated with the same input conditions as Scenario 2a, with the only exception that a hydraulic connection was manually inserted into the model that hydraulically connects the mining area (predominately pyroxenite) with the dolomitic geology that has a higher conductance. This connection simulates the scenario where the pit intersects the dolomitic geology at depth and potentially increases groundwater inflows into the proposed open pit area.

Figure 52 illustrates the Scenario 2b's transient water balance that is 0%, indicating convergence in the model during the simulation.

The results indicated that maximum inflows of approximately 960 m³/d could be expected from mining with P95 inflows estimated at 870 m³/d (Figure 51; Table 26). Backfilling within the proposed pit will create zones of higher permeability and recharge which may lead to higher inflows towards the backfilled sections of the proposed pit. The peaks evident in the simulated inflow data (Figure 51) are resultant from the seasonal rainfall fluctuations. In this scenario, the pit is hydraulically connected with the dolomite which also has higher recharge and thus has a larger influence of the seasonal inflow peaks.

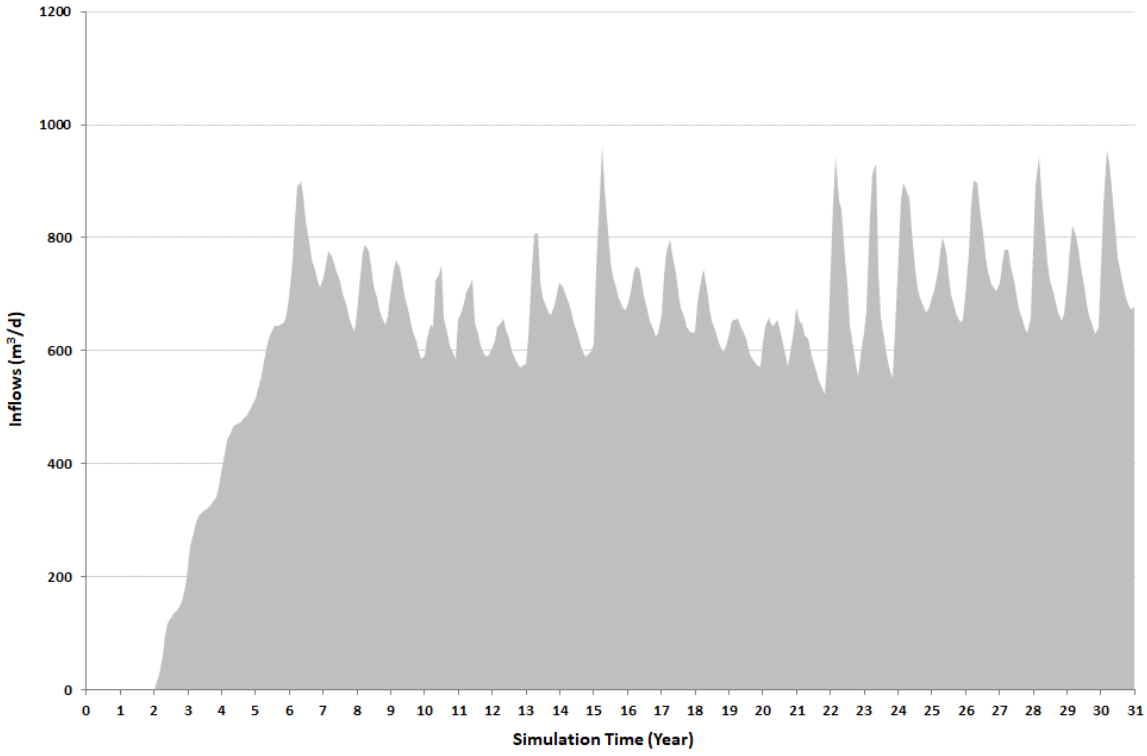

Figure 51: Scenario 2b's simulated inflows during mining operational phase

Table 26: Scenario 2b's statistical analysis of inflows

Statistical parameter	Total Inflows (m³/d)
Mean	655

Min	13
Max	963
P5	318
P50	666
P95	873

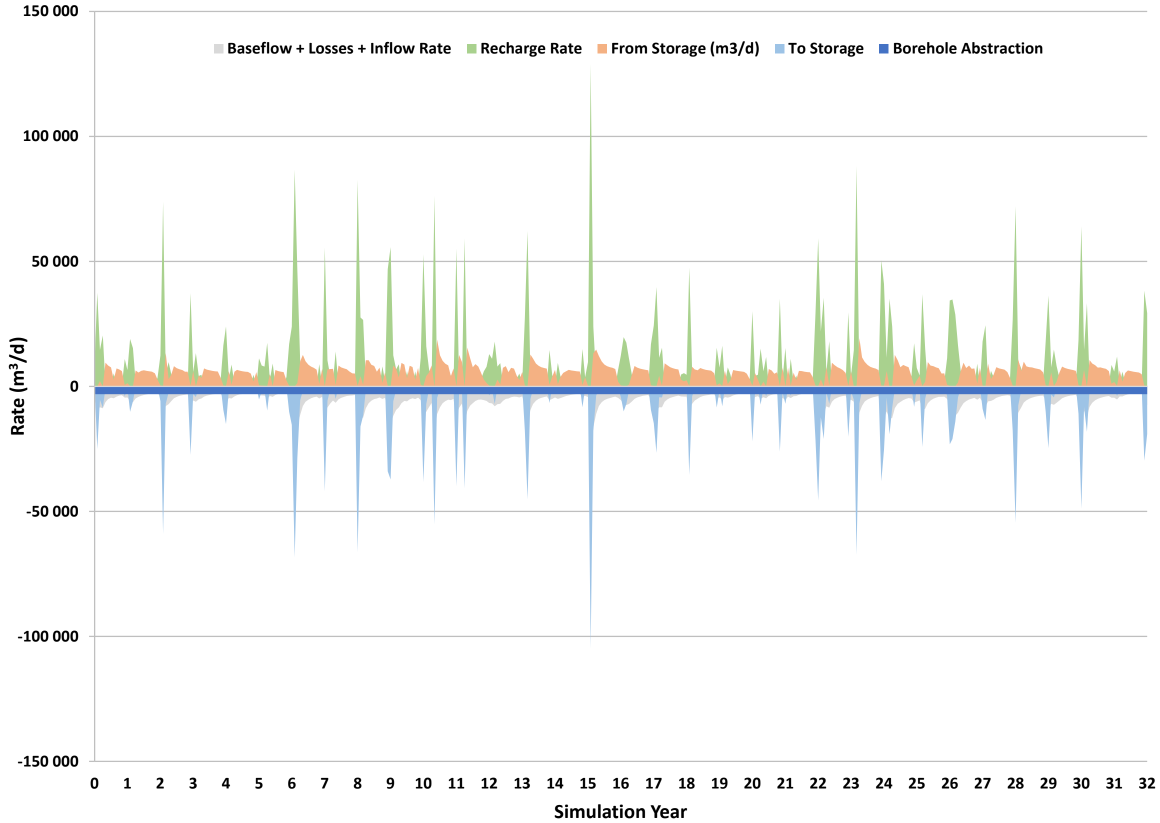

Figure 52: Scenario 2b's water balance with inflow rates, and recharge- and storage components

The radius of influence (ROI) as illustrated in Figure 112 depicts the simulated drawdown during the LoM. The maximum drawdown ranges between 50 – 55 m which is only in the vicinity of the north-western edge of the open pit as mining in this area is the deepest relative to the topography. The ROI influences < 1800 ha in the vicinity of the proposed pit with the drawdown reaching < 1.7 km south-west, <1 km south-east, < 2.1 km north-west, and < 4.0 km north-east of the proposed open pit.

11.1.8.6.4 Scenario 3a: Operational- and post-operational phase – TDS mass migration from overburden facility and backfilled pit

The mass transport model was developed to simulate potential impacts chemical mass constituents that may leach from the backfilled pit and overburden facility. No leachate data from a geochemical assessment was available during the assessment and analogue geochemical data from similar hydrogeochemical environments was used as input into the model. From the analogue geochemical data, TDS, nitrate, and sulphate were identified as potential constituents of concern.

From the hydrocensus baseline data, a background TDS concentration of 600 mg/ℓ was applied to the model domain in line with the mean baseline TDS concentration. At the overburden facility, a constant source of 2000 mg/ℓ was conservatively applied from the commencement of the operational phase, as well as sequentially applied to the backfilled open-pit areas with the same concentration. Rehabilitation of the open-pit footprint during the post-operational phase will limit oxidation of the sulphide bearing rocks and was simulated accordingly. The post-operational TDS concentrations are highly dependent on the success of the rehabilitation on the affected area as TDS indicates the overall quality of the water chemistry. During the post-operational phase, the input TDS concentrations on the backfilled area was linearly decreased to 1000 mg/ℓ from 5 years post operations, in line with reduced oxidation.

As mentioned, this simulation does not account for potential geochemical reactions and is dependent on appropriate rehabilitation measures to mitigate the potential post-operational risks. Figure 114 illustrates the potential zone of influence (ZOI) of TDS at the end of LoM. The potential unmitigated mass migration of TDS's plume exceeding the SANS 241:2015 TDS drinking water limit does not migrate more than 250 m from the proposed pit perimeter or the overburden facility's perimeter.

At 25 and 50 years post-operational phase, the potential unmitigated mass migration of TDS's plume does not exceed the SANS 241:2015 TDS drinking water limit (Figure 115; Figure 116).

11.1.8.6.5 Scenario 3b: Operational- and post-operational phase – Nitrate mass migration from overburden facility and backfilled pit

Nitrate is expected to originate from explosives used in mining and does not occur naturally in the mineralogy. A maximum expected nitrate source of 200 mg/ℓ was applied to the overburden facility from the commencement of the operational phase, as well as sequentially applied to the backfilled open-pit areas with the same concentration. From various other mining areas in the Bushveld Complex, the nitrate decay rate can vary. During this simulation, a conservative nitrate half-life of 500 days was applied. No more ammonium-nitrate based explosives will be used during the post-operational phase and should thus denitrify and decay during the post-operational phase. With a source term of 200 mg/ℓ and a nitrate half-life of 500 days, the nitrates produced for mining should be below the mean baseline within 10 years post-operational.

Upon cessation of mining activities and the use of ammonium-nitrate based explosives, the total mass of nitrate remaining in the disturbed geology and overburden will decay with no addition of nitrate mass to the system. Figure 117 illustrates the potential zone of influence (ZOI) of the nitrates at the end of LoM. The potential mass migration of nitrates' plume exceeding the baseline mean nitrate concentration does not migrate more than 400 m from the proposed pit perimeter or the overburden facility's perimeter.

During the post-operational phase, the nitrates will continue to decay and 5 years post-operational phase, the potential plume exceeding the baseline mean nitrate concentration does not extend beyond 300 m from the pit perimeter (Figure 118). With exception to the north-western perimeter of the pit, the simulated plume does migrate exceeding the baseline mean nitrate concentration does not migrate more than 100 m from the proposed pit and overburden facility's perimeters.

11.1.8.6.6 Scenario 3c: Operational- and post-operational phase – Sulphate mass migration from overburden facility and backfilled pit

The focus of the numerical mass transport model is to determine the impact any mass potentially may have from leaching from the backfilled pit and overburden facility. No leachate data from a geochemical assessment was available during the assessment (samples are currently being analysed according to GNR 635 and GNR 636) and analogue geochemical data from surrounding mines in similar hydrogeochemical environments was used as input into the model. From the analogue geochemical data, TDS, nitrate, and sulphate were identified as potential constituents of concern. The potential for acid mine drainage (AMD) is furthermore expected to be low as the material has 0.25 to 0.5 % sulphur content. In addition to the low sulphur content, the oxide zone has sufficient buffering capacity (24% CaO) to neutralize low concentrations AMD (MSA, 2012).

A constant source of maximum expected value of 1000 mg/ℓ was applied to the overburden facility from the commencement of the operational phase, as well as sequentially applied to the backfilled open-pit areas with the same concentration. Rehabilitation of the open-pit footprint during the post-operational phase will limit oxidation of the sulphide bearing rocks and was simulated accordingly. During the post-operational phase, the input sulphate concentrations on the backfilled area was linearly decreased to 250 mg/ℓ from 10 years post operations. This applied concentration is more than 8 times higher than the mean groundwater baseline sulphate to warrant conservancy of the simulations.

Convective transport was used in the model and even though sulphates could potentially leach from the overburden facility, it is expected that the receiving geochemical environment has sufficient buffering capacity as stated above.

As mentioned, this simulation does not account for potential geochemical reactions and is dependent on appropriate rehabilitation measures to mitigate the potential post-operational risks. Figure 119 illustrates the potential zone of influence (ZOI) of the sulphates at the end of LoM. The potential unmitigated mass migration of sulphates' plume exceeding the SANS 241:2015 sulphate drinking water limit does not migrate more than 150 m from the proposed pit perimeter or the overburden facility's perimeter.

At 25 and 50 years post-operational phase, the potential unmitigated mass migration of sulphates' plume does not exceed the SANS 241:2015 sulphate drinking water limit (Figure 120; Figure 121).

11.1.9 **Heritage Resources**

The following section was completed with the assistance of the heritage practitioner Mr Neels Kruger (refer to Appendix 6.2: Heritage Impact Assessment).

An analysis of historical aerial imagery and archive maps of areas subject to this assessment suggests a varied landscape that ranges between densely vegetation natural habitats and areas which has been subjected to historical farming activities possibly sterilising the area of heritage remains. This inference was confirmed during archaeological site assessments where heritage remains were encountered across the project area.

The following heritage findings were made during the site survey.

11.1.9.1 The Stone Age

- **Site Exigo-ZNM-SA01 Stone Age Scatter (-24.11819589 29.02046579)**
  Uitloop 3 KS Ptn 63
- **Site Exigo-ZNM-SA02 Stone Age Scatter (-24.11648548 29.02092696)**
  Uitloop 3 KS Ptn 51
- **Site Exigo-ZNM-SA03 Stone Age Scatter (-24.11648548 29.02092696)**
  Uitloop 3 KS Ptn 35

Stone Age remains occur abundantly in the larger Mokopane landscape where locally available raw material for the manufacture of stone tools is available in the geological landscape. Similarly, scatters of Stone Age artefacts were observed in low densities in the project area. Most of the artefacts are Middle Stone Age lithics such as blades and scrapers indicating various degrees of weathering and patination on the surface of the lithics. This might imply that they have been transported by water and have lain on the surface of the landscape for varying lengths of time. Hornfels is the predominant raw material used but quartzite and banded sandstone are also evident. No evidence of any factory or workshop site, or the result of any human settlement was identified in any of the project areas. The fairly small numbers and disturbed context in which they were found means that the archaeological remains in the study area have been rated as having moderate-low archaeological significance. It is highly likely that Earlier, Middle and possibly Later Stone Age scatters will occur in the area, specifically along drainage lines. The Stone Age sites are located within the demarcated footprint for the mine development and impact on the sites can be anticipated.

Photo 11: View of area containing Stone Age occurrences at Site Exigo-ZNM-SA01

Photo 12: Highly weathered MSA tools from Site Exigo-ZNM-SA01

Photo 13: View of densely vegetated area containing Stone Age occurrences at Site Exigo-ZNM-SA02

Photo 14: Weathered MSA tools from Site Exigo-ZNM-SA02. Note the diagnostic broken blade on the left

Photo 15: A weathered MSA scraper from Site Exigo-ZNM-SA03

11.1.9.2 The Historical / Colonial Period

- **Site Exigo-ZNM-HP01 Historical Period Calcrete Quarry (-24.11647903 29.02882498)**
  Uitloop 3KS Ptn 0
- **Site Exigo-ZNM-HP03 Historical Period Calcrete Quarry (-24.11782499 29.01964612)**
  Uitloop 3KS Ptn 56

Two large open-air calcrete quarries probably dating to the recent Historical Period occurs on Portion 0 and Portion 56 of the farm Uitloop. The quarry at Site Exigo-ZNM-HP01 is approximately 30m long and in places more than 4m deep and heaps of large stones surround the open excavations. The quarry at Site Exigo-ZNM-HP03, excavated into calcrete is approximately 20m long and in places 2m deep. It seems that the quarries have been used until relatively recently based on excavations and material culture still visible at the sites. The sites are probably of limited research potential and they are rated as of low heritage significance.


Photo 16: View excavated stone heaps at Site Exigo-ZNM-HP01


Photo 17: View of Historical Period quarry site at Site Exigo-ZNM-HP03

- **Site Exigo-ZNM-HP02 Historical Period Settlement Area (-24.117279 29.02177404)**
  Uitloop 3KS Ptn 0

A small settlement area consisting of the foundation remains of a rectangular stone building and material culture such as glass, metal, and plastic were noted on Portion 0 of the farm Uitloop. In addition, the remains of a stone-line footpath were noted. An absolute age for the structures could not be ascertained but an analysis of historical topographical maps and aerial photographs imply that the site was in use by around 1960 and it is likely that the site, along with Site Exigo-ZNM-HP04, formed a larger settlement complex. The site is probably around 60 years - and generally protected under the National Heritage Resource Act (NHRA 1999). The feature at the site are poorly preserved and of low heritage significance but there is a high risk that burials might be encountered around the settlement area.

Photo 18: View of a Historical Period settlement area at Site Exigo-ZNM-HP02. Note stone-lined walkway

- **Site Exigo-ZNM-HP04 Historical Period Settlement Area (-24.11849622 29.02150934)**
  Uitloop 3KS Ptn 57

Another small settlement area consisting of the scattered remains of stones probably used for building as well as material culture such as glass, metal, and plastic were noted on Portion 57 of the farm Uitloop. An absolute age for the structures could not be ascertained but an analysis of historical topographical maps and aerial photographs imply that the site was in use by around 1960 and it is likely that the site, along with Site Exigo-ZNM-HP02, formed a larger settlement complex. The site is probably around 60 years - and generally protected under the National Heritage Resource Act (NHRA 1999). The feature at the site are poorly preserved and of low heritage significance but there is a high risk that burials might be encountered around the settlement area.

Photo 19: Dated glass and metal noted on the surface at Site Exigo-ZNM-HP04

11.1.9.3 Graves and Burials

At least 5 graves or potential burial sites were identified across the project area. The burial places hold various numbers of graves, a number of which might be older than 60 years or unmarked. In many instances, burial locations in this area follow a general (and fairly common) pattern where graves occur around the remains of historical house structures and homestead complexes.

- **Site Exigo-ZNM-BP01 Stone Cairn Burial (-24.11819589 29.02046579)**
  Uitloop 3KS Ptn 57

A square stone structure, probably indicating a grave was noted in association with Site Exigo-ZNM-HP04 on Portion 57 the farm Uitloop 3KS. The burial is indicated by a rectangular stone structure filled in with soil. The site is not fenced off and its condition of preservation is poor. No material culture was noted on the surface in association with the grave. The burial site, which is of high heritage significance, occurs in close proximity of the demarcated infrastructure footprints for the mine development and impact on the site can be anticipated.

Photo 20: View of the burial structure at Site Exigo-ZNM-BP01

- **Site Exigo-ZNM-BP02 Stone Cairn Burials (-24.11648548 29.02092696)**
  Uitloop 3KS Ptn 0

A number of graves occur in a densely vegetated section of the farm Uitloop 3KS. The burials, which were first identified by Roodt in 2008[5] are indicated by crudely stacked stone cairns. The site is not fenced off and its condition of preservation is poor. No material culture was noted on the surface in association with the graves. The burial site, which is of high heritage significance, occurs within the demarcated footprint for the mine development and impact on the site might occur.

[5] Roodt. F. 2008. Heritage Resources Scoping Report N11 road re-alignment Mokopane : Limpopo. R&R Consultants

Photo 21: View of densely overgrown burial structures at Site Exigo-ZNM-BP02.

- **Site Exigo-ZNM-BP03 Stone Cairn Burials (-24.11648548 29.02092696)**
  Uitloop 3KS Ptn 0
- **Site Exigo-ZNM-BP04 Stone Cairn Burials (-24.11906099 29.01328049)**
  Uitloop 3KS Ptn 39
- **Site Exigo-ZNM-BP05 Stone Cairn Burials (-24.12028399 29.02022724)**
  Uitloop 3KS Ptn 57

A number of graves or presumed graves occur on various portions of Uitloop in densely vegetated sections of the project area. The possible burials are indicated by crudely stacked stone cairns. The sites are not fenced off and the condition of preservation of the burials is generally poor. The burial sites, which are of high heritage significance, occur within or in the demarcated footprint for the mine development apart from Site Exigo-ZNM-BP04 which occurs in the larger project area and impact on the sites can be anticipated.

Photo 22: View of a potential burial cairn structure at Site Exigo-ZNM-BP03

Photo 23: View of a potential burial cairn structure at Site Exigo-ZNM-BP04

Photo 24: View of potential burial cairn structures at Site Exigo-ZNM-BP05

11.1.9.4 Other sites / features

- **Site Exigo-ZNM-FT01 Stone Features / Structures (-24.11420301 29.02912203)**
  Uitloop 3KS Ptn 0

An irregular stone structure or stone cairn was noted on Portion 0 of the Farm Uitloop in a densely vegetated section of the project area. The function of the feature is not known but it might indicate prehistoric or Historical Period burials. As such, the heritage significance of the feature remains to be established and is therefore unknown. The site is located within the demarcated footprint for the mine development and impact on the site can be anticipated.


Photo 25: View of an unidentified stone structure in the project area

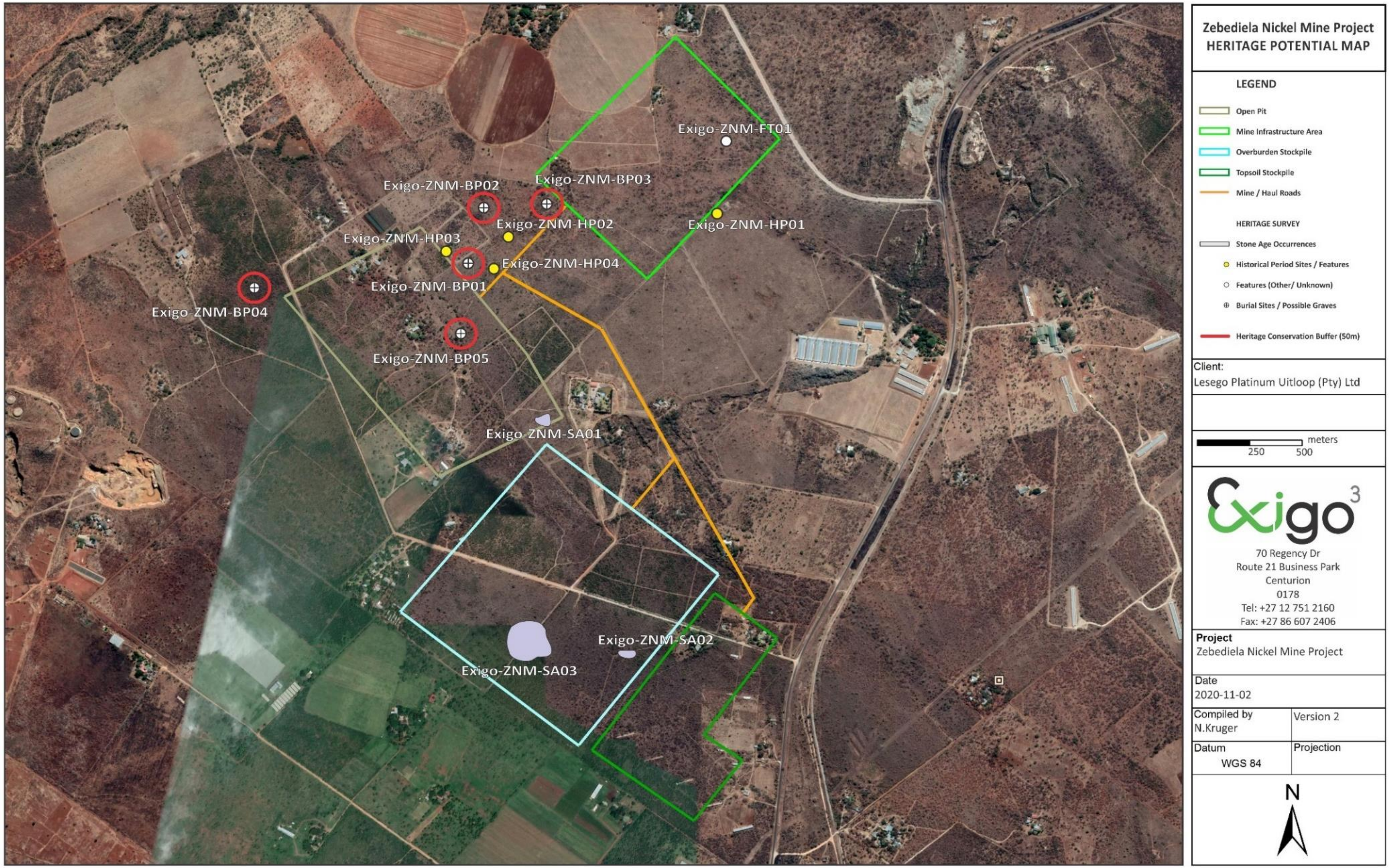

Figure 53: Map of heritage sites and recommended conservation buffers

11.1.10 Palaeontology

A palaeontological impact assessment was performed by Dr Heidi Fourie. The sections below were provided by Dr Fourie and offer an overview of the possible palaeontological resources that could be found at the proposed mine site.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of sedimentary rock strata the palaeontological sensitivity is generally low to very high.

The Transvaal Supergroup fills an east-west elongated basin in the south-central part of the old Transvaal (now North West, Gauteng and Mpumalanga) as far south as Potchefstroom. It is Vaalian in age, approximately 2600 (Mega-annum) Ma to 2100 Ma. A maximum thickness of the Transvaal Supergroup reaches 2000 m in the north-eastern section. The east-west elongated basin is filled with clastic, volcanic and chemical sedimentary rocks. Three groups based on lithological differences have been established: they are the Rooiberg, Chuniespoort, and Pretoria Groups as well as other smaller groups (Kent 1980, Snyman 1996). It is the Bushveld Complex that is responsible for the tilting of the Transvaal sediments and the heat of its intrusion having created andalusite crystals (Norman and Whitfield 2006). This Supergroup is underlain by the Ventersdorp, Witwatersrand and Pongola Supergroups, and the Dominion Group. Three prominent ridges are present from the oldest to the youngest, the Time Ball Hill, Daspoort and Magaliesberg Formations (Norman and Whitfield 2006).

The Pretoria Group consists predominantly of quartzite and shale, together with a prominent volcanic unit, minor conglomerate, chemical and volcanic members. It comprises the Hekpoort Andesite, Dullstroom Basalt, Time Ball Hill, Silverton, and Magaliesberg Quartzite Formations as well as several smaller formations (in total 15) and overlies the Chuniespoort Group (Kent 1980). The Time Ball Hill shale Formation is known to contain 'algal microfossils' diagenetic in origin. Stromatolites as they are known are preserved in the subordinate carbonate rocks (Kent 1980). The Pretoria Group is clastic sedimentary in nature (Eriksson 1999). The pile of sedimentary rocks, mainly mudstones and quartzites with some basalt can collectively reach a thickness of up to 5 km (Visser 1989). The Rooihoogte Formation sits at the base of the Pretoria Group and is quite thin (10 – 150 m). The chert is present as boulders or a breccia. It is often lumped with the Time Ball Hill Formation (Visser 1989).

The Chuniespoort Group is made up of chemical and biochemical sediments such as dolomite, chert, limestone and banded iron formation, carbonaceous shale is also present. At the top of the Malmani Subgroup is the Duitschland Formation underlain by the Penge and Monte Christo Formations. Sandstone is mostly absent. It is this formation that has great economic value for its lead, zinc, dolomite, and manganese (Kent 1980, Snyman 1996). Fluorspar, concrete aggregate, iron ore and manganese are also mined from this formation. Cave formation in the dolomite is a major concern in developing areas, especially in the 1500 m thick dolomite of the Malmani Subgroup. Chemical sediments such as fine-grained limestone and dolomite is made up of deposits of organically derived carbonate shells, particles or precipitate. Dolomite is magnesium-rich limestone formed from algal beds and stromatolites.

The Black reef Formation of the Transvaal Supergroup consists of quartzite with lenses of grit and conglomerate. Shale is always present, particularly near the top close to the contact with the overlying dolomite (Kent 1980). It is Vaalian in age and not very thick, only up to 500 m in the north-east. It contains a fair amount of gold and the limestone is mined (Snyman 1996). The Black Reef Formation is known for stromatolite carbonates and fossiliferous Late Cenozoic cave breccias similar to the Malmani dolomite. Algal microfossils are reported from shales and are probably from diagenetic origin. Stromatolites are preserved in the subordinate carbonate rocks.

Legend to Map and short explanation.

Vl – Melanorite, pyroxenite, serpentinized harzburgite, chromite layer (green). Lower zone, Rustenburg Layered Suite, Bushveld Complex. Vaalian.

Vt – Shale, hornfels, subordinate schist: Nooitgedacht Quartzite Member (brown). Time Ball Hill, Pretoria Group, Transvaal Supergroup. Vaalian.

Vd – Limestone, dolomite, chert, shale, quartzite, diamictite, hornfels, and conglomerate (purple). Duitschland Formation, Chuniespoort Group, Transvaal Supergroup. Vaalian.

Vmd – Dolomite, chert (blue), Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup. Vaalian.

Vbr – Quartzite, shale, sandstone, volcanic rocks (dark blue). Black Reef Formation. Vaalian.

Rg – Leucocratic grey biotite granite-gneiss, leucocratic granite and pegmatite (pink). Randian.

Zp – Acid to intermediate lava, pyroclasts (dark purple). Zwazian.

---f--- – (black) Fault.

---f--- – (black) Fault.

⊥ 30 - Strike and dip of bed.

------ - Concealed geological boundary.

□ – Approximate position of development (in white on the Figure).

Figure 54: The geology of the development area

Chemical sediments such as fine-grained limestone and dolomite is made up of deposits of organically derived carbonate shells, particles or precipitate. Dolomite is magnesium-rich limestone formed from algal beds and stromatolites. These Early Proterozoic Transvaal stromatolitic dolomites formed and released free oxygen at around 2900 – 2400 Ma. Stromatolites are common in the Malmani dolomites, accepted to be the fossil remnants of the simplest single-celled organisms. They are finely layered, concentric, mound-like structures formed by microscopic algal organisms (Norman and Whitfield 2006). Chert may contain fossils such as echinoids or sponges if nodular, although not common and is rated unlikely.

Figure 55: Example of a stromatolite present in dolomite (Photograph: E. Butler)

Stromatolites are significant indicators of palaeoenvironments and provide evidence of algal growth between 2640 and 2432 million years ago (Groenewald and Groenewald 2014). The Malmani dolomites are home to most of the cave systems that has yielded hominin fossils such as those at Mokopane's cave. Caves in the Malmani dolomite (Vmd) of the Transvaal Supergroup provided a refuge for man's distant ancestors (Norman and Whitfield 2006). These caves are also home to Middle and Late Stone Age cultures. The cave breccia in the Cradle of Humankind, near Johannesburg, yielded internationally renowned hominins such as Australopithecus africanus and robustus and extinct mammals and other fauna. The cave of Makapansgat is also close by (+/-20 km).

In the rocks overlying the Black Reef Formation there is evidence for life on an abundant scale as cyanobacteria came to dominate the shallow sea forming stromatolites of varying shapes. Large, elongate stromatolite domes can be seen at Boetsap in the North West Province (McCarthy and Rubidge 2005) and the algal microfossils reported from the Time Ball Hill Formation shales are probably of diagenetic origin (Eriksson 1999).

The Time Ball Hill Formation (Vt), Transvaal Supergroup is present in the Pretoria Group. Nixon et al. (1988) described the black shales south-west of Potchefstroom as consisting of overlapping laminated basal mounds which are stromatolitic as well as spheroidal possible planktonic fossil algae. These can range in size from 3.5 - 17 mm in height and up to 10 mm in diameter and can be present in the development area.

There are significant fossil resources of high significance for the Chuniespoort Group, Transvaal Supergroup that may be impacted by the development and if destroyed are no longer available for scientific research or other public good.

Refer to Table 43 for the relevant mitigation measures and Table 42 for the relevant specialist recommendations.

11.1.11 **Visual aspects of the study area**

Graham Young from Graham A Young Landscape Architect (GYLA) was commissioned to undertake a Visual Impact Assessment and he visited the site on 28 and 29 June 2019. In order to identify the study area, the Visual Impact Assessment identified receptors within a 10km radius surrounding the site as the zone of potential influence (refer to Figure 56). Receptors that are located within the zone of potential influence could potentially be visually impacted and require further investigation. The project area is characterised by urban development (communities of Mahwelereng, Ga-Madiba, Masodi, Tshamahansi, Phola Park, Sekgakgapeng, Mosate, Maroteng, and Masehlaneng) in the west and south-west (Mokopane), general farmland and a number of chicken farms in the central areas, and dominated by savannah cover hills in the northern, eastern and south-eastern sections. It's in these areas where game farm breeding and other tourist facilities occur. In the south-east, immediately south of the R101 and up against the Makapan mountain is the Mokopane Biodiversity Centre's property, approximately 1300ha in extent. The Makapansgat World Heritage site does not fall within the study area. It's located approximately 5km directly east of the eastern extremity of the study area.

Hills, within the study area, generally block views from the north, east and far south sections of the study area. The most sensitive viewers were identified as receptors living in and visiting adjacent homesteads/communities to immediate north, east and south of the project site. Residential areas to the west of the proposed mine, Mahwelereng, Ga-Madiba, Masodi, Tshamahansi, Phola Park, Sekgakgapeng, Mosate, Maroteng, and Masehlaneng, were also identified as potentially sensitive. Tourist facilities (accommodation and game farms) to the north and east of the project site and the Mokopane Biodiversity Centre south-east of the project site, and people travelling along the Percy Fyfe Road to tourist destinations north of the study area are also considered potentially sensitive to the proposed mining activities.

11.1.11.1 Visual Resource Value / Scenic Quality

The area is characterised by three distinct landscape types: the urban / industrial character in the west and southern areas; the farmland (including commercial chicken farms/rural landscape (within which the project sites occur), central to the study area; and the hills and mountains, which dominate the eastern and northern areas of the study area.

The value of the visual resource for the study area has an overall rating of moderate, as the once natural landscape has been compromised with the intrusion of urban/industrial/infrastructure and agriculture related activities but is still potentially sensitive to change that would occur given the scale and nature of the proposed mining activities.

Landscape types most sensitive to change (due to construction, operation and decommissioning of the proposed mine) and with a low visual absorption capacity, are the mountains and hills north and east of the study area. Change in these landscape types, specifically caused by the proposed mining activities will negatively impact on the scenic quality of the area.

The lower plains associated with the agricultural lands central to the study area, are less sensitive to change but these areas for the most part will be displaced by the open pit, overburden and topsoil stockpiles and infrastructure, thereby causing a negative impact on the landscape.

The landscape types least sensitive to change are the degraded plains and open areas denude of vegetation, and urban and infrastructural areas immediately north of Mokopane and the north-western sector of the study area. This is due to the damage already done to the original landscape through the spread of urban and industrial activities and therefore these areas have the highest capacity to absorb change in the landscape. However, no mining activities are proposed in these areas.

Refer to Appendix 9 for photographic panoramas illustrating the character and nature of the study area and Figure 56, which indicates the location of the viewing points.

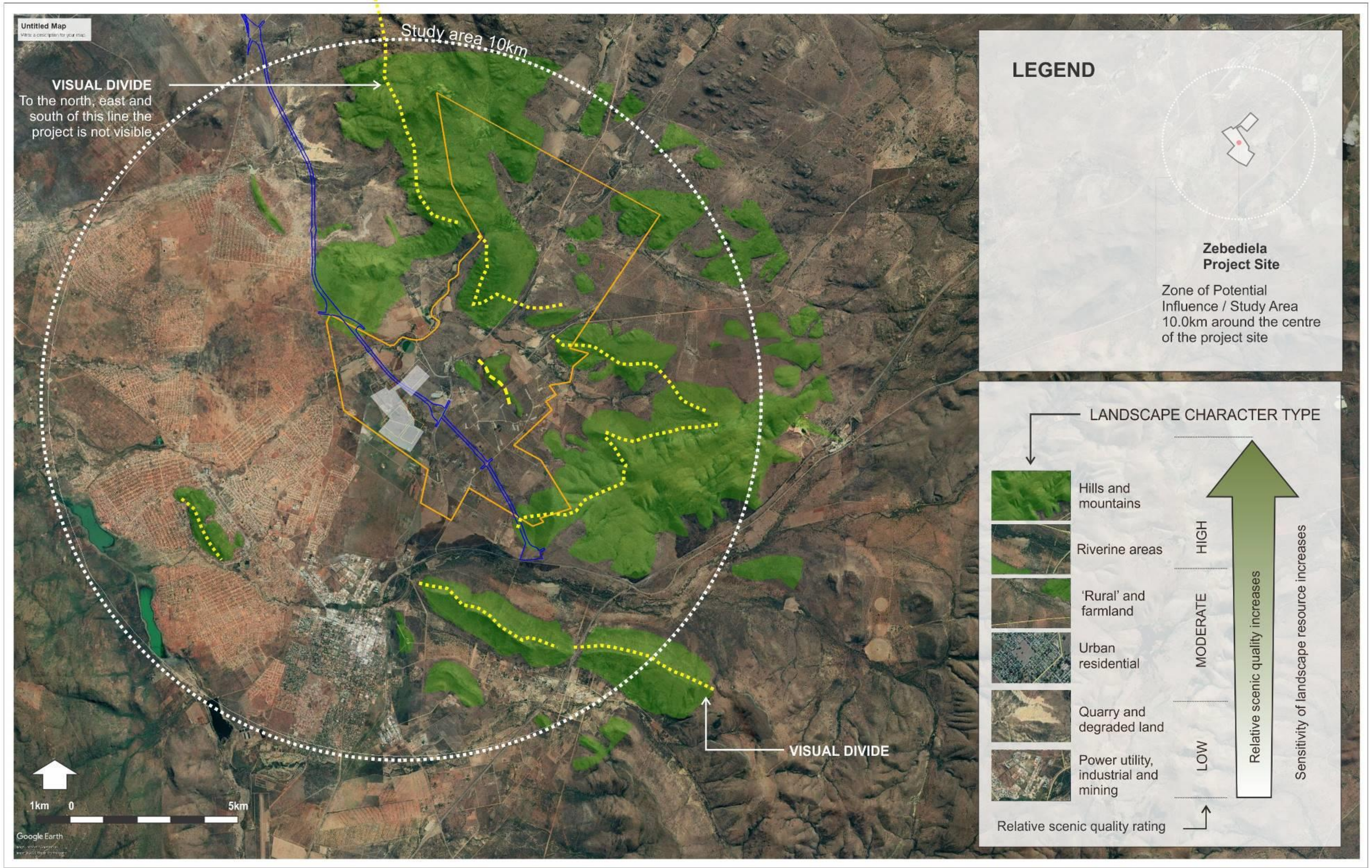

Figure 56: Visual Impact Assessment Study Area indicating landscape type and sensitivities within a 10 km radius surrounding the site (GYLA, 2020)

11.1.11.2 Visual Receptors

Visual receptors include people living in or visiting farmsteads located in the northern, central, and eastern sections of the study area, residents from the various communities west of the project site, as well as people living in Mokopane. Other receptors include people travelling along the N1, N11, the Percy Fyfe road and other local roads traversing the study area.

The mine and its associated activities are located within a moderately (rural farmland) sensitive landscape type. This landscape type has a moderate (treed areas) to low visual absorption capacity (VAC). Whereas the eastern sector of the study area has a high VAC due to the taller savannah vegetation, which would also block many views to the project site. Within the context of the study area and the region, the following receptors were identified as potentially sensitive to the proposed mining activities:

Table 27: Potential Sensitivity of Visual Receptors

High	Moderate	Low
People visiting farms and tourist facilities to the north, east (game farms) and south (Mokopane Biodiversity Centre) of the project site. Residents living on farms located within the study area, especially for viewer locations within the middleground of views (i.e. up to a 5.0km zone of influence). Locals and visitors travelling through the study area on the Percy Fyfe road. Residents living along the eastern edge of the communities immediately west of the project site.	Locals and visitors travelling through the study area on the N11 Ring Road and N1.	People working within the study area and travelling along local roads whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

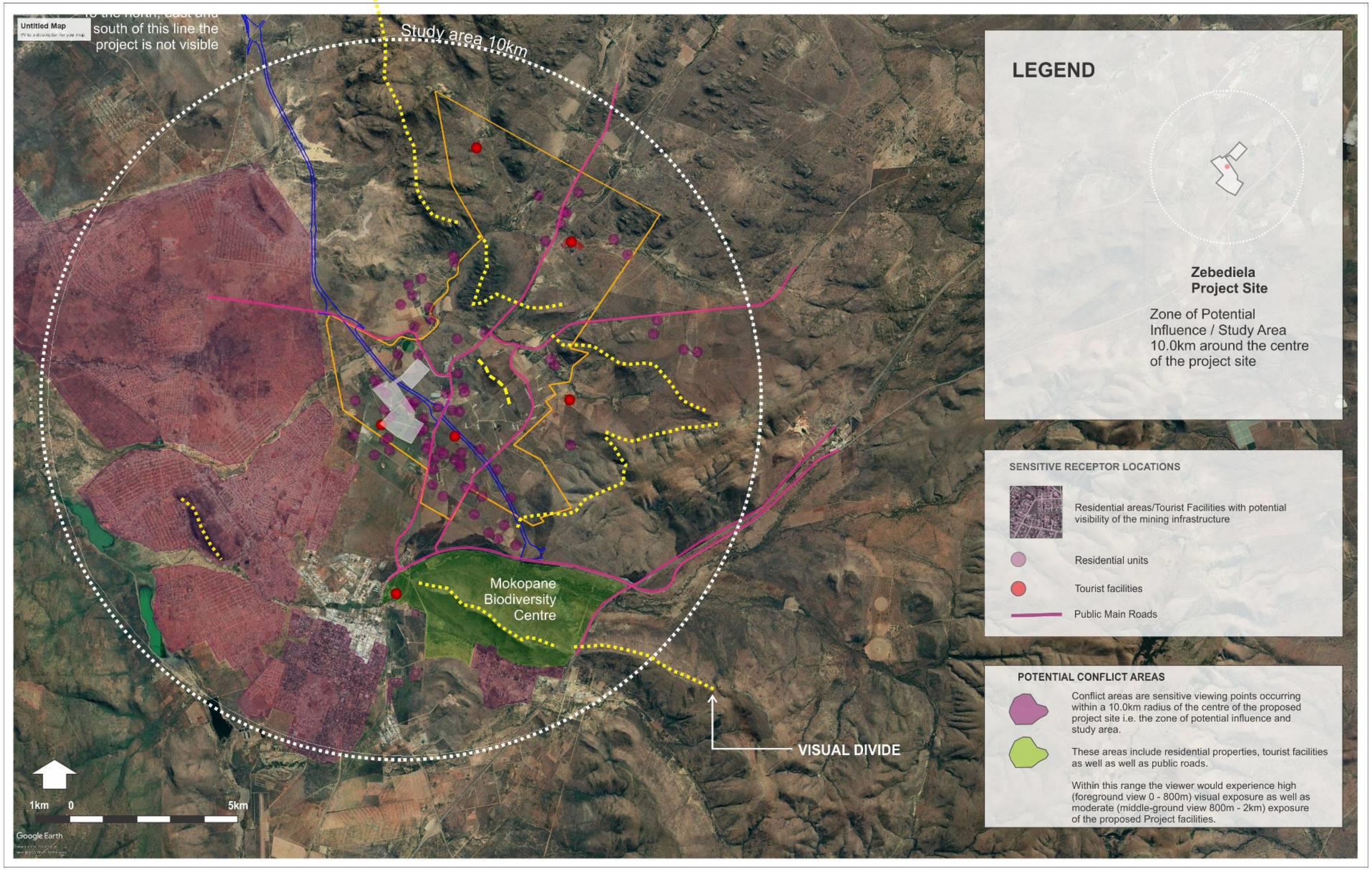

Figure 57: Visual Impact Assessment Study Area indicating Sensitive Receptors

11.1.11.3 Sense of Place

According to Lynch (1992) sense of place is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own. The sense of place for the study area derives from the combination of all landscape types and their impact on the senses. The study area's sense of place will change depending on the viewers location and the extent of human activities included in and given the viewing envelope. The eastern section of the study area has a greater natural sense of place dominated by the hills and mountains, whereas the western sections are mostly urban and have a weaker sense of place.

11.1.11.4 Visibility

The 'zone of potential influence' for the proposed mine was established at 10 km around the centre of the project site. Over 10 km, the impact of mining activities would have diminished as they will recede into the background and/or visibility would be reduced due to atmospheric conditions (haze and fog on days when certain climatic conditions prevail) and/or topography and vegetative cover. Hills, within the study area, generally block views from the north, east and far south sections of the study area as is evident in the viewshed analysis in Figure 88 to Figure 92 (combined viewshed of all mining activities).

In determining the visibility of the proposed mine, the proposed heights of the mining activities and infrastructure were used to model the viewsheds Figure 88 (Open Pit); Figure 89 (Mine Infrastructure Area); Figure 90 (Topsoil Stockpile); to Figure 91 (Overburden Facility) an: Figure 92 (All activities). The following parameters (using the worst-case scenario i.e. highest level of an activity/structure), were used to generate the viewsheds:

- Open Pit: at natural ground level (NGL)
- Topsoil stockpiles: 2m (north) and 10m (south) above NGL
- Overburden stockpile: 10m above NGL
- Mine infrastructure area:
    - Product stockpile - 22m above NGL
    - Crushers - 12m above NGL
    - Course Ore Silo - 11m above NGL
    - Heavy duty vehicle (HDV) Workshop - 18m above NGL

The composite viewshed in Figure 83 indicates the spatial extent of where views of the mining activities would potentially be visible based on topographic relief. This is a theoretical model as only contours were used to generate it. However, when the model was tested on site, it became clear that many views, other than those originating from the farms/open areas to the north-west of the site, would be completely or partially blocked by vegetation and /or structures.

The most visible feature would be the overburden facility at approximately 13 years after start-up, when its full height will have been achieved (refer to Figure 82). Figure 7-5 combines all activities and has a similar visibility spatial pattern as the overburden facility, and they slightly increase the visual envelope in the western open space sector of the study area. The simulations in Figure 93 to Figure 96 indicate visibility of the proposed mine from the most exposed areas.

Project components are potentially most visible from the Percy Fyfe road immediately east of the project site and from residences east of the road. However, due to the vegetative cover (refer to Figure 85 to Figure 87) in this general area, views of mining activities, would be partially or completely obstructed.

Although the viewshed analysis shows that aspects of the proposed mine could be potentially highly visible, onsite observations indicate that only the houses located along the extreme eastern sections of Mahwelereng-B and Tshamahansi, would have partially obstructed views of the top of the overburden facility and the structures at the mine infrastructure area as is evident in the simulation in Figure 96.

The proposed mine will not be visible from the residential areas in Mokopane, nor from the tourist lodges east and north of the project site (Tabaphaswa Mountain Sanctuary base, Tibani Lodge and Amatava Lodge).

11.1.12 Noise

Baseline noise measurements were conducted on the 29th September 2020 at seven (7) localities as presented in Figure 58 below. The noise measurement localities were decided on based on receptors identified prior to fieldwork, via a desktop assessment and during discussions with the project team. A desktop assessment of the area indicated some transportation networks within the study area. Ten-minute LAIeq (SANS10103:2008) measurements were conducted during the daytime (22:00 – 06:00[6]) within the study area.

Based on the noise measurements the following Rating Levels in line with SANS 10103:2008 are proposed for the identified receptors:

- Suburban Rating (50 dBA daytime and 40 dBA night-time outdoors ad 40 dBA daytime and 30 dBA night-time indoors with open windows) for all receptors that are based adjacent or within proximity of the Percy Fyfe route (within app. 250m). The Percy Fyfe route is the only contributor in the study area that can influence a higher than Rural Rating.
- A Rural Rating (45 dBA daytime and 35 dBA night-time outdoors ad 35 dBA daytime and 25 dBA night-time indoors with open windows) for all other receptors.

[6] SANS10103:2008 criterion

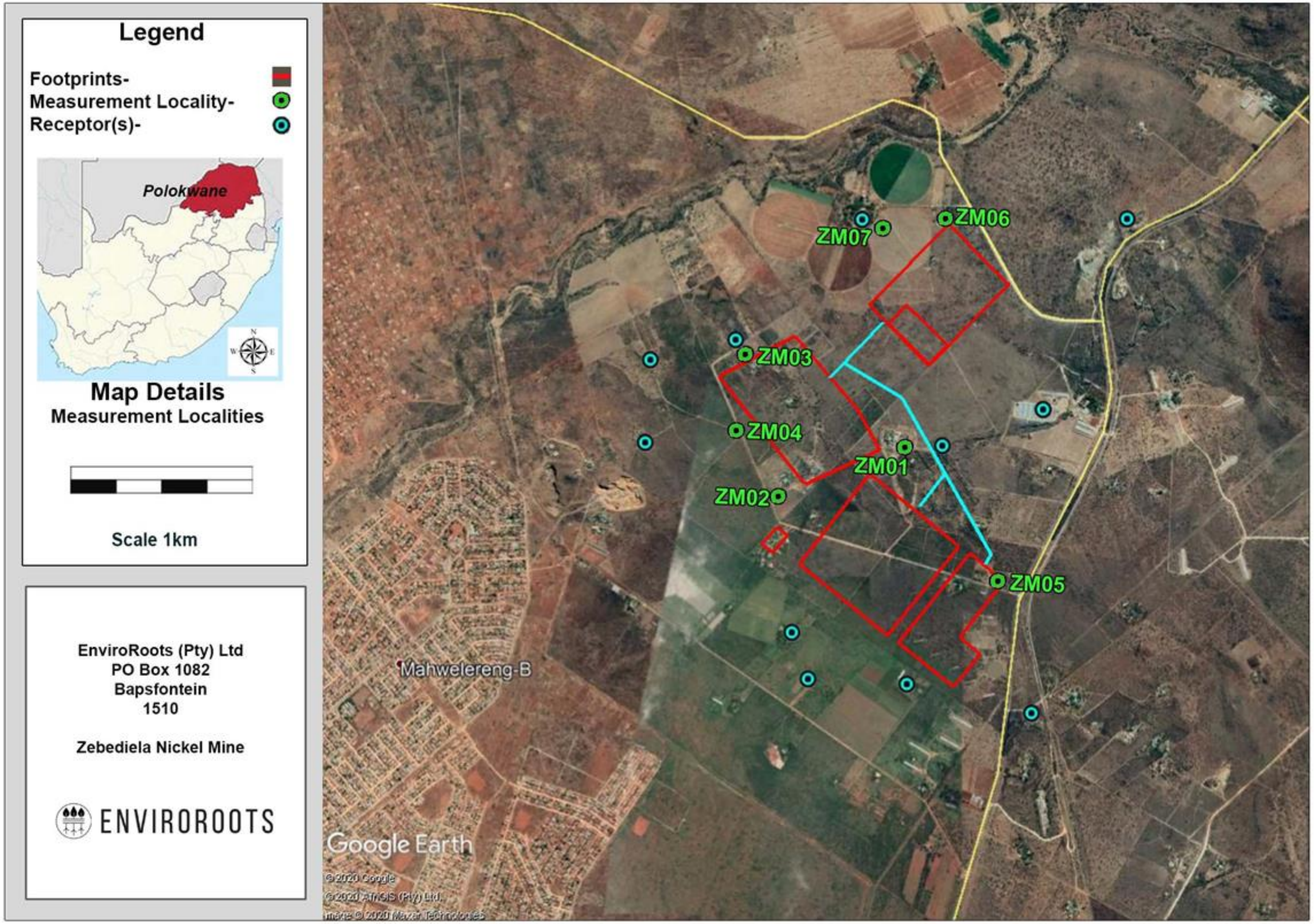

Figure 58: Measurement localities within the study area

11.1.12.1 Noise Sensitive Developments

Receptors were identified by means of desktop assessment (GoogleEarth®, +-1,000m from the project footprint). Receptor localities are presented in Figure 59. Certain receptors are based directly adjacent (directly on) the mine footprint or a haul route. These receptors will not be within the impact assessment and are assumed to be relocated prior to construction starting (discussed with main consultant). The localities of assessed receptors are presented in Figure 59. Should a receptor remain that has been identified as relocated this Environmental Noise Impact Assessment must be re-assessed with the Noise Sensitive Development (NSD) reinstated for assessment.

Receptors were referenced as R1 to R11. Receptors R7 is a private poultry and rabbit farm. Receptor R5 is a dwelling with chicken broilers adjacent to the property. Receptor R1 is a dwelling however further east from it is the Platreef Resources offices (both considered as receptor R1).

Table 28: List of potential noise-sensitive developments as identified

Measurement/NSD Locality	Latitude	Longitude
NSD For Assessment		
R1	24° 7'56.15"S	29° 1'7.33"E
R2	24° 8'5.99"S	29° 1'30.33"E
R3	24° 7'20.68"S	29° 0'37.26"E
R4	24° 7'6.08"S	29° 0'38.80"E
R5	24° 7'2.12"S	29° 0'55.56"E
R6	24° 8'5.22"S	29° 1'10.35"E
R7	24° 7'14.98"S	29° 1'58.05"E
R8	24° 6'39.53"S	29° 1'20.95"E
R9	24° 6'40.27"S	29° 2'15.06"E
R10	24° 7'21.69"S	29° 1'37.30"E
R11	24° 8'11.10"S	29° 1'56.76"E
NSD Considered Relocated		
N/A	24° 7'7.91"S	29° 0'59.76"E
	24° 7'13.69"S	29° 1'6.73"E
	24° 7'27.78"S	29° 1'8.98"E
	24° 7'35.56"S	29° 1'11.44"E
	24° 7'41.89"S	29° 1'1.18"E
	24° 7'21.42"S	29° 1'28.36"E
	24° 7'21.69"S	29° 1'37.30"E
	24° 7'37.51"S	29° 1'44.53"E
	24° 7'47.67"S	29° 1'41.01"E
	24° 7'47.41"S	29° 1'47.23"E
	24° 8'3.09"S	29° 1'48.62"E

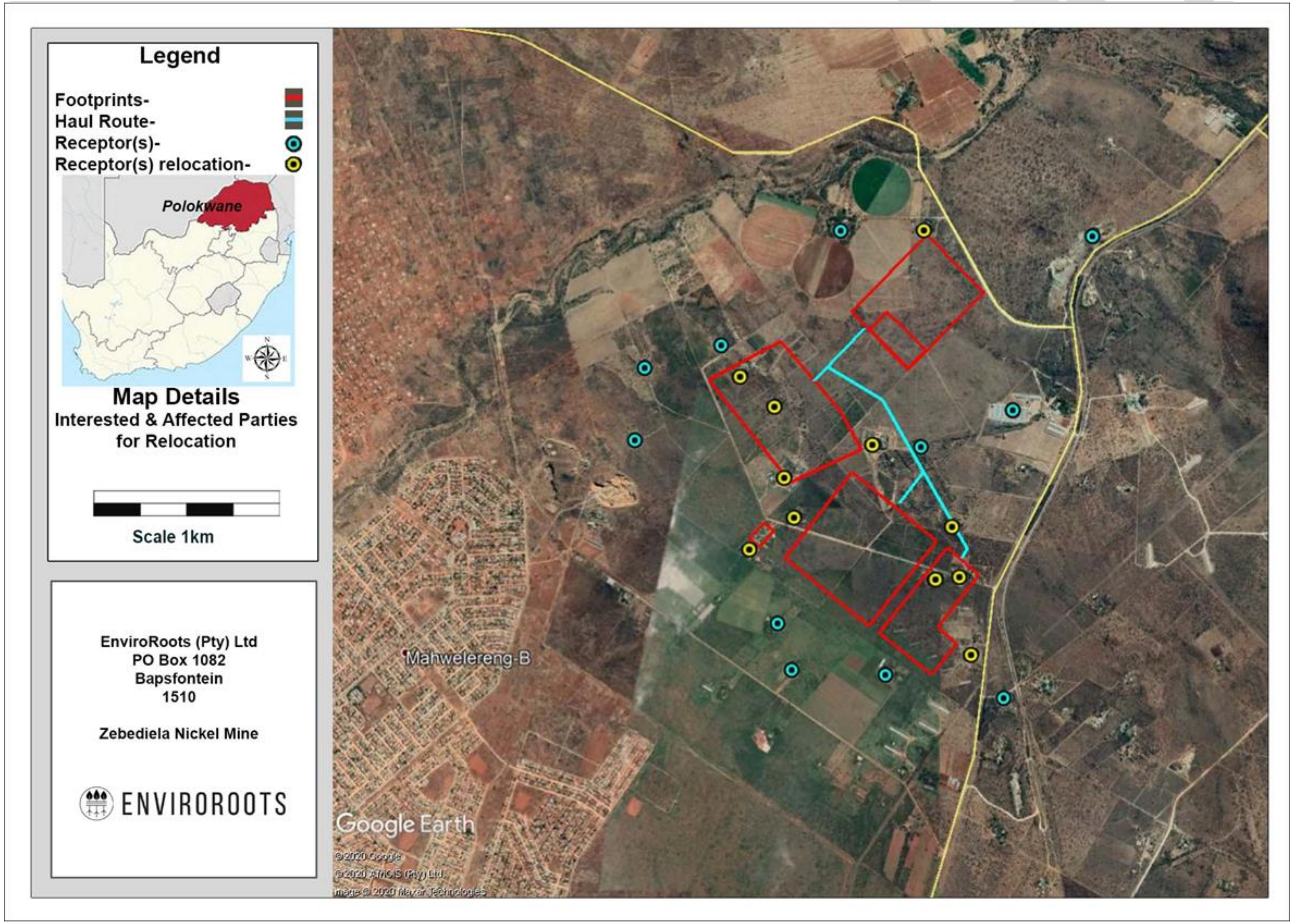

Figure 59: Interested & Affected Parties (NSD) – All receptors

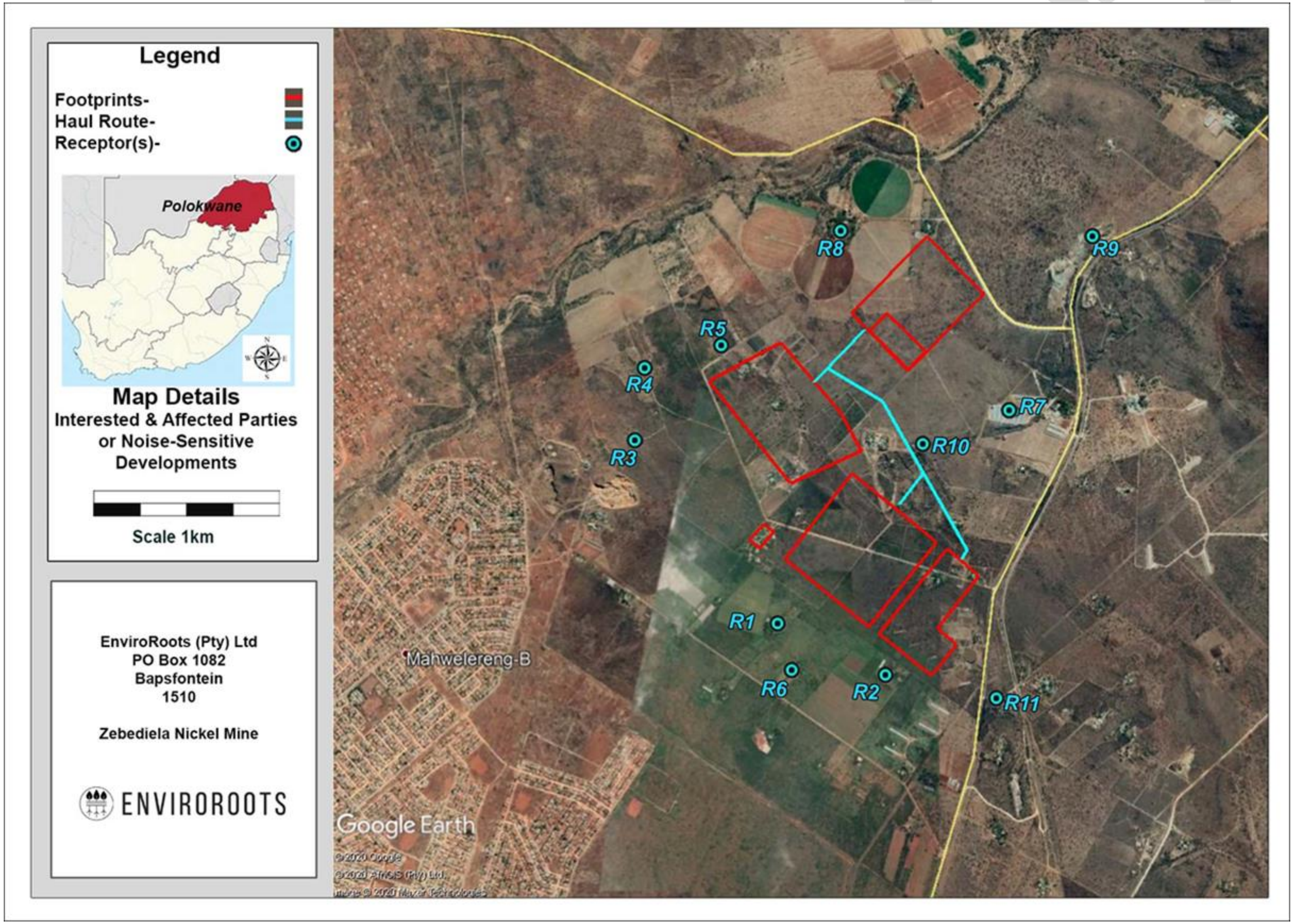

Figure 60: Interested & Affected Parties (NSD) – Relocated (assumed) removed – assessed NSD

11.1.12.2 Noise Conceptual Modelling

A conceptual noise model was developed for both construction and operational activities. The assessment of the noise impact of the site on the surrounding receptors is based on a worst-case approach.

The assessment made use of one moderately high SPL apparatus operating at maximum capacity for the construction phase. The noise source was then assessed in a linear fashion on the closest point of any footprint boundary (or fixed infrastructure locality) in relation to the receptors. The assessment considered day-time activities; it is assumed that most/all construction will occur during daytime periods.

The linear noise project is presented below in Figure 61. The outcome of the modelled scenario and impact assessment for the construction phase highlighted the following key points:

- During the day – Low Environmental Consequence at receptors R1, R2, R5 and R10.
- Construction activities could exceed 7 dBA limits at receptors (legislation limits) during worst case daytime scenario. These events will only be short-term, until pit highwalls, berms or infrastructure has been completed.
- Should night-time work occur within 300m of R1, R2, R5 and R10 further mitigation would be required.
- Mitigation is recommended to ensure compliance with the Noise Control Regulations under all circumstances, to cover unforeseen circumstances and to ensure the 7 dBA exceedance of the Rating level (as per impact assessment) does not occur.

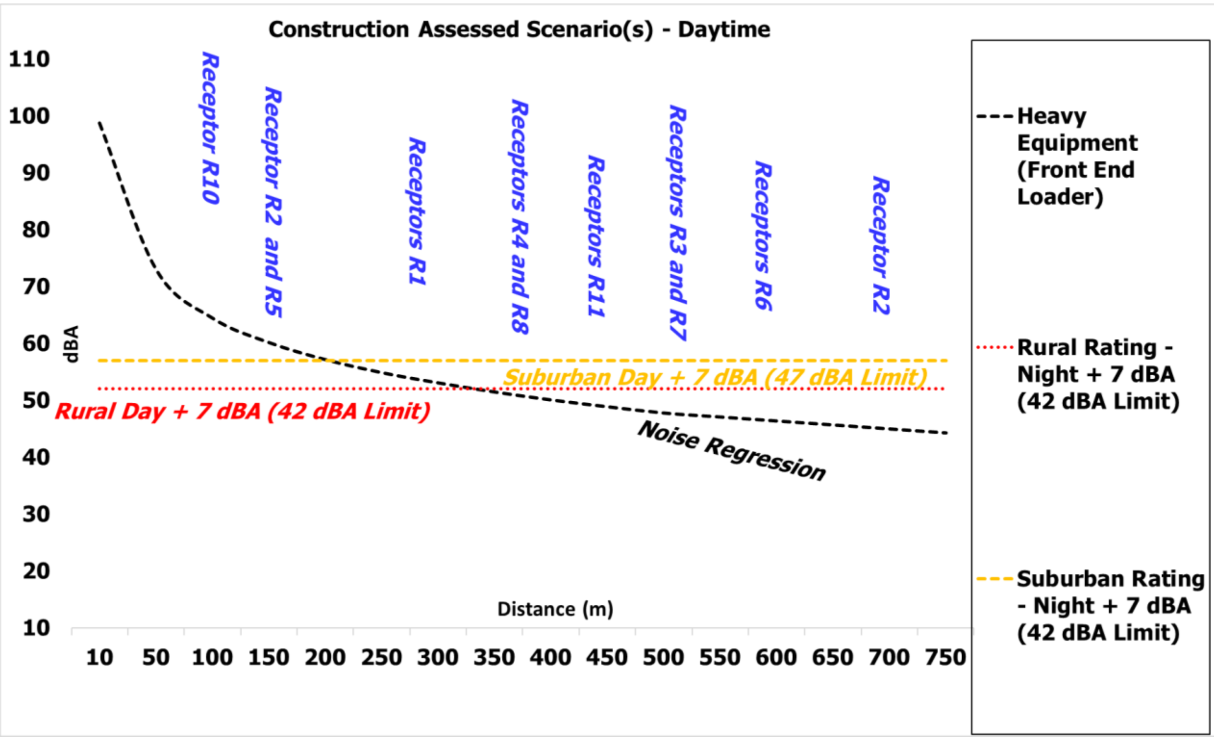

Figure 61: Construction noise levels – Linear representation of certain construction activities

Table 29: Calculated Noise and Baseline Rating Levels –Construction (Day)

Calculated Noise and Baseline Rating Levels

I&AP	Rating Level (Day dBA)	Calculated $L_{Req,T}$ (dBA)	Increase above Rating (dBA)	Comment
R1	45	+52	Yes	Receptors that are within 200m (Suburban Rating) and 300m (Rural Rating) require some mitigation (daytime assessment). Important receptors for mitigation consideration are Receptors R1, R2, R5 and R10
R2	45	+52	Yes	
R3	45	47	Yes	
R4	45	50	Yes	
R5	45	+ 52	Yes	
R6	45	46	Yes	
***R7**	**50**	47	No	
R8	45	50	Yes	
***R9**	**50**	<50	No	
R10	45	+52	Yes	
***R11**	**50**	49	Yes	

***Note receptors R7, R9 and R11 higher Rating level due to Percy Fyfe route.**

The outcome of the modelled scenario and impact assessment for the operational phase indicated the following:

- During the night – High Environmental Consequence for receptors R2, R5 and R10. A low for receptors R1, R3, R4 and R8.
- Mitigation is also proposed for receptors R6 and R7 (receptor R6 in same locality of R1 and R2, while R7 may have tones or impulsive corrections considered due to plant operations (i.e. precautious stance).
- To ensure noise levels are kept below 7 dBA at receptors (legislation limits above Rating level) and 61 dBA LAeq,24 hour at the boundary of the plant, mitigation is proposed (refer to Figure 98 for location of proposed berms).
- No cumulative assessment was conducted; however the worst-case scenario is considered sufficient.

Access route assessments are presented in Figure 62 (linear fashion).

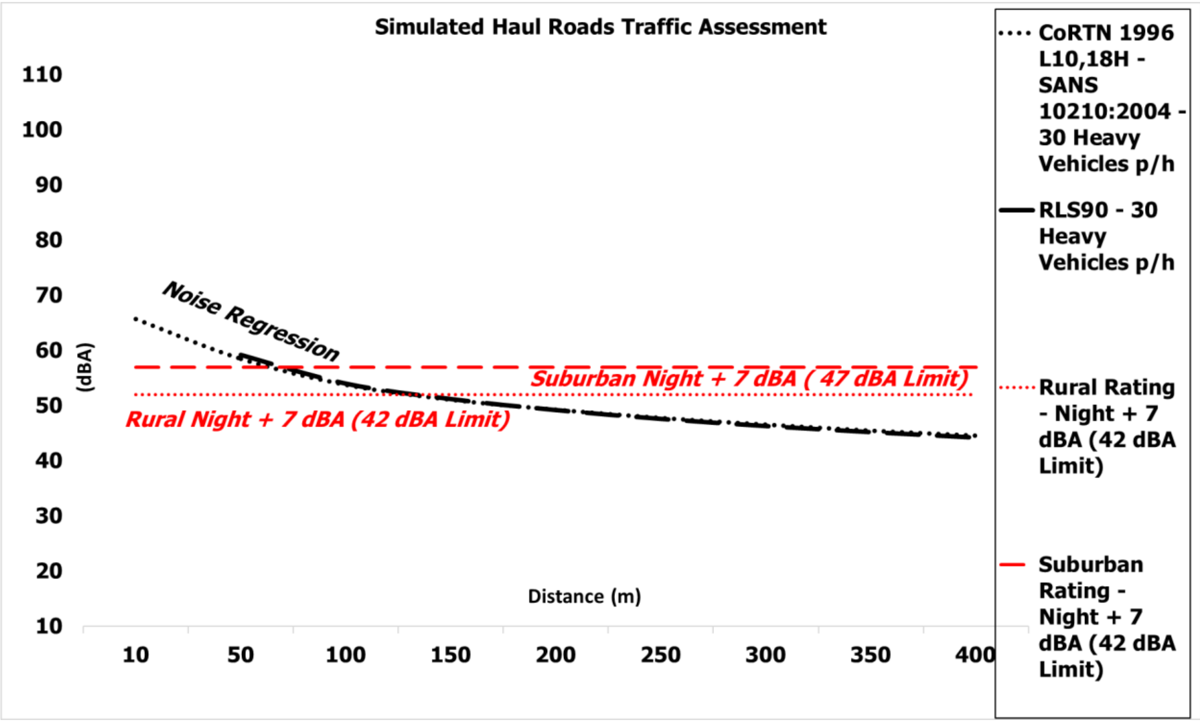

Figure 62: Construction noise levels– Linear representation of haul routes

Table 30: Calculated Noise and Baseline Rating Levels –Operational Phase (Night)

Calculated Noise and Baseline Rating Levels				
I&AP	**Rating Level (Night dBA)**	**Calculated $L_{Req,T}$ (dBA)**	**Increase above Rating (dBA)**	**Comment**
R1	35	38	Yes	Important receptors for mitigation consideration are R1 – R6, R8 and R10. As a precautious stance (due to the plant operations), mitigation for receptor R7 is also considered (potential for impulsive events or tones (+ 5dB correction for receptors R7, R8 and R10, receptors within 500m of the plant footprint).
R2	35	+42	Yes	
R3	35	38	Yes	
R4	35	41	Yes	
R5	35	+42	Yes	
R6	35	<35	No	
***R7**	**40**	<40**	No	
R8	35	42**	Yes	
***R9**	**40**	<40	No	
R10	35	+42**	Yes	
***R11**	**40**	<40	No	

***Note receptors R7, R9 and R11 higher Rating level due to Percy Fyfe route.**

****Note receptors R7, R8 and R11 could potentially be given a +5dBA impulse/tone correction due to plant activities**

The outcome of the modelled contours is presented in Figure 96. Modelled contours are presented in increments of 5 dBA from the 40-dBA indicator.

11.1.13 Socio-Economic Environment

11.1.13.1 Spatial context and regional linkages

The proposed project site is located in the Mogalakwena Local Municipality (LM) which is one of five (5) LM's of the larger Waterberg District Municipality (DM) in the Limpopo Province of South Africa (Waterberg District Municipality, 2017). The seat of the Mogalakwena LM is Mokopane, which is located approximately 60 km south-west of Polokwane, the capital of the province and 200 km north-east of Pretoria (Figure 63). The province shares international borders with Zimbabwe, Botswana and Mozambique. The proposed project site is located in Ward 12 of the Mogalakwena LM (Figure 64).

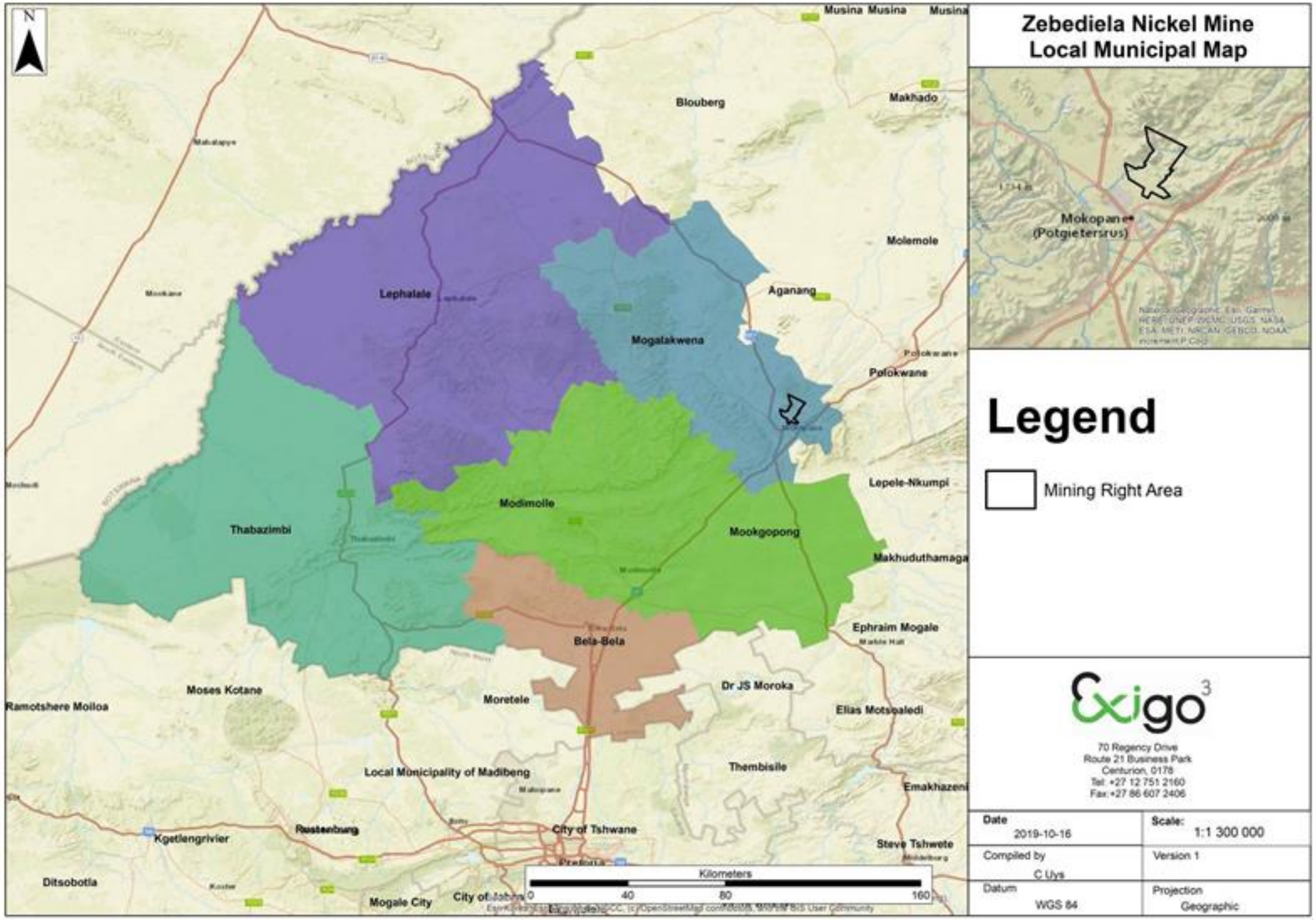

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Figure 63: Location of the proposed Mining Right Area in the Mogalakwena Local Municipality

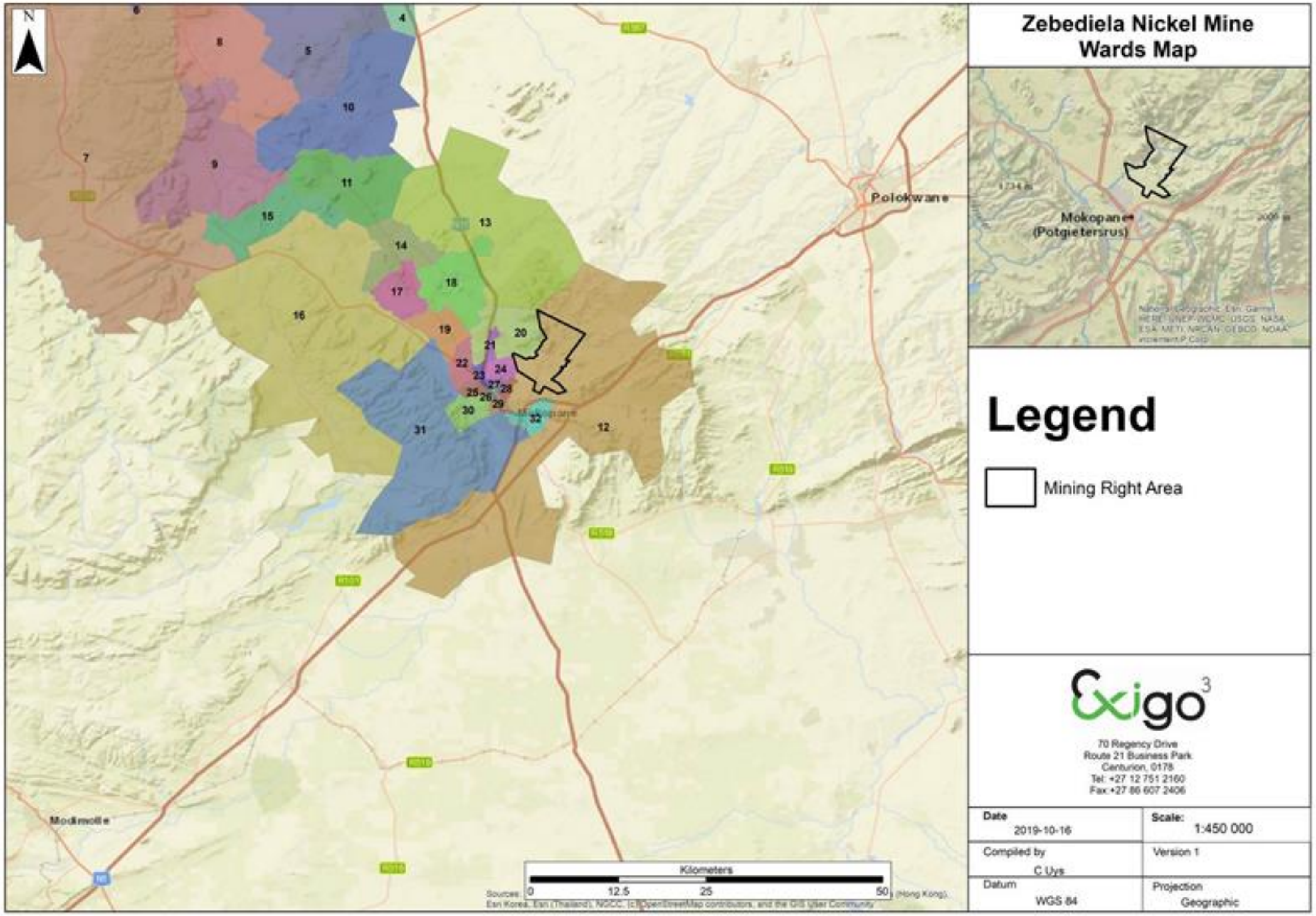

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Figure 64: Location of the proposed Mining Right Area in Ward 12

The Waterberg DM is a Category C municipality, which denotes that the municipality has a municipal executive and legislative authority in an area that includes more than one municipality. The DM is one of five district municipalities in Limpopo and is the biggest district in the province. It is comprised of five local municipalities, namely Bela-Bela, Lephalale, Modimolle-Mookgophong, Mogalakwena and Thabazimbi (Mogalakwena Local Municipality, 2019).
The Mogalakwena LM was established on the 5th of December 2000 through the merging of various municipalities and councils that had previously served Potgietersrus and surrounding areas. These local authorities included Greater Potgietersrus, Bakenberg and Koedoesrand/Rebone. The Mogalakwena LM is a Category B municipality, which means it shares a municipal executive and legislative authority with a Category C municipality within whose area it falls (Urban-Econ, 2020).

11.1.13.2 Major towns and settlements

This project will be situated near Mokopane, previously called Potgietersrus after a voortrekker leader Piet Potgieter. The town is now named in honour of the Ndebele chief of the Tlou tribe, chief Mgombane Gegana, whose Northern Sotho translation is Mokopane (Mogalakwena LM, 2018). Close to the project site is the township, Mahwelereng-B, which is approximately 2km from Mokopane and is bordered by Sekgakgapeng, Ga-Michele, Moshate and Madiba townships. The project site is located close to the township of Mahwelereng with the project boundary being 520 meters from the western side of the township and the proposed mining pit being located approximately 1.4 km from the township. From Mokopane, the project site may be accessed via the R101 as well as the Percy Fyfe Road.

The Mogalakwena LM is largely situated in a bushveld environment and in a multicultural community (Mogalakwena LM, 2018). The area is rich in minerals – primarily platinum, diamonds and granite, and together with the rich agricultural produce of wheat, tobacco, cotton, beef, maize, peanuts and citrus, these sectors drive the local economy. Notably is the Zebediela Citrus estate which is one of the largest citrus farms in the southern hemisphere (Mogalakwena LM, 2018).

11.1.13.3 Sense of place, history and cultural aspects

Mokopane, as with Lephalale and Thabazimbi, is the result of mining activities around the minerals found in these areas. The area also boasts various tourism sites such as the Makapan’s valley, a UNESCO Heritage Site, which is located 15 km north of Mokopane town (Mogalakwena LM, 2018). In the caves of Makapan’s valley, notable sediments, fossils, bones and artefacts were found and are persevered as a unique record of hominid habitation and evolution which dates back to 3.3 million years (Mogalakwena LM, 2018). Additionally, a museum and various game and nature reserves are observed as tourist sites in the area offering outdoor activities ranging from hiking, fishing, water sports, game viewing, camping and birdwatching.

The most widely spoken language in the Mogalakwena LM is Sepedi (73%), followed by Xitsonga (9%) and IsiNdebele (7%). In the district, a similar pattern is observed as the majority (55%) of the population speaks Sepedi however, the second predominant language is Setswana (11%), followed by Xitsonga (8%) and Afrikaans (7%). At provincial level, Sepedi is the most widely spoken language (52%), followed by Xitsonga (17%) and Tshivenda (17%).

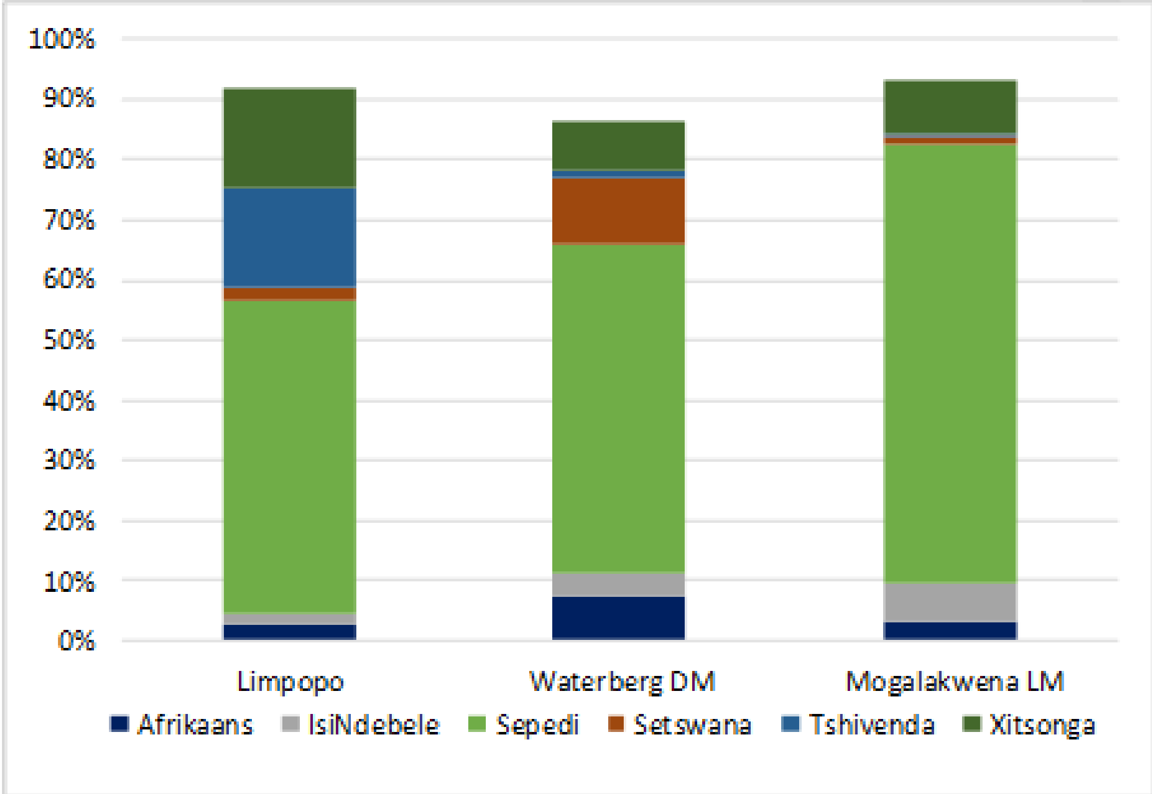


Figure 65: Most spoken languages in the study area (Stats SA, 2012)

11.1.13.4 Demographics and crime profiles

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

The Mogalakwena LM has a population of approximately 340 757 people, with a total of 86 708 households (Quantec, 2020). The Mogalakwena LM constitutes approximately 45% of the Waterberg DM population, thus having the highest population in the Waterberg DM. Furthermore, approximately 43% of the total households in the Waterberg DM are located in the Mogalakwena LM. The average household size of the Mogalakwena LM is 3.9 as shown in the table below which also displays similar trends on a district, provincial and national level.

Table 31: Demographic profile, 2018 (Quantec, 2020)

Location	Area (km^2)	Population	Household Total	Average Household size	Household density per km^2
Mogalakwena LM	6 166,1	340 757	86 708	3.9	14.0
Waterberg DM	4 4913,4	761 688	202 446	3.8	4.5
Limpopo	125 753,9	5 982 584	1 549 949	3.9	12.3

South Africa	1 220 813	58 775 022	16 366 368	3.6	13.4

The Mogalakwena municipal area recorded an annual population growth rate of 0.7% per annum between 2015 and 2019 (Quantec, 2020).

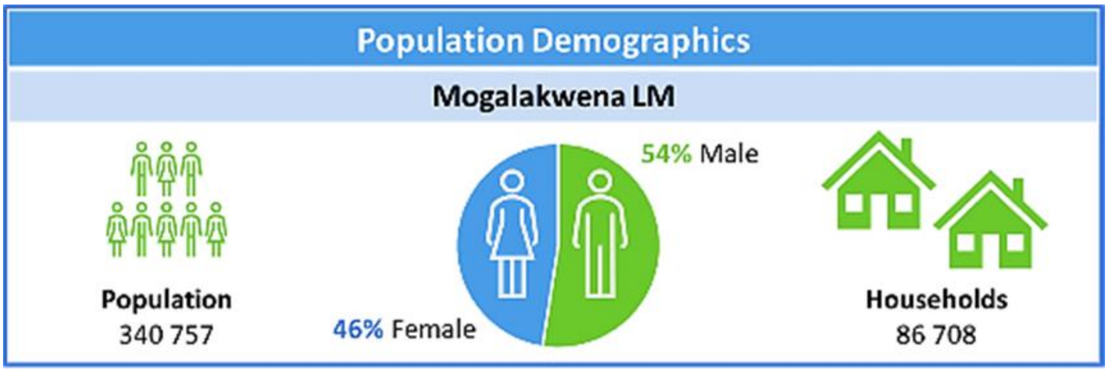


Figure 66: Population demographics in the Mogalakwena LM (Quantec, 2019)

A greater proportion of the population is comprised of males who make up 54% of the total population as shown in the figure above. Furthermore, the majority (58.2%) of the population are aged between 15 and 64 followed by those below 15 years with just over 31%, and the minority of the population are aged over 65 years making up approximately 10.5% of the total population (Quantec, 2020). This denotes that the working age group dominates and that the majority of the population is productive.

Statistics related to crime in the Mogalakwena LM revealed that crime has been constantly increasing between 2016 to 2019. According to the Mogalakwena LM IDP, the crime categories with the highest crime level include community reported serious crime, assault, theft, drug-related crimes, and burglaries. The most prevalent crimes in Mokopane are community reported serious crimes and drug-related crimes (Mogalakwena Local Municipality, 2019). Between 2017 and 2018, the Mahwelereng Cluster, which comprises of police stations within the Mogalakwena area was considered to be the worst in terms of contact crimes, burglaries at residential premises and livestock theft (Waterberg District Municipality, 2019). Crime prevention, safety and security are among the municipality's priorities, and as outlined in the local strategic documents, planned improvements to the provision of basic services and infrastructure such as street lighting are envisaged to assist with crime reduction in the area (Urban-Econ, 2020).

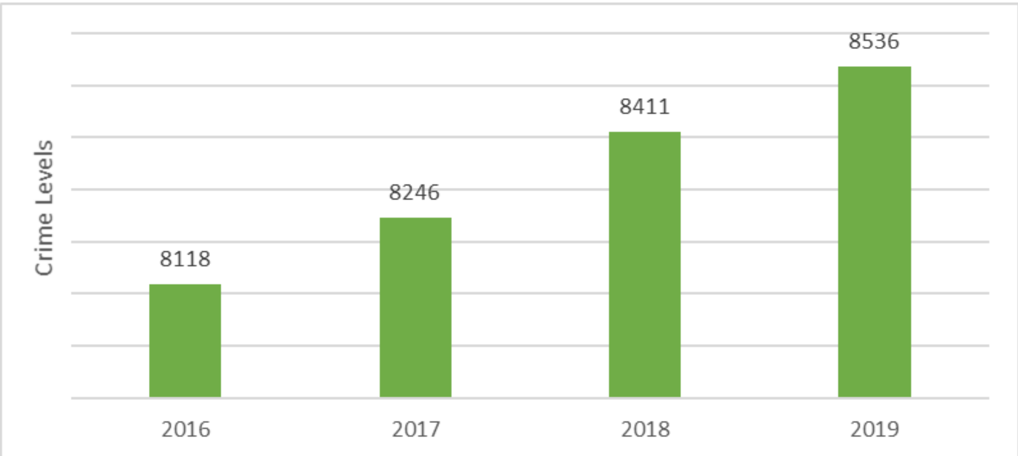


Figure 67: Mogalakwena LM: Serious Crime Levels (Quantec, 2020)

11.1.13.5 Income and educational levels

The average income of an economy is used to measure its standard of living and it also speaks to an economy's development status. Income distribution is one of the most important indicators of social welfare, as income is a primary means by which people are able to satisfy their basic needs such as food, clothing, shelter, health, services, etc. Changes in income inflict changes in the standard of living, more specifically: a positive change in income can assist individuals, households, communities and countries to improve living standards.

The table below shows the various statistics for the Mogalakwena LM. The table demonstrates that just over 15% of the population did not earn an income. Based on the table, 38.9% of the population are in the low-income category, while 43.1% are in the middle-income category and the minority are in the upper-income category.

Table 32: Income levels of Mogalakwena LM (Statistics SA, 2012)

Annual household income	Percentage
No income	15,40%
R1 - R4,800	5,20%
R4,801 - R9,600	10,60%
R9,601 - R19,600	23,10%
R19,601 - R38,200	22,10%
R38,201 - R76,4000	10,20%
R76,401 - R153,800	6,40%
R153,801 - R307,600	4,40%
R307,601 +	2,50%

In terms of educational levels, the graph below depicts that the highest education level attained by many people is Grade 12. However, the minority group are those who have obtained higher degrees (Master’s, Doctorate) constituting 519 people while 40 693 people make up for the other or unspecified educational level (Quantec, 2020). Low educational levels tend to be linked to low skilled labour and in Mogalakwena LM the low levels of education can be linked to the high number of lower-income brackets, which further suggest that the general population is poor (Mogalakwena Local Municipality, 2019).

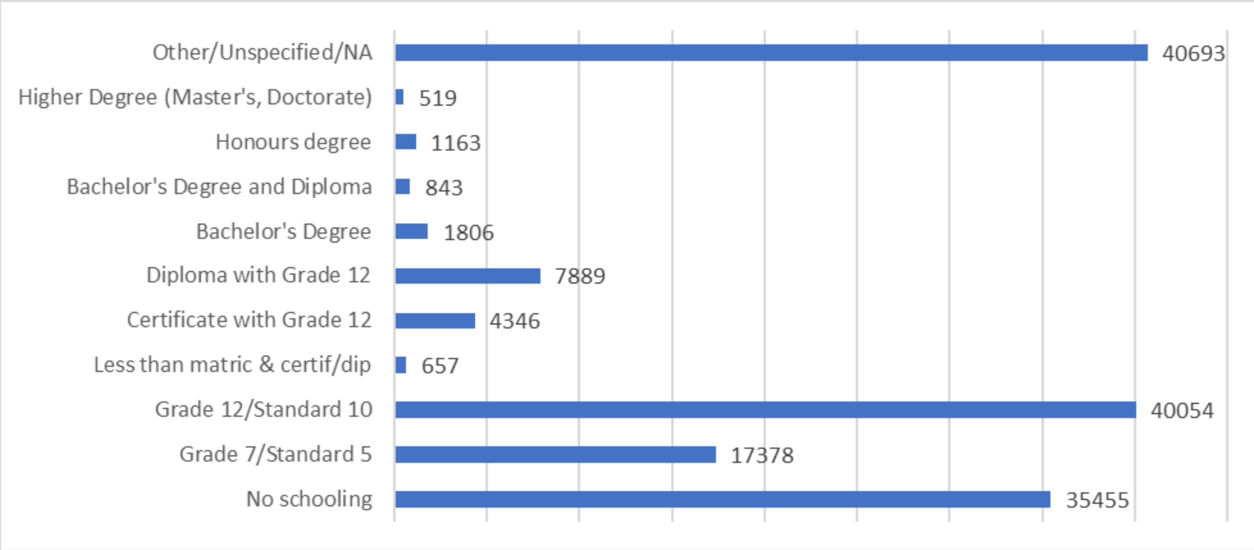


Figure 68: Educational levels in Mogalakwena LM (Quantec, 2020)

11.1.13.6 Economy

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector are also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

The Gross Value Added (GVA) of the Mogalakwena LM was valued at R8 855.3 million at constant prices for 2019. This constitutes approximately 4.3% of the total GVA of Limpopo and 16.4% of the total GVA of the Waterberg DM, making it the second largest contributor to the DM following Thabazimbi as shown in the table below. Additionally, it is important to note that between 2010 and 2019, the Mogalakwena LM's economy grew at an average rate of 0.89% per year, while the Waterberg DM grew at a rate of 0.67% and the Limpopo province's economy grew at an average rate of 1.11%, while the nation as a whole grew at an average rate of 1.39% per annum. This indicated that the local economy of Mogalakwena LM does not grow at the same rate as Limpopo, which may have limitations in the creation of new employment opportunities in the area. The below figures illustrate these trends.

Table 33: Municipality contributions to Waterberg DM and Limpopo province (2020)

	GVA	GVA Contributions	
	R (millions)	**Waterberg DM**	**Limpopo**
Limpopo Province	204 631.5	100%	
Waterberg District	53 979.6	26.38%	100%
Thabazimbi LM	28 705.1	14.03%	53.18%
Lephalale LM	8 460.4	4.13%	15.67%
Mookgopong LM	1 477.3	0.72%	2.74%
Modimolle LM	3 302.7	1.61%	6.12%
Bela-Bela LM	3 178.7	1.55%	5.89%

Mogalakwena LM	8 855.3	4.33%	16.40%

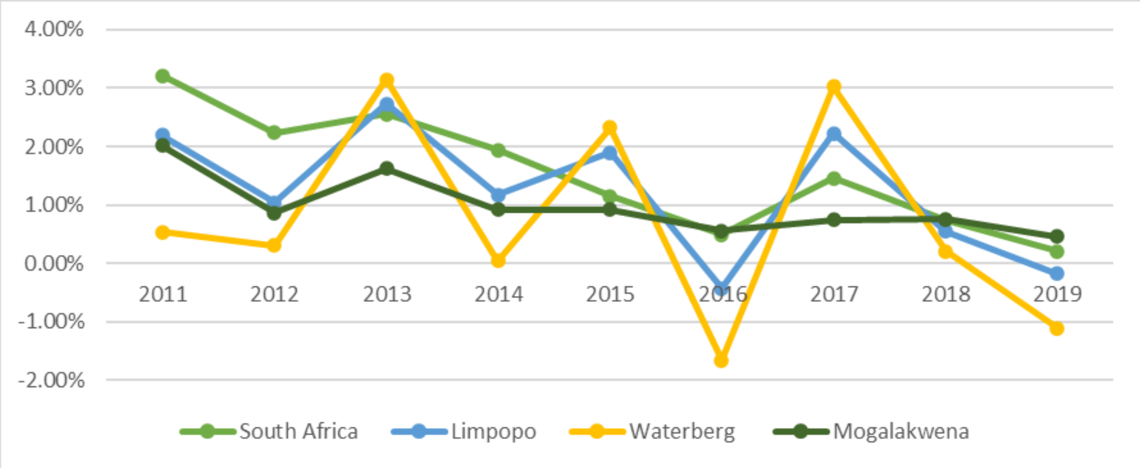


Figure 69: GVA growth trends for study areas (Quantec, 2020)

Table 34 shows that the tertiary sector is the highest contributor to the LM. The highest contributing sectors of the municipal area include wholesale and retail trade, finance and business services, and government services. However, the Mogalakwena's IDP argues that the area is rich in minerals – including platinum, diamonds and granite – and together with the rich agriculture produce of wheat, tobacco, cotton, beef, maize, peanuts and citrus these two sectors (mining and agriculture) drive the local economy (Mogalakwena Local Municipality, 2019).

Recent data however, suggests that the mining sector in the municipality has been consistently declining. Since 2010, the mining industry's GVA has dropped by more than 25% in constant figures – from R787 million (in constant 2010 prices) in 2010 to R576 million (in constant 2010 prices) in 2018. This reflects a 3.8% decline per annum. The reduced output of the mining sector resulted in its contribution to the economy dropping from 9.7% in 2010 to 6.6% in 2018. Given that the mining industry contributed over 15% to the local economy in 2000, this shows that the sector experienced a staggering shrinkage over the last two decades and is no longer the key driver of the local economy. On the other hand, the agricultural industry in the municipality showed a slow but steady increase; however, in terms of the GVA contribution, it is among the smallest economic sectors in the area. Its importance though, similar to the mining industry, lies in its ability to bring income from outside the local municipality due to its export-orientation (Urban-econ, 2020).

Table 34: Sector Contributions to the Mogalakwena Economy in 2018, Constant 2010 Prices (Quantec, 2020)

Mogalakwena LM Economic Sectors	GVA (R millions)	Contribution
Agriculture, forestry, and fishing	163.2	1.8%
Mining and quarrying	651.3	7.4%
Manufacturing	337.6	3.8%
Electricity, gas, and water	152.3	1.7%
Construction	353.3	4.0%
Wholesale and retail trade, catering, and accommodation	2 011.9	22.7%
Transport, storage, and communication	560.3	6.3%
Finance, insurance, real estate, and business services	1 847.0	20.9%
General government	2 277.9	25.7%

Community, social and personal services	500.4	5.7%
Total	**8 855.3**	**100.0%**

11.1.13.7 Labour force and employment structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

As at 2019, the Working Age Population (WAP) constituted 56.9% of the Mogalakwena LM population, which translates into 194 043 people (Quantec, 2020). The figure below further illustrates the labour force profile in which over half of the WAP is not economically active (NEA) while just under a third of the WAP is employed. The rest of the WAP is unemployed and this accounts for 34 985 people. Majority of the employed population has formal employment and almost a third of this population are semi-skilled. Furthermore, the Mogalakwena LM employs approximately 7% of the Waterberg district's employed population. Over the past 10 years, the number of unemployed persons has been increasing relative to the WAP, while the employment trends have varied over the years. As of 2019 the unemployment rate was 40.9%. According to the Mogalakwena IDP, women, and especially rural women, constitute the greatest number affected by the lack of job opportunities as well as other social problems (Mogalakwena Local Municipality, 2019).

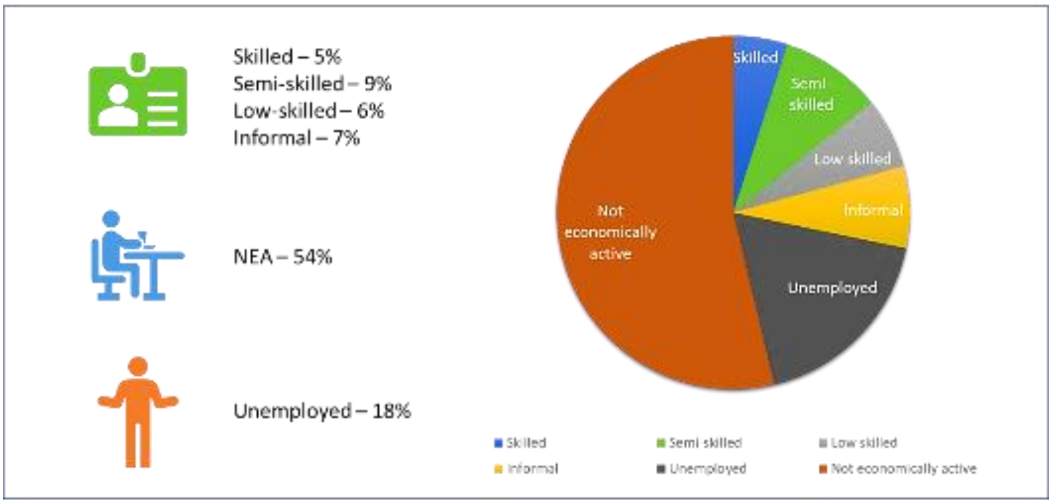


Figure 70: Labour-force Profile for Mogalakwena local Municipality

While the figure above indicates the total employment figures for all economic sectors in the Mogalakwena LM, the table below indicates employment per economic sector. The tertiary sector is the highest employer in the Mogalakwena area, constituting almost 78.7% of the employed population. Mining is the smallest employer in the area, accounting for 1% of total employment. The table below highlights that all the service-orientated sectors have shown growth, while the majority of the primary and secondary sectors have declined between 2015 and 2019.

Table 35: Mogalakwena Employment Distribution by Sector (Quantec, 2020)

	2015	2019	Changes
Agriculture, forestry, and fishing	3 907	3530	↓
Mining and quarrying	658	569	↓

Manufacturing	4 200	4230	↑
Electricity, gas, and water	197	195	↓
Construction	3 255	3 149	↓
Wholesale and retail trade, catering, and accommodation	13 934	14 554	↑
Transport, storage, and communication	1 970	2 009	↑
Finance, insurance, real estate, and business services	6 722	6 915	↑
General government	9 006	9 055	↑
Community, social and personal services	10 519	10 607	↑

11.1.13.8 Access to Services and State of Local Built Environment

Access to shelter, water, electricity, sanitation, and other services are indicators that assist to determine the standard of living of the people in the area under investigation. Infrastructure and the state of local infrastructure is another indicator to contemplate when considering living standards. The availability of social and economic infrastructure including roads, educational facilities, and health facilities further indicates the nature of the study area, which is valuable in developing a complete profile of the circumstances in which communities are living. These measurements create a baseline against, which the potential impacts of the proposed project can be assessed.

11.1.13.9 Settlement profile

The household density of Mogalakwena LM is 14 households/km^2 and the population density is 55.3 persons/km^2 (Urban-Econ Calculations based on Quantec, 2020). Village settlements in the Mogalakwena LM are relatively small with an average 506 stands per village while the urban core has settlements that are large and clustered (Mogalakwena Local Municipality, 2019). Mokopane is one of the three proclaimed townships within the municipality together with Mahwelereng, which is situated in direct proximity to the proposed project site, and Rebone. .

11.1.13.10 Access to Housing and Basic Services

As of 2019, 91.5% of the Mogalakwena LM houses are brick structured dwellings on separate yards; 4.9% are informal dwellings; 1,1% are traditional dwellings, almost 2% are flats, complexes and backyard dwellings (Quantec, 2020). This shows that over 90% of the households are formal dwellings. Nonetheless, the LM experiences challenges in the provision of adequate housing. Among these challenges are insufficient land for development as the LM is not accredited to perform housing delivery; and lack of an Integrated Human Settlement Plan or Housing Plan for future planning.

The majority of the households in Mogalakwena LM have access to electricity and comprise of just over 92% of the households while approximately 7% of the households use candles and a relatively small percentage - 1% - uses alternative energy sources such as solar, gas, paraffin and other unspecified sources. The LM is serviced by both Eskom and the Municipality, with the majority of the rural area being serviced by Eskom while the municipality services the areas in town and farming areas surrounding town. The municipality services a total area of 2800 km^2 which is approximately 45% of the area of the LM. Amongst its key challenges is insufficient funding to maintain and service infrastructure.

Approximately 19.94% of the LM households have piped water within their dwellings; 42.45% have piped water within yards; 29.45% has access to piped water on community stands; while almost 8.16% rely on other sources such as water carriers/tankers, borehole, rain-water tanks, dams, and springs amongst others. Mogalakwena is a Water Service Authority (WSA) and also a Water Service Provider (WSP) meaning that the LM has an obligation to progressively ensure efficient, affordable, economical and sustainable access to water services (Mogalakwena Local Municipality, 2019). Among the challenges experienced by the LM in providing water are: water quality and reliability, especially in rural areas; operation and maintenance costs are economically unsustainable; and inadequacy to address the growing demand due to un-planned settlements.

With regards to sanitation over half (67.02%) of the households use pit latrines; 28.44% of the houses have access to flush toilets or chemical toilets; almost 1% use bucket latrines; and approximately 3.64% of the households use unspecified toilet systems (Quantec, 2020). While sanitation services have improved over the years, there remains a need “to adopt service levels in respect of basic services and ultimately the development of a comprehensive sanitation plan in order to meet the national target” (Mogalakwena Local Municipality, 2019).

Approximately 63.54% of households have their own refuse dumps; 26.54% have their waste removed by local authorities, and 7.61% have no waste removal services (Quantec, 2020).

The figure below is a summary of access to basic services within the Mogalakwena LM.

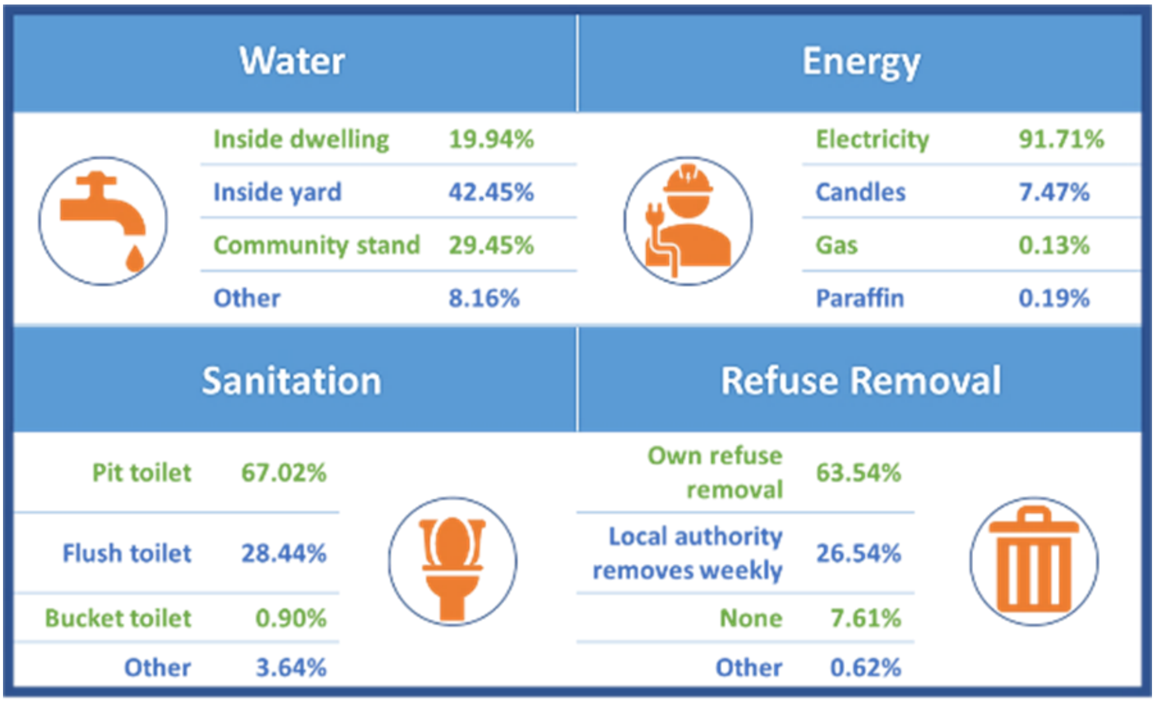


Figure 71: Access to services in the Mogalakwena LM (Stats SA, 2012)

The most common modes of transport include buses and taxis, private cars, donkey carts, bicycles & walking. Since residential areas are separated from places of work, people tend to travel long distances to employment areas. Moreover, some of the roads are not suitable for formal transport due to their poor condition (Mogalakwena LM, 2019).

11.1.14 Traffic

The proposed N11 Ring Road runs through the mining area close to the open mine pit and effectively cuts the southern part of the mining area in two. Access to the N11 is via a planned interchange with Road D1231. Should the proposed N11 Ring Road not be completed by the time the mine comes into production the D1603 to the R101 will have to be used as an interim haul route. SANRAL is also planning the upgrade/rehabilitation of the existing section of the N11 from Mokopane to the access of the Mogalakwena Mine. Access to the mine will be off Road D1603. Any crossing of the proposed N11 Ring Road will either be over or underneath the proposed N11 Ring Road with a bridge or bridges.

The Traffic Impact Assessment conducted by C Havenga Transportation Engineers assessed the impact of the additional peak hour trips generated by the mine on the road network. The mining operation is not a land use for which trip generation figures are available in the South African Trip Data Manual (COTO, 2019). Mines have shift change times that may fall outside the normal weekday morning and afternoon peak hours on the road network. The worse-case traffic scenario will be when the shift change times correspond with the peak traffic hours on the road network and will be evaluated for the purpose of this study.

The following trips will be generated by the mine:

Mining operations (Trucks):

Average Daily Truck Traffic (on haul roads and external routes):

(Calculations based on 30 ton or 50 ton trucks where applicable, 12 hour operation and 30 days a month)

- Ore to crushing and screening plant 100 000 tpm = 100 000/30/12/50 = 6 trucks/h (on haul road/ internal trips)
- Ore to concentration plant 100 000 tpm = 100 000/30/12/30 = 9 trucks/h (to nearby Mogalakwena or Ivanplats Platreef operations/ external trips)
- Waste to Overburden Facility 110 855 tpm = 110 855/30/12/50 = 6 trucks/h (on haul road/ internal trips)

The expected peak hour trip generation (trucks) onto Road D1603 (Turfloop) is depicted below:

Table 36: Expected peak hour trip generation (Trucks)

Expected number of truck trip		
In	**Out**	**Total**
9	9	18

Based on the above this amounts to 9 x 30ton trucks trips per hour over a 12 hour day, 30 days a month. The truck trips are therefore expected to increase on this road with 3240x30ton trips a month and a similar number for the return trips.

Employees (for both construction and operations)

The mine will employ a total of 200 people during the LoM. The workforce will be divided into 4 shifts of 50 people per shift. Employees will be accommodated in Mokopane and the nearby townships of Mahwelereng and Ga-Madiba.

The breakdown of workforce is as follows together with the expected modal split and occupancy:

- 20 Highly skilled (supervisors and engineers) 1 person/vehicle
- 160 Skilled (drivers, machine operators) some ride sharing (2 persons/vehicle)
- 20 Semi-skilled/unskilled (labourers) public transport (15 people per bus)

Table 37: Expected peak hour trip generation (light vehicles)

Employment	Workers/ shift	Number of trips	Expected number of trips		
			In	Out	Total
Highly skilled	5	5	5	5	10
Skilled	40	20	20	20	40
Semi-skilled/unskilled	5	5	1	1	2
Total	**50**	**30**	**26**	**26**	**52**

The total expected peak hour trips are depicted below:

Table 38: Expected peak hour trip generation (total)

In	Out	Total
35	35	70

The results of the capacity analyses indicate that from a traffic impact point of view no mitigation measures are required at the respective intersections analysed. There will however be a significant increase in truck traffic. To accommodate truck turning movements mitigation measure are proposed (refer to Table 43). The application can be supported from a traffic flow point of view.

11.1.15 Blasting and Vibration

During the Blasting and Vibration Assessment (Appendix 6.12: Blasting and Vibration Assessment), the area surrounding the proposed mining area was reviewed for structures, traffic, roads, human interface, animals' interface etc. Various installations and structures were observed. The condition of these structures ranges from industrial construction to poor condition structures. Water boreholes were identified at close proximity to the pit area. There are a significant number of water boreholes within the mining right area and it is uncertain what the long-term plan will be for these boreholes. A mitigation plan will be required to determine if these boreholes will be retained or replaced. Heritage sites were also identified in relation to the pit area. Specific recommendations will be required from the Heritage Specialist regarding these sites (refer to Appendix 6.2: Heritage Impact Assessment). This section concentrates on the outcome of modelling the possible effects of ground vibration, air blast and fly rock specifically to these points of interest or possible interfaces. Ground vibration and air blast was calculated from the edge of the pit outline and modelled accordingly. Blasting further away from the pit edge will certainly have lesser influence on the surroundings. A worst case is then applicable with calculation from pit edge.

The opencast operations were evaluated for expected levels of ground vibration from future blasting operations. The distances between structures and the pit area is a contributing factor to the levels of ground vibration expected and the subsequent possible influences. It is observed that for the different charge masses evaluated that levels of ground vibration will change as well. The minimum charge used indicated thirty-four POI's of concern and the maximum charge indicated sixty-three POI's of concern (included are the farm buildings/structures, heritage site and hydrocensus boreholes inside the pit area) in relation to possible structural damage. On a human perception scale hundred and seventy-eight POI's were identified where vibration levels may be perceptible and higher for the minimum charge and two hundred and thirty-six POI's for the maximum charge. Refer to Table 12 and 13 of the Blasting and Vibration Assessment (Appendix 6.12) for the POI's identified and which might be impacted. Perceptible levels of vibration may be experienced up to 3671 m, unpleasant up to 1651 m and intolerable up to 752m from the pit area. Problematic levels of ground vibration, levels greater than the proposed limit, are expected up to 1546 m from the pit edge for the maximum charge. Any blast operations further away from the boundary will have a lesser influence on these points.

Air blast predicted for the maximum charge ranges between 122.6 and 157.7 dB for all the POI's considered. This includes the nearest points such as the heritage sites, farm buildings/structures and houses. These levels may contribute to effects such as rattling of roofs, doors or windows with limited points that are expected to be damaging and others could lead to complaints. Minimum charge predictions identified that one hundred and eighty POI's could experience levels of air blast that could lead to complaints and fifteen POI's that could be problematic. Maximum charge predictions indicate that hundred and seventy three POI's around the pit area could experience air blast that could lead to complaints and twenty two POI's that could be problematic. Both charges showed hundred and ninety five POI's that could possibly complain or be problematic. Refer to Table 14 and 15 of the Blasting and Vibration Assessment for the POI's identified and which might be impacted.

The current accepted limit on air blast is 134 dBL and damages are only expected to occur at levels greater than 134 dBL. Prediction shows that air blast will be greater than 134 dB at distances of 680 m and closer to the pit boundary. Infrastructure at the pit area such as roads, heritage sites, power lines/pylons, railway line and boreholes are present but air blast does not have any influence on these installations. The possible negative effects from air blast are expected to be the same than that of ground vibration. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pit is located such that "free blasting", meaning no controls on blast preparation, will not be possible. The effect of stemming control will need to be considered. In many cases the lack of proper control on stemming material and length contributes mostly to complaints from neighbours.

The occurrence of fly rock in any form will have a negative impact if found to travel outside the unsafe zone. A safe distance from blasting is calculated following rules and guidelines from the International Society of Explosives Engineers (ISEE). Based on a 310 mm diameter blast hole and 4.3 m stemming length, a possible fly rock range with a safety factor of 2 was calculated to be 1239 m. A review of the calculated unsafe zone showed a hundred and seventeen POI's (including eight POI's inside the pit area at this stage), are within the unsafe zone. This calculation is a guideline and any distance cleared should not be less. This unsafe zone however needs to be further qualified and determined following the completion of the final blasting designs taking into account stemming control.

The occurrence of fumes in the form the NOx gas is not a given and is very dependent on various factors as discussed in section 13.6 of the Blasting and Vibration Assessment. The occurrence of fumes should however be closely monitored. Various boreholes were identified within the blasting influence area surrounding the pit area. Table 17 of the above assessment indicated the location of the boreholes identified as well as those which may be influenced by the proposed blasting.

Ground vibration is the primary possible cause of structural damage and requires more detailed planning in preventing damage and maintaining levels within accepted norms. Air blast and fly rock can be controlled using proper charging methodology irrespective of the blast hole diameter and patterns used. A detail inspection of the area and accurate identification of structures will need to be done to ensure the allowable levels of ground vibration, and the limits to be applied. It will be imperative to ensure that a monitoring program is done to confirm levels of ground vibration and to ensure that ground vibration levels are not exceeded.

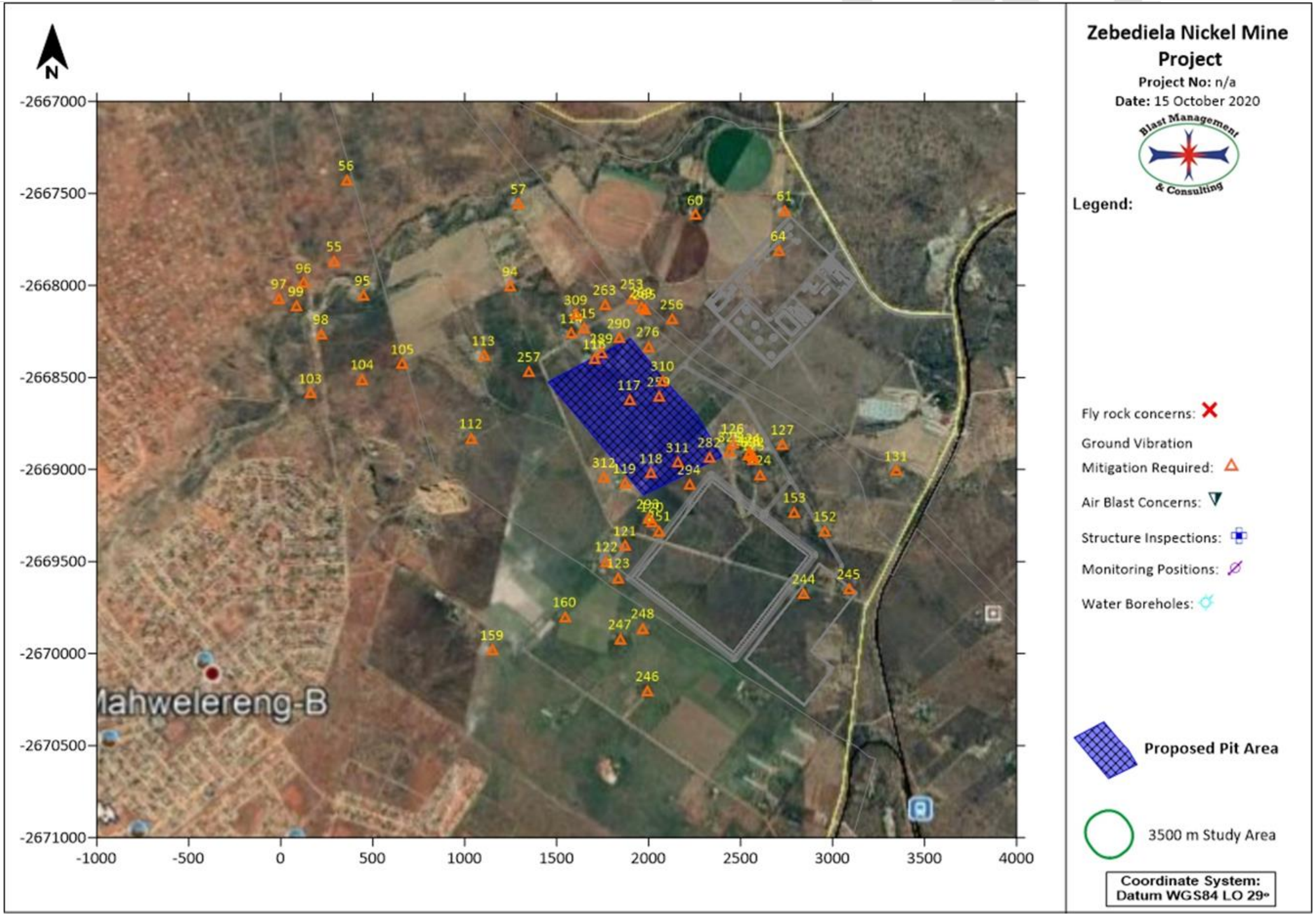


Figure 72: Structures identified where ground vibration mitigation will be required

12. DESCRIPTION OF THE CURRENT LAND USES

12.1. Description of specific environmental features and infrastructure on the site

The land where the proposed activity is planned to be developed is currently mostly used for commercial agricultural activities comprising of crop farming, game farming, livestock farming and poultry farming. Landscape character types are landscape units refined from Mucina and Rutherford (2011) vegetation types, the regional physiographic and cultural data derived from 1:50 000 topographical maps, aerial photographs and information gathered on the site visit. Dominant landform and land use features (e.g., hills, rolling plains, valleys, urban and mining areas) of similar physiographic and visual characteristics, typically define landscape character types. The following landscape types were identified within the study area:

- **Natural Landscape – Hills and Mountains**

According to Mucina and Rutherford (2011) the study area occurs within the Savannah Biome. Three vegetation units (original vegetation) occur within the study area, which all fall into the Central Bushveld classification. Makhado Sweet Bushveld in the west (mostly replaced by urban development with few remnants remaining); Polokwane Plateau Bushveld in the central areas (mostly replaced with farming practices although remnants remain amongst the buildings and infrastructure); and Mamabolo Mountain Bushveld on the mountains in the north, east and south-eastern sections of the study area. This savannah type is the most intact and covers the mountainous areas that form a dramatic backdrop to the study area along its northern, eastern, and south-eastern edges. Its landscape features rocky hills with moderate to steep slopes covered by a variety of small trees and shrubs. Indicator trees include, amongst others, *Sclerocarya birrea subsp. caffra, Combretum molle, Croton gratissimus* and *Cussonia natalensis*. The Makhado Sweet Bushveld and Polokwane Plateau Bushveld units occur on slightly to moderately undulating plains with some hills interspersed.

- **Riverine**

Two rivers traverse the study area, both of which are tributaries to the Sterk River system. The northern is the Rooisloot River, which flows from north to south-west through the study area and is the source of several irrigation schemes along its banks immediately north of the proposed open pit and generally of the project site. The second, unnamed stream, flows east to west through the southern part of the study area immediately south of the R101 and then trough the centre of Mokopane. Neither are directly affected by the proposed mine development.

- **Rural, Farmland and Open Land**

This landscape type occurs in the centre of the study area. It comprises slightly rolling (with a few hills) topography covered in savannah east of the Percy Fyfe road. The western section (west of the road) is dominated by farmland, some of which is under irrigation adjacent to the Rooisloot River. The original savannah vegetation is sparser than what occurs in the eastern section. South of the project site, between it and the northern limits of Mokopane is flat, mostly treeless open land.

- **Urban Residential**

Residential areas of the various communities and Mokopane, dominate the western extremes of the study area.

- **Quarry and Degraded Land**

A quarry is located immediately west of the open pit and degraded land (most likely from over-grazing and poor farming practices) occur in the north-western sections of the study area as well as immediately south of the Makapan mountain associated with the agricultural holdings.

- **Industry and Infrastructure**

Industrial land is mostly confined to the northern extremities of Mokopane as well as to the south-east of the town. A railway line as well as an Eskom power line traverse the study area from south to north-east. Both pass through the project area. The area is serviced by several provincial roads as well as the N1 national road linking it to Zimbabwe and the rest of South Africa. The SANRAL N11 Ring Road is proposed to pass through the project site.

12.2. Description of specific environmental features and infrastructure surrounding the site

The project site is located within an area with existing mining activities, such as Anglo American's Mogalakwena Mine and Ivanplats Platreef Project which is approximately 25 km and 9 km north-west of the proposed site, respectively. The project area is characterised by urban development (communities of Mahwelereng, Ga-Madiba, Masodi, Tshamahansi, Phola Park, Sekgakgapeng, Mosate, Maroteng, and Masehlaneng) in the west and south-west (Mokopane), general farmland and a number of chicken farms in the central areas, and dominated by savannah cover hills in the northern, eastern and south-eastern sections. It's in these areas where game farm breeding and other tourist facilities occur. In the south-east, immediately south of the R101 and up against the Makapan mountain is the Mokopane Biodiversity Centre's property, approximately 1300ha in extent. The Makapansgat World Heritage site does not fall within the study area. It's located approximately 5km directly east of the eastern extremity of the study area.

A number of hills are located in the centre of the mining right area in an east west direction. The dominant land uses in the study area is agriculture and grazing. The study area is characterised by a number of smallholdings with some poultry, game and cattle farming. These is also some crop farming to the north-east of the proposed open pit and a preparatory school and urban township to the south-west. The Percy Fyfe tarred road transects the study area from south-west to north-east with various gravel access roads off of this road. A Transnet Railway line runs parallel to the tarred road.

13. ENVIRONMENTAL AND CURRENT LAND USE MAP

(DMR Guideline: Show all environmental, and current land use features)

The following landuses or environmentally sensitive features are located on the site or directly adjacent:

- Although large sections of the project area have been modified for crop cultivation in the past, original vegetation remains throughout the area. Other disturbances as a result of rubble dumping, littering and the area being used as a pass through by local people are also prevalent in the area. Dominant land uses in the study area is agriculture and grazing.
- From Figure 73 below, the proposed Mining Right Area (MRA) encompasses cultivated commercial fields and a few water bodies and mining areas. The cultivated commercial fields are also observed close to the MRA boundary. Located to the north of the MRA are protected areas, with nature reserves located on the north-eastern side and south-eastern side of the mining right boundary. The Makapan Valley World Heritage Site extends to the eastern side of the MRA boundary.
- In proximity to the MRA on the south-western side are urban townships such as Sekgakgapeng, Mahwelereng, and Madiba, among others. Rural villages may also be observed on the western side of the MRA and between the rural villages and urban townships, subsistence farming is common.

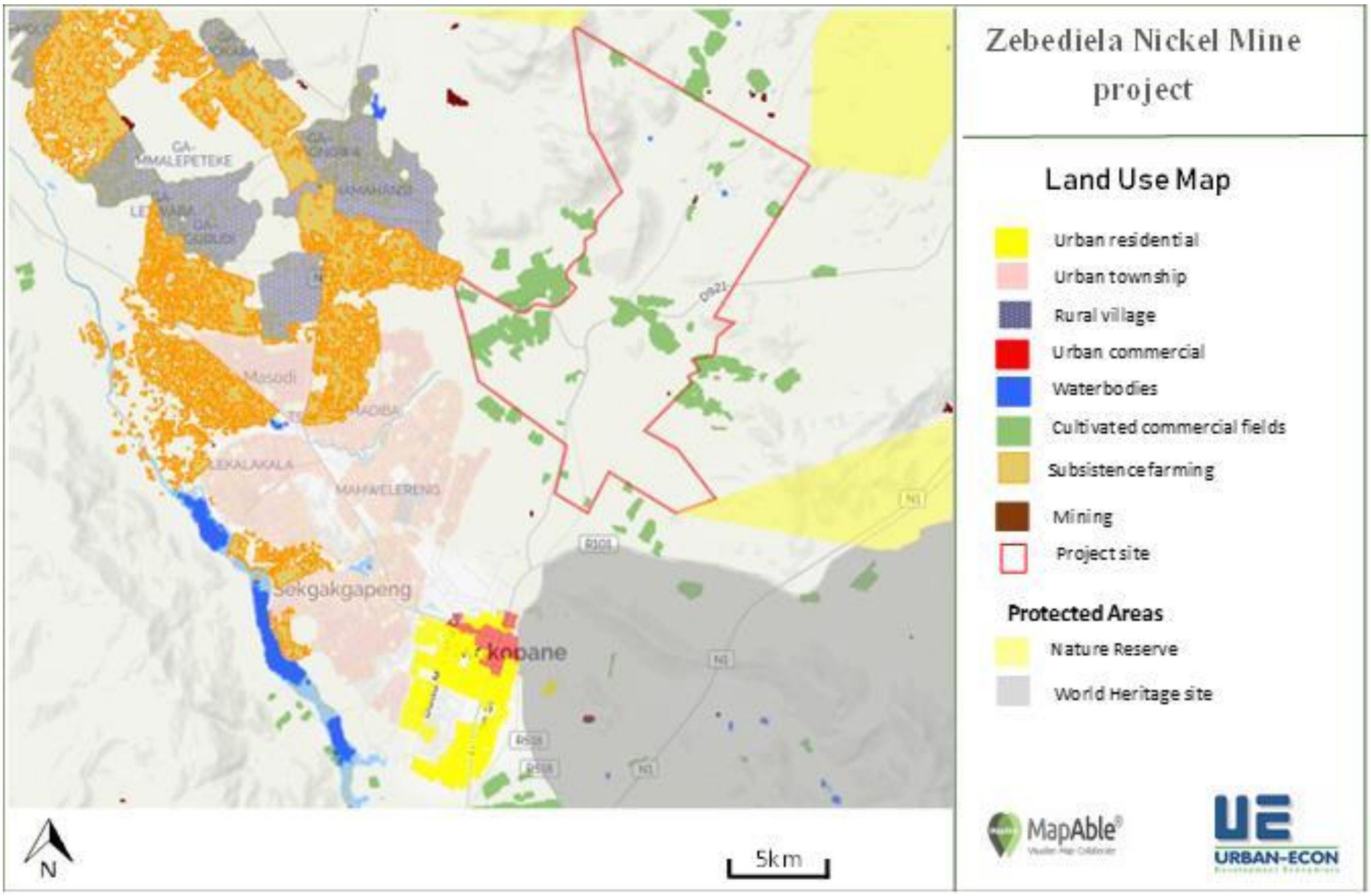


Figure 73: Land-Use Map of the Project Site and Surrounding Areas

- Figure 74 below provides a more detailed description of activities that have been preliminarily identified to be located within the proposed project site. It shows that the proposed project site encompasses a large number of smallholdings that are predominantly used for commercial agricultural activities. Livestock farming, which in the area encompasses game breeding, rabbit, and poultry farming, appears to be the most common commercial agricultural activity. There is also some crop farming in the north-western section of the site. The project area also includes a transport company, a workshop that fixing mining equipment and accommodation facilities.

- The directly affected farm portions are used for permanent residences and economic activity. Economic activities, on the farm portions, include commercial farming, guest housing and accommodation, schooling, and other economic activities. Additionally, many landowners provide housing to other people that permanently live on the land. One landowner actively manages and supplies the town of Mokopane with water.
- In terms of the Department of Environmental Affairs and Tourism (DEAT) guidelines for Integrated Environmental Management (IEM), sensitive landscapes are a broad term applying to: Nature conservation or ecologically sensitive areas – indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, lakes, islands, lagoon, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species; Unstable physical environments - such as unstable soil and geo-technically unstable areas; Important nature reserves – river systems, groundwater systems, high potential agricultural land; Sites of special scientific interest; Sites of social significance or interest – including sites of archaeological, historic, cultural spiritual or religious importance and burial sites; and Green belts or public open space in municipal areas. Sensitive landscapes in terms of the above definition are illustrated in Figure 75 below and include:
  - Heritage features:
    - Heritage features of low to moderate archaeological significance as well as graves and potential burial sites occur in the area as indicated in Figure 53.
  - Ecologically Sensitive areas:
    - Most of the habitat types in the study area can be considered as having a Medium Botanical Sensitivity.
    - Rocky outcrops and ridges occur in the study area and are often habitats for red data and endemic species of an area, while also supporting a unique floral and faunal species composition. This vegetation unit occurs in two areas of the project area namely a small outcrop in the south-eastern section and a ridge in the northern section of the proposed mining infrastructure footprint areas. The rocky outcrops and ridges provide suitable habitat to protected plants, small mammals and reptiles and are therefore of High Ecological Function and of High Conservational Value for the biodiversity that they support.
    - All of the drainage channels on the project site area are non-perennial. The narrow band of trees that occurs along the channel can be classified as riparian vegetation. The vegetation is largely still considered natural habitat, with all areas in the floodline classified as a high sensitivity area with a high conservation priority.
    - The Rooisloot (a NFEPA River) traverses the proposed mining right area and is located approximately 900 m to the north north-west of the proposed open pit boundary. A tributary of the Rooisloot occurs approximately 3 km to the north-east of the proposed open pit. A non-perennial channel representing a tributary of the Rooisloot occurs will be directly impacted by the open pit and overburden facility. The non-perennial channel forms a flatter area around the drainage channel and can be classified as a riparian flat drainage channel.

- No red data species were documented during the ecological survey and no listed protected plant species occur on the proposed development sites. However, the following protected trees were found:
  - Sclerocarya birrea (marula);
  - Boscia albitrunca (shepherds tree);
  - Combretum imberbe.
- Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) are found on site (refer to Figure 29). The mining project study area is located in the following areas specified in the Limpopo Conservation Plan:
  - CBA2; and
  - ESA2.

- Areas with Agricultural Potential
  - Soils in the study area have low to moderate or no agricultural potential. Only the soils in the north-western section of the project area which are under irrigation (pivots) are classified as having a High Agricultural Potential.
- Unstable physical environments
  - Dolomitic bedrock occurs throughout large parts of the study area as well as geological faults as indicated in Figure 75.

Refer to the baseline environmental chapter (section 11) for more information.

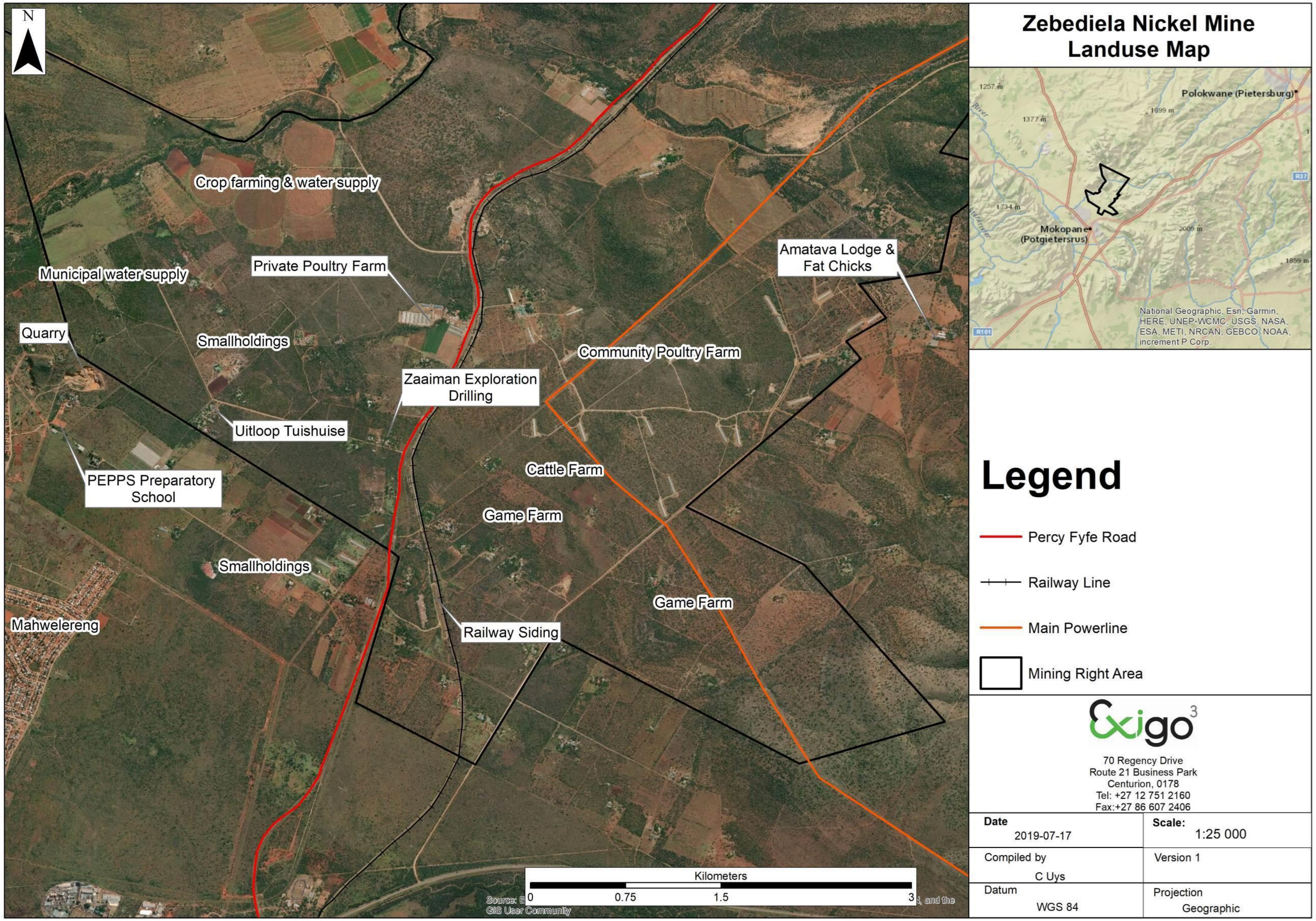


Figure 74: Current Land Use Map for the study area

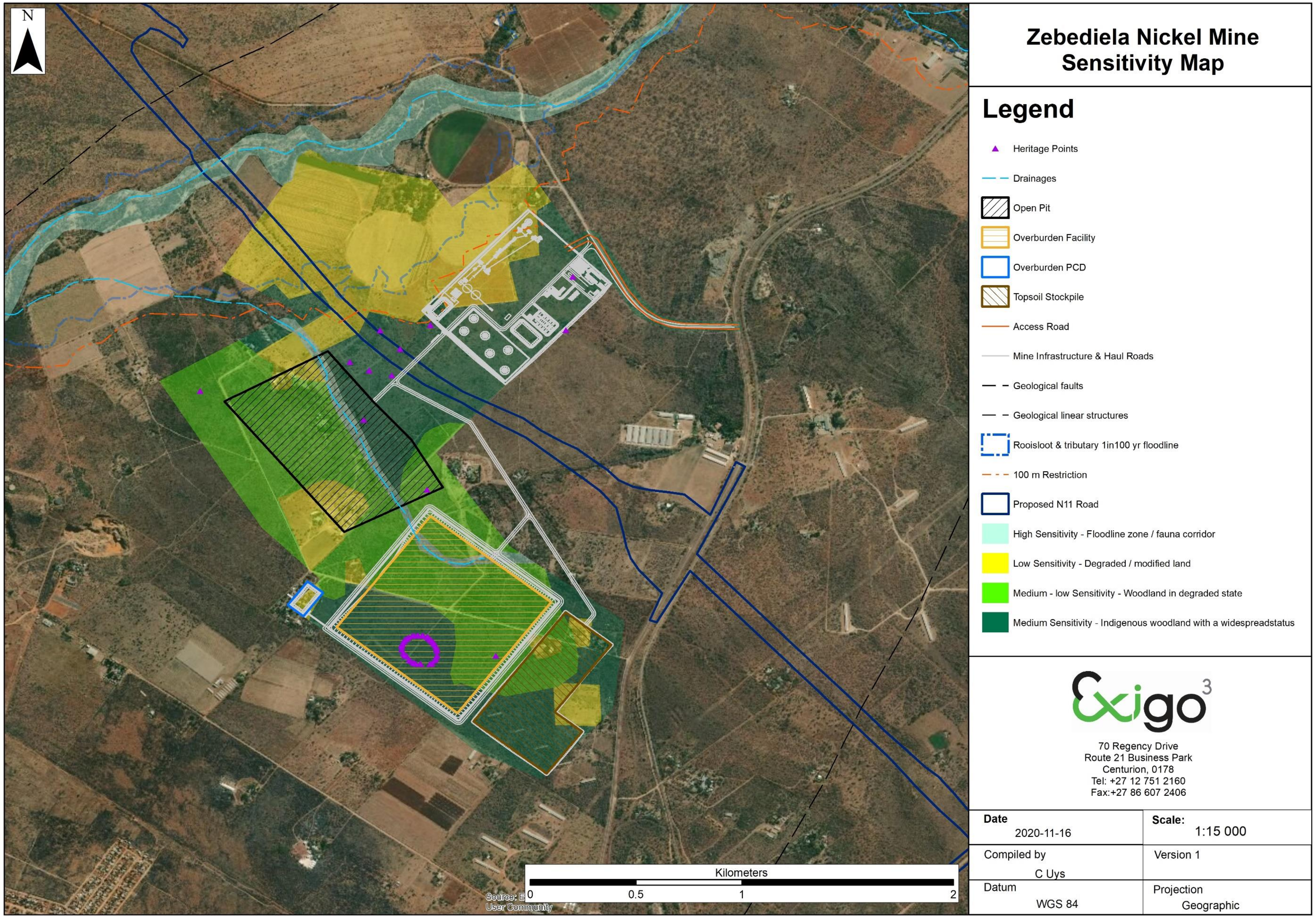


Figure 75: Sensitivity Map

14. IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS

(DMR Guideline: 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).

Refer to Table 39 below.

Table 39: Impact Assessment Matrix

No	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Probability		Duration		Scale		Magnitude/ Severity		Significance		Mitigation Effect
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	
Ecological Impacts															
Planning Phase															
1	Obtaining of IWUL for crossings and mining through water courses	Delay of mining onset	WOM	Negative	Definite	5	Short term	1	Local	1	High	8	50	Moderate	
			WM	Negative	Highly Probable	4	Short term	1	Local	1	Medium	6	32	Low	Can be avoided, managed or mitigated
2	Obtaining permits for the eradication of protected trees / flora	Delay of plant construction	WOM	Negative	Definite	5	Short term	1	Local	1	Low	2	20	Negligible	
			WM	Negative	Highly Probable	4	Short term	1	Local	1	Low	2	16	Negligible	Can be avoided, managed or mitigated
Construction Phase															
3	Clearing of vegetation for open pit, construction of infrastructure, access roads etc. causing direct habitat destruction / fragmentation	Habitat destruction / fragmentation of fauna habitats	WOM	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate	Can be avoided, managed or mitigated
4	Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation	Soil erosion and sedimentation	WOM	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate	Can be avoided, managed or mitigated
5	Vegetation clearing / vehicle movement	Spreading and establishment of alien invasive species	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	High	8	60	Moderate	
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low	Can be avoided, managed or mitigated
6	Vegetation clearing / vehicle movement	Habitat degradation due to dust	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	
			WM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate	Can be avoided, managed or mitigated
7	Heavy machinery and vehicle movement on site	Spillages of harmful substances	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated
8	Clearing of vegetation for open pit through water courses as well as road crossings	Impediment of flow patterns	WOM	Negative	Definite	5	Permanent	5	Regional	3	High	8	80	High	Can be avoided, managed or mitigated
			WM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate	
9	Heavy machinery and vehicle movement on site; Construction of infrastructure, roads etc. on site	Road mortalities of fauna / impact of human activities on site	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	
Operational Phase															
10	Laydown areas of overburden facility and topsoil stockpile	Habitat destruction / fragmentation of fauna habitats	WOM	Negative	Definite	5	Permanent	5	Regional	3	High	8	80	High	Can be avoided, managed or mitigated
			WM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate	
11	Increased hardened surfaces around infrastructure and exposed areas around open pits, laydown areas of overburden facility and topsoil stockpile	Soil erosion and sedimentation	WOM	Negative	Definite	5	Permanent	5	Regional	3	High	8	80	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	
12	Heavy machinery and vehicle movement on site	Spreading and establishment of alien invasive species	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Medium	6	52	Moderate	Can be reversed
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Low	2	32	Low	
13	Heavy machinery and vehicle movement on site	Habitat degradation due to dust	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be reversed
			WM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate	
14	Heavy machinery and vehicle movement on site	Spillages of harmful substances	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be reversed
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	
15	Heavy machinery and vehicle movement on site; workers accommodated on site	Road mortalities of fauna / impact of human activities on site	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	

	causing poaching, wood collection, fires etc.														
Closure and Decommissioning Phase															
16	Rehabilitation of mining site	Improvement of habitat through revegetation / succession over time	**WOM**	*Positive*	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low	N/A
			WM	*Positive*	Definite	5	Permanent	5	Local	1	Medium	6	60	Moderate	
17	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Local	1	Low	2	12	Negligible	
18	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Spreading and establishment of alien invasive species	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	Can be reversed
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	
19	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site / vehicle movement on site	Habitat degradation due to dust	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be reversed
			WM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low	
20	Heavy machinery and vehicle movement on site	Spillages of harmful substances	**WOM**	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	
21	Heavy machinery and vehicle movement on site	Road mortalities of fauna / impact of human activities on site	**WOM**	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	
Post-Closure & Rehabilitation Phase															
22	Natural Successional processes	Improvement of habitat through revegetation / succession over time	**WOM**	*Positive*	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low	N/A
			WM	*Positive*	Definite	5	Permanent	5	Local	1	Medium	6	60	Moderate	
23	Exposed surfaces / unrehabilitated areas on site post closure / poor monitoring during LoM	Soil erosion and sedimentation	**WOM**	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible	
24	Exposed surfaces / poor monitoring of revegetation on site	Spreading and establishment of alien invasive species	**WOM**	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible	
Soils, Agricultural Potential and Land Capability Impacts															
Planning Phase															
25	Obtaining of IWUL for crossings (hydric soils) and mining layout on sensitive soils	Delay of mining onset	**WOM**	Negative	Probable	2	Long term	4	Local	1	High	8	26	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Local	1	Medium	6	8	Negligible	
Construction Phase															
26	Topsoil & subsoil stripping	Soil destruction and sterilization	**WOM**	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	Can be reversed
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate	
27	Heavy machinery and vehicle movement on site	Soil compaction	**WOM**	Negative	Definite	5	Permanent	5	Local	1	High	8	70	High	Can be reversed
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low	
28	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses	Soil erosion and sedimentation	**WOM**	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate	
29	Heavy machinery and vehicle movement on site	Spillages of harmful substances	**WOM**	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
30	Topsoil & subsoil stripping	Loss of land capability	**WOM**	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	Can be reversed
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate	
Operational Phase															
31	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterilization	**WOM**	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	Can be reversed
			WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate	
32		Soil compaction	**WOM**	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	Can be reversed

	Heavy machinery and vehicle movement on site, laydown areas of overburden and topsoil facilities		WM	Negative	Definite	5	Long term	4	Local	1	Medium	6	55	Moderate	
33	Laydown areas of overburden and topsoil facilities, crushing and stockpiling	Increased Soil erosion and sedimentation	WOM	Negative	Definite	5	Permanent	5	Regional	3	High	8	80	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	
34	Heavy machinery and vehicle movement on site	Spillages of harmful substances to the soils	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	
35	Topsoil & subsoil stripping	Loss of land capability	WOM	Negative	Definite	5	Permanent	5	Site	2	High	8	75	High	Can be reversed
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate	
Closure and Decommissioning Phase															
36	Demolition of mining infrastructure; Heavy machinery and vehicle movement on site	Improvement of eroded soils and compaction	WOM	*Positive*	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low	N/A
			WM	*Positive*	Definite	5	Permanent	5	Local	1	Medium	6	60	Moderate	
37	Demolition of mining infrastructure / Cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	
38	Demolition of mining infrastructure, Heavy machinery and vehicle movement on site	Soil compaction	WOM	Negative	Definite	5	Permanent	5	Local	1	Medium	6	60	Moderate	Can be reversed
			WM	Negative	Definite	5	Long term	4	Local	1	Low	2	35	Low	
39	Heavy machinery and vehicle movement on site	Spillages of harmful substances	WOM	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	
Post-Closure & Rehabilitation Phase															
40	Rehabilitation	Improvement of land capability	WOM	*Positive*	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low	N/A
			WM	*Positive*	Definite	5	Permanent	5	Local	1	Medium	6	60	Moderate	
41	Rehabilitation	Soil erosion and sedimentation	WOM	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Local	1	Low	2	8	Negligible	
Heritage Impacts															
Planning Phase															
42	Siting of Open Pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	WOM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	
43	Siting of Overburden Facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	WOM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	
44	Siting of Mine Plant, Open Pit and Mine Roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Improbable	1	Short term	1	Local	1	Medium	6	8	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	
45	Siting of Mine Plant, Open Pit and Mine Roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Improbable	1	Short term	1	Local	1	High	8	10	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Local	1	Low	2	4	Negligible	
Construction Phase															
46	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low	N/A
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
47	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low	N/A
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
48			WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low	N/A

	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
49	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
Operational Phase															
50	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low	N/A
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
51	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low	N/A
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
52	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Highly Probable	4	Permanent	5	Site	2	Low	2	36	Low	N/A
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
53	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Highly Probable	4	Permanent	5	Regional	3	High	8	64	High	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	
Closure and Decommissioning Phase															
54	Rehabilitation of Open Pit footprint	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	WOM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
55	Rehabilitation of Overburden footprint	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	WOM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
56	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
57	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Improbable	1	Short term	1	Site	2	High	8	11	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
Post-Closure & Rehabilitation Phase															
58	Rehabilitation of Open Pit footprint	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	WOM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
59	Rehabilitation of Overburden footprint	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	WOM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
60	Rehabilitation of plant, open pit and mine road footprints	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	WOM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
61	Rehabilitation of plant, open pit and mine road footprints	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by	WOM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	N/A
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	

		Mine Plant, Open Pit and Mine Roads													
Palaeontological Impacts															
Construction Phase															
62	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	**WOM**	Negative	Highly Probable	4	Permanent	5	Local	1	Low	2	32	Low	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Permanent	5	Local	1	Low	2	32	Low	
63	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of fossils.	**WOM**	Negative	Highly Probable	4	Permanent	5	Local	1	High	8	56	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Permanent	5	Local	1	Low	2	16	Negligible	Can be avoided, managed or mitigated
64	Construction of buildings, dams, roads, pylons. Exploration for mining	Preservation of fossils.	**WOM**	Positive	Improbable	1	Permanent	5	Local	1	Low	2	8	Negligible	May cause irreplaceable loss of resources
			WM	Negative	Highly Probable	4	Permanent	5	Local	1	Medium	6	48	Moderate	Can be avoided, managed or mitigated
Hydrogeological Impacts															
Construction Phase															
65	Oil, grease and diesel spillages from construction vehicles	Contamination to ground- and surface water systems	**WOM**	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible	Can be avoided, managed or mitigated
66	On-site sanitation	Contamination to ground- and surface water systems	**WOM**	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Local	1	Medium	6	16	Negligible	Can be avoided, managed or mitigated
67	Storage of chemicals and building materials during construction of mine infrastructure	Contamination to ground- and surface water systems	**WOM**	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	Can be avoided, managed or mitigated
Operational Phase															
68	Mine dewatering	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receives very low if any groundwater inflows	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low	Can be avoided, managed or mitigated
69	Spillages of hydrocarbons & reagents, use of explosives	Contamination to ground- and surface water systems		Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	Can be avoided, managed or mitigated
				Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
70	Acid Mine Drainage (AMD) from the mine and overburden facility	Contamination to ground- and surface water systems	**WOM**	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	Can be avoided, managed or mitigated
71	Mass transport and seepage from overburden facility at the proposed mine along surface drainages and groundwater pathways	Contamination to ground- and surface water systems	**WOM**	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
Closure and Decommissioning Phase															
71	Oxidation of backfilled material for example sulphates	Groundwater and surface water contamination	**WOM**	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
72			**WOM**	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated

	The formation of a pit lake during backfilling which will create elevated salt concentrations from higher evaporation on surface	The deterioration of the groundwater environment	WM	Negative	Improbable	1	Medium term	3	Local	1	Medium	6	10	Negligible	Can be avoided, managed or mitigated
73	Seepage and mass transport from overburden not yet backfilled and open-pit mine impacting on groundwater and surface water quality	Contamination to ground- and surface water systems	WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
Post-closure and Rehabilitation Phase															
74	Contamination from the open pit and backfilled material not yet backfilled	Groundwater and surface water contamination	WOM	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
75	Formation of a pit lake after backfilling	Elevated salt concentrations from higher evaporation on surface leading to the deterioration of the groundwater environment contamination	WOM	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Local	1	Medium	6	22	Low	Can be avoided, managed or mitigated
76	Seepage and mass transport from opencast mine pit impacting on groundwater quality	Contamination to ground- and surface water systems	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	Can be avoided, managed or mitigated
			WM	Positive	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
Air Quality Impacts															
Planning Phase															
77	Existing ambient baseline	Particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
Construction Phase															
78	Transport and general construction activities	Gaseous and particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	
79	Clearing of groundcover and levelling of area	Particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	
80	Materials handling	Particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Short term	1	Local	1	Medium	6	32	Low	
81	Wind erosion from open areas	Particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	
Operational Phase															
82	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	
83	Crushing and screening	Particulate emissions; fugitive dust	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	
84	Materials handling	Particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Medium	6	44	Moderate	
85	Wind erosion	Particulate emissions; fugitive dust	WOM	Negative	Highly Probable	4	Long term	4	Site	2	Medium	6	48	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Local	1	Low	2	28	Low	
Closure and Decommissioning Phase															
85				Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated

	Dust generated during rehabilitation activities	Particulate emissions; fugitive dust		Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	
86	Demolition of infrastructure	Particulate emissions; fugitive dust		Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
				Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	
87	Tailpipe emissions from the vehicles used during the closure phase	Gaseous and particulate emissions; fugitive dust		Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
				Negative	Highly Probable	4	Short term	1	Site	2	Medium	6	36	Low	
Post-Closure & Rehabilitation Phase															
88	Wind erosion from open areas	Particulate emissions; fugitive dust	**WOM**	Negative	Highly Probable	4	Medium term	3	Site	2	High	8	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Medium term	3	Local	1	Low	2	24	Low	
Noise Impacts															
Construction Phase															
89	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	Negative	Probable	2	Short term	1	Site	2	High	8	22	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
90	Topsoil Stockpile	Noise impact on R1, R2 and R7	**WOM**	Negative	Probable	2	Short term	1	Site	2	High	8	22	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
91	Open Cast Pit	Noise impact on R4 and R5	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
92	Open Cast Pit	Noise impact on R4 and R6	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
93	Open Cast Pit	Noise impact on R4 and R7	**WOM**	Negative	Probable	2	Short term	1	Site	2	High	8	22	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
94	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
95	Plant	Noise impact on R7, R8 and R10	**WOM**	Negative	Improbable	1	Short term	1	Site	2	High	8	11	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
96	Plant	Noise impact on R7, R8 and R11	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
97	Plant	Noise impact on R7, R8 and R12	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
98	Haul Roads	Noise impact on R7 and R10	**WOM**	Negative	Probable	2	Short term	1	Site	2	High	8	22	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
99	Topsoil Stockpile	Noise impact on R1, R2 and R7	**WOM**	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	
Operational Phase															
100	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
101	Topsoil Stockpile	Noise impact on R1, R2 and R6	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	
102	Open Pit	Noise impact on R4 and R5	**WOM**	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
103	Open Pit	Noise impact on R4 and R6	**WOM**	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
104	Open Pit	Noise impact on R4 and R7	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	
105	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
106	Plant	Noise impact on R7, R8 and R10	**WOM**	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
107	Plant	Noise impact on R7, R8 and R10	**WOM**	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	

108	Plant	Noise impact on R7, R8 and R10	**WOM**	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
109	Haul Roads	Noise impact on R7 and R10	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	
110	Topsoil Stockpile	Noise impact on R1, R2 and R6	**WOM**	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Low	2	8	Negligible	
Blasting & Vibration Impacts															
Operational Phase															
111	Open cast mining activities: blasting	Ground Vibration impact on Chicken Broilers	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
112	Open cast mining activities: blasting	Ground Vibration impact on Farm Buildings with various residences/sheds	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
113	Open cast mining activities: blasting	Ground Vibration impact on Houses	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
114	Open cast mining activities: blasting	Ground Vibration impact on Structures	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
115	Open cast mining activities: blasting	Ground Vibration impact on SANRAL Road	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
116	Open cast mining activities: blasting	Air blast Impact on Chicken Broilers	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
117	Open cast mining activities: blasting	Air blast Impact on Farm Buildings/Structures	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
118	Open cast mining activities: blasting	Air blast Impact on Heritage Site	**WOM**	Negative	Definite	5	Long term	4	Regional	3	Low	2	45	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
119	Open cast mining activities: blasting	Air blast Impact on Houses	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
120	Open cast mining activities: blasting	Air blast Impact on Hydrocensus Borehole	**WOM**	Negative	Definite	5	Long term	4	Regional	3	Low	2	45	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
121	Open cast mining activities: blasting	Air blast Impact on Informal Housing	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
122	Open cast mining activities: blasting	Air blast Impact on Planned SANRAL Road	**WOM**	Negative	Definite	5	Long term	4	Regional	3	Low	2	45	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
123	Open cast mining activities: blasting	Air blast Impact on Ruins	**WOM**	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
124	Open cast mining activities: blasting	Air blast Impact on Structure	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
125	Open cast mining activities: blasting	Fly rock Impact on Building/Structure	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
126	Open cast mining activities: blasting	Fly rock Impact on Cement Dam	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
127	Open cast mining activities: blasting	Fly rock Impact on Chicken Broilers	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
128	Open cast mining activities: blasting	Fly rock Impact on Farm Buildings/Structures	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
129	Open cast mining activities: blasting	Fly rock Impact on Gravel Road	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
130	Open cast mining activities: blasting	Fly rock Impact on Heritage Site	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
131			**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated

	Open cast mining activities: blasting	Fly rock Impact on Houses	WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
132	Open cast mining activities: blasting	Fly rock Impact on Hydrocensus Borehole	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
133	Open cast mining activities: blasting	Fly rock Impact on Informal Housing	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
134	Open cast mining activities: blasting	Fly rock Impact on Pivot Irrigation	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
135	Open cast mining activities: blasting	Fly rock Impact on Planned SANRAL Road	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
136	Open cast mining activities: blasting	Fly rock Impact on Railway Line	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
137	Open cast mining activities: blasting	Fly rock Impact on Reservoir	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
138	Open cast mining activities: blasting	Fly rock Impact on Road	WOM	Negative	Definite	5	Long term	4	Regional	3	Medium	6	65	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Low	2	36	Low	
139	Open cast mining activities: blasting	Fly rock Impact on Ruins	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
140	Open cast mining activities: blasting	Fly rock Impact on Structures	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	
Visual Impacts															
Construction Phase															
141	Preparation of earthworks for pit area, mine infrastructure and topsoil and overburden facility areas and the construction of the offices, plant and infrastructure.	Build access roads to site, exposure of earth to create terraces for the construction activities - the building of the plant and office infrastructure. Prestrip site to establish open pit area. The exposure of earth and rock (stark contrast with existing landscape character) results in the altering of the visual quality and sense of place of areas around the project site. These activities which will also generate dust and will be visible in foreground and middleground views from residential areas and farmstead accommodation and public roads. Night lighting during this phase.	WOM	Negative	Definite	5	Medium term	3	Regional	3	High	8	70	High	May cause irreplaceable loss of resources
			WM	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	Can be avoided, managed or mitigated
142	Removal of vegetation, topsoil and soft overburden from mining (open pit) areas.	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and	WOM	Negative	Definite	5	Medium term	3	Regional	3	Medium	6	60	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate	Can be avoided, managed or mitigated

		visible in the middleground and background from residential areas and farmsteads and sections of public roads.													
Operational Phase															
143	Removal of vegetation, topsoil and soft overburden from mining (open pit) areas.	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WOM**	Negative	Definite	5	Medium term	3	Regional	3	Medium	6	60	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Definite	5	Medium term	3	Site	2	Medium	6	55	Moderate	Can be avoided, managed or mitigated
144	Excavation of the mining areas using drill rigs, blasting, excavators and dozers.	Exposure of rock through blasting that would contrast with the existing natural landscape in the immediate vicinity of the open pit as the mining operation advances along with the movement of trucks and excavators that would generate dust. The result is the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
			WM	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate	Can be avoided, managed or mitigated
145	Trucks moving overburden to the overburden facility in the first 13 years of operation, graders maintaining the haul roads and water tankers wetting the roads	Dust generated by moving trucks that is visible from surrounding residential areas and public roads will result in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads. Night	**WOM**	Negative	Definite	5	Long term	4	Site	2	Medium	6	60	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated

		lighting during this phase.													
146	Growth of the overburden facility as the mining progresses. Concurrent backfilling and rehabilitation of open pit areas.	Physical presence of the overburden facility that alters the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	WOM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
			WM	Negative	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	Can be avoided, managed or mitigated
147	Lighting of the plant and office areas including security lighting.	Light pollution resulting in the alteration of the baseline visual quality and sense of place of the project site and its environs. Lights will be visible from nearby residential areas and public roads.	WOM	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low	Can be avoided, managed or mitigated
Closure and Decommissioning Phase															
148	Backfilling of overburden into open pit areas and final grading (shaping with graders) , laying of topsoil in selected areas and hydroseeding.	The final shaping (dust creation) and rehabilitation process that alters the visual quality and sense of place of the study area. These activities will be visible from nearby residential and homestead areas as well as public roads.	WOM	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Long term	4	Regional	3	medium	6	26	Low	Can be reversed
149	Removal of topsoil from the stockpile to rehabilitate damaged areas including the open pit, overburden and the mine infrastructure footprint areas	Improvement of the visual quality and sense of place of the project area visible from nearby residences areas and public roads.	WOM	Positive	Probable	2	Medium term	3	Site	2	Medium	6	22	Low	N/A
			WM	Positive	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	N/A
Post-Closure Phase															
150	Rehabilitation of exposed areas and growth of grasses and vegetation (management and maintenance)	Improvement of the visual quality and sense of place of the project area visible from nearby residences as well as public roads.	WOM	Positive	Improbable	1	Short term	1	Site	2	Low	2	5	Negligible	Can be reversed
			WM	Positive	Definite	5	Medium term	3	site	2	Low	2	35	Low	Can be reversed
Socio-economic Impacts															
Construction Phase															
151	Construction activities	Temporary stimulation of economy	WOM	Positive	Definite	5	Short term	1	Regional	3	Medium	6	50	Moderate	N/A
			WM	Positive	Definite	5	Short term	1	Regional	3	Medium	6	50	Moderate	N/A
152	Construction activities	Temporary creation of employment	WOM	Positive	Definite	5	Short term	1	Regional	3	Medium	6	50	Moderate	N/A
			WM	Positive	Definite	5	Short term	1	Regional	3	Medium	6	50	Moderate	N/A
153	Construction activities	Skills development due to the creation of new employment opportunities	WOM	Positive	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible	N/A
			WM	Positive	Highly Probable	4	Short term	1	Regional	3	High	8	48	Moderate	N/A
154	Construction activities	Government revenue increase due to capital expenditure	WOM	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
			WM	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A

155	Construction activities	Temporary increase in household income during construction	**WOM**	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
			WM	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
156	Construction activities	Loss of commercial activities - agriculture and tourism	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be avoided, managed or mitigated
157	Construction activities	Change to the sense of place	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
			WM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
158	Construction activities	Temporary increase in crime and social conflicts associated with influx of people	**WOM**	Negative	Highly Probable	4	Medium term	3	Regional	3	Medium	6	48	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Regional	3	Low	2	16	Negligible	Can be avoided, managed or mitigated
159	Construction activities	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	Negative	Highly Probable	4	Short term	1	Site	2	High	8	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible	Can be avoided, managed or mitigated
160	Construction activities	Impact on property values	**WOM**	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low	Can be avoided, managed or mitigated
161	Construction activities	Physical displacement and potential loss of family ties	**WOM**	Negative	Highly Probable	4	Permanent	5	Regional	3	Medium	6	56	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Permanent	5	Regional	3	Medium	6	28	Low	Can be avoided, managed or mitigated
162	Construction activities	Economic displacement of disadvantaged communities	**WOM**	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Regional	3	High	8	30	Low	Can be avoided, managed or mitigated
163	Construction activities	Increased pressure on local services and infrastructure	**WOM**	Negative	Definite	5	Short term	1	Regional	3	Medium	6	50	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible	Can be avoided, managed or mitigated
Operational Phase															
164	Mining and processing activities	Sustainable stimulation of economy	**WOM**	Positive	Definite	5	Long term	4	Regional	3	High	8	75	High	N/A
			WM	Positive	Definite	5	Long term	4	Regional	3	High	8	75	High	N/A
165	Mining and processing activities	Creation of employment	**WOM**	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
			WM	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
166	Mining and processing activities	Impact on government revenue	**WOM**	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
			WM	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
167	Mining and processing activities	Change to the sense of place	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
			WM	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	May cause irreplaceable loss of resources
168	Mining and processing activities	Increase in household income during operation	**WOM**	Positive	Highly Probable	4	Long term	4	Regional	3	Medium	6	52	Moderate	N/A
			WM	Positive	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	N/A
169	Mining and processing activities	Improved living standards of positively affected households	**WOM**	Positive	Probable	2	Long term	4	Regional	3	Medium	6	26	Low	N/A
			WM	Positive	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	N/A
170	Mining and processing activities	Skills development of permanently employed workers	**WOM**	Positive	Definite	5	Long term	4	Regional	3	Low	2	45	Moderate	N/A
			WM	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
171	Mining and processing activities	Local economic development benefits derived through mine's social responsibility programme	**WOM**	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
			WM	Positive	Definite	5	Long term	4	Regional	3	Medium	6	65	High	N/A
172	Mining and processing activities	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	Negative	Highly Probable	4	Long term	4	Regional	3	High	8	60	Moderate	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Long term	4	Regional	3	Medium	6	26	Low	Can be avoided, managed or mitigated
Closure and Decommissioning Phase															
173	Decommissioning of mine	Temporary stimulation of economy	**WOM**	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
			WM	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
174	Decommissioning of mine	Temporary employment	**WOM**	Positive	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible	N/A
			WM	Positive	Highly Probable	4	Short term	1	Regional	3	High	8	48	Moderate	N/A

175	Decommissioning of mine	Temporary increase in household income	**WOM**	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
			WM	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
176	Decommissioning of mine	Impact on government revenue	**WOM**	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
			WM	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
177	Decommissioning of mine	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	Negative	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	Can be avoided, managed or mitigated
Post-Closure & Rehabilitation Phase															
178	Mine rehabilitation and aftercare	Temporary stimulation of economy	**WOM**	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
			WM	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
179	Mine rehabilitation and aftercare	Temporary employment	**WOM**	Positive	Probable	2	Short term	1	Regional	3	Medium	6	20	Negligible	N/A
			WM	Positive	Highly Probable	4	Short term	1	Regional	3	High	8	48	Moderate	N/A
180	Mine rehabilitation and aftercare	Temporary increase in household income	**WOM**	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
			WM	Positive	Definite	5	Short term	1	Regional	3	Low	2	30	Low	N/A
181	Mine rehabilitation and aftercare	Impact on government revenue	**WOM**	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
			WM	Positive	Probable	2	Short term	1	Regional	3	Low	2	12	Negligible	N/A
182	Mine rehabilitation and aftercare	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	Negative	Probable	2	Short term	1	Site	2	Medium	6	18	Negligible	May cause irreplaceable loss of resources
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	Can be avoided, managed or mitigated
183	Mine rehabilitation and aftercare	Improved quality of life due to rehabilitation activities	**WOM**	Positive	Probable	2	Permanent	5	Site	2	Medium	6	26	Low	May cause irreplaceable loss of resources
			WM	Positive	Highly Probable	4	Permanent	5	Site	2	Medium	6	52	Moderate	Can be avoided, managed or mitigated
Traffic Impacts															
Construction Phase															
184	Vehicular operation and usage of roads	Increase in traffic	**WOM**	Negative	Definite	5	Medium term	3	Site	2	High	8	65	High	Can be avoided, managed or mitigated
			WM	Negative	Definite	5	Medium term	3	Site	2	High	8	65	High	Can be avoided, managed or mitigated
185	Construction of access roads and road upgrades	Improved access points	**WOM**	Positive	Highly Probable	4	Medium term	3	Site	2	High	8	52	Moderate	N/A
			WM	Positive	Definite	5	Permanent	5	Site	2	High	8	75	High	N/A
186	Construction of access roads and road upgrades	Impeded access	**WOM**	Negative	Highly Probable	4	Medium term	3	Site	2	Medium	6	44	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Short term	1	Site	2	Low	2	10	Negligible	Can be avoided, managed or mitigated
187	Construction of access roads and road upgrades	Improved road quality	**WOM**	Positive	Highly Probable	4	Medium term	3	Site	2	High	8	52	Moderate	N/A
			WM	Positive	Definite	5	Permanent	5	Site	2	High	8	75	High	N/A
188	Use of existing gravel roads	Deterioration of road quality	**WOM**	Negative	Highly Probable	4	Medium term	3	Site	2	High	8	52	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Short term	1	Site	2	Medium	6	9	Negligible	Can be avoided, managed or mitigated
189	Traffic accidents	Traffic accidents	**WOM**	Negative	Probable	2	Medium term	3	Site	2	High	8	26	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible	Can be avoided, managed or mitigated
Operational Phase															
190	Vehicular operation and usage of roads	Increase in traffic	**WOM**	Negative	Definite	5	Long term	4	Regional	3	High	8	75	High	Can be avoided, managed or mitigated
			WM	Negative	Definite	5	Long term	4	Site	2	High	8	70	High	Can be avoided, managed or mitigated
191	Use of existing gravel roads	Deterioration of road quality	**WOM**	Negative	Highly Probable	4	Long term	4	Site	2	High	8	56	Moderate	Can be avoided, managed or mitigated
			WM	Negative	Improbable	1	Long term	4	Site	2	Medium	6	12	Negligible	Can be avoided, managed or mitigated
192	Traffic accidents	Traffic accidents	**WOM**	Negative	Probable	2	Long term	4	Site	2	High	8	28	Low	Can be avoided, managed or mitigated
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	Can be avoided, managed or mitigated

15. CUMULATIVE IMPACTS

A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

The anticipated impacts resulting from the construction and implementation of this development could potentially result in cumulative effects in the following areas:

- Ecological and Wetland/Riparian impact
- Air Quality impact
- Visual impact
- Groundwater impact

15.1. Ecological and Wetland/Riparian Impact

The cumulative impacts associated with the construction, operational, decommissioning and closure phases are the same as included in Table 39 for the different mining components. The rating will be higher compared to the individual component ratings as the landscape scarring are permanent features affecting the species diversity and composition of the general vegetation patterns of the study area. This will contribute to a loss of diversity and species composition over the larger area of the specific vegetation type. Cumulative effects only become critical if there are no other suitable habitats in the adjacent areas. Water abstraction and dust pollution will also increase through the operation of the proposed mine. The impacts associated with the rehabilitation of the mining sites are positive considering that the rehabilitated land will improve habitats in the area, even though it still represents degraded land.

15.2. Air Quality Impact

Literature states that by adding the peak model concentrations to the background concentrations, this can result in severe overestimation of the source contribution and that a more realistic method is to add twice the annual mean background concentrations to the peak (or 99.9th percentile) (Ministry for the Environment, 2004). PM2.5 and PM10 have been sampled at the Mokopane ambient monitoring station. If the background PM2.5 and PM10 concentrations at Mokopane for the period 2019 are assumed to be representative of the project study area, the annual and daily cumulative ground level concentrations may increase with as follows:

- PM2.5: increasing with a further 15.8 μg/m³ (annual) and 31.6 μg/m³ (daily)
- PM10: increasing with a further 63.4 μg/m³ (annual) and 126.8 μg/m³ (daily)

15.3. Visual Impact

The proposed mine will be constructed / developed in phases over a period of approximately 30 years and as the mine develops it will contribute to the negative impact (high without mitigation moderate with effective mitigation) on the landscape aesthetics of the area. Cumulative effects also arise from the intervisibility of the range of mining developments within the sub-region. The separate effects of each of these developments may not be of major significance, but together they could create an unacceptable degree of adverse effects on visual receptors within their combined visual envelopes (this was a concern in the public engagement process). Intervisibility for mining projects to the north-west of the study area with the proposed mine, when combined over time, could therefore result in the sub-region being impacted upon in a manor beyond the anticipated negative impacts of the proposed mine alone.

15.4. Groundwater Impact

There is a current dewatering impact on groundwater in the project area due to existing abstraction in the area. The mean baseline groundwater levels (24m to 27 m) are 10-15 m deeper than would be expected, as groundwater levels declined by 0.5-1.0 m/a, which is not sustainable. This impact is currently rated as very high to low. Boreholes will be further impacted due to dewatering from the proposed mine and this will result in a very high to low cumulative impact. The radius of influence from dewatering may influence < 1800 ha in the vicinity of the proposed open pit with the drawdown of 50 – 55 m reaching < 1.7 km south-west, <1 km south-east, < 2.1 km north-west, and < 4.0 km north-east of the proposed pit.

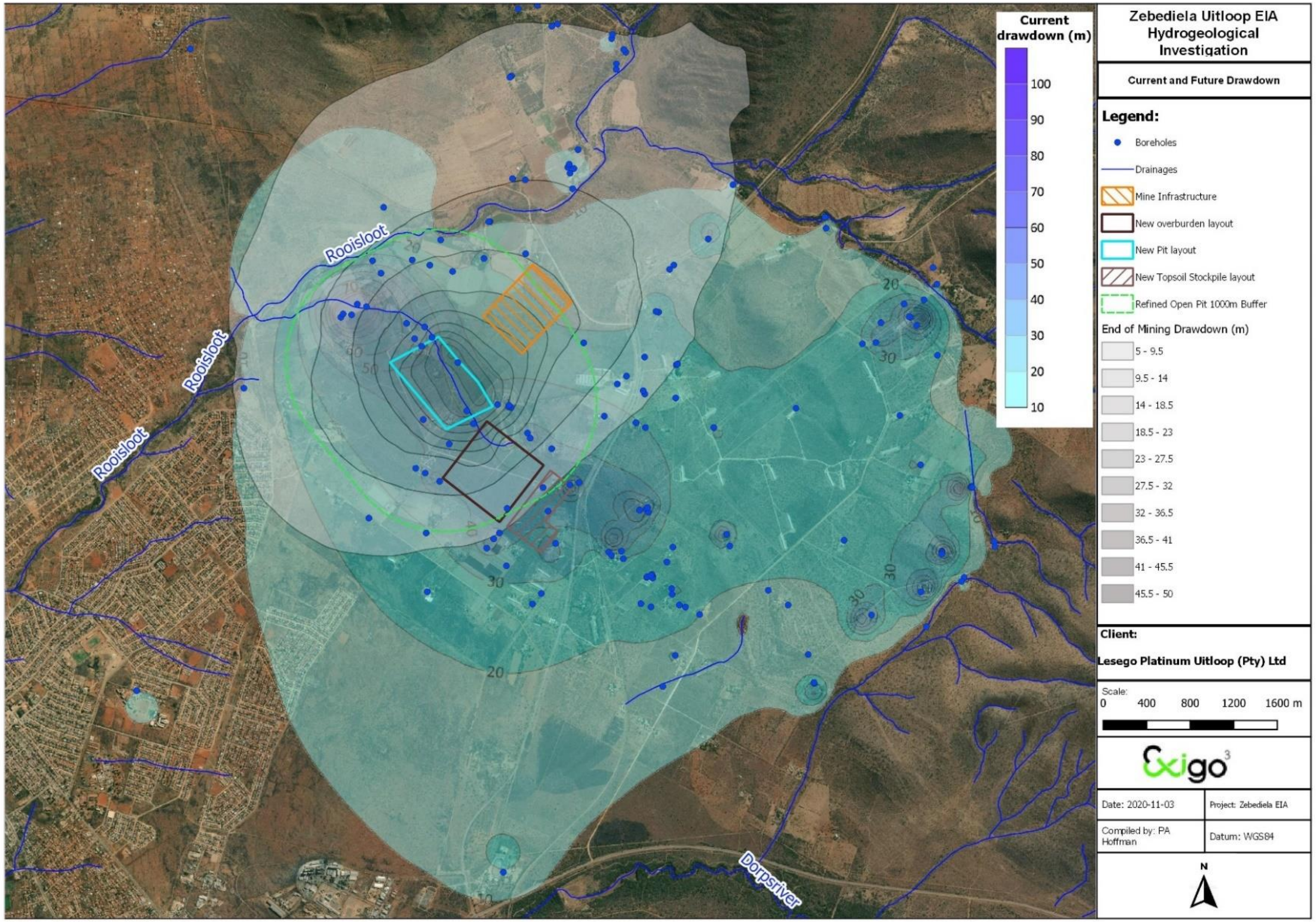


Figure 76: Current and future mine dewatering impact zones

16. 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).

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. Assessment of impacts will be based on the Department of Environmental Affairs Integrated Environmental Management (IEM) Information Series 5: Impact Significance. The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004)[7], that was adapted to fit this process and in line with the EIA Regulations of 2014 (as amended in 2017). These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts will be determined through a synthesis of the criteria below:

Probability. This describes the likelihood of the impact actually occurring.

Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
Probable:	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly Probable:	It is most likely that the impact will occur at some stage of the development.
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mitigatory actions or contingency plans to contain the effect.

Duration. The lifetime of the impact

Short term:	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
Medium term:	The impact will last up to the end of the phases, where after it will be negated.
Long term:	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
Permanent:	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale. The physical and spatial size of the impact

Local:	The impacted area extends only as far as the activity, e.g. footprint

[7] Plomp, H. A process for assessing and evaluating environmental management risk and significance in a gold mining company. Conference Papers-Annual National Conference of the International Association for Impact Assessment: South African Affiliate. 2004

Site: The impact could affect the whole, or a measurable portion of the above mentioned properties.

Regional: The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity. Does the impact destroy the environment, or alter its function.

Low: The impact alters the affected environment in such a way that natural processes are not affected.

Medium: The affected environment is altered, but functions and processes continue in a modified way.

High: Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance. This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

Negligible: The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.

Low: The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.

Moderate: The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.

High: The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights will be assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Short term	1
	Medium term	3
	Long term	4
	Permanent	5

Scale	Local	1
	Site	2
	Regional	3
Magnitude/Severity	Low	2
	Medium	6
	High	8
Significance	**Sum (Duration, Scale, Magnitude) x Probability**	
	Negligible	<20
	Low	<40
	Moderate	<60
	High	>60

The significance of each activity will be rated without mitigation measures and with mitigation measures for both construction, operational and closure phases of the proposed mine development.

The mitigation effect of each impact will be indicated without and with mitigation measures as follows:

- Can be reversed
- Can be avoided, managed or mitigated
- May cause irreplaceable loss of resources

17. 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

Refer to the Alternatives Assessment discussion in section 8.2 for the advantages and disadvantages of the site layout alternative options considered. An assessment of impacts identified for the proposed mine development was undertaken in section 14.

The positive and negative impacts with a high significance, without mitigation (WOM) are summarized in the table below. The impact rating with mitigation (WM) is indicated to the right. The complete impact rating is included in Table 39.

Table 40: High Significance Impacts

No	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance	
					Score	Magnitude
Ecological Impacts						
Construction Phase						
3	Clearing of vegetation for open pit, construction of infrastructure, access roads etc. causing direct habitat destruction / fragmentation	Habitat destruction / fragmentation of fauna habitats	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
4	Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation	Soil erosion and sedimentation	**WOM**	Negative	75	High
			WM	Negative	44	Moderate
6	Vegetation clearing / vehicle movement	Habitat degradation due to dust	**WOM**	Negative	75	High
			WM	Negative	60	Moderate
8	Clearing of vegetation for open pit through water courses as well as road crossings	Impediment of flow patterns	**WOM**	Negative	80	High
			WM	Negative	60	Moderate
Operational Phase						
10	Laydown areas of overburden facility and topsoil stockpile	Habitat destruction / fragmentation of fauna habitats	**WOM**	Negative	80	High
			WM	Negative	60	Moderate
11	Increased hardened surfaces around infrastructure and exposed areas around open pits, laydown areas of overburden facility and topsoil stockpile	Soil erosion and sedimentation	**WOM**	Negative	80	High
			WM	Negative	48	Moderate
13	Heavy machinery and vehicle movement on site	Habitat degradation due to dust	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
Soils, Agricultural Potential and Land Capability Impacts						
Construction Phase						
26	Topsoil & subsoil stripping	Soil destruction and sterilization	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
27	Heavy machinery and vehicle movement on site	Soil compaction	**WOM**	Negative	70	High
			WM	Negative	35	Low
28		Soil erosion and sedimentation	**WOM**	Negative	75	High

	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses		**WM**	Negative	44	Moderate
30	Topsoil & subsoil stripping	Loss of land capability	**WOM**	Negative	75	High
			WM	Negative	44	Moderate
Operational Phase						
31	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterilization	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
32	Heavy machinery and vehicle movement on site, laydown areas of overburden and topsoil facilities	Soil compaction	**WOM**	Negative	75	High
			WM	Negative	55	Moderate
33	Laydown areas of overburden and topsoil facilities, crushing and stockpiling	Increased Soil erosion and sedimentation	**WOM**	Negative	80	High
			WM	Negative	48	Moderate
35	Topsoil & subsoil stripping	Loss of land capability	**WOM**	Negative	75	High
			WM	Negative	44	Moderate
Heritage Impacts						
Construction Phase						
49	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	Negative	64	High
			WM	Negative	16	Negligible
Operational Phase						
53	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	Negative	64	High
			WM	Negative	16	Negligible
Hydrogeological Impacts						
Operational Phase						
68	Mine dewatering	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receives very low if any groundwater inflows	**WOM**	Negative	75	High
			WM	Negative	26	Low
Air Quality Impacts						
Operational Phase						
82	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	**WOM**	Negative	75	High
			WM	Negative	48	Moderate
83	Crushing and screening	Particulate emissions; fugitive dust	**WOM**	Negative	75	High
			WM	Negative	48	Moderate

Blasting & Vibration Impacts						
Operational Phase						
111	Open cast mining activities: blasting	Ground Vibration impact on Chicken Broilers	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
112	Open cast mining activities: blasting	Ground Vibration impact on Farm Buildings with various residences/sheds	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
113	Open cast mining activities: blasting	Ground Vibration impact on Houses	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
114	Open cast mining activities: blasting	Ground Vibration impact on Structures	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
115	Open cast mining activities: blasting	Ground Vibration impact on SANRAL Road	**WOM**	Negative	75	High
			WM	Negative	36	Low
116	Open cast mining activities: blasting	Air blast Impact on Chicken Broilers	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
117	Open cast mining activities: blasting	Air blast Impact on Farm Buildings/Structures	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
119	Open cast mining activities: blasting	Air blast Impact on Houses	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
121	Open cast mining activities: blasting	Air blast Impact on Informal Housing	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
123	Open cast mining activities: blasting	Air blast Impact on Ruins	**WOM**	Negative	65	High
			WM	Negative	36	Low
124	Open cast mining activities: blasting	Air blast Impact on Structure	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
125	Open cast mining activities: blasting	Fly rock Impact on Building/Structure	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
126	Open cast mining activities: blasting	Fly rock Impact on Cement Dam	**WOM**	Negative	75	High
			WM	Negative	36	Low
127	Open cast mining activities: blasting	Fly rock Impact on Chicken Broilers	**WOM**	Negative	75	High
			WM	Negative	36	Low
128	Open cast mining activities: blasting	Fly rock Impact on Farm Buildings/Structures	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
129	Open cast mining activities: blasting	Fly rock Impact on Gravel Road	**WOM**	Negative	75	High
			WM	Negative	36	Low
130	Open cast mining activities: blasting	Fly rock Impact on Heritage Site	**WOM**	Negative	75	High
			WM	Negative	36	Low
131	Open cast mining activities: blasting	Fly rock Impact on Houses	**WOM**	Negative	75	High
			WM	Negative	52	Moderate

132	Open cast mining activities: blasting	Fly rock Impact on Hydrocensus Borehole	**WOM**	Negative	65	High
			WM	Negative	36	Low
133	Open cast mining activities: blasting	Fly rock Impact on Informal Housing	**WOM**	Negative	75	High
			WM	Negative	36	Low
134	Open cast mining activities: blasting	Fly rock Impact on Pivot Irrigation	**WOM**	Negative	75	High
			WM	Negative	36	Low
135	Open cast mining activities: blasting	Fly rock Impact on Planned SANRAL Road	**WOM**	Negative	75	High
			WM	Negative	36	Low
136	Open cast mining activities: blasting	Fly rock Impact on Railway Line	**WOM**	Negative	65	High
			WM	Negative	36	Low
137	Open cast mining activities: blasting	Fly rock Impact on Reservoir	**WOM**	Negative	75	High
			WM	Negative	36	Low
138	Open cast mining activities: blasting	Fly rock Impact on Road	**WOM**	Negative	65	High
			WM	Negative	36	Low
139	Open cast mining activities: blasting	Fly rock Impact on Ruins	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
140	Open cast mining activities: blasting	Fly rock Impact on Structures	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
Visual Impacts						
Construction Phase						
141	Preparation of earthworks for pit area, mine infrastructure and topsoil and overburden facility areas and the construction of the offices, plant and infrastructure.	Build access roads to site, exposure of earth to create terraces for the construction activities - the building of the plant and office infrastructure. Prestrip site to establish open pit area. The exposure of earth and rock (stark contrast with existing landscape character) results in the altering of the visual quality and sense of place of areas around the project site. These activities which will also generate dust and will be visible in foreground and middleground views from residential areas and farmstead accommodation and public roads. Night lighting during this phase.	**WOM**	Negative	70	High
			WM	Negative	48	Moderate
Operational Phase						
144	Excavation of the mining areas using drill rigs, blasting, excavators and dozers.	Exposure of rock through blasting that would contrast with the existing natural landscape in the immediate vicinity of the open pit as the mining operation advances along with the movement of trucks and	**WOM**	Negative	75	High

		excavators that would generate dust. The result is the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WM**	Negative	60	Moderate
146	Growth of the overburden facility as the mining progresses. Concurrent backfilling and rehabilitation of open pit areas.	Physical presence of the overburden facility that alters the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WOM**	Negative	75	High
			WM	Negative	52	Moderate
Socio-economic Impacts						
Construction Phase						
157	Construction activities	Change to the sense of place	**WOM**	Negative	75	High
			WM	Negative	75	High
Operational Phase						
164	Mining and processing activities	Sustainable stimulation of economy	**WOM**	Positive	75	High
			WM	Positive	75	High
165	Mining and processing activities	Creation of employment	**WOM**	Positive	65	High
			WM	Positive	65	High
166	Mining and processing activities	Impact on government revenue	**WOM**	Positive	65	High
			WM	Positive	65	High
167	Mining and processing activities	Change to the sense of place	**WOM**	Negative	75	High
			WM	Negative	75	High
170	Mining and processing activities	Skills development of permanently employed workers	**WOM**	Positive	45	Moderate
			WM	Positive	65	High
171	Mining and processing activities	Local economic development benefits derived through mine’s social responsibility programme	**WOM**	Positive	65	High
			WM	Positive	65	High
Traffic Impacts						
Construction Phase						
184	Vehicular operation and usage of roads	Increase in traffic	**WOM**	Negative	65	High
			WM	Negative	65	High
185	Construction of access roads and road upgrades	Improved access points	**WOM**	Positive	52	Moderate
			WM	Positive	75	High
187	Construction of access roads and road upgrades	Improved road quality	**WOM**	Positive	52	Moderate

			WM	Positive	75	High
Operational Phase						
190	Vehicular operation and usage of roads	Increase in traffic	**WOM**	Negative	75	High
			WM	Negative	70	High

Most of the impacts associated with the development can be mitigated to negligible, low or moderate levels of significance. The impacts of high significance after mitigation are as follows:

- Socio-economic impacts
  - Change to the sense of place.
- Socio-economic benefits
  - Sustainable stimulation of economy
  - Creation of employment
  - Impact on government revenue
  - Skills development of permanently employed workers
  - Local economic development benefits derived through mine's social responsibility programme
- Traffic Impacts
  - Increase in traffic
  - Improved access points
  - Improved road quality

The above change to the sense of place impact, with a high significance following mitigation, is negative while the remaining socio-economic impacts are positive benefits of the project. The increase in traffic impact associated with the project is a negative impact with a high significance even with the implementation of mitigation, while the improved access points and road quality are positive impacts.

18. THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

Refer to Table 39 and Table 43.

19. MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

Refer to section 8 for site alternatives considered.

20. STATEMENT MOTIVATING THE ALTERNATIVE DEVELOPMENT LOCATION WITHIN THE OVERALL SITE

(DMR Guideline: provide a statement motivating the final site layout that is proposed)

A site selection matrix summarising the specialist recommendations and other practical considerations of the different sites are indicated in Table 5 under section 8. All the alternative sites assessed have positive and negative aspects associated with them. The following site location alternatives are preferred:

1. Overburden Facility and Topsoil Stockpile Site Location Alternative 3

Overburden Alternative 3 is preferred from a soil, land capability and agricultural potential; ecological; heritage, air quality and noise perspective. The layout of the Overburden facility alternative was further optimised to reduce the footprint from 49 ha to 44 ha and to ensure that the location is not underlain by dolomite and does not occur over any geological faults. Overburden Alternative 3 is also preferred due to practical engineering considerations (e.g. shorter hauling distance, lower operational and rehabilitation costs and carbon footprint) and as it is located outside the proposed SANRAL N11 Ring Road and reserve.

2. Mine Infrastructure Site Location Alternative 2

Alternative Option 2 is preferred over Alternative Option 1 as this location is situated closest to the open pit (approximately 500 m to the north-east of the proposed Open Pit on Portion 0 of Uitloop 3 KS). This will ensure that the ore won't need to be hauled far, which will lower the operational cost and carbon footprint of the project. Alternative site 2 is preferred from an air quality and noise perspective due to the least number of surrounding receptors and distance (over 1000 m) from the town of Mokopane. The location closest to road D1231 (Percy Fyfe Road) will also enable a higher noise level rating. The location of Mine Infrastructure Location Alternative 2 was further optimised to reduce the footprint from the original 53 ha to 33 ha, thereby lessening the impact on natural vegetation and protected trees. The layout of Option 2 was also optimised to fall outside the 1:100-year floodline of the Rooisloot River and avoid impacting on fertile soils under irrigation as far as possible. The site is located outside the proposed SANRAL N11 Ring Road and reserve.

21. 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

(DMR Guideline: 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)

Refer to EIA methodology in section 16 and Table 39 and Table 41 below.

22. ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

The supporting impact assessment conducted by the EAP is included in Table 39.

Table 41: Impact and Mitigation Type to be implemented.

No	Activity	Impact	Without or With Mitigation	Significance		Mitigation Type
				Score	Magnitude	
Ecological Impacts						
Planning Phase						
1	Obtaining of IWUL for crossings and mining through water courses	Delay of mining onset	WOM	50	Moderate	Compliance measure
			WM	32	Low	
2	Obtaining permits for the eradication of protected trees / flora	Delay of plant construction	WOM	20	Negligible	Compliance measure
			WM	16	Negligible	
Construction Phase						
3	Clearing of vegetation for open pit, construction of infrastructure, access roads etc. causing direct habitat destruction / fragmentation	Habitat destruction / fragmentation of fauna habitats	WOM	75	High	Control/reduction measure
			WM	55	Moderate	
4	Topsoil & subsoil stripping, exposure of soils, ore and rock to wind and rain during construction causing erosion and sedimentation	Soil erosion and sedimentation	WOM	75	High	Control/reduction measure
			WM	44	Moderate	
5	Vegetation clearing / vehicle movement	Spreading and establishment of alien invasive species	WOM	60	Moderate	Control/reduction measure
			WM	32	Low	Control/reduction measure
6		Habitat degradation due to dust	WOM	75	High	

	Vegetation clearing / vehicle movement		WM	60	Moderate	Control/reduction measure
7	Heavy machinery and vehicle movement on site	Spillages of harmful substances	WOM	52	Moderate	Avoidance/Prevention measure
			WM	16	Negligible	
8	Clearing of vegetation for open pit through water courses as well as road crossings	Impediment of flow patterns	WOM	80	High	Avoidance/Prevention measure
			WM	60	Moderate	
9	Heavy machinery and vehicle movement on site; Construction of infrastructure, roads etc. on site	Road mortalities of fauna / impact of human activities on site	WOM	52	Moderate	Avoidance/Prevention measure
			WM	14	Negligible	
Operational Phase						
10	Laydown areas of overburden facility and topsoil stockpile	Habitat destruction / fragmentation of fauna habitats	WOM	80	High	Control/reduction measure
			WM	60	Moderate	Control/reduction measure
11	Increased hardened surfaces around infrastructure and exposed areas around open pits, laydown areas of overburden facility and topsoil stockpile	Soil erosion and sedimentation	WOM	80	High	Control/reduction measure
			WM	48	Moderate	
12	Heavy machinery and vehicle movement on site	Spreading and establishment of alien invasive species	WOM	52	Moderate	Control/reduction measure
			WM	32	Low	
13	Heavy machinery and vehicle movement on site	Habitat degradation due to dust	WOM	75	High	Control/reduction measure
			WM	55	Moderate	Control/reduction measure
14	Heavy machinery and vehicle movement on site	Spillages of harmful substances	WOM	52	Moderate	Avoidance/Prevention measure
			WM	14	Negligible	
15	Heavy machinery and vehicle movement on site; workers accommodated on site causing poaching, wood collection, fires etc.	Road mortalities of fauna / impact of human activities on site	WOM	52	Moderate	Avoidance/Prevention measure
			WM	14	Negligible	
Closure and Decommissioning Phase						
16	Rehabilitation of mining site	Improvement of habitat through revegetation / succession over time	WOM	28	Low	Enhancement
			WM	60	Moderate	

17	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	WOM	48	Moderate	Control/reduction measure
			WM	12	Negligible	
18	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Spreading and establishment of alien invasive species	WOM	48	Moderate	Control/reduction measure
			WM	14	Negligible	
19	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site / vehicle movement on site	Habitat degradation due to dust	WOM	56	Moderate	Control/reduction measure
			WM	22	Low	
20	Heavy machinery and vehicle movement on site	Spillages of harmful substances	WOM	48	Moderate	Avoidance/Prevention measure
			WM	10	Negligible	
21	Heavy machinery and vehicle movement on site	Road mortalities of fauna / impact of human activities on site	WOM	52	Moderate	Avoidance/Prevention measure
			WM	14	Negligible	
Post-Closure & Rehabilitation Phase						
22	Natural Successional processes	Improvement of habitat through revegetation / succession over time	WOM	28	Low	Enhancement
			WM	60	Moderate	
23	Exposed surfaces / unrehabilitated areas on site post closure / poor monitoring during LoM	Soil erosion and sedimentation	WOM	44	Moderate	Control/reduction measure
			WM	8	Negligible	
24	Exposed surfaces / poor monitoring of revegetation on site	Spreading and establishment of alien invasive species	WOM	44	Moderate	Control/reduction measure
			WM	8	Negligible	
Soils, Agricultural Potential and Land Capability Impacts						
Planning Phase						
25	Obtaining of IWUL for crossings (hydric soils) and mining layout on sensitive soils	Delay of mining onset	WOM	26	Low	Compliance measure
			WM	8	Negligible	
Construction Phase						
26	Topsoil & subsoil stripping	Soil destruction and sterilization	WOM	75	High	Avoidance/Prevention measure
			WM	55	Moderate	
27	Heavy machinery and vehicle movement on site	Soil compaction	WOM	70	High	Control/reduction measure
			WM	35	Low	

28	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses	Soil erosion and sedimentation	**WOM**	75	High	Control/reduction measure
			WM	44	Moderate	
29	Heavy machinery and vehicle movement on site	Spillages of harmful substances	**WOM**	52	Moderate	Avoidance/Prevention measure
			WM	16	Negligible	
30	Topsoil & subsoil stripping	Loss of land capability	**WOM**	75	High	Avoidance/Prevention measure
			WM	44	Moderate	
Operational Phase						
31	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterilization	**WOM**	75	High	Remediation/corrective measure
			WM	55	Moderate	
32	Heavy machinery and vehicle movement on site, laydown areas of overburden and topsoil facilities	Soil compaction	**WOM**	75	High	Control/reduction measure
			WM	55	Moderate	
33	Laydown areas of overburden and topsoil facilities, crushing and stockpiling	Increased Soil erosion and sedimentation	**WOM**	80	High	Control/reduction measure
			WM	48	Moderate	
34	Heavy machinery and vehicle movement on site	Spillages of harmful substances to the soils	**WOM**	52	Moderate	Avoidance/Prevention measure
			WM	14	Negligible	
35	Topsoil & subsoil stripping	Loss of land capability	**WOM**	75	High	Remediation/corrective measure
			WM	44	Moderate	
Closure and Decommissioning Phase						
36	Demolition of mining infrastructure; Heavy machinery and vehicle movement on site	Improvement of eroded soils and compaction	**WOM**	28	Low	Enhancement
			WM	60	Moderate	
37	Demolition of mining infrastructure / Cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	**WOM**	52	Moderate	Control/reduction measure
			WM	14	Negligible	
38	Demolition of mining infrastructure, Heavy machinery and vehicle movement on site	Soil compaction	**WOM**	60	Moderate	Control/reduction measure
			WM	35	Low	
39	Heavy machinery and vehicle movement on site	Spillages of harmful substances	**WOM**	48	Moderate	Avoidance/Prevention measure
			WM	10	Negligible	

Post-Closure & Rehabilitation Phase						
40	Rehabilitation	Improvement of land capability	**WOM**	28	Low	Enhancement
			WM	60	Moderate	
41	Rehabilitation	Soil erosion and sedimentation	**WOM**	44	Moderate	Remediation/corrective measure
			WM	8	Negligible	
Heritage Impacts						
Planning Phase						
42	Siting of Open Pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	**WOM**	4	Negligible	N/A
			WM	4	Negligible	
43	Siting of Overburden Facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	**WOM**	4	Negligible	N/A
			WM	4	Negligible	
44	Siting of Mine Plant, Open Pit and Mine Roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	8	Negligible	N/A
			WM	4	Negligible	
45	Siting of Mine Plant, Open Pit and Mine Roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	10	Negligible	Avoidance/Prevention measure
			WM	4	Negligible	
Construction Phase						
46	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	**WOM**	36	Low	N/A
			WM	16	Negligible	
47	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	**WOM**	36	Low	N/A
			WM	16	Negligible	
48	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	36	Low	N/A
			WM	16	Negligible	
49	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	64	High	Avoidance/Prevention measure
			WM	16	Negligible	
Operational Phase						
50	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	**WOM**	36	Low	N/A
			WM	16	Negligible	

51	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	**WOM**	36	Low	N/A
			WM	16	Negligible	
52	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	36	Low	N/A
			WM	16	Negligible	
53	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	64	High	Avoidance/Prevention measure
			WM	16	Negligible	
Closure and Decommissioning Phase						
54	Rehabilitation of Open Pit footprint	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	**WOM**	5	Negligible	N/A
			WM	5	Negligible	
55	Rehabilitation of Overburden footprint	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	**WOM**	5	Negligible	N/A
			WM	5	Negligible	
56	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	9	Negligible	N/A
			WM	5	Negligible	
57	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	11	Negligible	N/A
			WM	5	Negligible	
Post-Closure & Rehabilitation Phase						
58	Rehabilitation of Open Pit footprint	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	**WOM**	5	Negligible	N/A
			WM	5	Negligible	
59	Rehabilitation of Overburden footprint	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	**WOM**	5	Negligible	N/A
			WM	5	Negligible	
60	Rehabilitation of plant, open pit and mine road footprints	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	9	Negligible	N/A
			WM	5	Negligible	
61	Rehabilitation of plant, open pit and mine road footprints	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	**WOM**	5	Negligible	N/A
			WM	5	Negligible	
Palaeontological Impacts						
Construction Phase						

62	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	WOM	32	Low	Avoidance/Prevention measure
			WM	32	Low	
63	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of fossils.	WOM	56	Moderate	Avoidance/Prevention measure
			WM	16	Negligible	
64	Construction of buildings, dams, roads, pylons. Exploration for mining	Preservation of fossils.	WOM	8	Negligible	Avoidance/Prevention measure
			WM	48	Moderate	
Hydrogeological Impacts						
Construction Phase						
65	Oil, grease and diesel spillages from construction vehicles	Contamination to ground- and surface water systems	WOM	36	Low	Avoidance/Prevention measure
			WM	18	Negligible	
66	On-site sanitation	Contamination to ground- and surface water systems	WOM	36	Low	Avoidance/Prevention measure
			WM	16	Negligible	
67	Storage of chemicals and building materials during construction of mine infrastructure	Contamination to ground- and surface water systems	WOM	44	Moderate	Avoidance/Prevention measure
			WM	10	Negligible	
Operational Phase						
68	Mine dewatering	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receives very low if any groundwater inflows	WOM	75	High	Remediation/ corrective measure
			WM	26	Low	
69	Spillages of hydrocarbons & reagents, use of explosives	Contamination to ground- and surface water systems		48	Moderate	Control measure
				24	Low	
70	Acid Mine Drainage (AMD) from the mine and overburden facility	Contamination to ground- and surface water systems	WOM	8	Negligible	N/A
			WM	8	Negligible	
71	Mass transport and seepage from overburden facility at the proposed	Contamination to ground- and surface water systems	WOM	60	Moderate	Avoidance/Prevention measure
			WM	28	Low	

	mine along surface drainages and groundwater pathways					
Closure and Decommissioning Phase						
71	Oxidation of backfilled material for example sulphates	Groundwater and surface water contamination	**WOM**	28	Low	Control measure
			WM	24	Low	
72	The formation of a pit lake during backfilling which will create elevated salt concentrations from higher evaporation on surface	The deterioration of the groundwater environment	**WOM**	28	Low	Control measure
			WM	10	Negligible	
73	Seepage and mass transport from overburden not yet backfilled and open-pit mine impacting on groundwater and surface water quality	Contamination to ground- and surface water systems	**WOM**	44	Moderate	Control measure
			WM	28	Low	
Post-closure and Rehabilitation Phase						
74	Contamination from the open pit and backfilled material not yet backfilled	Groundwater and surface water contamination	**WOM**	28	Low	Control measure
			WM	24	Low	
75	Formation of a pit lake after backfilling	Elevated salt concentrations from higher evaporation on surface leading to the deterioration of the groundwater environment contamination	**WOM**	28	Low	Control measure
			WM	22	Low	
76	Seepage and mass transport from opencast mine pit impacting on groundwater quality	Contamination to ground- and surface water systems	**WOM**	48	Moderate	Control measure
			WM	28	Low	
Air Quality Impacts						
Planning Phase						
77	Existing ambient baseline	Particulate emissions; fugitive dust	**WOM**	60	Moderate	Avoidance/Prevention measure
			WM	52	Moderate	
Construction Phase						
78	Transport and general construction activities	Gaseous and particulate emissions; fugitive dust	**WOM**	44	Moderate	Control/reduction measure
			WM	36	Low	
79	Clearing of groundcover and levelling of area	Particulate emissions; fugitive dust	**WOM**	44	Moderate	Control/reduction measure
			WM	36	Low	

80	Materials handling	Particulate emissions; fugitive dust	**WOM**	44	Moderate	Control/reduction measure
			WM	32	Low	
81	Wind erosion from open areas	Particulate emissions; fugitive dust	**WOM**	44	Moderate	Control/reduction measure
			WM	36	Low	
Operational Phase						
82	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	**WOM**	75	High	Control/reduction measure
			WM	48	Moderate	
83	Crushing and screening	Particulate emissions; fugitive dust	**WOM**	75	High	Control/reduction measure
			WM	48	Moderate	
84	Materials handling	Particulate emissions; fugitive dust	**WOM**	56	Moderate	Control/reduction measure
			WM	44	Moderate	
85	Wind erosion	Particulate emissions; fugitive dust	**WOM**	48	Moderate	Control/reduction measure
			WM	28	Low	
Closure and Decommissioning Phase						
85	Dust generated during rehabilitation activities	Particulate emissions; fugitive dust		44	Moderate	Control/reduction measure
				36	Low	
86	Demolition of infrastructure	Particulate emissions; fugitive dust		44	Moderate	Control/reduction measure
				36	Low	
87	Tailpipe emissions from the vehicles used during the closure phase	Gaseous and particulate emissions; fugitive dust		44	Moderate	Control/reduction measure
				36	Low	
Post-Closure & Rehabilitation Phase						
88	Wind erosion from open areas	Particulate emissions; fugitive dust	**WOM**	52	Moderate	Remediation/corrective measure
			WM	24	Low	
Noise Impacts						
Construction Phase						
89	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	22	Low	Control/reduction measure
			WM	5	Negligible	

90	Topsoil Stockpile	Noise impact on R1, R2 and R7	**WOM**	22	Low	Control/reduction measure
			WM	5	Negligible	
91	Open Cast Pit	Noise impact on R4 and R5	**WOM**	5	Negligible	Control/reduction measure
			WM	5	Negligible	
92	Open Cast Pit	Noise impact on R4 and R6	**WOM**	9	Negligible	Control/reduction measure
			WM	5	Negligible	
93	Open Cast Pit	Noise impact on R4 and R7	**WOM**	22	Low	Control/reduction measure
			WM	5	Negligible	
94	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	5	Negligible	Control/reduction measure
			WM	5	Negligible	
95	Plant	Noise impact on R7, R8 and R10	**WOM**	11	Negligible	Control/reduction measure
			WM	5	Negligible	
96	Plant	Noise impact on R7, R8 and R11	**WOM**	9	Negligible	Control/reduction measure
			WM	5	Negligible	
97	Plant	Noise impact on R7, R8 and R12	**WOM**	5	Negligible	Control/reduction measure
			WM	5	Negligible	
98	Haul Roads	Noise impact on R7 and R10	**WOM**	22	Low	Control/reduction measure
			WM	5	Negligible	
99	Topsoil Stockpile	Noise impact on R1, R2 and R7	**WOM**	5	Negligible	Control/reduction measure
			WM	5	Negligible	
Operational Phase						
100	Overburden Stockpile	Noise impact on R1, R2 and R6	**WOM**	24	Low	Control/reduction measure
			WM	8	Negligible	
101	Topsoil Stockpile	Noise impact on R1, R2 and R6	**WOM**	56	Moderate	
			WM	24	Low	
102	Open Pit	Noise impact on R4 and R5	**WOM**	24	Low	
			WM	8	Negligible	

103	Open Pit	Noise impact on R4 and R6	WOM	24	Low	
			WM	8	Negligible	
104	Open Pit	Noise impact on R4 and R7	WOM	56	Moderate	
			WM	24	Low	
105	Overburden Stockpile	Noise impact on R1, R2 and R6	WOM	16	Negligible	
			WM	8	Negligible	
106	Plant	Noise impact on R7, R8 and R10	WOM	16	Negligible	
			WM	8	Negligible	
107	Plant	Noise impact on R7, R8 and R10	WOM	24	Low	
			WM	8	Negligible	
108	Plant	Noise impact on R7, R8 and R10	WOM	16	Negligible	
			WM	8	Negligible	
109	Haul Roads	Noise impact on R7 and R10	WOM	56	Moderate	
			WM	24	Low	
110	Topsoil Stockpile	Noise impact on R1, R2 and R6	WOM	16	Negligible	
			WM	8	Negligible	
Blasting & Vibration Impacts						
Operational Phase						
111	Open cast mining activities: blasting	Ground Vibration impact on Chicken Broilers	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
112	Open cast mining activities: blasting	Ground Vibration impact on Farm Buildings with various residences/sheds	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
113	Open cast mining activities: blasting	Ground Vibration impact on Houses	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
114	Open cast mining activities: blasting	Ground Vibration impact on Structures	WOM	75	High	Control/reduction measure

			WM	52	Moderate	
115	Open cast mining activities: blasting	Ground Vibration impact on SANRAL Road	WOM	75	High	Control/reduction measure
			WM	36	Low	
116	Open cast mining activities: blasting	Air blast Impact on Chicken Broilers	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
117	Open cast mining activities: blasting	Air blast Impact on Farm Buildings/Structures	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
118	Open cast mining activities: blasting	Air blast Impact on Heritage Site	WOM	45	Moderate	Control/reduction measure
			WM	36	Low	
119	Open cast mining activities: blasting	Air blast Impact on Houses	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
120	Open cast mining activities: blasting	Air blast Impact on Hydrocensus Borehole	WOM	45	Moderate	Control/reduction measure
			WM	36	Low	
121	Open cast mining activities: blasting	Air blast Impact on Informal Housing	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
122	Open cast mining activities: blasting	Air blast Impact on Planned SANRAL Road	WOM	45	Moderate	Control/reduction measure
			WM	36	Low	
123	Open cast mining activities: blasting	Air blast Impact on Ruins	WOM	65	High	Control/reduction measure
			WM	36	Low	
124	Open cast mining activities: blasting	Air blast Impact on Structure	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
125	Open cast mining activities: blasting	Fly rock Impact on Building/Structure	WOM	75	High	Control/reduction measure

			WM	52	Moderate	
126	Open cast mining activities: blasting	Fly rock Impact on Cement Dam	WOM	75	High	Control/reduction measure
			WM	36	Low	
127	Open cast mining activities: blasting	Fly rock Impact on Chicken Broilers	WOM	75	High	Control/reduction measure
			WM	36	Low	
128	Open cast mining activities: blasting	Fly rock Impact on Farm Buildings/Structures	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
129	Open cast mining activities: blasting	Fly rock Impact on Gravel Road	WOM	75	High	Control/reduction measure
			WM	36	Low	
130	Open cast mining activities: blasting	Fly rock Impact on Heritage Site	WOM	75	High	Control/reduction measure
			WM	36	Low	
131	Open cast mining activities: blasting	Fly rock Impact on Houses	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
132	Open cast mining activities: blasting	Fly rock Impact on Hydrocensus Borehole	WOM	65	High	Control/reduction measure
			WM	36	Low	
133	Open cast mining activities: blasting	Fly rock Impact on Informal Housing	WOM	75	High	Control/reduction measure
			WM	36	Low	
134	Open cast mining activities: blasting	Fly rock Impact on Pivot Irrigation	WOM	75	High	Control/reduction measure
			WM	36	Low	
135	Open cast mining activities: blasting	Fly rock Impact on Planned SANRAL Road	WOM	75	High	Control/reduction measure
			WM	36	Low	
136	Open cast mining activities: blasting	Fly rock Impact on Railway Line	WOM	65	High	Control/reduction measure

			WM	36	Low	
137	Open cast mining activities: blasting	Fly rock Impact on Reservoir	WOM	75	High	Control/reduction measure
			WM	36	Low	
138	Open cast mining activities: blasting	Fly rock Impact on Road	WOM	65	High	Control/reduction measure
			WM	36	Low	
139	Open cast mining activities: blasting	Fly rock Impact on Ruins	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
140	Open cast mining activities: blasting	Fly rock Impact on Structures	WOM	75	High	Control/reduction measure
			WM	52	Moderate	
Visual Impacts						
Construction Phase						
141	Preparation of earthworks for pit area, mine infrastructure and topsoil and overburden facility areas and the construction of the offices, plant and infrastructure.	Build access roads to site, exposure of earth to create terraces for the construction activities - the building of the plant and office infrastructure. Prestrip site to establish open pit area. The exposure of earth and rock (stark contrast with existing landscape character) results in the altering of the visual quality and sense of place of areas around the project site. These activities which will also generate dust and will be visible in foreground and middleground views from residential areas and farmstead accommodation and public roads. Night lighting during this phase.	WOM	70	High	Control/reduction measure
			WM	48	Moderate	
142	Removal of vegetation, topsoil and soft overburden from mining (open pit) areas.	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	WOM	60	Moderate	Control/reduction measure
			WM	55	Moderate	
Operational Phase						
143	Removal of vegetation, topsoil and soft overburden from mining (open pit) areas.	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the	WOM	60	Moderate	Control/reduction measure
			WM	55	Moderate	

		middleground and background from residential areas and farmsteads and sections of public roads.				
144	Excavation of the mining areas using drill rigs, blasting, excavators and dozers.	Exposure of rock through blasting that would contrast with the existing natural landscape in the immediate vicinity of the open pit as the mining operation advances along with the movement of trucks and excavators that would generate dust. The result is the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WOM**	75	High	Control/reduction measure
			WM	60	Moderate	
145	Trucks moving overburden to the overburden facility in the first 13 years of operation, graders maintaining the haul roads and water tankers wetting the roads	Dust generated by moving trucks that is visible from surrounding residential areas and public roads will result in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads. Night lighting during this phase.	**WOM**	60	Moderate	Control/reduction measure
			WM	16	Negligible	
146	Growth of the overburden facility as the mining progresses. Concurrent backfilling and rehabilitation of open pit areas.	Physical presence of the overburden facility that alters the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	**WOM**	75	High	Control/reduction measure
			WM	52	Moderate	
147	Lighting of the plant and office areas including security lighting.	Light pollution resulting in the alteration of the baseline visual quality and sense of place of the project site and its environs. Lights will be visible from nearby residential areas and public roads.	**WOM**	60	Moderate	Control/reduction measure
			WM	24	Low	
Closure and Decommissioning Phase						
148	Backfilling of overburden into open pit areas and final grading (shaping with graders) , laying of topsoil in selected areas and hydroseeding.	The final shaping (dust creation) and rehabilitation process that alters the visual quality and sense of place of the study area. These activities will be visible from nearby residential and homestead areas as well as public roads.	**WOM**	48	Moderate	Remediation/corrective measure
			WM	26	Low	
149	Removal of topsoil from the stockpile to rehabilitate damaged areas including the open pit, overburden and the mine infrastructure footprint areas	Improvement of the visual quality and sense of place of the project area visible from nearby residences areas and public roads.	**WOM**	22	Low	Enhancement
			WM	48	Moderate	
Post-Closure Phase						
150			**WOM**	5	Negligible	Enhancement

	Rehabilitation of exposed areas and growth of grasses and vegetation (management and maintenance)	Improvement of the visual quality and sense of place of the project area visible from nearby residences as well as public roads.	**WM**	35	Low	
Socio-economic Impacts						
Construction Phase						
151	Construction activities	Temporary stimulation of economy	**WOM**	50	Moderate	Enhancement
			WM	50	Moderate	
152	Construction activities	Temporary creation of employment	**WOM**	50	Moderate	Enhancement
			WM	50	Moderate	
153	Construction activities	Skills development due to the creation of new employment opportunities	**WOM**	20	Negligible	Enhancement
			WM	48	Moderate	
154	Construction activities	Government revenue increase due to capital expenditure	**WOM**	30	Low	N/A
			WM	30	Low	
155	Construction activities	Temporary increase in household income during construction	**WOM**	30	Low	N/A
			WM	30	Low	
156	Construction activities	Loss of commercial activities - agriculture and tourism	**WOM**	56	Moderate	Control/reduction measure
			WM	56	Moderate	
157	Construction activities	Change to the sense of place	**WOM**	75	High	Control/reduction measure
			WM	75	High	
158	Construction activities	Temporary increase in crime and social conflicts associated with influx of people	**WOM**	48	Moderate	Control/reduction measure
			WM	16	Negligible	
159	Construction activities	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	44	Moderate	Control/reduction measure
			WM	18	Negligible	
160	Construction activities	Impact on property values	**WOM**	26	Low	Avoidance/Prevention measure
			WM	26	Low	
161	Construction activities	Physical displacement and potential loss of family ties	**WOM**	56	Moderate	Avoidance/Prevention measure
			WM	28	Low	
162	Construction activities	Economic displacement of disadvantaged communities	**WOM**	60	Moderate	

			WM	30	Low	Avoidance/Prevention measure
163	Construction activities	Increased pressure on local services and infrastructure	WOM	50	Moderate	Avoidance/Prevention measure
			WM	20	Negligible	
Operational Phase						
164	Mining and processing activities	Sustainable stimulation of economy	WOM	75	High	Enhancement
			WM	75	High	
165	Mining and processing activities	Creation of employment	WOM	65	High	Enhancement
			WM	65	High	
166	Mining and processing activities	Impact on government revenue	WOM	65	High	N/A
			WM	65	High	
167	Mining and processing activities	Change to the sense of place	WOM	75	High	Enhancement
			WM	75	High	
168	Mining and processing activities	Increase in household income during operation	WOM	52	Moderate	Enhancement
			WM	60	Moderate	
169	Mining and processing activities	Improved living standards of positively affected households	WOM	26	Low	Enhancement
			WM	60	Moderate	
170	Mining and processing activities	Skills development of permanently employed workers	WOM	45	Moderate	Enhancement
			WM	65	High	
171	Mining and processing activities	Local economic development benefits derived through mine's social responsibility programme	WOM	65	High	N/A
			WM	65	High	
172	Mining and processing activities	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	WOM	60	Moderate	Control/reduction measure
			WM	26	Low	
Closure and Decommissioning Phase						
173	Decommissioning of mine	Temporary stimulation of economy	WOM	12	Negligible	N/A
			WM	12	Negligible	
174	Decommissioning of mine	Temporary employment	WOM	20	Negligible	Enhancement
			WM	48	Moderate	

175	Decommissioning of mine	Temporary increase in household income	**WOM**	30	Low	N/A
			WM	30	Low	
176	Decommissioning of mine	Impact on government revenue	**WOM**	12	Negligible	N/A
			WM	12	Negligible	
177	Decommissioning of mine	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	20	Negligible	Control/reduction measure
			WM	12	Negligible	
Post-Closure & Rehabilitation Phase						
178	Mine rehabilitation and aftercare	Temporary stimulation of economy	**WOM**	12	Negligible	N/A
			WM	12	Negligible	
179	Mine rehabilitation and aftercare	Temporary employment	**WOM**	20	Negligible	Enhancement
			WM	48	Moderate	
180	Mine rehabilitation and aftercare	Temporary increase in household income	**WOM**	30	Low	N/A
			WM	30	Low	
181	Mine rehabilitation and aftercare	Impact on government revenue	**WOM**	12	Negligible	N/A
			WM	12	Negligible	
182	Mine rehabilitation and aftercare	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	**WOM**	18	Negligible	Control/reduction measure
			WM	10	Negligible	
183	Mine rehabilitation and aftercare	Improved quality of life due to rehabilitation activities	**WOM**	26	Low	Enhancement
			WM	52	Moderate	
Traffic Impacts						
Construction Phase						
184	Vehicular operation and usage of roads	Increase in traffic	**WOM**	65	High	Avoidance/ Prevention measure
			WM	65	High	
185	Construction of access roads and road upgrades	Improved access points	**WOM**	52	Moderate	
			WM	75	High	
186	Construction of access roads and road upgrades	Impeded access	**WOM**	44	Moderate	
			WM	10	Negligible	

187	Construction of access roads and road upgrades	Improved road quality	**WOM**	52	Moderate	
			WM	75	High	
188	Use of existing gravel roads	Deterioration of road quality	**WOM**	52	Moderate	
			WM	9	Negligible	
189	Traffic accidents	Traffic accidents	**WOM**	26	Low	Avoidance/ Prevention measure
			WM	14	Negligible	
Operational Phase						
190	Vehicular operation and usage of roads	Increase in traffic	**WOM**	75	High	
			WM	70	High	
191	Use of existing gravel roads	Deterioration of road quality	**WOM**	56	Moderate	Avoidance/ Prevention measure
			WM	12	Negligible	
192	Traffic accidents	Traffic accidents	**WOM**	28	Low	Avoidance/ Prevention measure
			WM	16	Negligible	

23. 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):

Table 42: Summary of specialist recommendations

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Socio-economic Impact Assessment	The following is recommended to increase the employment opportunities created in the local communities, where feasible: • Employ labour-intensive methods in construction, where feasible. • Employ local residents and communities, where possible. • Sub-contract to local construction companies, where possible. • Utilise local suppliers, where possible. • Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for	X	Refer to Table 43 and Appendix 6.1: Socio-Economic Impact Assessment
Archaeological Impact Assessment	• It is likely that in situ Stone Age remains might occur in previously untransformed and undetected contexts in the larger landscape. As such, it is recommended that these areas be monitored by an informed ECO in order to avoid the destruction of previously undetected heritage remains. • it is recommended that the Historical Period quarries and the remains of Historical Period settlement areas older than 60 years areas be monitored by an informed ECO in order to avoid the destruction of previously undetected heritage remains. The necessary destruction permits should be obtained from the relevant Heritage Resources Authorities prior to site alteration or destruction. Generally, the sites should be closely monitored by an informed ECO in order to avoid the destruction of previously undetected heritage remains or human burial sites. • It is primarily recommended that a 50m conservation buffer be implemented around all burial sites. The infrastructure components proposed for the project should be designed in such a way as to avoid encroaching on the required 50m conservation buffer. It is further recommended that the burial sites be fenced off with wire, chicken wire or palisade fencing of a minimum height of 1.8m placed no closer than 2m from the burials. Each burial should have an access gate and access control should be applied to the site. A heritage Site Management Plan (SMP) should be compiled for each of the burials to stipulate conservation measures, responsible persons and chance find procedures for further heritage mitigation. The developer should carefully liaise with the heritage specialist, SAHRA as well as local communities and possible affected parties with regards to the management and monitoring	X	Refer to Table 43 and Appendix 6.2: Heritage Impact Assessment

	of any human grave or cemetery in order to detect and manage negative impact on the sites. Should impact on any of the burial sites prove inevitable, full grave relocations are recommended for these burial grounds. This measure should be undertaken by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains. A full social consultation process with the descendant family and other affected parties should occur in conjunction with the mitigation of cemeteries and burials. • It is recommended that the initial stages of the development on Portions 51, 52 and Portion 0 of Uitloop 3 KS be monitored to re-assess the presence of possible heritage resources in the project area. • It is recommended that the EIA public participation and social consultative process address the possibility of further graves occurring in the project area. • Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately. • It is essential that cognisance be taken of the larger archaeological landscape of the area in order to avoid the destruction of previously undetected heritage sites. It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the Study Area along water sources and drainage lines, fountains and pans, which would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development.		
Palaeontological Impact Assessment	• As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive. • The overburden and inter-burden must always be surveyed for fossils during construction or mining. Special care must be taken during the digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden during construction not to intrude upon fossiliferous layers. This should be overseen by an Environmental Control Officer. • Care must be taken during any dolomite risk assessment according to SANS 1936-1 (2012) as stromatolites may be present. • Mitigation may be needed if a fossil is found, in this case, the area must be fenced off with a no-go barrier of 30 m. • Mitigation may be needed if a fossil is found, in this case, the area must be fenced off with a no-go barrier of 30 m. • The development may go ahead with caution, if a fossil is found, all construction must stop, and SAHRA must be notified. The Environmental Control Officer must familiarise him- or herself with the Malmani Subgroup fossils.	X	Refer to Table 43 and Appendix 6.2: Heritage Impact Assessment

	• As part of the Environmental Authorisation conditions, an Environmental Control Officer (ECO) will be appointed to monitor the construction activities in line with the legally binding Environmental Management Programme Report (EMPR) so that when a fossil is unearthed they can notify the relevant department and specialist to further investigate. Therefore, the EMPR must include the involvement of a palaeontologist (for training of ECO and in an advisory capacity). The ECO together with the mine geologist must survey for fossils after blasting, digging and excavation (ground breaking).		
Ecological Impact Assessment and Wetland/Riparian Delineation	• Any eradication of the protected trees (Boscia albitrunca, Sclerocarya birrea documented throughout the area at low densities) listed in the National Forest Act would need a licence being obtained from DAFF. • All alien species should be eradicated, while larger tree species should be preserved where possible to enhance the aesthetic state of the habitat. • Any impact (mining through drainage) would need a water licence application to DWS. The management of stormwater water around the open pit should be addressed by a hydrological engineer. A grass canal should be established to divert water around the open pit. The canal should be planted with hydrophytic grasses and sedges to provide habitat to various waterfowl, small mammals and reptilians. • A rehabilitation plan should be developed for the proposed mine inclusive of the recommended grass canal. • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction. • No animals may be poached. Many animals are protected by law and poaching or other interference could result in a fine or jail term. • Do not feed any wild animals on site. • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. • Roads in the area should be designed without vertical pavements to allow for the movement of small mammals. Culverts underneath roads at drainage crossings provide easy migration of smaller fauna. • Monitoring of the environmental aspects is recommended for the future phases of the proposed development should the authorities approve the application.		Refer to Table 43 and Appendix 6.3: Ecological Impact Assessment and Wetland/Riparian Delineation
Soils, Agricultural Potential and Land Capability Assessment	• It is recommended that topsoil originating from different areas should be stored separately during the operational phase. • It is recommended that topsoil from stockpiles in excess of 5 meters be used first for concurrent rehabilitation.	X	Refer to Table 43 and Appendix 6.4: Soils, Agricultural Potential and Land Capability Impact Assessment
Hydrogeological Impact Assessment	• The 3D numerical groundwater model needs to be updated before commencement of mining activities with updated impacts and mitigation, followed by an annual recalibration and update of the groundwater model.	X	Refer to Table 43 and Appendix 6.5: Hydrogeological Impact Assessment

	• A geochemical specialist study and speciation model needs to be developed to evaluate the geochemical environment based on plant processes and environmental geochemical reactions with potential mass movement. The results from the geochemical analysis (ore and overburden material) would also need to be incorporated with the updated iteration of the model • A structural geological model should be developed and output fed back into the groundwater model. • The life of mine dynamic water, mass, and salt balance model must be developed to quantify the process water circuit which is the driver of potential seepage sources and subsequently needs to be updated before the commencement of mining and updated yearly with operational parameters. • It is recommended that dolomite specialists investigate the dolomitic nature of the geology especially within the vicinity of the planned mining infrastructure to evaluate the potential of subsidence. • A sub minimum of five additional monitoring boreholes need to be drilled up- and downstream of the proposed mining area and subsequently monitored as indicated in Appendix D: Monitoring Protocol of the Hydrogeological Impact Assessment. It is important to note that existing receptor monitoring boreholes cannot be used for monitoring purposes before the land has been procured. The borehole construction and geological logs of existing boreholes are also not available. The conceptual monitoring localities will however be reviewed following the next iteration of the numerical model. • The monitoring protocol (Appendix D: Monitoring Protocol Appendix D: Monitoring Protocol of the Hydrogeological Impact Assessment.) needs to be adhered to and reviewed after two years of operations to ensure sufficient and efficient data is being collected and interpreted. Annual internal and external reviews and audits of the environmental monitoring needs to be conducted by an independent entity. The monitoring data should be archived on a digital database for future reference. • Management and mitigation measures should be implemented as recommended in the Hydrogeological Impact Assessment.		

Environmental Mine Water Balance & Water Supply Options Analysis	• Make-up water should be secured and at the same time develop a plan to manage the groundwater resources sustainably. This can be achieved by establishment of a single water supply entity that can monitor and manage the groundwater systems.
	• Water supply options identified in this study should be expanded with specific reference to the surface water dam and additional potential to supplement water supply to the mine, Mokopane and local communities and expansion to a full mine with a processing plant and tailings facility.
	• Enhancing recharge and managing alien vegetation should be investigated and the volumes of water that it could supply to the groundwater systems.
	• The mine water balance should be updated with an integrated dynamic version with daily time steps to optimise the buffer storage capacities and pumping rates required.
	• The mine water balance model should include a chemical constituent (salt) balance model to simulate the life of mine water quality.
	• It would be important to manage the open pit sump, and stockpile volumes to enable continuous operation of the plant in flood conditions.
	• Options to manage surplus water should be investigated in more detail.
	• Flow meters must be installed at the following locations:
	  ○ Open Pit Ring Main
	  ○ Open Pit Sump to Settling Dam and Plant Process (Raw) Water Dam
			Refer to Table 43 and Appendix 6.6: Environmental Mine Water Balance and Water Supply Options Analysis

	○ External water resource to plant. ○ Overflows to pollution control dams • Flow meters must be calibrated at least once a year. • A mine water and salt management plan must be developed to ensure sustainable water quantity and quality management with specific reference to management of flood events during the surplus water period. • The outcomes of the water management model should be included and aligned to the EIA or other authorizations required, with specific reference to discharge events and water quality. • A mine water management committee should be instated who reports to a single water manager to enable integrated mine water management. • A digital (online) water information management system should be integrated with the SCADA for real time dewatering status and pressure response reports. • The mine water and salt mass balance model must be updated and recalibrated at least once a year. • Shaping of the overburden facility should be investigated to maximise infiltration and minimise runoff.		
Stormwater Management Plan	• The dams and drain sizes in this project were sized optimally with some minor additional capacity to act as a safety factor. Care should however be taken to keep dam levels to a minimum in the wet season.		Refer to Table 43 and Appendix 6.7: Environmental Stormwater Management Plan (SWMP)
Air Quality Impact Assessment	• It is recommended that receptors within the impacted area (i.e. exceedance of the NAAQS (see section 4.2.2.3 of the Air Quality Impact Assessment Report)) be relocated. If this is not possible, it is recommended that a PM10 sampling campaign be undertaken (once activities commence) at the closest receptors to the operations in order to ensure that NAAQS are being met. • Due to the close proximity of sensitive receptors to project activities, it is recommended that chemical suppression or paving (90% control efficiency) be applied to all unpaved road sections to minimise the impact from this source on the surrounding areas. • It is recommended that as a minimum, mitigation by means of water sprayers (providing a 50% control efficiency) at the crushing and screening plant be implemented to minimise impacts from this source. Due to the close proximity of sensitive receptors to the operations, additional mitigation such as hooding and scrubbers should be implemented if feasible. • It is recommended that dust fallout and PM10 sampling, as outlined in section 6.2.3.2 of the Air Quality Impact Assessment Report, be undertaken in order to monitor the impacts from the proposed project activities	X	Refer to Table 43 and Appendix 6.8: Air Quality Impact Assessment
Noise Impact Assessment	• It is highly recommended that the Environmental Co-ordinator keep continuous communication with receptors regarding noises and potential loud noise events. Prior knowledge of a noise event will be far more ideal than a receptor who has not been notified of loud noise circumstance. • Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g. concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence.	X	Refer to Table 43 and Appendix 6.9: Noise Impact Assessment

	• The construction team should make use of equipment that has lower SPL or is designed to produce lower SPL (heavy equipment operating within 300m of a receptor). • It is recommended to implement a berm barrier on the south-eastern plant footprint boundary in relation to Receptor R7 and R10. • Should any tipping be required on the outsides of the overburden/topsoil tip or berm (over the stockpiles directly facing a receptor) the tipping is recommended to take place during the daytime hours (recommended between 07:00 and 21:00), and in relation to receptors R1, R2 and R6. • A berm or barrier could be implemented at the boundary of the haul road corridor. This does not need to be a berm, but a solid double brick wall (no apertures, at least 1m higher than the highest noise source on an ADT, e.g. exhaust port at height of cabin). The barrier would require enclosing the property or be long enough along the road corridor to create an acoustical shadow along the length (e.g. at least 50m from the property in each direction). • The developer could approach the receptor and municipalities to request in writing an exemption in terms of noise. This agreement is an acceptance of the potential night-time exceedance of the Rating level during a worst-case situation. There also exists certain applications that could be taken, including zoning the route as a “controlled area” to operate at a higher level. • If feasible the haul route could operate at lower frequencies during the hours of 21:00 till 07:00 (one hour before/after SANS10103:2008 Rating level day/night), or acceptable hours that is agreed between receptors and mine. • The mine could consult with an acoustical consultant to implement mitigation at the receptor’s dwellings. Options could include double glazing, acoustical mitigation within the roof void, windows and doors that seal etc. • The mine could investigate an alternative layout with a minimum 250m distance between the receptor and the haul route. • Where feasible noisy equipment should be enclosed. These enclosures could be double brick building units, concrete or steel. Units that are enclosed should have minimal apertures (openings) facing receptors (north-west direction, receptors R8). The building should have a roof enclosure as well. Equipment that should be considered for some enclosure are the crushers, screening plant, screen and feed conveyor area, emergency loading hopper (if feasible). • Should evaluated receptors in this report (R1 – R11) be relocated, the impact significance can be considered as negligible. • Should a receptor remain that has been identified as relocated (see Appendix D and Figure 2 of the Noise Impact Assessment), the Noise Impact Assessment must be re-assessed with the noise sensitive development (NSD) reinstated for assessment. • Where feasible, noisy equipment and areas (crushing, screening and specifically tipping points and conveyor feeds) should not be raised at high elevations. The noisy equipment and areas should be located as low as possible for acoustical berms and surrounding buildings/stockpiles to act as noise shields. • Should the project operations require alarms (e.g. when an operation ceases), an acoustical consultant/engineer should be consulted to ensure minimal alarm noise direction into the direction of receptors (north-west direction). Although these alarms are exempt from the acoustical assessment,		

	these alarms (should they go off frequently) have a potential to cause a noise nuisance should it be measurable/audible at receptors. • The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. Although heavy vehicle reverse alarms are exempt from noise legalisation (GN R154) and needs to meet occupational health and safety standards, certain reverse alarms are less intrusive (less tonal more broadband character etc.). • Should the layout change as assessed in the Noise Impact Assessment, the report layout must be reviewed in terms of environmental acoustics. • If the project proposes to extend or expand local municipality routes, a noise assessment should be conducted (GN R154 legislation requirement). Expansion or extend refers to a municipal road that the project engineers require to add an extra lane or change the specifications of the road paving etc. • Onsite noise measurements should be considered on a frequent basis, to help identify any fault or loud equipment that may require enclosures or maintenance. A Quarterly noise measurements programme is recommended during all phases. • If feasible, engineering test should be conducted during noise measurements to identify any noisy equipment requiring enclosures, or equipment where maintenance is required.		

Traffic Impact Assessment	• It is recommended that access to the mine be obtained off Road D1603. A formal access application will need to be made to Limpopo Road Agency (RAL).
	• It is recommended that the following mitigation measures are implemented:
	  • Intersection: R101 and Road D1231: 60m left-slip lane on R101 western approach.
	  • Intersection: Road D1603 and D1231: 60m left-slip lane on D1231 southern approach.
	  • Intersection: Road D1603 and Mine access: 60m left-slip lane on D1603 eastern approach.
	  • The structural capacity of Road D1231 needs to be assessed to determine if this road can accommodate the expected traffic demand from the mine.
	• It is recommended that Road D1603 be upgraded with the relevant road pavement design to an appropriate standard.
		X	Refer to Table 43 and Appendix 6.10: Traffic Impact Assessment

Visual Impact Assessment	• Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation. • Adopt responsible construction practices aimed at containing the construction/establishment activities to specifically demarcated areas. • Construction activities should be limited not to occur after 22:00. • Lower the mine infrastructure area terrace along the northern side (i.e. cut to fill with most cut occurring along the southern edge) to reduce visibility of activities from the nearby residences (north-west and the local road immediately north of it • In addition to the lowering of the terrace, it is recommended that a three-meter-high berm around the mine infrastructure area is developed and which extends: along the northern section of the eastern boundary; along the northern boundary and along the northern half of the western boundary. The berm should be hydroseeded and planted with trees indigenous to the area (i.e. that occur in the Polokwane Plateau Bushveld veld type).	X	Refer to Table 43 and Appendix 6.11: Visual Impact Assessment

	• Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities is exposed. In all other areas, the natural occurring vegetation, should be retained, especially along the periphery of the sites. • All cut and fill slopes and areas affected by construction work (mine infrastructure and administration areas) should be progressively top-soiled and re-vegetated as soon as possible. • The proposed 5 m high and 10 m wide berm around the entire pit perimeter should be hydroseeded. • Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants enhance biodiversity, a desirable outcome for the area. This approach can significantly reduce long term costs as less maintenance would be required over conventional landscaping methods as well as the introduced landscape being more sustainable. • A registered Professional Landscape Architect, working alongside the project ecologist should be appointed to assist with the final rehabilitation plan for the project. • Minimise the number of light fixtures to the bare minimum, including security lighting • When possible limit night-driving to the absolute minimum.		
Blasting and Vibration Assessment	• The mine may need to consider the relocation of all infrastructure within 500 m from the pit boundary. • Regulatory requirements indicate specific requirements for all non-mining structures and installations within 500 m from the mining operation. The mine will have to apply for the necessary authorisations as prescribed in the various acts, and specifically Mine Health and Safety Act Regulation 4.16 as well as recommendations regarding infrastructure within the pit areas. • The Mine Health and Safety Act Regulation 17.6(a) will be applicable and will need to be considered. The location of the opencast pit boundary is closer than 100 m from private installations and the necessary legal requirements will need to be addressed. • Blast designs should be reviewed prior to first blast planned. It is recommended that such a first test blast to confirm levels and ground vibration and air blast be done, and detail monitoring be done and used to help define blasting operations going forward. • The current proposed stemming lengths used provides for limited 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 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. • The calculated minimum safe distance for blasting is 1239 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 needs to determine this distance. • The planned SANRAL N11 ring road is 210m from the pit area. When blasting is to be conducted closer than the safe boundary (this will need to be determined in a risk assessment for drilling and blasting) road traffic management will be required. Traffic will need to be stopped during blasting times		Refer to Table 43 and Appendix 6.12: Blasting and Vibration Assessment

	at the pre-determined safe distances. There are also smaller local farm access roads in close proximity of the pit area that will also require traffic management during blasting periods. The local community should be consulted with regards to road closures. SANRAL must be consulted regarding closures on the new planned road. The Railway line is at closest distance of 1141 m and does not require any specific mitigations. • The option of photographic survey of all structures up to 1500 m from the pit areas is recommended. This process will ensure record of the pre-blasting status of the nearest structures to the pit areas. • The mine has opted to prescribe a recommended ground vibration limit of 10 mm/s. Additional recommended ground vibration and air blast levels limits for blasting operations are provided in Table 31 of the Blasting & Vibration Study Report. • 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. Blasting is not recommended in fog, the dark, when wind is blowing strongly in the direction of an outside receptor or with low overcast clouds. 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. • 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. • A video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions. • It is highly recommended that a changed blast design should be considered. It is recommended that blasthole diameters are reduced to 165 mm with stemming lengths of 4.1 m minimum. Single hole firing is to be investigated once a first blast is planned and may still be considered to manage impacts.		
Financial Closure Provision and Rehabilitation Plan	• Undertake concurrent rehabilitation over and above structural and functional rehabilitation, such as implementing water treatment projects that treat and clean water during the LoM. • Undertake projects that can enrich the soil profile in the area and generate topsoil onsite • It is recommended that trials are undertaken during the early stages of the project to prove that topsoil and / or a growth-medium can be generated onsite in preparation with the amount required for closure.	X	Refer to Table 43 and Blasting and Vibration Assessment

Refer to Appendix 6: Specialist Reports.

24. ENVIRONMENTAL IMPACT STATEMENT

24.1. Summary of the key findings of the environmental impact assessment

The findings of the specialist studies undertaken within this EIA&EMPR provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. Most specialist studies concur that, provided that all the mitigation and management measures and specialist recommendations are implemented, there are no environmental fatal flaws that should prevent the proposed project from proceeding. Most of the high significance can be mitigated to moderate or low significance.

The Traffic Impact Assessment by Havenga (2020) however identified that the impact due to an increase in traffic from the proposed mine will still be high even with the implementation of mitigation measures. Havenga (2020) recommends the upgrading of slip lanes to accommodate truck turning movements. It is also recommended that Road D1603 be upgraded with the relevant road pavement design to an appropriate standard. The Traffic Impact Assessment found the impacts from improved access points and improved road quality to be positive and of a high significance with the implementation of mitigation measures. The Socio-Economic Impact Assessment also found that impacts due to a change in sense of place from the mine will remain high with the recommended mitigation measures. However the Visual Impact Assessment (GYLA, 2020) found that the alteration of the visual quality and sense of place of the study area will be moderate with the implementation of mitigation measures. The proposed N11 Ring Road runs through the proposed mining area close to the open mine pit and effectively cuts the southern part of the mining area in two. In discussions with SANRAL the implementation of this road is a priority and is expected to commence in the near future. It should therefore be noted that impacts in terms of traffic and a change in sense of place will still occur due to the planned N11 Ring Road.

The Socio-Economic Impact Assessment (Urban-Econ, 2020) identified a total of thirty-three social and economic impacts for all project phases. The negative social and economic impacts relate to 1) loss of commercial activities, mainly agriculture and tourism; 2) change to the sense of place; 3) increase in crime and social conflicts associated with an influx of people, 4) deterioration of quality of life due to dust, noise, visual, water supply and water pollution as well as other environmental impacts; 5) impact on property values; 6) economic displacement of disadvantaged communities; and 7) increased pressure on local services and infrastructure. These impacts can however be mitigated to negligible, low and moderate significance with the implementation of mitigation measures, apart from the impact on the sense of place as mentioned above. Of the thirty-three identified impacts, twenty-one impacts are positive impacts and relate to 1) stimulation of the economy; 2) creation of employment; 3) skills development; 4) increase in government revenue due to capital expenditure; 5) increase in household incomes; 6) improved living standards of positively affected households and due to rehabilitation activities; and 7) local economic development benefits derived through the mine's social responsibility programme.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA&EMPR will form part of the contract with the contractors appointed to construct and maintain the proposed mine and associated infrastructure. The EIA&EMPR would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA&EMPR for key cycle phases (i.e. construction, operation, closure/decommissioning and post-closure/rehabilitation) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

24.2. Final Site Map

Refer to Appendix 4: Site Plan

24.3. Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

Refer to section 17.

25. PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

1. Specialist recommendations which could be included as conditions have been discussed in Table 42.
2. Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Table 39 and Table 43 and contained in the respective studies.

26. FINAL PROPOSED ALTERNATIVES

Refer to section 8.

27. ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

1. Provision of surface lease agreements or purchase agreements with relevant landowners prior to commencement of construction phase/post-authorisation.
2. Compensation agreements to be entered into with relevant landowners prior to construction.
3. An Environmental Noise Measurement Programme (Monitoring Programme) needs to be implemented. See section 8.2 of the Noise Impact Assessment Report. An independent acoustical consultant should investigate operations. Monitoring must be done to assess for a disturbing noise or a noise nuisance, identifying any potential acoustical issues (e.g. equipment that is broken that could be creating exceeding noise levels). This will also ensure that future community/receptor encroachment or development can be tracked (documentation of development of the area and environmental acoustics). The compliance in terms of noise levels at the project boundary is also required.
4. The Eskom Transmission (Tx) Warmbad-Witkop 1 275kV powerlines will be affected by the proposed mine as such the following terms and conditions must be complied with:
   - No construction or excavation work shall be executed within 20 metres from any Eskom power line structure. All work within Eskom Tx's servitude areas shall comply with the relevant Eskom earthing standards in force at the time.
   - The use of explosives of any type within 500 metres of Eskom Tx's services, shall only occur with Eskom Tx's previous written permission. If such permission is granted the applicant must give at least fourteen (14) working days prior notice of the commencement of blasting.

- Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion.
- No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom Tx's apparatus and/or services, without prior written permission having been granted by Eskom Tx. If such permission is granted the applicant must give at least seven working days' notice prior to the commencement of work.
- No work shall commence unless Eskom Tx has received the applicant's written acceptance of the conditions specified in this letter of consent within 30 days of the date of this letter and or before commencement of any work.
- No work shall commence unless Eskom Tx has received the applicant's written acceptance of the conditions specified in the letter of consent dated 10 March 2020 before commencement of any work.
- Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area.
- The clearances between Eskom Tx's live electrical equipment and the proposed construction work shall be observed as stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).

5. Refer to Table 42 for a full list of conditions which could possibly be included in the Environmental Authorisation.

28. DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

Assumptions and limitations applicable to the assessment process and mitigation measures proposed in specific specialist studies include the following:

Socio-economic Study

- Project-related information supplied by the environmental practitioner and the client for the analysis is assumed to be reasonably accurate.
- The secondary data sources used to compile the socio-economic baseline (demographics and the dynamics of the economy) although not exhaustive, can be viewed as being indicative of broad trends within the study area.
- The identification of possible impacts was based on the experience of the project team with similar studies in the past and given the existing level of knowledge of the socio-economic environment.
- Possible impacts, as well as stakeholder responses to the identified impacts, cannot be predicted with complete accuracy, even when circumstances are similar and these predictions are based on research and years of experience, taking the specific set of circumstances into account.

Ecology & Wetland/Riparian Study

- In order to obtain a comprehensive understanding of the dynamics of the flora and fauna of the study area, surveys should ideally be replicated over several seasons and over a number of years. However, due to project time and budget constraints such long-term studies are not feasible and this biodiversity study was conducted over one season.

- The large study area did not allow for the finer level of assessment that can be obtained in smaller study areas. Therefore, data collection in this study relied heavily on data from representative, homogenous sections of vegetation units, as well as general observations, aerial photograph analysis, generic data and a desktop analysis;
- This report focuses only on the wetlands / riparian zones at the proposed development footprints. Other wetland / riparian areas further away from the proposed development were not assessed.

Thus, even though it might be assumed that survey findings are representative of the ecosystem of the project area, it should be stated that the possibility exists that individual plants or animal species might have been missed due to the nature of the terrain. Therefore, maintaining due cognisance of the integrity and accuracy of the ecological survey, it should be stated that the ecological resources identified during the study do not necessarily represent all the ecological resources present on the property.

Soils, Agricultural Potential and Land Capability Study

- In order to obtain a comprehensive understanding of the dynamics of the soils of the study area, surveys should ideally be replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible;
- The large study area did not allow for the finer level of assessment that can be obtained in smaller study areas. Therefore, data collection in this study relied heavily on data from representative, homogenous sections of soils, as well as general observations, aerial photograph analysis, generic data and a desktop analysis.

Palaeontological Study

The accuracy and reliability of the study may be limited by the following constraints:

- Most development areas have never been surveyed by a palaeontologist or geophysicist.
- Variable accuracy of geological maps and associated information.
- Poor locality information on sheet explanations for geological maps.
- Lack of published data.
- Lack of rocky outcrops.
- Inaccessibility of site.
- Insufficient data from developer and exact layout plan for all structures.

Heritage Study

The site survey primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the aerial survey) as well as areas of high human settlement catchment. In summary, the following constraints were encountered during the site survey:

- The surrounding vegetation in the project area is mostly comprised out of mixed grasslands, occasional trees and hilltop vegetation. The general visibility at the time of the site inspection ranged from high to low and visibility constrained site identification in the project area, particularly Portions 51, 52 and Portion 0.

It should be noted that, even though it might be assumed that survey findings are representative of the heritage landscape of the project area for the Project, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

Air Quality Study

- Ambient data:
  - NO2, SO2, PM10 and PM2.5 ambient concentrations were assessed. This information was obtained from the South African Air Quality Information System (SAAQIS) website for the Mokopane monitoring station managed by DEFF.
- Emissions:
  - The project emission inventory was limited to airborne particulates, including PM10, PM2.5 and TSP (total suspended particulates).
  - Information required for the calculation of emissions from fugitive dust sources for the proposed project operations was provided by the client. The assumption was made that this information was accurate.
  - Routine emissions from the proposed project operations were estimated and modelled. Atmospheric releases occurring as a result of non-routine operations or accidents were not accounted for.
- Impact assessment:
  - The simulated impacts are screened against health effect screening levels, NAAQS and NDCR. The report does not include a comprehensive health risk assessment.
  - The impact assessment is confined to the quantification of impacts on human health due to exposures via the inhalation pathway only and not through the ingestion and dermal absorption pathways for humans.
  - The construction and closure phases were assessed qualitatively due to the temporary nature of these operations, whilst the operational phase was assessed quantitatively.

Noise Study

There are limitations and uncertainties regarding acoustical measurements. Noise levels has the potential to fluctuate based on numerous components, including:

- Longer-term measurements (as well as night measurements) were unfeasible due to safety issues of equipment. Site investigations, measurements (in terms of the SANS10103:2008) and desktop assessment is deemed as sufficient to determine the Rating level.
- A SANRAL route is proposed traversing/intersecting between the plant and open cast pit. This route will not form part of the study. This limitation is mentioned as the measurement programme developed is for the mine only. It also should be noted that the planned route may have the potential to change the Rating (an assumption), with the Noise Impact Assessment still making use of assessed rating levels as measured on site (Rural Rating).
- The noise level may change from day to day due to activities within a community (e.g. road traffic fluctuations, see point below) or even at a singular dwelling itself. Dwelling related infrastructure (e.g. air-conditioning units, swimming pool pumps etc.) that has the potential to influence noise levels in terms of dB.

- Seasonal changes have the potential to influence sound levels directly (e.g. rain) or indirectly (influence from faunal communication, see point below).
- Faunal communication measurement fluctuations due to seasonal, time of day or night etc. Certain fauna communicates during certain hours e.g. cicada may only be audible during night-hours, crepuscular birds are only audible during evening or night hours, crickets may be more audibly active as seasons get hotter etc.
- Measurements near mining and industries fluctuates depending on equipment in use, capacity load in use, unforeseen equipment in care and maintenance. Certain equipment may not be running optimally, with the consequence been excessive elevated noise levels (e.g. gas leaks, conveyor pulley roller squeaking, excessive vibrations (and associated noise) from unmaintained dampers on equipment etc.
- Road traffic noise fluctuates due to time of measurement investigation (e.g. peak traffic morning or evening conditions, early morning hours etc.; and
- Metrological conditions can influence noise measurements. These include inversion and diffraction in the temperature layer, change in temperature and humidity etc.

Where necessary longer-term measurements may be required to be conducted. For a Rating level determination 10-minute measurement (day and night), desktop assessment (of development of the area) as well as onsite investigations can be considered sufficient. For a noise source investigation (e.g. operational monitoring) longer-term measurements may counter above limitations (if confidence in 10-minute measurements is low).

Traffic Study

The use of the proposed N11 Ring Road is proposed for the transport of ore to a nearby mine. In discussions with SANRAL the implementation of this road is a priority and is expected to commence in the near future. Exact time frames are not yet available but it can be assumed that the road will be commissioned in the next 5 years. Trucks from the mine could therefore use this road in the near future and will therefore not have to use Road D1603 to the existing N11.

Stormwater Management Plan

The Rational Method was used to calculate the run-off estimation and is based on the following assumptions:

- The rate of rainfall is constant throughout the storm and uniform over the entire catchment.
- Catchment imperviousness remains constant for the duration of the storm.
- The contributing impervious area is uniform over the entire catchment.

Blasting and Vibration Study

- The project area is not currently an active mining operation. No drilling and blasting are being done. Estimates applied are based on standard accepted equations for predictions.
- 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 regarding ground vibration and air blast.
- Blast Management & Consulting was not involved in the blast design. The information on blast design applied was provided by the client.
- The study is based on the author's knowledge and information provided by the project applicant.

Visual Study

- The extent of the study area is determined by the zone of potential influence, which in this study relates to a radius of 10,0km around the Project site[8].
- The description of project components is limited to what has been supplied to the author prior to the date of completion of this report.[9]
- The accuracy of the viewshed analysis depends on the quality of the input digital surface model (DSM). Readily available digital contours for the area are limited to 20m contours. We have interpolated these down to 1m intervals to get better accuracy. However, these types of viewshed investigations (using readily available GIS software and terrain contours only) are limited in their accuracy due to their inability to incorporate vegetation information. To be more accurate at predicting absolute visibility, the analysis would require "a 3D model of a tree/plant and a layer indicating the spatial distribution and density of vegetation on the landscape" (Llobera 2007:799) and buffering all existing buildings, structures and infrastructure. The possibility of indicating both, the spatial and density distribution of tree/plants, and the three-dimensional model representing vegetation and all structures, is currently not available to the author. Therefore, on-site observations are critical. These indicated that many views from within the study area are blocked to the project site by existing buildings and vegetation (specifically west and north of the site).
- Site photos were taken in the winter and do not reflect the complete landscape character of the area as experienced through all seasons. The weather was sunny with moderate haze conditions.

Environmental Water Balance and Water Supply Study

- Monthly rainfall data for Mokopane climate number:06338827 was used for a period of 90 years, which was supplemented with daily data for 19 years;
- There is limited runoff data available for disturbed land surface types and thus there is uncertainty associated with these numbers. Conservative-case scenarios were simulated in aligned with the precautionary principle (NEMA, 1998).

Hydrogeological Study

The following assumptions and limitations apply to the numerical groundwater model:

- Prior to development, the flow system is in equilibrium and therefore in steady state.

[8] Distance Zones set of pre-determined distances from a viewpoint and help in delineating the extent of a study area. In the Bureau of Land Management's visual resource management system, landscapes are subdivided into three distanced zones based on relative visibility from travel routes or observation points. The three zones are foreground-middleground, background, and seldom seen. The foreground-middleground zone includes areas seen from highways, rivers, or other viewing locations that are less than 5–8 km away. Seen areas beyond the foreground-middleground zone but usually less than 24 km away are in the background zone. Areas not seen as foreground-middleground or background (i.e., hidden from view) are in the seldom-seen zone (US Department of the Interior. 2013).

[9] Exigo 2020 10 16 (Zebediela) Updated Project Description. docx

- Recharge from rainfall over the area is between 1.5% and 5.0% (8.8 mm/a to 29.5 mm/a) of MAP i.e. 580 mm/a (Appendix 6.5: Hydrogeological Impact Assessment).
- The aquifer system is represented by a three-dimensional system consisting of 17 hydraulic zones within the first layer, 21 hydraulic zones within the second layer, and 21 hydraulic zones within the third layer (Appendix 6.5: Hydrogeological Impact Assessment).
- The modelling approach was based on the precautionary principle in areas where limited data was available This means that the simulated impacts should be larger than would be the actual case. To improve on the model accuracy, monitoring and model updates with recalibrations should be done in the pre-construction and operational phases with adaptive management measures implemented to manage impacts and mitigation measures.
- Due to the regional scale of the model, faults were modelled conservatively as approximately 50 m wide in their horizontal influence and were believed to be vertically deeper than the model's bottom boundary. These faults are assumed planar and vertical in orientation.
- The geochemical results for the ore and overburden material were outstanding when this report was compiled. The samples were however submitted to a laboratory for analysis according to GNR 635 and GNR 636 and will be incorporated into the hydrogeological report. Conservative assumptions were made regarding residue facilities chemical source term.
- As identified from the 2019 and 2020 hydrocensus surveys, the area is dependent on groundwater abstraction for socio- and economic purposes. From the hydrocensus data, most boreholes classified as being used for water supply, production, or irrigation purposes; had a (conservative) constant abstraction rate of 1 ℓ/s assigned. Domestic and livestock boreholes had constant rates assigned ranging between 0.05 and 1 ℓ/s. Boreholes to the north of the planned opencast mine have higher yields as some of these boreholes supply the municipality with water daily.
- When assumptions were made or reference values used, a conservative approach was followed. A groundwater model is an approximation of the real system, and aims to simulate system behaviour and potential changes with developments.

Financial Provision and Rehabilitation Study

- No provision is made for Tailings Storage Facilities (TSFs): neighbouring and existing TSFs will be utilised for this project;
- Not enough detail is available at this stage to assess and determine the potential cost of rehabilitating and/or removal of geomembranes, HDPE, under-drainage and barrier systems that may be required to be implemented as per the water use license conditions;
- There is no detail on powerlines & cable racks;
- Partial Backfill will be undertaken, therefore a void will remain at the end of LOM;
- Topsoil and/or growth mediums will be generated on site during the LOM.

29. REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

Please refer to section 24.1 for a summary of the key findings of the EIA.

The findings of the specialist studies undertaken within this EIA&EMPR provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. As mentioned in section 24.1, most specialist studies conducted for the project concur that, provided that all the mitigation and management measures and specialist recommendations are implemented, that there are no environmental fatal flaws that should prevent the proposed project from proceeding.

The Traffic Impact Assessment by Havenga (2020) identified that the increase in traffic from the proposed mine will be considered an impact of high significance even with the implementation of mitigation measures. The Traffic Impact Assessment found the positive benefits from improved access points and improved road quality to be of high significance with the implementation of mitigation measures. The Socio-Economic Impact Assessment also found that impacts due to a change in sense of place from the mine will remain high with the recommended mitigation measures. However the Visual Impact Assessment (GYLA, 2020) found that the alteration of the visual quality and sense of place of the study area will be moderate with the implementation of mitigation measures. The proposed N11 Ring Road runs through the proposed mining area close to the open mine pit and effectively cuts the southern part of the mining area in two. In discussions with SANRAL the implementation of this road is a priority and is expected to commence in the near future. It should therefore be noted that impacts in terms of traffic and a change in sense of place will still occur due to the planned N11 Ring Road.

The Socio-Economic Impact Assessment (Urban-Econ, 2020) for the project stated that creation of employment in the area, as well as the associated skills development through training of local people for the commercial and mining sectors, will be a high positive impact and will be a significant benefit of the project. The new employment opportunities created will increase household income levels and buying power which, in turn, will benefit local entrepreneurs, businesses and service providers; thereby resulting in sustainable stimulation of the economy and an increase in government revenue. The proponent's proposed social development projects could also enhance the economic opportunities for local people.

30. CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

30.1. Specific conditions to be included into the compilation and approval of EMPR

Please refer to section 27.

30.2. Rehabilitation requirements

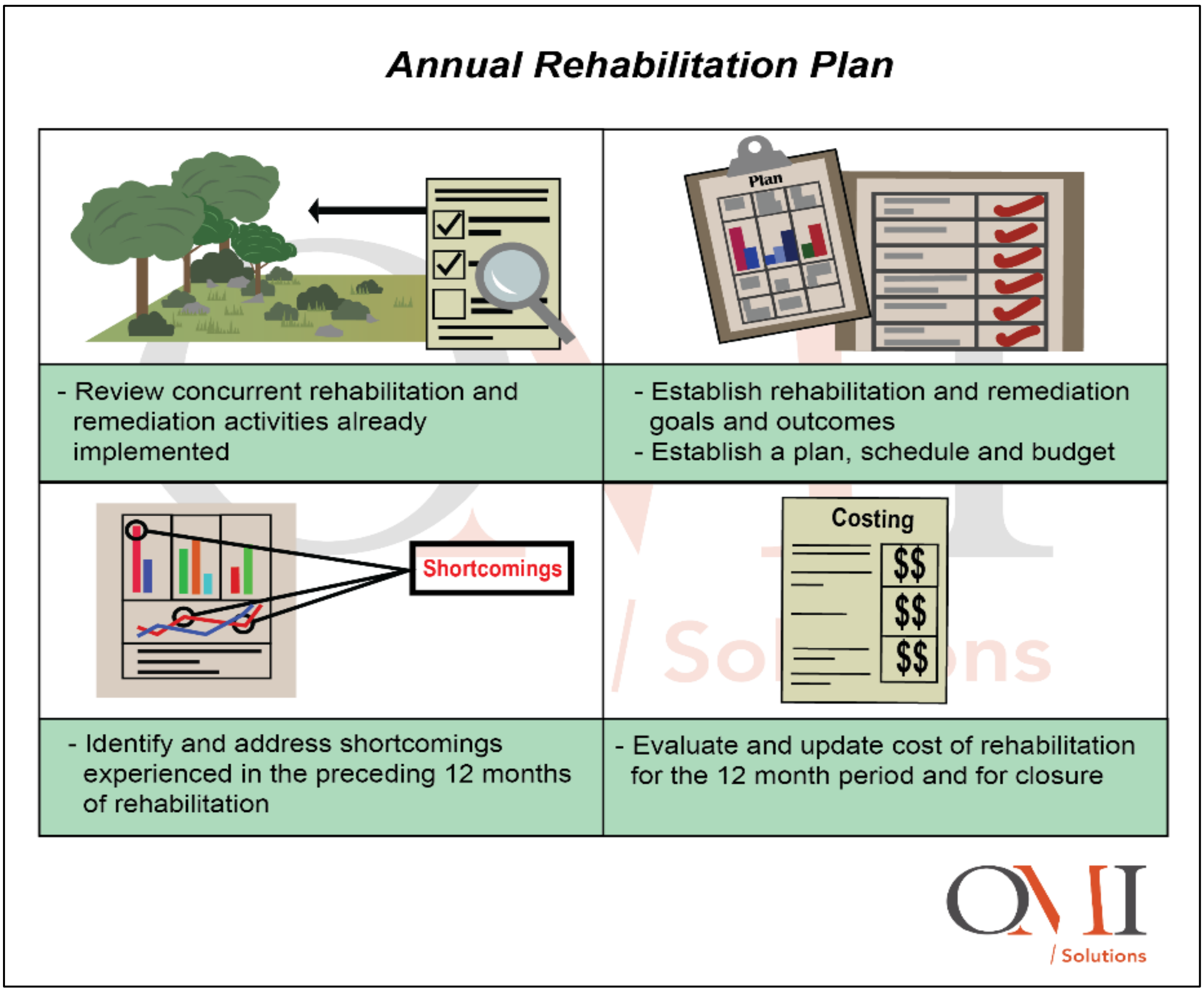
The overarching mine closure objectives aim to ensure sustainability beyond mine closure and leave a positive legacy post closure. An Annual Rehabilitation plan is compiled and assessed on an Annual Basis (refer to the schematic in the figure below). The Annual Rehabilitation is in line with the Scheduled (Planned) approach.

In Year 1, 545 070 m^3 of waste is planned to be stockpiled and this forms part of the overall concurrent rehabilitation strategy. As part of the Final Rehabilitation, Decommissioning and Closure Plan, 67.30% of the void will remain at the end of LoM. Backfill of the pit will only commence in Year 9 and it will stop in Year 13. Backfilling will initially be at a rate of 287,695 m3 per annum. No other dismantling, decommissioning and/or rehabilitation is planned in Year 1.

Therefore, there are only two measurable components that can be measured as part of Year 1 rehabilitation which is in line with the Final Rehabilitation, Decommissioning and Closure Plan namely:

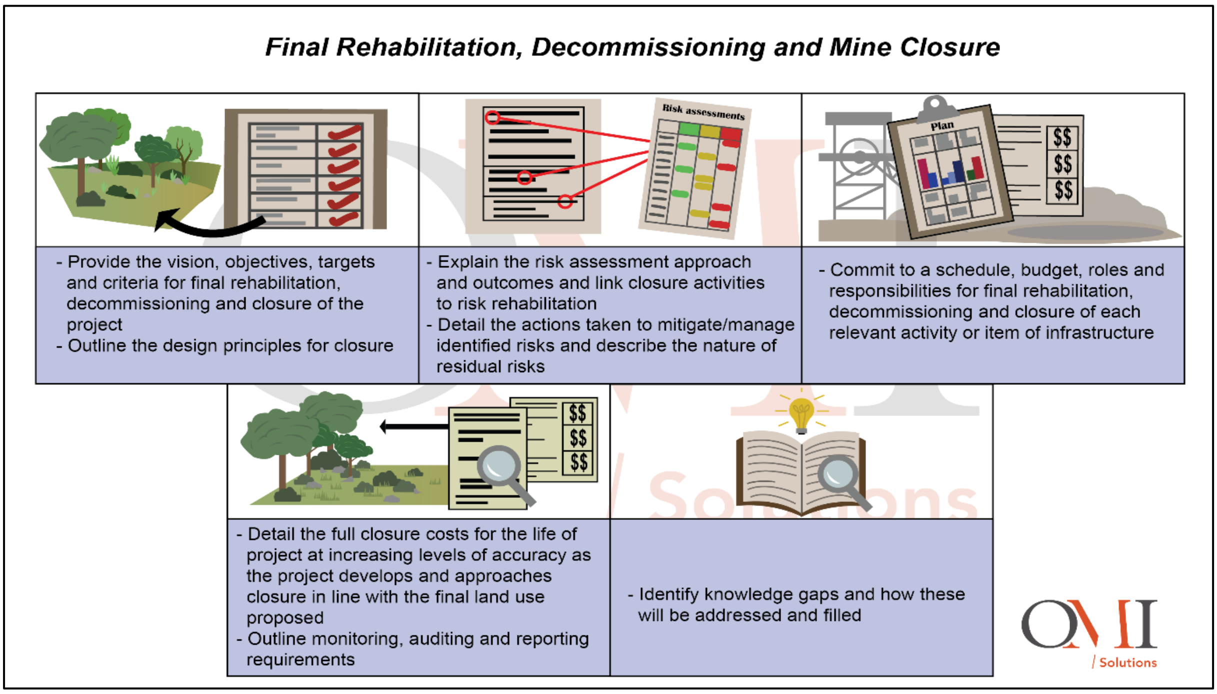
1. Stockpiling of waste on the overburden facility - A total footprint of 44ha with a capacity of 3 470 394 m^3 is planned for this facility. However, 545 070 m^3 of waste will only require a footprint of approximately 6.6 ha to be used in Year 1.

2. Initiating the stockpiling of a safety berm around the perimeter of the open pit with a height of 5m and a width of 10m, the assumption is made that approximately 4313 m^3 will be stockpiled for this purpose.

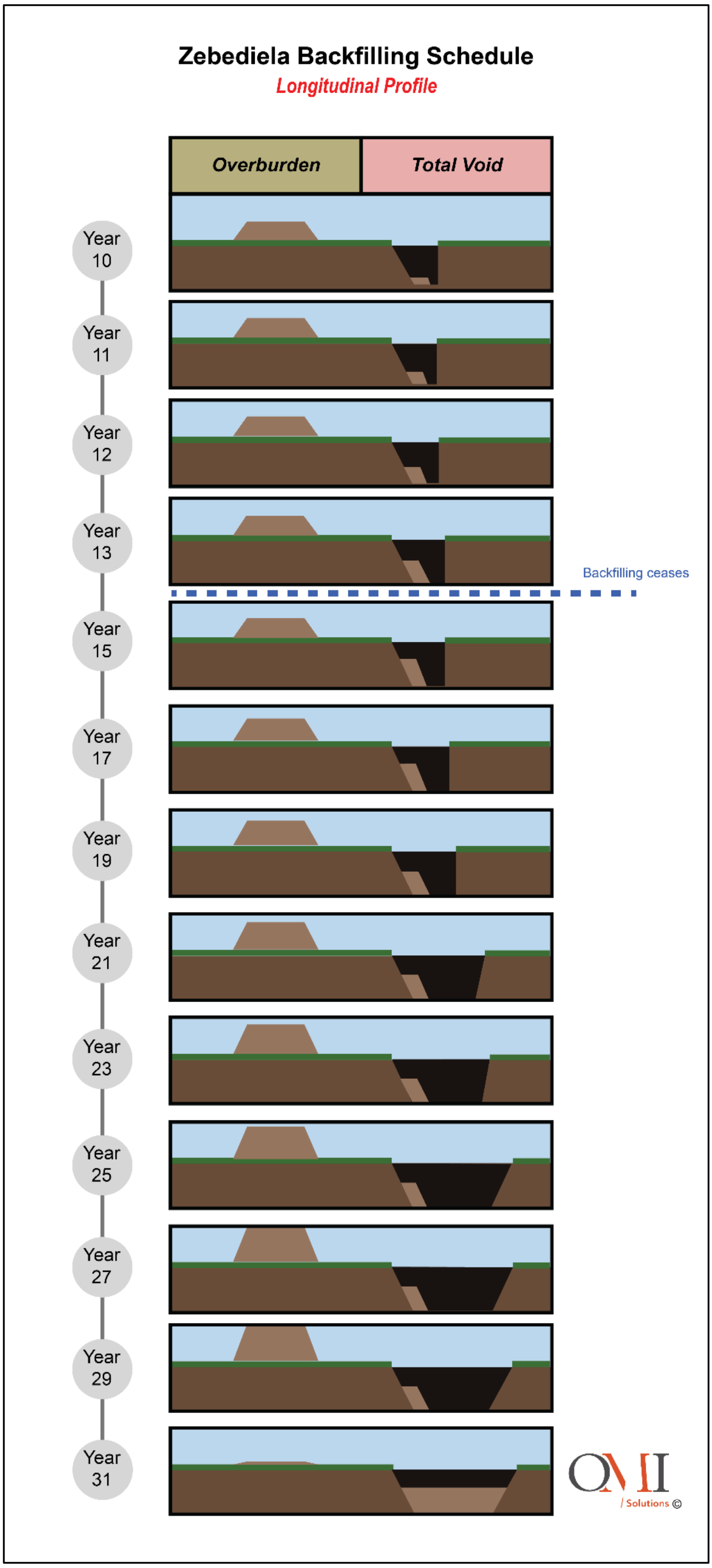


Final Rehabilitation, Decommissioning and Closure Plan

Each operation requires to ensure that a Final Rehabilitation, Decommissioning and Mine Closure plan is compiled and assessed on an Annual Basis. This is shown schematically in the figure below.



The proposed backfill schedule is shown below. As per the Production Profile provided by the Applicant, concurrent backfilling will take place until Year 13, thereafter it ceases and therefore as part of the Final Rehabilitation, Decommissioning and Closure Plan; 67,3% of the void will remain.



Refer to section 4 of Appendix 6.13: Financial Closure Provision and Rehabilitation Plan.

31. PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED.

Environmental Authorisation is requested for a period of 30 years as specified in the Mining Right application.

32. UNDERTAKING

DMR Guideline: 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.

Please refer to section 42 of Part B.

33. FINANCIAL PROVISION

DMR Guideline: State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

The mine's environmental liability is estimated at R 167 801 932.32 (Incl. VAT) over an estimated 30 year Life of Mine (scheduled closure).

33.1. Explain how the aforesaid amount was derived

- Quantity estimations and assumptions were made from the Conceptual drawings provided by Nurizon Consulting (Pty) Ltd. These quantity estimations are provided in Annexure A of Appendix 6.13.
- The detail provided on the drawings only provides a Class 5 estimate. Therefore, the degree of accuracy of this cost estimation ranges between -50% to +50%, despite the rates being market-related as of 2020 and verified by EPCM.
- Assumptions and notes for estimated Quantities in the Plant areas were sourced from the initial Redco calculations made during the Scoping Phase.
- Residual / Latent Risks have been addressed by some but not all of the specialists. In addition, some of the recommendations are over-conservative due to the unknowns, thus the accuracy of their recommendations is believed to be -50% to +50%, it is believed that with adequate and proper mitigation and concurrent management thereof, the less likely residual and latent risks will be of concern.
- Expert recommendations and assumptions have been made with respect to the required depth of topsoil and/or a growth medium required. However, it is further recommended that Trials are undertaken during the early stages of the project to prove that topsoil and / or a growth-medium can be generated onsite in preparation with the amount required for closure.

Refer to section 10 of Appendix 6.13: Mine Rehabilitation and Closure Plan.

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

The Applicant will submit an updated Mine Works Programme to the DMRE that makes reference to this aspect along with the Final EIA&EMPR.

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

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

No deviations were made to the methodology used in determining impact and risk significance.

34.2. Motivation for the deviation

Not applicable.

35. OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

35.1. 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):-

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

The following potential socio-economic impacts were assessed and the results thereof are provided in the Socio-Economic Impact Assessment (Appendix 6.1: Socio-Economic Impact Assessment).

- Construction Phase Impacts
  - Temporary stimulation of the Local and National Economy
  - Temporary Creation of Employment in Local and National Economies
  - Increased Household Income and Improved Standard of Living
  - Skills Development due to the Creation of New Employment Opportunities
  - Government Revenue Increase due to Capital Expenditure
  - Change in Sense of Place
  - Loss of commercial activities – agriculture and tourism
  - Temporary increase in crime and social conflicts associated with influx of people
  - Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts
  - Impact on property values
  - Physical displacement and potential loss of family ties
  - Economic displacement of disadvantaged communities
  - Added Pressure on Basic Services and Social and Economic Infrastructure
- Operational Phase Impacts
  - Sustainable Stimulation of the Local and National Economy
  - Creation of Employment in the Local and National Economy
  - Skills Development due to the Creation of New Employment Opportunities
  - Increase in Household Income and Standard of Living
  - Impact on Government Revenue
  - Change in Sense of Place
  - Local economic development benefits derived through mine’s social responsibility programme
  - Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts
- Closure and Decommissioning Phase Impacts
  - Temporary stimulation of the Local and National Economy
  - Temporary Creation of Employment in Local and National Economies
  - Increased Household Income and Improved Standard of Living
  - Impact on Government Revenue

- Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts

- Post-Closure and Rehabilitation Phase Impacts
  - Temporary stimulation of the Local and National Economy
  - Temporary Creation of Employment in Local and National Economies
  - Increased Household Income and Improved Standard of Living
  - Impact on Government Revenue
  - Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts
  - Improved quality of life due to rehabilitation activities

The relevant mitigation measures are provided in Table 43 of this report.

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

The following heritage impacts were assessed and the results thereof are provided in the Heritage Impact Assessment (Appendix 6.2: Heritage Impact Assessment). The impacts on heritage resources due to the proposed development can be divided into two main categories:

- Indirect or secondary effects: impact on heritage resources occurs later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access.
- Direct or primary effects: impact on heritage resources occurs at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work.

The impacted heritage resources are as follows:

- A small number of Middle Stone Age (MSA) artefacts were noted at three localities in the project area (Site Exigo-ZNM-SA01, Site Exigo-ZNM-SA02, Site Exigo-ZNM-SA03). Most of the artefacts are Middle Stone Age lithics such as blades and scrapers indicating various degrees of weathering and patination on the surface of the lithics. The fairly small numbers and disturbed context in which they were found means that the archaeological remains in the Study Area have been rated as having moderate-low archaeological significance. It is highly likely that Earlier, Middle and possibly Later Stone Age scatters will occur in the area, specifically along drainage lines. The Stone Age sites are located within the demarcated footprint for the mine development and impact on the sites can be anticipated
- Two Historical Period quarries and the remains of two Historical Period settlement areas (Site Exigo-ZNM-HP01 - Site Exigo-ZNM-HP04) in the project area might be older than 60 years and generally protected under the National Heritage Resource Act (NHRA 1999). The quarry at Site Exigo-ZNM-HP01 is approximately 30m long and in places more than 4m deep and heaps pf large stones surround the open excavations. The quarry at Site Exigo-ZNM-HP03, excavated into calcrete is approximately 20m long and in places 2m deep. It seems that the quarries have been used until relatively recently based on excavations and material culture still visible at the sites. The sites are probably of limited research potential and they are is rated as of low heritage significance.

The two small settlement areas (Site Exigo-ZNM-HP02 and Site Exigo-ZNM-HP03) consisting of the foundation remains of a rectangular stone building and the scattered remains of stones probably used for building as well as material culture such as glass, metal, and plastic were noted on Portion 0 and 57 of the farm Uitloop. In addition, the remains of a stone-line footpath were noted. An absolute age for the structures could not be ascertained but an analysis of historical topographical maps and aerial photographs imply that the sites were in use by around 1960 and it is likely that the sites formed a larger settlement complex. The features at the sites are poorly preserved and of low heritage significance but there is a high risk that burials might be encountered around the settlement area.

- At least 5 burial sites or possible burial sites / graves were noted on a number of farm portions in the project area (Site Exigo-ZNM-BP01 - Site Exigo-ZNM-BP05). These receptors are of high significance for their heritage, social and cultural value. The burial sites occur in close proximity of the demarcated infrastructure footprints, apart from Site Exigo-ZNM-BP04 which occurs in the larger project area, for the mine development and impact on the sites can be anticipated.
- An irregular stone structures or stone cairn was noted on Portion 0 of the Farm Uitloop in densely vegetated sections of the project area. The function of the feature is not known but it might indicate prehistoric or Historical Period burials. As such, the heritage significance of the feature remains to be established and is therefore unknown. The site is located within the demarcated footprint for the mine development and impact on the site can be anticipated.

The relevant mitigation measures are provided in Table 43 of this report.

36. OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

Please refer to the Alternatives Assessment in section 8.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

37. ENVIRONMENTAL MANAGEMENT PROGRAMME

37.1. Details of the EAP

Refer to section 1.1 and 1.2.

37.2. Description of the Aspects of the Activity

Key aspects identified by the EAP (Exigo) and specialists that were assessed as part of the EIA include inter alia:

- Socio-economic aspects (labour and working conditions, etc.)
- Archaeological and palaeontological aspect
- Ecological aspect (Fauna and Flora)
- Wetland/Riparian aspect (surface water)
- Soils, agricultural potential and land capability aspect
- Hydrogeological aspect (groundwater)
- Water supply
- Stormwater aspect
- Air quality aspect
- Noise aspect
- Traffic aspect
- Visual aspect
- Blasting & Vibration aspect
- Mine Closure & Rehabilitation aspect

Also refer to section 11 and Table 39.

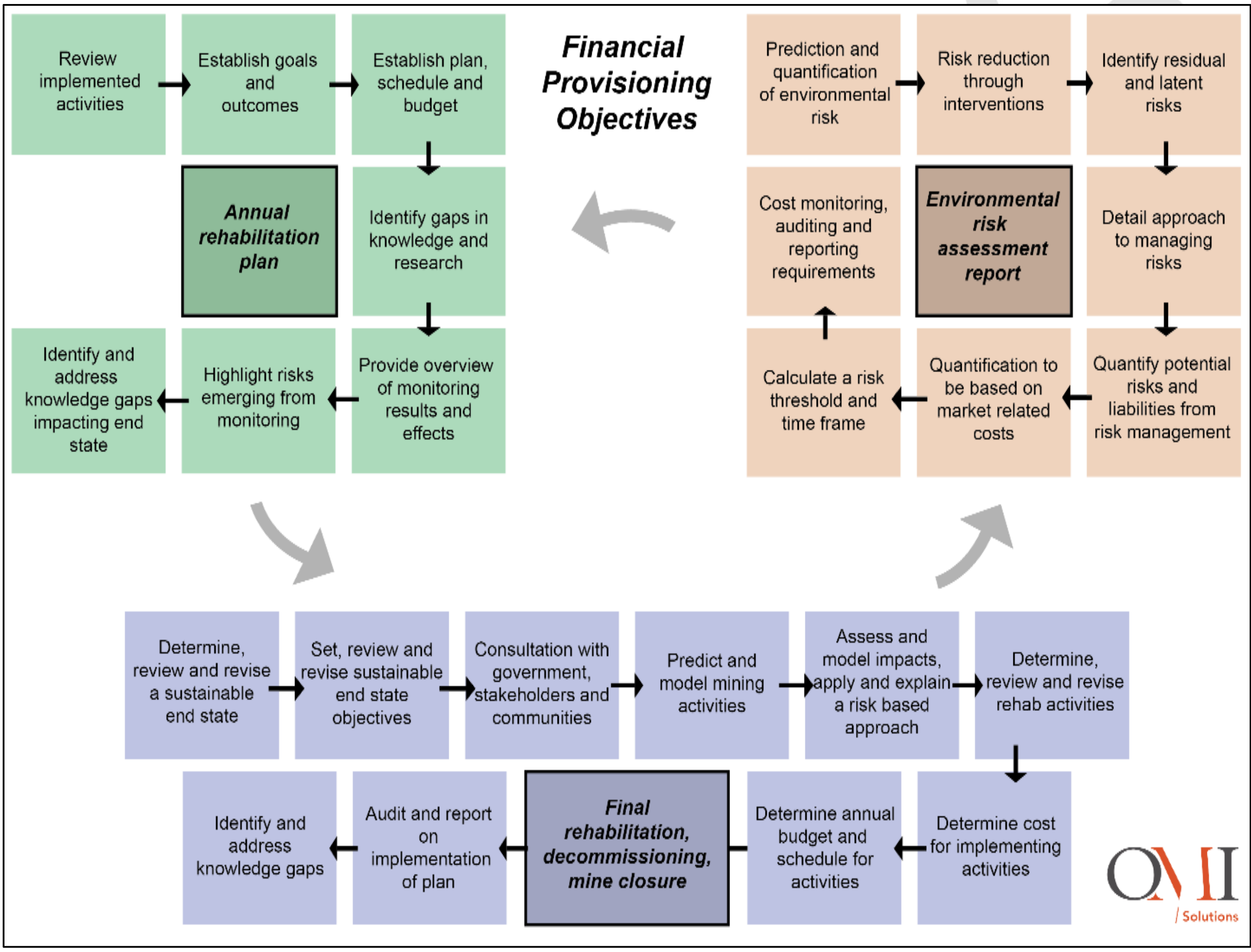
37.3. Composite Map

Refer to Appendix 4: Site Plan

37.4. Description of Impact management objectives including management statements

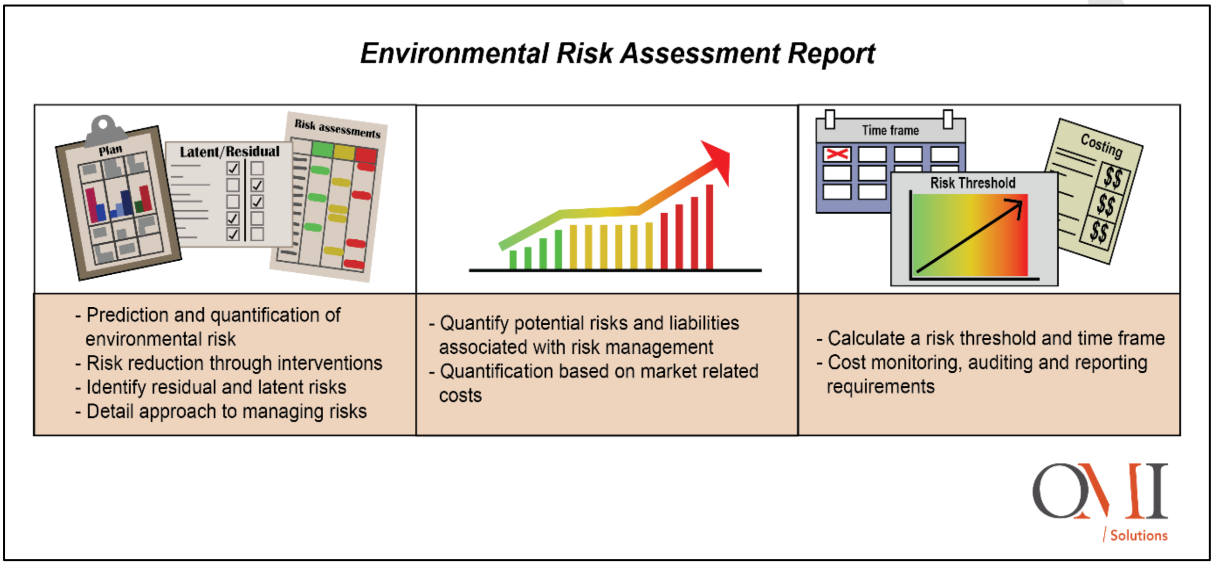
37.4.1 Determination of closure objectives

The intended Financial Provisioning Objectives as per GN 1147 is summarised in the figure below.

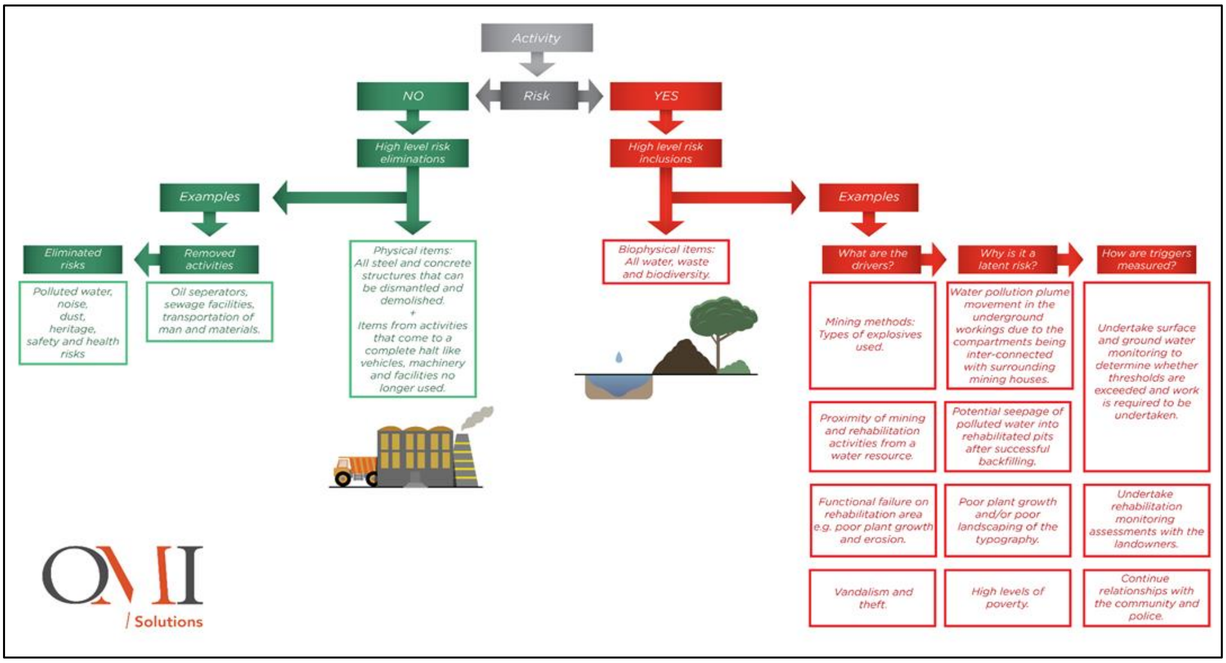


37.4.2 **The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity**

Each operation is required to undertake a risk assessment on an Annual Basis to assess the potential Latent or Residual Environmental Impacts that may potentially result from the mining activities. The process that should be followed when undertaking such a risk assessment is shown schematically in the figure below.



The figure below represents the methodology used when determining which activities may result in a potential Latent or Residual Impact. Please refer to Annexure D of Appendix 6.13, for the detailed Risk Assessment undertaken for the proposed Zebediela Nickel Mine.



It is not currently proposed that any form of extraneous water treatment will be required post closure, however seepage capturing, water monitoring and effective rehabilitation will be required to achieve minimal latent risks post closure on the groundwater of the surrounding water users. Water monitoring will be allowed for post closure or until such time as the water quality is suitable according to the SANS 241:2015 water limits. The water monitoring will be conducted as per the operational monitoring programme until such time as water has returned to the SANS 241:2015 limits.

The bulk of the infrastructure is located on Uitloop II Lower Zone dunites, harzburgites and pyroxenites, and only the surface mine infrastructure is located on the Malmani Subgroup of the Chuniespoort Group of the Transvaal Supergroup. The area where the plant is located is therefore located on interlayered sequences of dolomite, interbedded chert-rich dolomite and minor quartzite and mudstone (Buurman, 2020). It is therefore likely that subsidence can take place post closure in these areas. The areas will need to be evaluated post closure for any subsidence to be able to take action timeously.

Refer to the Financial Provision Report (Appendix 6.13) as well as Table 43 for mitigation measures proposed to manage ecological degradation.

37.4.3 **Potential risk of Acid Mine Drainage**

No leachate data from a geochemical assessment was available during the assessment (samples are currently being analysed according to GNR 635 and GNR 636) and analogue geochemical data from surrounding mines in similar hydrogeochemical environments was used as input into the model. From the analogue geochemical data, TDS, nitrate, and sulphate were identified as potential constituents of concern.

The potential for acid generation is based on the pyrrhotite and pentlandite in the sulphide zone which is <3%. The whole rock (solid) phase with total sulphur at 0.25 to 0.5% sulphide and sulphide sulphur at <0.01%, would make the potential for acid formation highly unlikely. The oxide zone and surface limestone have an overabundance of calcium and magnesium that would neutralise any acid formation in the overburden material.

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

The geochemical results for the ore and overburden material were outstanding when this report was compiled. The samples were however submitted to a laboratory for analysis according to GNR 635 and GNR 636 and will be incorporated into the updated hydrogeological report.

Conservative assumptions were made regarding residue facilities chemical source term. The potential for acid mine drainage (AMD) is expected to be low as the material has 0.25 to 0.5 % sulphur content. In addition to the low sulphur content, the oxide zone has sufficient buffering capacity (24% CaO) to neutralize low concentrations of AMD (MSA PEA, 2012).

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

Not applicable. Refer to sections directly above.

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

Not applicable. Refer to sections directly above.

37.5. Volumes and rate of water use required for the mining operation

An environmental mine water balance was developed for the proposed mine. A dynamic model was developed to simulate transient water flow volumes at planned mine production rates to determine the mine water balance on monthly time steps.

Potential sources include the following:

- **External Water Resource Make-up Water Circuit (clean water):** External make-up water would be sourced from groundwater boreholes in and around the mine site. The water rights have not been procured or approved yet, but there should be sufficient water available from transfer of existing water rights.
- **Mine dewatering**: Water abstracted for the purpose of pit dewatering is pumped to the open pit settling dam to be utilised for make-up water in the Plant Process (Raw) Water Dam
- **Potable water circuit:** External water would be pumped to the Plant Potable Water Tank where it is treated and supplied to the change house and offices.
- **Overburden facility:** Runoff from the overburden would be contained in the Overburden Pollution Control Dam.
- **Stormwater** runoff that is in contact with disturbed areas i.e. Plant Area, Overburden Facility (OF), Run of Mine (ROM) Stockpile Areas, must be contained in PCDs according to GNR704 (DWS, 1998). Rainwater and run-off collected within the open pit is pumped to the Pit Settling Dam and then to the Plant Process (Raw) Water Dam for re-use.
- **Sewage** water treatment results in the production of sewage sludge and effluent that must be re-used in the system. Sewage sludge must be disposed within regulatory requirements or used in rehabilitation.
- **Dust suppression:** Allowance was made for dust suppression water volumes of 300 m^3/d.

The dewatering rate was simulated on the mine plan to peak at 500 to 600 m^3/d (Exigo, 2020a) (Figure 77). Dewatering water would be pumped via the Open Pit Settling Dam to the Plant Process (Raw) Water Dam and back to the pit for mining purposes (Figure 78).

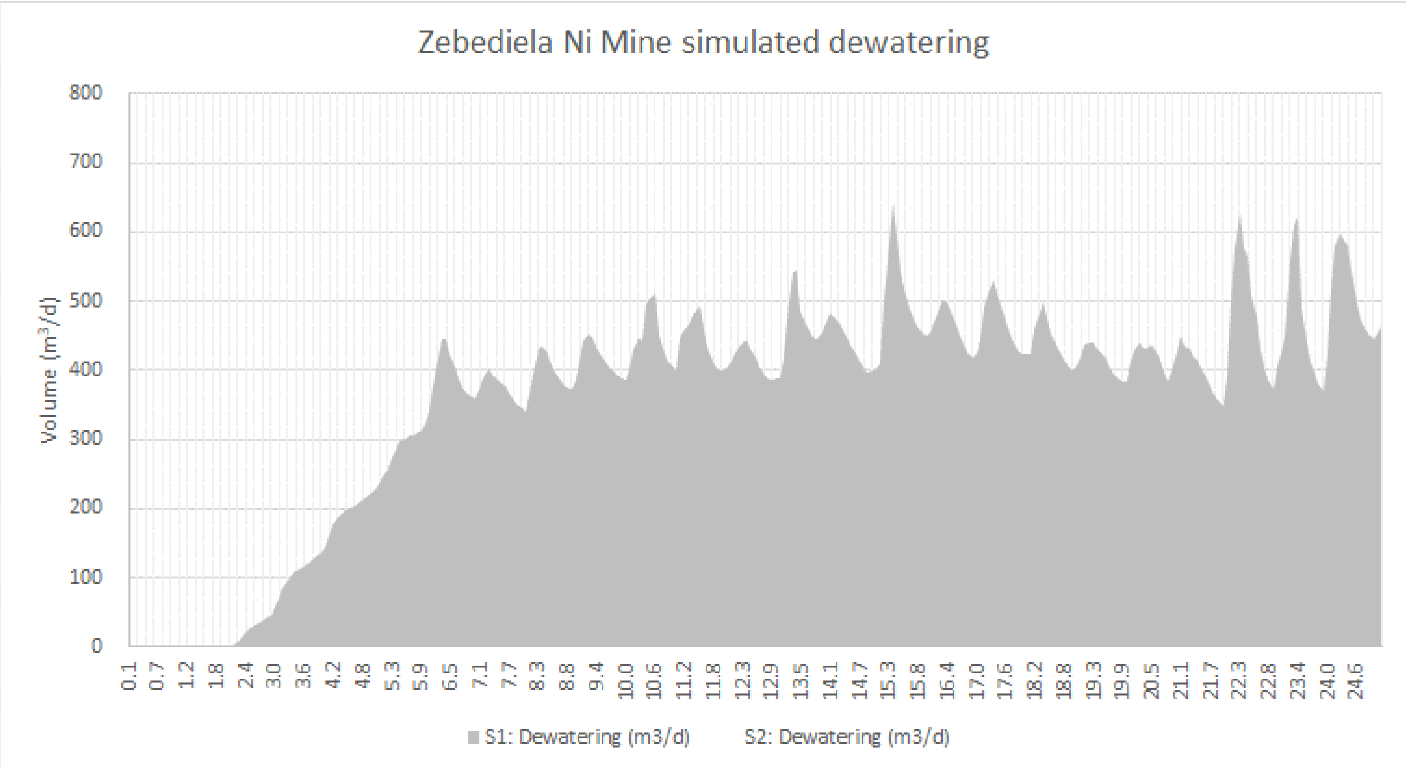


Figure 77: Open Pit Dewatering Rates (Vivier et al, 2020a)

Three steady-state mine water balance scenarios were simulated to quantify the mine water demand and the surplus volume conditions (Figure 78 to Figure 80):

1. Scenario 1: Dry conditions, max water demand no dewatering.
2. Scenario 2: Median rain with mine dewatering conditions
3. Scenario 3: Surplus water with flooding and mine dewatering conditions

The mine water balance outputs indicated the following:

1. Scenario 1: The maximum water demand is 14 480 m^3/mon (480 m^3/d or 0.15 m^3/ton milled) (Figure 74).
2. Scenario 2: Under median rainfall conditions (28 mm/mon), and mean dewatering of 588 m3/d (Figure 79), the mean surplus water generated by the site would be 5150 m^3/mon (170 m^3/d). This small volume should be managed within the system by using the water for rehabilitation purposes or maintaining a slightly larger open pit sump area.
3. Scenario 3: Surplus water during 1:50 wet conditions (200 mm in 24 hours) would result in a surplus water of 92 000 m3 (Figure 80). The stormwater buffer capacity is 54 700 m^3 from the open pit sump (10 000 m^3), Plant PCD (20 000 m^3) and Overburden PCD (24 700 m^3). The surplus water that will have to be either (i) discharged (ii) temporarily contained in the open pit is 58 355 m^3 or (iii) the runoff from the Overburden Facility and Plant Complex will have to be lowered by implementing design alternatives and/or (iv) artificial recharge of the aquifer during surplus water conditions.

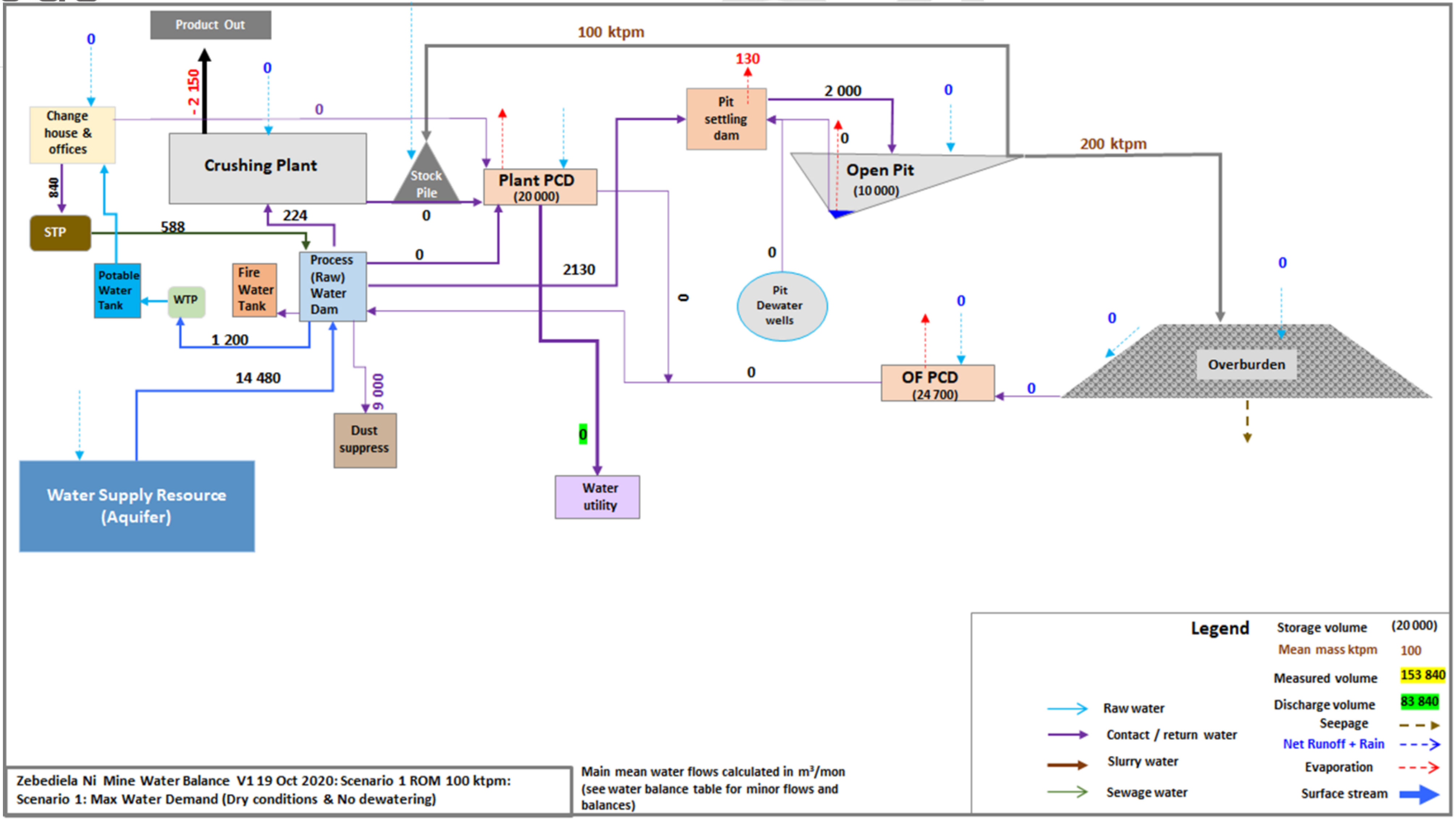


Figure 78: Zebediela Ni Mine: Scenario 1: Dry conditions, max water demand water flow

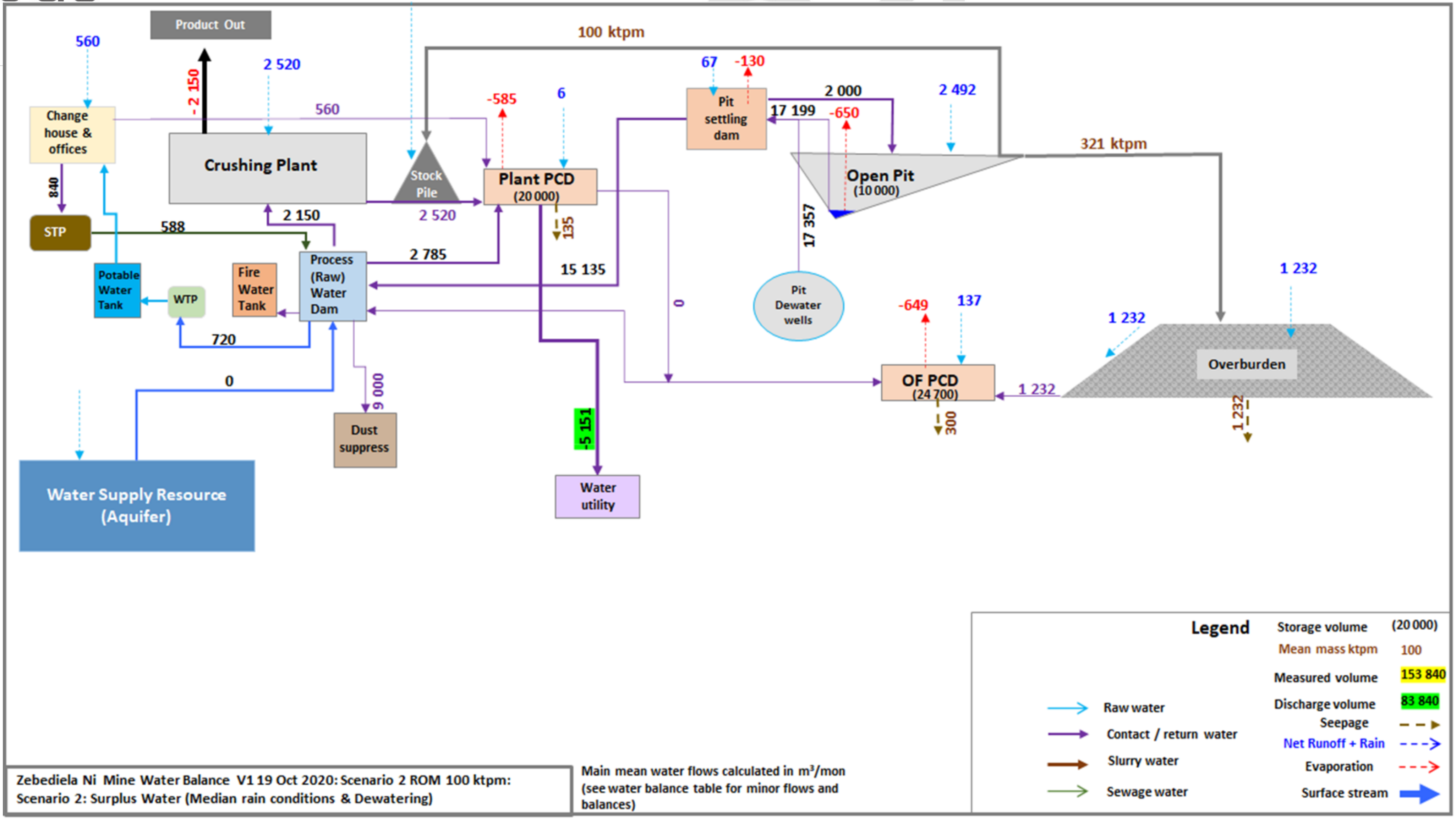


Figure 79: Zebediela Ni Mine: Scenario 2: Median rain and mine dewatering conditions

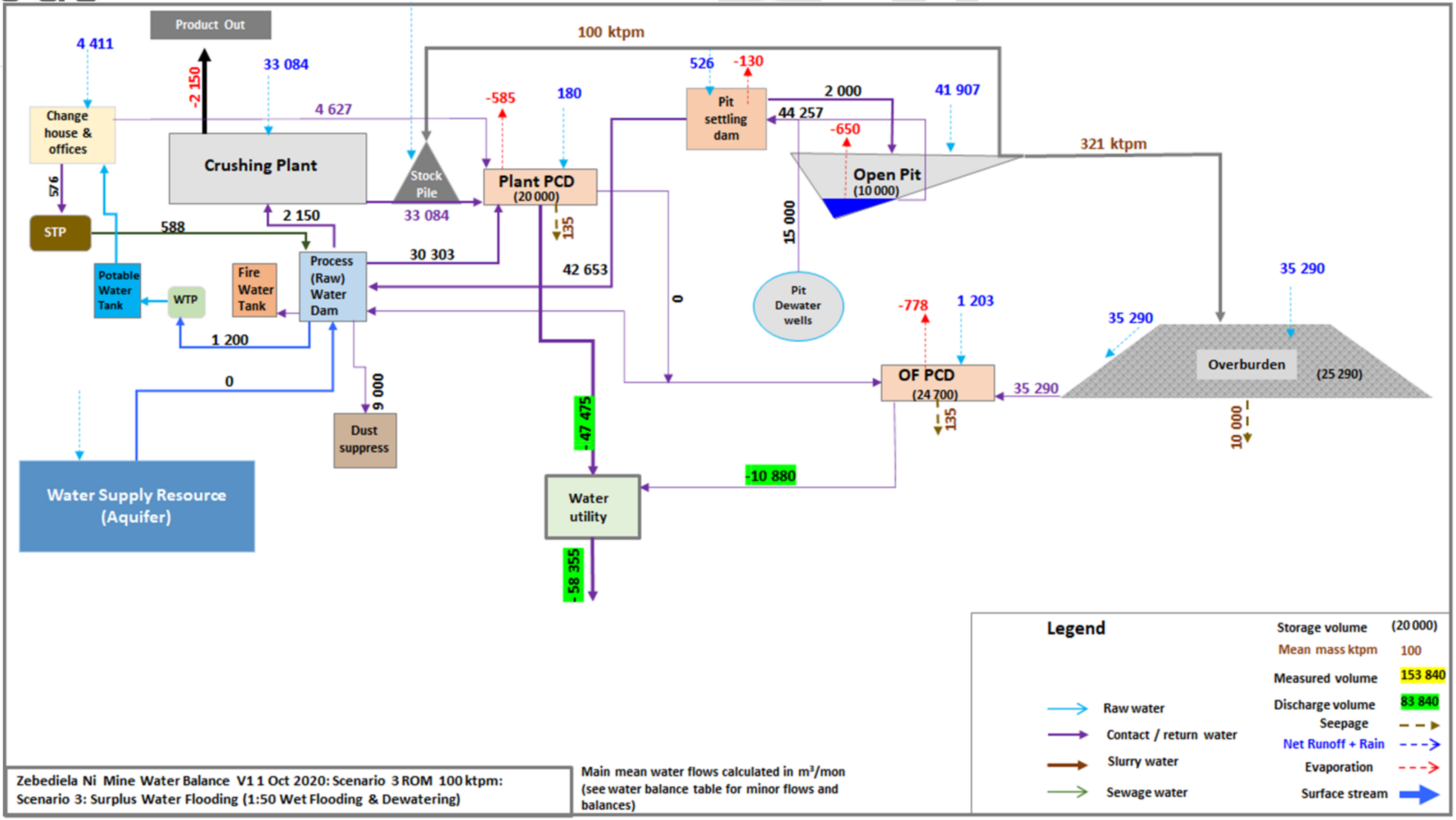


Figure 80: Zebediela Ni Mine: Scenario 3: Surplus water with flooding and mine dewatering conditions

The steady-state mine water balance was upgraded to a transient monthly version. The transient model showed that:

1. Make-up water from an external water resource would decrease with time as it is replaced by mine dewatering. From year 6, the mine would produce surplus water due to dewatering and rainwater harvesting (Figure 81).
2. Mean monthly make-up water would increase from 2000 m³/mon in December to 14 000 m³/mon in August (Figure 82).
3. The mean inflow from stormwater harvesting is 13 600 m3/mon with a mean monthly high of 46 500 m3/mon in December months (Figure 83).
4. The stormwater containment capacity should be increased by 60 000 m3, which could be achieved by enlarging the open pit sump and ROM stockpile to cater for flooding conditions (Figure 84).

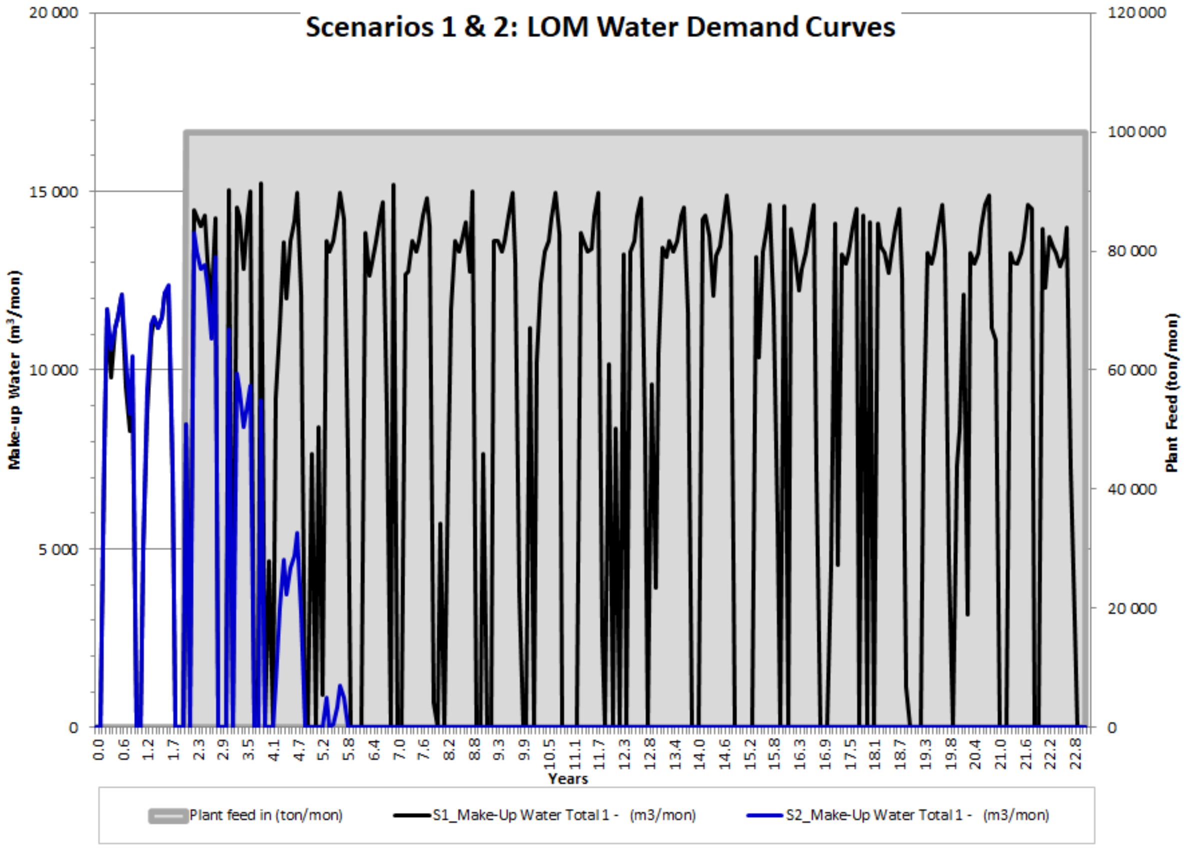


Figure 81: Scenarios 1 & 2: LOM simulation Make-Up Water Requirement

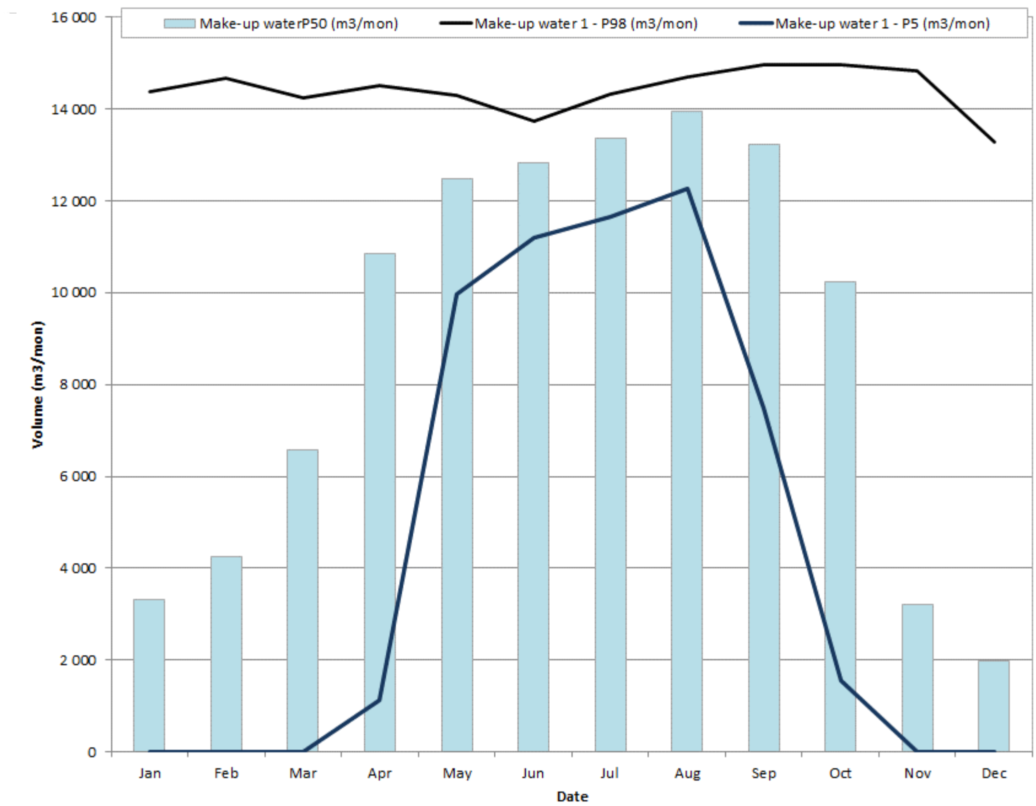


Figure 82: Scenario 2: Monthly Make-Up Water Requirement

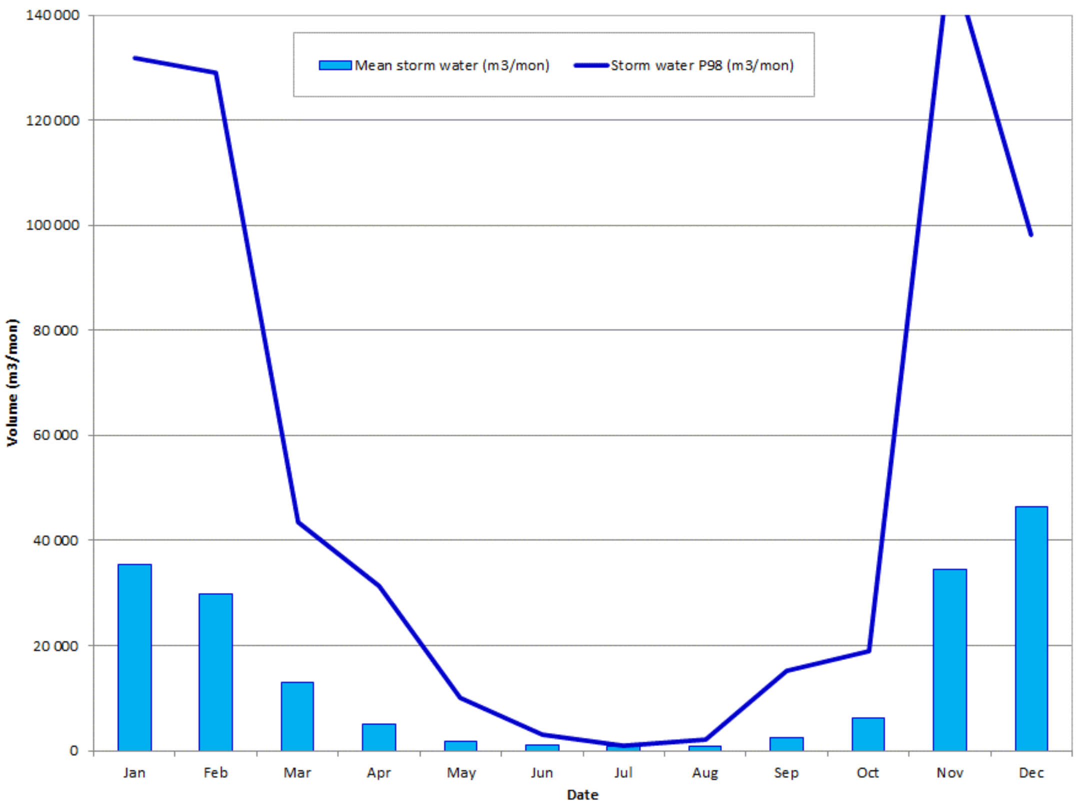


Figure 83: Scenario 2: Monthly stormwater volumes

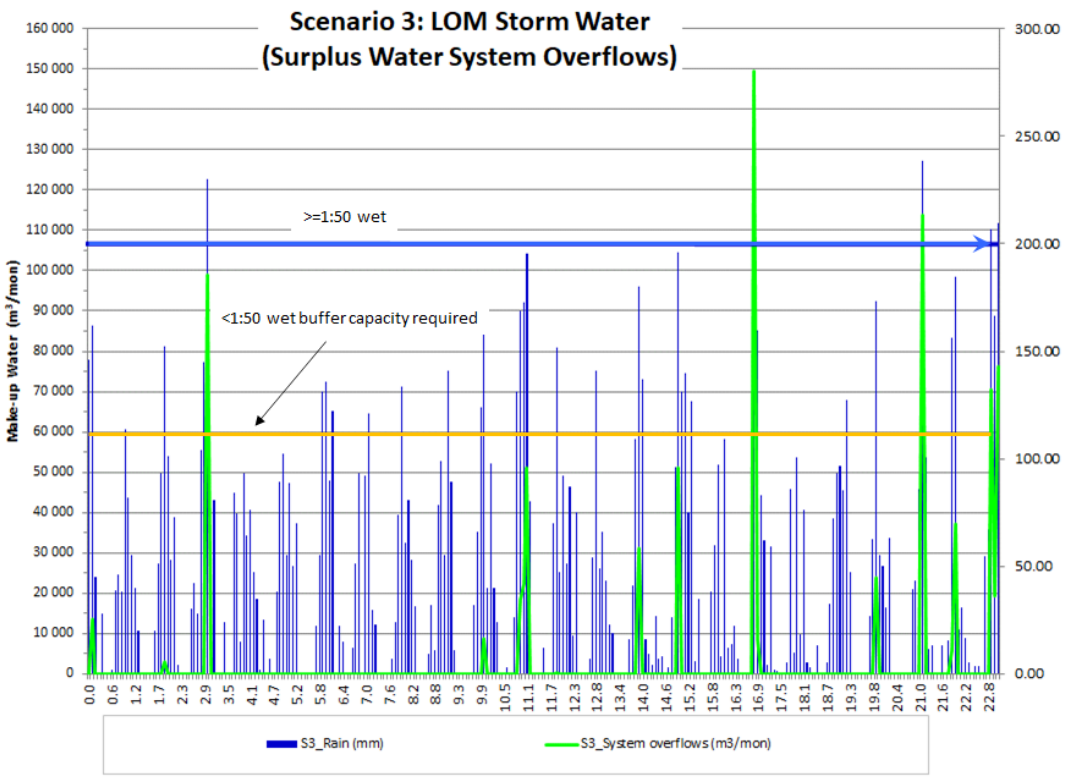


Figure 84: Scenario 2: LOM simulation system overflows compared to 1:50 wet conditions

37.6. Has a water use licence been applied for?

A Water Use Licence Application has not yet been submitted, but is currently in process and will be submitted to the Department of Water and Sanitation following the submission of the Final EIA & EMPr Report and the finalisation of the detail design of the Overburden Facility.

37.7. Impacts to be mitigated in their respective phases

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

Table 43: Mitigation Measures to rehabilitate the environment

No	Impact	Estimated size and scale of disturbance	Mitigation Measures	Time period for implementation	Compliance with Standards
Ecological Impacts					
Planning Phase					
1	Delay of mining onset	±150 ha	Apply and obtain IWUL from DWS after liaison with relevant officials and site visit to the area.	Planning Phase	National Water Act (Act No 36 of 1998) (NWA)
2	Delay of plant construction	±150 ha	Apply and obtain permits from DAFF after liaison with relevant officials and follow-up site visit to the area	Planning Phase	National Forest Act (Act 84 of 1998) (NFA)
Construction Phase					
3	Habitat destruction / fragmentation of fauna habitats	±150 ha	• The removal of the isolated indigenous trees and shrubs should only occur on the construction footprint area of the development and not over the larger area. Where possible, vegetation should be retained in between infrastructural elements associated with the project. • Conduct flora species search and rescue efforts before ground clearing begins in order to reduce negative impacts on species of concern. • Remove and relocate any plants of botanical or ecological significance as indicated by the ecologist or Mine Environmental Control Officer (ECO). • No activity must take place within the 1:100 year floodline or the delineated riparian habitat, whichever is the greatest, or within 500 m	Construction Phase	National Environmental Management Act No. 107 of 1998 (NEMA); National Environmental Management: Biodiversity Act No. 10 of 2004 (NEMBA); Limpopo Environmental Management Act No. 7 of 2003 (LEMA)

			radius from the boundary of any wetland unless authorised by a water use licence. • No activities that negatively affect catchment yield, hydrology and hydraulics must be practised unless authorised. • All construction activities should be conducted in such a way that minimal damage is caused to the water courses riparian zone. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. Where impacts are unavoidable a water use licence application should be submitted to Department of Water & Sanitation. • Work in streams and riparian zones should preferably be done during the low flow season. • The construction camp must be located outside the extent of the water course(s) and must be recovered and removed within one (1) month after construction has been completed. • Construction should preferably take place in winter to reduce disturbance to breeding fauna and flowering flora; • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. • Monitoring should be implemented during the construction activities to ensure that minimal impact is caused to the watercourses of the area; • Vegetation to be removed as it becomes necessary – do not clear the entire footprint simultaneously. • The Mine ECO should advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The Mine ECO should enforce any measures that he/she deem necessary. Regular environmental training should be provided to construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation. • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling of trenches during construction. • Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. Poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist. • Use existing facilities (e.g., access roads, graded areas) to the extent possible to minimize the amount of new disturbance.		

			• Ensure protection of important resources by establishing protective buffers to exclude unintentional disturbance. All possible efforts must be made to ensure as little disturbance as possible to the sensitive habitats such as ravines and moist grassland pockets during construction. • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance will occur outside these areas.		
4	Soil erosion and sedimentation	±150 ha	• Sediment trapping, erosion and stormwater control should be addressed by a hydrological engineer in a detailed stormwater management plan. • The overall macro-channel structures and mosaic of cobbles and gravels must be maintained by ensuring a balance (equilibrium) between sediment deposition and sediment conveyance maintained. A natural flooding and sedimentation regime must thus be ensured as far as reasonably possible. • Steps must be taken to ensure that stormwater does not result in bank instability and excessive levels of silt entering the water course(s). • Stormwater must be diverted from construction works, access roads, linear infrastructure and must be managed in such a manner as to disperse runoff and to prevent the concentration of stormwater flow. • The velocity of stormwater discharges must be attenuated and the banks of the water courses protected. • Cover disturbed soils as completely as possible, using vegetation or other materials. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth • Structures must be non-erosive, structurally stable and must not induce any flooding or safety hazard	Construction Phase	NEMA, NEMBA

			• Structures must be inspected regularly for accumulation of debris, blockage, erosion of abutments and overflow areas - debris must be removed and damages must be repaired and reinforced immediately. • Necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures and activities and to prevent in-stream sedimentation. • Stockpiling of removed soil and sand must be stored outside of the 1:100 floodline and/or delineated riparian habitat and/or the regulated area of a water course, whichever is the greater, to prevent being washed into the channel and must be covered to prevent wind and rain erosion. • Slope/bank stabilisation measures must be implemented with a 1:3 ratio or flatter and vegetated with indigenous vegetation immediately after the shaping. • As much indigenous vegetation growth as possible should be promoted within the proposed development area in order to protect soil and to reduce the percentage of the surface area which is paved, hardened and/or compacted.		
5	Spreading and establishment of alien invasive species	±150 ha	• Control involves killing the alien invasive plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. The control of these species should even begin prior to the construction phase considering that small populations of the AIS occur around the sites. • Institute strict control over materials brought onto site, which should be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to site or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. • Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. • Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented.	Construction Phase	NEMA, NEMBA, Alien and Invasive Species Lists, GNR 599/2014 & GNR 864/2016

			• A detailed plan should be developed for control of noxious weeds and invasive plants that could colonize the area as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations.		
6	Habitat degradation due to dust	±150 ha	• Daily dampening of dust areas or other dust suppression methods such as dust-aside or more environmentally friendly methods. Re-vegetation of impacted areas is to be conducted on an on-going basis. • Place dust generating activities where maximum protection can be obtained from natural features. • Locating dust generating activities where prevailing winds will blow dust away from users. • Minimize the need to transport and handle materials by placing adequate storage facilities close to processing areas. • Minimize the re-handling of material which obviously has cost benefits as well. • Exposed material should be protected from the wind by keeping it within voids or protecting it with topographical features where possible. • Reduce the drop heights wherever practicable. • Protect activities from wind by erecting a screen or using a natural barrier. • All roads on site should be dampened or treated with a binding agent. • The general vehicle speed should be restricted as there is a direct relationship between the speed and vehicle entrained emissions. Speed limit on site should be 40km/h and on National roads 80km/h • Monitoring, modelling and emission measurements should be regarded as complementary components in any integrated approach to exposure assessment or determining compliance against air quality criteria.	Construction Phase	NEMA, NEMBA, National Dust Control Regulations (GNR 827/2013), National Ambient Air Quality Standards (GNR 1210/2009)
7	Spillages of harmful substances	±150 ha	• Ensure that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones. The risk of spillages of reagents and hydrocarbons on the soil during transportation can be reduced with proper maintenance of vehicles. This would include a rigorous and proactive maintenance program. • This risk can be further reduced through an adequate program of training of drivers and crews. This would include defensive driver training, basic vehicle maintenance, and emergency control of spills.	Construction Phase	Hazardous Substances Act (Act No. 15 of 1973)

			In order for the vehicle crews to be adequately able to control any spills at an early stage, the vehicles must be properly equipped with spill containment equipment (booms, sandbags, spades, absorbent pads, etc.). Responsibility for training lies with the transport contractor. Adequate training, maintenance, and equipment of transport crews should be included as a requirement for transport contracts. • All employees will be trained in cleaning up of a spillage. The necessary spill kits containing the correct equipment to clean up spills will be made available at strategic points.. • Pollution of and disposal/spillage of any material into the water course must be prevented, reduced, or otherwise remediated through proper operation, maintenance and effective protective measures. • Vehicles and other machinery must be serviced well outside the 1:100 year floodline or delineated riparian habitat, whichever is the greatest. • Oils and other potential pollutants must be disposed of at an appropriate licenced site, with the necessary agreement from the management of such a site. • Vehicles must be checked for oil leaks and all maintenance must take place at a designated site further than 32 meters from the boundary of the water course(s). • Any hazardous substances must be handled according to the relevant legislation relating to transport, storage and use of the substance and all storage facilities must be equipped with large, clearly readable material safety data sheets (MSDS). • All reagent storage tanks and reaction units must be supplied with a bunded area built to contain sufficient capacity of the facility and provided with sumps and pumps to return the spilled material back into the system. The system must be maintained in a state of good repair and standby pumps must be provided. • Silt, litter and hydrocarbon (oil) traps must be installed to minimise the risk of pollutants entering the natural drainage system of the area. A register must be in place to indicate that oils are recovered/recycled or alternatively disposed at a licenced facility. • Activities (including spill clean-up) must start up-stream and proceed into a down-stream direction, so that the recovery processes can start immediately, without further disturbance from upstream works.		
8	Impediment of flow patterns	±40 ha	• Unless authorised by a water use licence, access and haul roads must not encroach into the extent of the water course(s).	Construction Phase	NEMA, NWA

			• No structures to be placed within the 1:100 year floodline and/or the delineated riparian areas unless authorised in a water use licence. • Appropriate design and mitigation measures must be developed and implemented to minimise impacts on the natural flow regime of the water course i.e. through placement of structures/supports and to minimise turbulent flow in the water course. • The diversion and impeding structures may not restrict channel flows by reducing the overall channel width or obstructing channel flow. Any water course crossing must minimise its impacts on the water course and must be assessed and documented as such and be available for review. • The indiscriminate use of machinery within the in-stream and riparian habitat will lead to compaction of soils and vegetation and must therefore be strictly controlled. • Stormwater management around the open pit should be addressed by a hydrological engineer. A grass canal should be established to divert water around the open pit. The canal should be planted with hydrophytic grasses and sedges to provide habitat to various waterfowl, small mammals and reptilians. A rehabilitation plan should be developed for the proposed mine inclusive of the recommended grass canal. Perform scheduled maintenance to be prepared for storms. Ensure that culverts have their maximum capacity, ditches are cleaned, and that channels are free of debris and brush than can plug structures. • Work in channels, streams and riparian zones should preferably be done during the low flow season. • The construction camp must be located outside the extent of the water course(s) and must be recovered and removed within one (1) month after construction has been completed • During the construction phase vehicles must not be allowed to indiscriminately drive through any water course(s)/ riparian areas. • Indigenous riparian vegetation, including dead trees, outside the limits of disturbance indicated in the site plans must not be removed from the area.		
9	Road mortalities of fauna / impact of human activities on site	±150 ha	• More fauna are normally killed the faster vehicles travel. A speed limit should be enforced as determined by the mine environmental manager. It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences).	Construction Phase	NEMA

			• Travelling at night should be avoided or limited as much as possible. No travelling at night should be allowed without approval by the mine manager. • Lights should be positioned 5m from the roads or paved areas.		
Operational Phase					
10	Habitat destruction / fragmentation of fauna habitats	±218 ha	• Concurrent rehabilitation should occur during the operational phase on all exposed areas created by construction as well as roads, stockpiles and the overburden facility. Only indigenous species should be used for rehabilitation. The following programmes should be implemented as part of the operational phase of the mine: ○ Concurrent rehabilitation programme ○ Alien invasive eradication programme ○ Fire management programme ○ Educational and training programme on conservation and ecological systems • Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.	Operational Phase	NEMA Regulation 543 Section 32 NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) NEMA Regulation 543 Section 32 Limpopo Environmental Management Act
11	Soil erosion and sedimentation	±150 ha	• Rehabilitation: revegetate or stabilise all disturbed areas as soon as possible. Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions. • The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Conservation of topsoil should be prioritized on site and done as follows: ○ Topsoil should be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify; ○ Topsoil stockpiles should be 2m in height to ensure the soil remain aerobic; ○ Stockpile topsoil separately from subsoil; ○ Stockpile in an area that is protected from stormwater runoff and wind; ○ Maintain topsoil stockpiles in a weed free condition; ○ Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it;	Operational Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32

			◦ Stockpile topsoil for the minimum time period possible i.e. strip just before the relevant activity commences as soon as it is completed. • Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.		
12	Spreading and establishment of alien invasive species	±150 ha	• Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.	Operational Phase	Alien and Invasive Species Regulations (GNR 599 of 2014) as part of the National Environmental Management: Biodiversity Act (10/2004)
13	Habitat degradation due to dust	±150 ha	• Dampening of disturbed areas as required. • Re-vegetation of mined areas is to be conducted on an ongoing basis. • Dust fallout monitoring to be conducted according to the requirements of the legislation. • Place dust generating activities where maximum protection can be obtained from natural features. • Locating dust generating activities where prevailing winds will blow dust away from surrounding landowners. • Minimize the need to transport and handle materials by placing adequate storage facilities close to processing areas. • Exposed material should be protected from the wind by keeping it within voids or protecting it with topographical features where possible. • Reduce the drop heights wherever practicable. • Protect activities from wind by erecting a screen or using a natural barrier. • Fine spray or fog suppression can also be used in loading bays. • All roads on site should be dampened or treated with a binding agent. • The general vehicle speed should be restricted as there is a direct relationship between the speed and vehicle entrained emissions. • Monitoring, modelling and emission measurements should be regarded as complementary components in any integrated approach to exposure assessment or determining compliance against air quality criteria.	Operational Phase	National Environmental Management Air Quality Act 39 of 2004 Section 32

			• Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.		
14	Spillages of harmful substances	±150 ha	• Vehicle maintenance only done in designated areas – spill trays, sumps to be used and managed according to the correct procedures. • Vehicles and machines must be maintained properly to ensure that oil spillages are kept to a minimum. • Fuel and oil storage facilities should be bunded with adequate stormwater management measures. • Operational and Maintenance plan and schedule for management of sewage facilities should be compiled. An emergency plan should be compiled to deal with system failures and should include a down-stream notification procedure. • Routine checks should be done on all mechanical instruments for problems such as leaks, overheating, vibration, noise or any other abnormalities. All equipment should be free of obstruction, be properly aligned and be moving at normal speed. Mechanical maintenance must be according to the manufacturer's instructions. • Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.	Operational Phase	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) Section 11(1)
15	Road mortalities of fauna / impact of human activities on site	±150 ha	• Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.	Operational Phase	NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) NEMA Regulation 543 Section 32 NEMA Regulation 543 Section 32
Closure and Decommissioning Phase					
16	Improvement of habitat through revegetation / succession over time	±150 ha	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas. • Rehabilitate all the land where infrastructure has been dismantled. • Diversion trenches and stormwater measures must be maintained. • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The mining areas will be shaped to make it safe.	Closure and Decommissioning Phase	NEMA, NEMBA, NEMA Financial Provisioning Regulations GNR 1147/2015, as amended

			• All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue till closure of the mine is approved.		
17	Soil erosion and sedimentation	±150 ha	• Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Closure and Decommissioning Phase	NEMA, NEMBA
18	Spreading and establishment of alien invasive species	±150 ha	• Refer to mitigation measures for the construction phase needed during the decommissioning phase that are similar.	Closure and Decommissioning Phase	NEMA, NEMBA, Alien and Invasive Species Lists, GNR 599/2014 & GNR 864/2016
19	Habitat degradation due to dust	±150 ha	• Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Closure and Decommissioning Phase	NEMA, NEMBA, National Dust Control Regulations (GNR 827/2013), National Ambient Air Quality Standards (GNR 1210/2009)
20	Spillages of harmful substances	±150 ha	• Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Closure and Decommissioning Phase	Hazardous Substances Act (Act No. 15 of 1973)
21	Road mortalities of fauna / impact of human activities on site	±150 ha	• Refer to mitigation measures for the construction phase needed during the decommissioning phase that are similar.	Closure and Decommissioning Phase	NEMA
Post-Closure & Rehabilitation Phase					
		±150 ha	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas.	Post-Closure &	

22	Improvement of habitat through revegetation / succession over time		• Rehabilitate all the disturbed areas and footprints. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitation areas until the area is self-sustaining. • Diversion trenches and stormwater measures must be maintained. • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The mining areas will be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue till closure of the mine is approved.	Rehabilitation Phase	NEMA, NEMBA, NEMA Financial Provisioning Regulations GNR 1147/2015, as amended
23	Soil erosion and sedimentation	±150 ha	• Diversion trenches and stormwater measures must be maintained. • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • Refer to mitigation measures for the construction and operational phases needed during the decommissioning phase that are similar.	Post-Closure & Rehabilitation Phase	NEMA, NEMBA
24	Spreading and establishment of alien invasive species	±150 ha	• Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation can outperform the invaders or aliens.	Post-Closure & Rehabilitation Phase	NEMA, NEMBA, Alien and Invasive Species Lists, GNR 599/2014 & GNR 864/2016
Soils, Agricultural Potential and Land Capability Impacts					
Planning Phase					
25	Delay of mining onset	±150 ha	• Apply and obtain IWUL from DWS after liaison with relevant officials and site visit to the area. • Siting of mine infrastructure on least sensitive areas.	Planning Phase	National Water Act (Act No 36 of 1998) (NWA)
Construction Phase					
	Soil destruction and sterilization	±150 ha	• Conservation of topsoil should be prioritized on site and done as follows:	Construction Phase	CONSERVATION OF AGRICULTURAL

26			○ The topsoil needs to be stockpiled separately from the overburden to preserve soil organisms and propagules. ○ Topsoil should only be harvested, handled and spread during the autumn and winter (March to August). Handling wet topsoil dramatically reduces soil beneficial properties and further damages soil structure due to increased compaction. ○ Topsoil stockpiles should not exceed a height of 2 meters where possible. The topsoil outer layer should also be protected from wind erosion by the use of wind nets and soil binders. If topsoil needs to be stockpiled for longer than 12 months, seeding will improve long term stability and help to keep the soil in an active state. ○ Topsoil stockpile heights in excess of 5 meters and duration of storage until the end of the mining operations will likely destroy the bulk of propagates and most of the soil microbes. This can be countered by ensuring proper rehabilitation of the stockpile itself and additional augmentation of the rehabilitated areas where the stored topsoil will finally be placed. In order to reduce the risk of degrading the topsoil when placed in a single large topsoil stockpile and to prevent cross zoning of soils from different vegetation types, it is recommended that topsoil originating from different areas should be stored separately during the operational phase. Dust suppression would likely be a priority. It is recommended that topsoil from stockpiles in excess of 5 meters be used first for concurrent rehabilitation. ○ Double handling of topsoil must be avoided as far as possible. Double handling will severely damage the underground structures such as roots and bulbs that contribute significantly to effective rehabilitation. ○ Stockpile topsoil separately from subsoil; ○ Stockpile in an area that is protected from stormwater runoff and wind; ○ Maintain topsoil stockpiles in a weed free condition; ○ Topsoil should not be compacted in any way, nor should any object be placed or stockpiled upon it.		RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
27	Soil compaction	±150 ha	• Soil should be handled when dry during removal and placement to reduce the risk of compaction. • Vegetation (grass and small shrubs) should not be cleared from the site prior to mining activities or construction (except if vegetation requires relocation as determined through an ecology assessment).	Construction Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983

			This material is to be stripped together with topsoil as it will supplement the organic and possibly seed content of the topsoil stockpile depending on the time of soil stripping (whether plants are in seed or not). • During construction, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Rip and/or scarify all compacted areas. Do not rip and/or scarify areas under wet conditions, as the soil will not loosen. Compacted soil can also be decompacted by "Rotary Decompactors" to effectively aerate soils for vegetation establishment.		NEMA Regulation 543 Section 32
28	Soil erosion and sedimentation	±150 ha	• When possible, topsoil stripping and excavation activities should be scheduled for the low rainfall season (winter). • Cover disturbed soils as completely as possible, using vegetation or other materials. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Sediment trapping, erosion and stormwater control should be addressed by a hydrological engineer in a detailed stormwater management plan. • All aspects related to dust and air quality should be addressed by an air quality specialist in a specialist report. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Gravel roads must be well drained in order to limit soil erosion.	Construction Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
29	Spillages of harmful substances	±150 ha	• Ensure that mining related waste or spillage and effluent do not affect the sensitive habitat boundaries and associated buffer zones. The risk of spillages of reagents and hydrocarbons on the soil during transportation can be reduced with proper maintenance of vehicles. This would include a rigorous and proactive maintenance program. • This risk can be further reduced through an adequate program of training of drivers and crews. This would include defensive driver	Construction Phase	Hazardous Substances Act (Act No. 15 of 1973)

			training, basic vehicle maintenance, and emergency control of spills. In order for the vehicle crews to be adequately able to control any spills at an early stage, the vehicles must be properly equipped with spill containment equipment (booms, sandbags, spades, absorbent pads, etc.). Responsibility for training lies with the transport contractor. Adequate training, maintenance, and equipment of transport crews should be included as a requirement for transport contracts. • Hydrocarbons should be stored in a concrete lined and bermed facility that has been designed to contain 110% of the volume of the tanks in the event of a spill. This eliminates the potential impacts to soils from spills of hydrocarbons. • All employees will be trained in cleaning up of a spillage. The necessary spill kits containing the correct equipment to clean up spills will be made available at strategic points in the plant area.		
30	Loss of land capability	±150 ha	• No specific mitigation can be applied during the construction phase itself to prevent loss of land capability considering that the land use will change to industrial. This however, does not prevent the mine from ensuring that disturbance and clearing should be confined to the footprint areas of the mine and not over the larger area. This can be done in the following ways: • Corridors should be secured around the mining footprint areas to ensure the current land use (grazing and agriculture) can continue in a functional way during mining. • Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. This could be done through the fencing off of the entire development footprint and institute strict access control to the portions of the owner-controlled property that are to remain undisturbed as soon as possible after initial site clearance. The fence should preferably be impermeable (for example a solid wall) to discourage invertebrates and small animals from entering the site. • All development activities should be restricted to specific recommended areas and strict buffer zones should be applied around the sensitive areas. The Environment Control Officer (ECO) should demarcate and control these areas. Unnecessary bulldozing through the veld should be avoided.	Construction Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
Operational Phase					

31	Soil destruction and sterilization	±150 ha	• The most desired approach during all of the mining phases is to continually rehabilitate the soils to the best possible state – taking into account the current technology and knowledge available as well as the financial means to conduct such rehabilitation. The rehabilitation of soils to pre-mining conditions is basically impossible though. • Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.	Operational Phase	NEMA, NEMBA
32	Soil compaction	±150 ha	• During operation, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by vehicles and equipment, wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. Vehicles should also stick to haul roads when dumping of overburden and topsoil are done. • Rip and/or scarify all compacted areas on a continuous basis. Do not rip and/or scarify areas under wet conditions, as the soil will not loosen. Compacted soil can also be decompacted by “Rotary Decompactors” to effectively aerate soils for vegetation establishment. • Refer to mitigation measures needed during the construction phase that are similar to the mitigation measures for impacts during the operational phase.	Operational Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
33	Increased Soil erosion and sedimentation	±150 ha	• Rehabilitation: revegetate or stabilise all disturbed areas as soon as possible. Indigenous trees can be planted in the buffer zone of the proposed development to enhance the aesthetic value of the site and stabilize soil conditions; • The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust); • Refer to mitigation measures that are similar for impacts during the construction phase.	Operational Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
34	Spillages of harmful substances to the soils	±150 ha	• Vehicle maintenance only done in designated areas – spill trays, sumps to be used and managed according to the correct procedures. • Vehicles and machines must be maintained properly to ensure that oil spillages are kept to a minimum. Fuel and oil storage facilities should be bunded with adequate stormwater management measures.	Operational Phase	Hazardous Substances Act (Act No. 15 of 1973)

			• Operational and Maintenance plan and schedule for management of sewage facilities should be compiled. An emergency plan should be compiled to deal with system failures and should include a down-stream notification procedure • Routine checks should be done on all mechanical instruments for problems such as leaks, overheating, vibration, noise or any other abnormalities. All equipment should be free of obstruction, be properly aligned and be moving at normal speed. Mechanical maintenance must be according to the manufacturer's instructions. • Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase		
35	Loss of land capability	±150 ha	• Only a small area of the land should be used for mining at a time. Rehabilitation should take place on a continuous basis where after the land would become partially available again as grazing/agricultural use. • Refer to mitigation measures needed during the operational phase that are similar to the mitigation measures for impacts during the construction phase.	Operational Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
Closure and Decommissioning Phase					
36	Improvement of eroded soils and compaction	±150 ha	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas. • Rehabilitate all the land where infrastructure has been demolished. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitated areas until the area is self-sustaining. • Diversion trenches and stormwater measures must be maintained • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The mining areas will be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue till closure of the mine is approved. • Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar.	Closure and Decommissioning Phase	NEMA Regulation 543 Section 32

37	Soil erosion and sedimentation	±150 ha	• Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar.	Closure and Decommissioning Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
38	Soil compaction	±150 ha	• During closure, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by vehicles wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • Rip and/or scarify all compacted areas on a continuous basis. Do not rip and/or scarify areas under wet conditions, as the soil will not loosen. Compacted soil can also be decompacted by "Rotary Decompactors" to effectively aerate soils for vegetation establishment. Other soil rehabilitation measures are discussed in section 11 of Appendix 6.3 • Soil should be sampled and analysed prior to replacement during rehabilitation. If necessary, and under advisement from a suitably qualified restoration ecologist, supplemental fertilisation may be necessary. • Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar	Closure and Decommissioning Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
39	Spillages of harmful substances	±150 ha	Refer to mitigation measures for the construction and operational phases needed during the decommissioning & closure phase that are similar.	Closure and Decommissioning Phase	Hazardous Substances Act (Act No. 15 of 1973)
Post-Closure & Rehabilitation Phase					
40	Improvement of land capability	±150 ha	• Once mining activities have ceased, disturbed areas should be rehabilitated and the grazing/agricultural capacity restored as far as possible. The rehabilitation of the soils and revegetation is discussed in section 11 of Appendix 6.3. • Refer to mitigation measures for the other mining phases needed during the closure phase that are relevant.	Post-Closure & Rehabilitation Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983

					NEMA Regulation 543 Section 32
41	Soil erosion and sedimentation	±150 ha	• Rehabilitation.	Post-Closure & Rehabilitation Phase	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983
Heritage Impacts					
Planning Phase					
42	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	±40 ha	• Apply for destruction permits.	Planning Phase	National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
43	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	±40 ha	• Apply for destruction permits.	Planning Phase	
44	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• Apply for destruction permits.	Planning Phase	
45	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• Plan a heritage conservation buffer of at least 50m around all graves. • Redesign project layout and road alignments to avoid the burial sites and the proposed conservation buffers where possible, especially with regards to sites Exigo-ZNM-BP03 and Exigo-ZNM-BP01. • Apply for permit to SAHRA for grave relocation where graves are impacted upon with regards to Site Exigo-ZNM-BP05 which is impacted by the open pit. Should sites Exigo-ZNM-BP03 and Exigo-ZNM-BP01 or their 50m conservation buffer be impacted by mining activities, grave relocations subject to permitting will have to be implemented for these sites as well.	Planning Phase	

Construction Phase					
46	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Construction Phase	National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
47	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Construction Phase	
48	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Construction Phase	
49	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• Implement a heritage conservation buffer of at least 50m around the grave. • Erect a fence around the burial site and apply access control with signage to indicate visitation contacts. • Implementation of a site management plan detailing site management conservation measures. Strict and continuous monitoring of the heritage site during construction. • Apply for permit to SAHRA for grave relocation where graves are impacted upon with regards to Site Exigo-ZNM-BP05 which is impacted by the open pit. Should sites Exigo-ZNM-BP03 and Exigo-ZNM-BP01 or their 50m conservation buffer be impacted by mining activities, grave relocations subject to permitting will have to be implemented for these sites as well. • General site monitoring by informed ECO.	Construction Phase	
Operational Phase					

50	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Operational Phase	National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
51	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Operational Phase	
52	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during operational activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Operational Phase	
53	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• Implement a heritage conservation buffer of at least 50m around the grave. • Erect a fence around the burial site and apply access control with signage to indicate visitation contacts. implementation of a site management plan detailing site management conservation measures. • Strict and continuous monitoring of the heritage site during operations. • Apply for permit to SAHRA for grave relocation where graves are impacted upon with regards to Site Exigo-ZNM-BP05 which is impacted by the open pit. Should sites Exigo-ZNM-BP03 and Exigo-ZNM-BP01 or their 50m conservation buffer be impacted by mining activities, grave relocations subject to permitting will have to be implemented for these sites as well. • General site monitoring by informed ECO.	Operational Phase	
Closure and Decommissioning Phase					
		±40 ha	• No mitigation is required.		NHRA

54	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit		• General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during decommissioning activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Closure and Decommissioning Phase	
55	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during decommissioning activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Closure and Decommissioning Phase	
56	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during decommissioning activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Closure and Decommissioning Phase	
57	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during decommissioning activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Closure and Decommissioning Phase	
Post-Closure & Rehabilitation Phase					
58	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during rehabilitation activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Post-Closure & Rehabilitation Phase	NHRA
59	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	±40 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during rehabilitation activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Post-Closure & Rehabilitation Phase	

60	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during rehabilitation activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Post-Closure & Rehabilitation Phase	
61	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	±153 ha	• No mitigation is required. • General site monitoring by informed ECO. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during rehabilitation activities, all activities should be suspended and the archaeological specialist should be notified immediately.	Post-Closure & Rehabilitation Phase	
Palaeontological Impacts					
Construction Phase					
62	Destruction of stromatolites		• Palaeontological site visit must be done in areas earmarked for construction. Palaeontologist must be appointed if stromatolites are exposed.	Construction Phase	NHRA
63	Destruction of fossils.		• Palaeontological site visit must be done in areas earmarked for construction. Palaeontologist must be appointed if fossils are exposed.	Construction Phase	
64	Preservation of fossils.	±150 ha	• Positive impact - no mitigation recommended.	Construction Phase	
Hydrogeological Impacts					
Construction Phase					
65	Contamination to ground- and surface water systems	±150 ha	• Roads should be compacted. • Vehicle maintenance in designated areas – use of spill trays, sumps and managed according to SOP's. • A rigorous, proactive vehicle maintenance program must be implemented.	Construction Phase	NWA, NEMWA, Hazardous Substances Act (Act No. 15 of 1973)

			• A Hydrocarbon and Emergency Spill Procedure Method Statement must be developed. • Spill kits to be used onsite and employees given spill containment training. • Spills on impermeable surfaces (i.e. cement or concrete), must be contained using oil absorbent materials. • Contaminated soils and remediation materials must be removed carefully and stored in adequate containers and disposed at a hazardous waste disposal facility. • Polluting materials must be handled with care. Prepare clear procedures for workers to deal with these products. • All waste oils and grease to be stored in sealed drums for recycling/reuse. • Refuelling to be done in appropriate locations onsite. • Fuel storage, maintenance, refuelling of vehicles/equipment to be carried out >150 m from watercourses. • Storage areas accommodating hazardous substances (fuel, oils and chemicals), must have an impermeable surface and be suitably bunded to retain 110% of all the container volumes. • All solid waste to be stored in covered waste skips/bins until disposal at a licence waste disposal facility. Waste must not be burned or buried on site. • General and hazardous waste not to be stored on site for more than 90 days. Should waste be stored on site for longer than 90 days, the conditions within the National Norms and Standards for the Storage of Waste (GNR. 926 of 29 November 2013) will need to be implemented.		
66	Contamination to ground- and surface water systems	±0.6 ha	• Monitoring systems to detect leaking and as well as visual observations of facilities conditions. A package plant would need to be utilised to mitigate contamination	Construction Phase	NWA, NEMWA
67	Contamination to ground- and surface water systems	±0.6 ha	• Monitoring systems to detect leaking and as well as visual observations of facilities conditions	Construction Phase	NWA, NEMWA, Hazardous Substances Act (Act No. 15 of 1973)

Operational Phase					
68	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receive very low if any groundwater inflows	±40 ha	• Abstraction volume monitoring and grouting (sealing) of fractures is a mitigation measurement as well as establishing a buffer between the mine and affected receptors by purchasing or leasing land. The option also exists to supply the municipality with excess groundwater.	Operational Phase	NEMA, NWA
69	Contamination to ground- and surface water systems	±150 ha	• Effective stormwater management would need to be done to mitigate impacts. • Also implement construction phase mitigation measures with regards to oil, grease and diesel spillage prevention.	Operational Phase	NWA, NEMWA, Hazardous Substances Act (Act No. 15 of 1973)
70	Contamination to ground- and surface water systems	±84 ha	• Given the low sulphur concentration from the mineralogy report and the sufficient buffering capacity AMD is not likely to occur.	Operational Phase	NEMA, NWA, NEMWA
71	Contamination to ground- and surface water systems	±44 ha	• Water quality monitoring and seepage capturing from boreholes and effective stormwater management would need to be done. Given the locality of the overburden stockpile, the open pit will act as a hydraulic barrier to which contaminants will migrate.	Operational Phase	NEMA, NWA
Closure and Decommissioning Phase					
71	Groundwater and surface water contamination	±40 ha	• Planning and land use design of post-operational land use; Backfilling of pit to above the baseline water levels pit need to be shaped to collect as much rainfall as possible to dilute elevated salt concentrations. The sulphur content of the material is however already low with sufficient background buffering capacity.	Closure and Decommissioning Phase	NEMA, NWA

72	The deterioration of the groundwater environment	±40 ha	• Planning and land use design of post-operational land use; Backfilling of pit to above the baseline water levels (1100 to 1150 mamsl). The pit needs to be shaped to collect as much water as possible. The pit lake could further be used for water storage and possibly aquaculture or potentially water supply to affected parties.	Closure and Decommissioning Phase	NEMA, NWA, NEMWA
73	Contamination to ground- and surface water systems	±44 ha	• Water quality monitoring and seepage capturing from boreholes Seepage capturing from non-perennial drainages could be used as a mitigation measurement.	Closure and Decommissioning Phase	NEMA, NWA
Post-closure and Rehabilitation Phase					
74	Groundwater and surface water contamination	±40 ha	• Planning and land use design of post-operational land use; the pit need to be shaped to collect as much rainfall as possible to dilute elevated salt concentrations and ensure all overburden residue material is backfilled.	Post-closure and Rehabilitation Phase	NEMA, NWA
75	Elevated salt concentrations from higher evaporation on surface leading to the deterioration of the groundwater environment contamination	±40 ha	• The pit needs to be shaped to collect as much rainfall as possible to dilute elevated salt concentrations. From the SGS data, the existing limestone and dolomite within the overburden would mitigate potential sulphur contamination	Post-closure and Rehabilitation Phase	NEMA, NWA, NEMWA
76	Contamination to ground- and surface water systems	±40 ha	• Water quality monitoring. The boreholes could further be used for water supply purposes when acceptable water quality is reached post closure or alternatively be used for irrigation purposes	Post-closure and Rehabilitation Phase	NEMA, NWA, NEMWA
Air Quality Impacts					
Planning Phase					
77	Particulate emissions; fugitive dust	N/A	• Best engineering practices to minimise impact on surrounding environment where feasible.	Planning Phase	National Environment Management: Air

					Quality Act No. 39 of 2004 (NEM:AQA), Ambient Air Quality Standards
Construction Phase					
78	Gaseous and particulate emissions; fugitive dust	±150 ha	• Maintenance of vehicles and wet suppression or chemical treatment on unpaved road surfaces.	Construction Phase	
79	Particulate emissions; fugitive dust	±150 ha	• Wet suppression where feasible. • Minimise extent of disturbed areas. • Reduction of frequency of disturbance. • Early re-vegetation of disturbed areas.	Construction Phase	
80	Particulate emissions; fugitive dust	±40 ha	• Wet suppression where feasible on materials handling activities and reducing drop height.	Construction Phase	
81	Particulate emissions; fugitive dust	±150 ha	• Wet suppression where feasible. • Minimise extent of disturbed areas. • Reduction of frequency of disturbance. • Early re-vegetation of disturbed areas.	Construction Phase	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
Operational Phase					
82	Gaseous and particulate emissions; fugitive dust	±7 ha	• Maintenance of vehicles and wet suppression or chemical treatment on unpaved road surfaces.	Operational Phase	
8	Particulate emissions; fugitive	±33 ha	• Maintenance of vehicles and wet suppression or chemical treatment	Operational Phase	
84	Particulate emissions; fugitive dust	±150 ha	• Wet suppression where feasible on materials handling activities and reducing drop height. • Enclosure or wet suppression of crushing activities.	Operational Phase	
85	Particulate emissions; fugitive dust	±150 ha	• Wet suppression where feasible. Stabilisation (chemical, rock cladding or vegetative) of overburden facility.	Operational Phase	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations

Closure and Decommissioning Phase					
85	Particulate emissions; fugitive dust	±150 ha	• Wet suppression where feasible.	Closure and Decommissioning Phase	
86	Particulate emissions; fugitive dust	±33 ha	• Wet suppression where feasible.	Closure and Decommissioning Phase	
87	Gaseous and particulate emissions; fugitive dust	±150 ha	• Maintenance of vehicles and wet suppression on unpaved road surfaces.	Closure and Decommissioning Phase	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
Post-Closure & Rehabilitation Phase					
88	Particulate emissions; fugitive dust	±150 ha	• Vegetation of open and disturbed areas.	Post-Closure & Rehabilitation Phase	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
Noise Impacts					
Construction Phase					
89	Noise impact on R1, R2 and R6	±44 ha	• Recommended (not compulsory) – Construction crew must conduct toolbox talks to educate their employees and ensure that they are aware of the legislation regarding noise. Should a noisy construction activity occur off the project footprint and near a receptor, the Environmental Coordinator should inform the receptor prior to the activity. Should noisy night-time activity occur (after 9pm, e.g.	Construction Phase	NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004,
	Noise impact on R1, R2 and R7	±20 ha		Construction Phase	

90			concrete pouring) the Environmental Coordinator should make receptors aware of the activity prior to the occurrence. • Recommended (not compulsory) – The construction team should make use of equipment that has lower SPL or is designed to produce lower SPL (heavy equipment operating within 300m of a receptor). • Compulsory: For R1, R2, R5 and R10 – Should a noisy night-time open cast truck and shovel/ stockpile/ haul route construction be required within 300m of these receptors (direct line-of-sight, activity with no berm/barrier/pit highwall or stockpile slope (acoustical screen in relation to the receptor) etc.), a representative should inform these receptors prior to the noise event. The mine should consult and measure the first night-time activity to recommend/discuss/plan immediate management mitigation measures should the measurement exceed +7 dBA over a 10-minute period. Once the measurements indicate no potential noise impacts, the construction can continue until berm/pit implementation (acoustical shield).		SANS 10328:2008, SANS 10357:2004
91	Noise impact on R4 and R5	±40 ha		Construction Phase	
92	Noise impact on R4 and R6	±40 ha		Construction Phase	
93	Noise impact on R4 and R7	±40 ha		Construction Phase	
94	Noise impact on R1, R2 and R6	±44 ha		Construction Phase	
95	Noise impact on R7, R8 and R10	±33 ha		Construction Phase	
96	Noise impact on R7, R8 and R11	±33 ha		Construction Phase	
97	Noise impact on R7, R8 and R12	±33 ha		Construction Phase	

98	Noise impact on R7 and R10	±4 ha		Construction Phase	
99	Noise impact on R1, R2 and R7	±20 ha		Construction Phase	
Operational Phase					
100	Noise impact on R1, R2 and R6	±44 ha	• Acoustical mitigation should be implemented regarding any external mounted ventilation stacks/exhaust stacks etc. at the plant area. An acoustical consultant/specialist or engineer can be consulted on mitigation. Options to consider are specified on page 37 of the Noise Impact Assessment (NIA). • Articulated Dump Truck (ADT), graders, roller compactor, truck and shovel operations etc. must operate behind a stockpile slope/berm barrier and in relation to receptors R1 – R6 and R10. See Figure 9 of the NIA for areas requiring an acoustical screen. The developer proposes berms around most of these areas that will be sufficient to act as a screen, including a 5 m high and 10 m wide berm around the entire pit perimeter and overburden berm and topsoil stockpiles of 10 m high. • A berm/barrier is required on the north-western plant footprint boundary facing receptor R8 as well as in relation to Receptor R7 and R10. For berm specifications refer to pages 37 and 39 of the NIA. • Should any tipping be required on the outsides of the overburden/topsoil tip or berm directly facing a receptor, the tipping is recommended to take place during the daytime hours (between 07:00 and 21:00), and in relation to receptors R1, R2 and R6. • Should the mine make use of the haul route past R10 at night (e.g. after 22:00) a combination of the following options should be considered (not compulsory): ○ A berm or barrier could be implemented at the boundary of the haul road corridor.	Operational Phase	NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
101	Noise impact on R1, R2 and R6	±20 ha		Operational Phase	
102	Noise impact on R4 and R5	±40 ha		Operational Phase	
103	Noise impact on R4 and R6	±40 ha		Operational Phase	
104	Noise impact on R4 and R7	±40 ha		Operational Phase	

<table>
<tr><td>105</td><td>Noise impact on R1, R2 and R6</td><td>±44 ha</td><td rowspan="6">The developer could approach the receptor and municipality to request in writing an exemption in terms of noise. There also exists certain applications that could be taken, including zoning the route as a “controlled area” to operate at a higher level.
If feasible the haul route could operate at lower frequencies during the hours of 21:00 till 07:00, or acceptable hours that is agreed between receptors and mine.
Mine to consult an acoustical consultant to implement mitigation at the dwelling.
Mine to investigate an alternative layout with a minimum 250m distance between the receptor and the haul route.
Note that should R10 be relocated, this mitigation should be discarded.
Environmental Co-ordinator to keep continuous communication with receptors regarding noises and potential loud noise events. A contact line should be made available to receptors should a valid noise complaint arise whereby receptors could lodge a complaint (and documented).
Should a valid noise complaint be lodged, it is advised that the Environmental coordinator contact an acoustical consultant with experience in noise monitoring to evaluate the complaint.
An Environmental Noise Measurement Programme (Monitoring Programme) needs to be implemented. See section 8.2 of the NIA Report (Appendix 6.9). An independent acoustical consultant should investigate operations. Monitoring must be done to assess for a disturbing noise or a noise nuisance, identifying any potential acoustical issues. Compliance in terms of noise levels at the project boundary is also required.
The following mitigation measures are recommended, but not compulsory:
Where feasible, noisy equipment and areas (crushing, screening and specifically tipping points and conveyor feeds) should not be raised at high elevations. The noisy equipment and areas should be located as low as possible for acoustical berms and surrounding buildings/stockpiles to act as noise shields.</td><td>Operational Phase</td><td></td></tr>
<tr><td>106</td><td>Noise impact on R7, R8 and R10</td><td>±33 ha</td><td>Operational Phase</td><td></td></tr>
<tr><td>107</td><td>Noise impact on R7, R8 and R10</td><td>±33 ha</td><td>Operational Phase</td><td></td></tr>
<tr><td>108</td><td>Noise impact on R7, R8 and R10</td><td>±40 ha</td><td>Operational Phase</td><td></td></tr>
<tr><td>109</td><td>Noise impact on R7 and R10</td><td>±40 ha</td><td>Operational Phase</td><td></td></tr>
<tr><td>110</td><td>Noise impact on R1, R2 and R6</td><td>±33 ha</td><td>Operational Phase</td><td></td></tr>
</table>

			○ Where feasible, noisy equipment should be enclosed. These enclosures could be double brick building units, concrete or steel. Units that are enclosed should have minimal apertures (openings) facing receptors (north-west direction, receptors R8). The building should have a roof enclosure as well. Equipment that should be considered for some enclosure are the crushers, screening plant, screen and feed conveyor area, emergency loading hopper (if feasible). ○ Should the project operations require alarms (e.g. when an operation ceases), an acoustical consultant/engineer should be consulted to ensure minimal alarm noise direction into the direction of receptors (north-west direction). ○ Should the layout change as assessed in the report, the report layout must be reviewed in terms of environmental acoustics. ○ The project should consider reverse alarms that do not generate a high noise nuisance due to its tonality. ○ Onsite noise measurements should be considered on a frequent basis, to help identify any fault or loud equipment that may require enclosures or maintenance. A Quarterly noise measurements programme is recommended during all phases. • Should evaluated receptors in this report (R1 – R11) be relocated, the impact significance can be considered as negligible. Should a receptor remain that has been identified as relocated (see Appendix D and Figure 2 of the NIA), the Environmental NIA must be re-assessed with the NSD reinstated for assessment.		
Blasting & Vibration Impacts					
Operational Phase					
11	Ground Vibration impact on Chicken Broilers	±40 ha	• Specific blast design that considers the actual blasting, and the ground vibration levels to adhere too. Only apply electronic initiation systems to facilitate single hole firing. Design for smaller diameter blast holes that will use fewer explosives per blast hole. • Use of a specialist to assist with drilling and blasting mitigation. Relocate the POI / acquire the POI of concern – mine owned. Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast,	Operational Phase	Minerals and Petroleum Resources Development Act No. 28 of 2002 (MPRDA)and Regulations (GNR 527/2004), NEMA, Explosives Act No. 26 of 1956 and Regulations (GNR 1604/1972), Mine
11	Ground Vibration impact on Farm Buildings with various	±40 ha			
11	Ground Vibration impact on Houses	±40 ha			
11	Ground Vibration impact on Structures	±40 ha			

11	Ground Vibration impact on SANRAL Road	±40 ha	increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-		Health and Safety Act No. 29 of 1996 and Regulations (GNR 93/1997)
11	Air blast Impact on Chicken Broilers	±40 ha	• Specific blast design that considers the actual blasting, and the ground vibration levels to adhere too. Only apply electronic initiation systems to facilitate single hole firing. Design for smaller diameter blast holes that will use fewer explosives per blast hole. • Use of a specialist to assist with drilling and blasting mitigation. Relocate the POI / acquire the POI of concern – mine owned. Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.		
11	Air blast Impact on Farm Buildings/Structures	±40 ha			
11	Air blast Impact on Heritage Site	±40 ha			
11	Air blast Impact on Houses	±40 ha			
12	Air blast Impact on Hydrocensus Borehole	±40 ha			
12	Air blast Impact on Informal Housing	±40 ha			
12	Air blast Impact on Planned SANRAL Road	±40 ha			
12	Air blast Impact on Ruins	±40 ha			
12	Air blast Impact on Structure	±40 ha			
12	Fly rock Impact on Building/Structure	±40 ha	• Specific blast design that considers the actual blasting, and the ground vibration levels to adhere too. Only apply electronic initiation systems to facilitate single hole firing. Design for smaller diameter blast holes that will use fewer explosives per blast hole. • Use of a specialist to assist with drilling and blasting mitigation. Relocate the POI / acquire the POI of concern – mine owned. Specific blast design to be done, shorter blast holes, smaller diameter blast hole, use of specific stemming materials to manage air blast, increased stemming lengths to reduce air blast effect. Used of specific stemming to manage fly rock - crushed aggregate of specific size. Re-design with increased stemming lengths.		
12	Fly rock Impact on Cement Dam	±40 ha			
12	Fly rock Impact on Chicken Broilers	±40 ha			
12	Fly rock Impact on Farm Buildings/Structures	±40 ha			
12	Fly rock Impact on Gravel Road	±40 ha			
13	Fly rock Impact on Heritage Site	±40 ha			
13	Fly rock Impact on Houses	±40 ha			

1	Fly rock Impact on	±40 ha			
13	Fly rock Impact on Informal Housing	±40 ha			
13	Fly rock Impact on Pivot Irrigation	±40 ha			
13	Fly rock Impact on Planned SANRAL Road	±40 ha			
13	Fly rock Impact on Railway Line	±40 ha			
13	Fly rock Impact on Reservoir	±40 ha			
13	Fly rock Impact on Road	±40 ha			
13	Fly rock Impact on Ruins	±40 ha			
14	Fly rock Impact on Structures	±40 ha			
Visual Impacts					
Construction Phase					
141	Build access roads to site, exposure of earth to create terraces for the construction activities - the building of the plant and office infrastructure. Prestrip site to establish open pit area. The exposure of earth and rock (stark contrast with existing landscape character) results in the altering of the visual quality and sense of place of areas around the project site. These activities which will also generate dust and will be visible in foreground and middleground views from	±150 ha	• Construction activities should be limited to not occur after 22:00. • Dust suppression techniques must be implemented along the haul roads. • Ensure lighting is directed away from sensitive viewing areas. • With the preparation of the portions of land onto which activities will take place the minimum amount of existing vegetation and topsoil should be removed. • All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use at heights and age that does not kill off the existing seed banks. • Adopt responsible construction practices aimed at containing the construction/establishment activities to specifically demarcated areas. • Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities is exposed.	Construction Phase	NEMA

	residential areas and farmstead accommodation and public roads. Night lighting during this phase.		• In all other areas, the natural occurring vegetation, should be retained, especially along the periphery of the sites. Paint structures with colours that reflect and compliment the colours of the surrounding landscape. • Lower the mine infrastructure area terrace along the northern side (i.e. cut to fill with most cut occurring along the southern edge)		
142	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	±150 ha	• Topsoil stockpiles should be shaped and vegetated (hydroseeded) in order to blend with the existing areas. • Dust suppression techniques must be implemented along the haul roads. • Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities is exposed. • In all other areas, the natural occurring vegetation, should be retained, especially along the periphery of the sites.	Construction Phase	NEMA
Operational Phase					
143	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	±150 ha	• Topsoil stockpiles should be shaped and vegetated (hydroseeded) in order to blend with the existing areas. • Dust suppression techniques must be implemented along the haul roads. • Earthworks should be executed in such a way that only the footprint and a small 'construction buffer zone' around the proposed activities is exposed. • In all other areas, the natural occurring vegetation, should be retained, especially along the periphery of the sites.	Operational Phase	NEMA
144	Exposure of rock through blasting that would contrast with the existing natural landscape in the immediate	±40 ha	• Mitigation will be difficult due to the scale, nature and orientation of the operations. • Remove vegetation in sections or as excavation proceeds.	Operational Phase	

	vicinity of the open pit as the mining operation advances along with the movement of trucks and excavators that would generate dust. The result is the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middle ground and background from residential areas and farmsteads and sections of public roads.		• Implement dust suppression techniques. • Ensure topsoil stockpiles are properly managed and maintained. • Concurrent rehabilitation of all backfilled areas in the open pit and the overburden and topsoil footprints should be carried out immediately after they have been established		
145	Dust generated by moving trucks that is visible from surrounding residential areas and public roads will result in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middle ground and background from residential areas and farmsteads and sections of public roads. Night lighting during this phase.	±48 ha	• Apply effective dust suppression techniques. When possible limit night-driving to the absolute minimum.	Operational Phase	
146	Physical presence of the overburden facility that alters the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middle ground	±48 ha	• Mitigation will be difficult. Only remove vegetation within the mining footprint. • Shape facilities to create a neat and tidy appearance and hydroseed areas to remain in place or to be 'static' for more than 6 months. • Dust suppression techniques should be implemented.	Operational Phase	

	and background from residential areas and farmsteads and sections of public roads.				
147	Light pollution resulting in the alteration of the baseline visual quality and sense of place of the project site and its environs. Lights will be visible from nearby residential areas and public roads.	±33 ha	• Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the infrastructure. • Avoid high pole top security lighting. • Use security lighting at the periphery of the site that is activated by movement and are not permanently switched on. • When possible limit night-driving to the absolute minimum.	Operational Phase	
Closure and Decommissioning Phase					
148	The final shaping (dust creation) and rehabilitation process that alters the visual quality and sense of place of the study area. These activities will be visible from nearby residential and homestead areas as well as public roads.	±150 ha	• Final grading of the excavation to avoid harsh excavated lines to blend with the slope of the surrounding topography. Rehabilitation of the disturbed footprints. Use only plants indigenous to the sub-region.	Closure and Decommissioning Phase	NEMA
149	Improvement of the visual quality and sense of place of the project area visible from nearby residences areas and public roads.	±150 ha	• Effective rehabilitation of the open pit and disturbed footprints. • Apply effective dust suppression techniques and no work to occur at night. • Rehabilitation of the disturbed footprints. Use only plants indigenous to the sub-region.	Closure and Decommissioning Phase	
Post-Closure Phase					
150	Improvement of the visual quality and sense of place of the project area visible	±150 ha	• Effective management of rehabilitated areas such that the grassed (hydroseeded) areas are established and permanently sustainable	Post-Closure Phase	NEMA

	from nearby residences as well as public roads.				
Socio-economic Impacts					
Construction Phase					
151	Temporary stimulation of economy	N/A	In order to optimise the stimulation of the local economy through direct, indirect and induced effects, the following should be applied where possible: • Procure construction materials, goods, and products from local and domestic suppliers if feasible • Employ local contractors where possible	Construction Phase	N/A
152	Temporary creation of employment		The following is recommended to increase the employment opportunities created in the local communities, where feasible: • Employ labour-intensive methods in construction, where feasible. • Employ local residents and communities, where possible. • Sub-contract to local construction companies, where possible. • Utilise local suppliers, where possible. • Organise local community meetings to advise the local labour on the project that is planned to be established and the jobs that can potentially be applied for	Construction Phase	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
153	Skills development due to the creation of new employment opportunities		• Adhere to the Social and Labour Plan that will establish mitigation measures to support skills development	Construction Phase	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)

154	Government revenue increase due to capital expenditure		• No mitigation measures are required.	Construction Phase	N/A
155	Temporary increase in household income during construction		• No mitigation measures are required.	Construction Phase	N/A
156	Loss of commercial activities - agriculture and tourism		• Where feasible and not affected by the footprint of mine's infrastructure, the existing agricultural activities should be retained. • Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for commercial farming after the project's closure.	Construction Phase	NEMA
157	Change to the sense of place		• Recommendations and mitigation measures provided in the Visual Impact Assessment must be adhered to.	Construction Phase	NEMA
158	Temporary increase in crime and social conflicts associated with influx of people		• Employ local residents and communities, where possible to avoid social conflicts • Train unemployed local community members with insufficient skills and increase absorption of local labour thereby decreasing in-migration.	Construction Phase	N/A
159	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts		• Recommendations and mitigation measures provided in the Air Quality, Noise and Visual Impact Assessments must be adhered to.	Construction Phase	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008,

					SANS 10357:2004
160	Impact on property values		• Devise and implement awareness campaigns around impacts of mining activities on property values. • Organise information sharing forums/talks for property owners and interested property investors attended by property specialists and real estate agents. • Properties or parts thereof of landowners who are directly affected by the proposed mine infrastructure and activities will need to be leased or purchased by the Applicant. This will be subject to agreement between the Applicant and the landowner. • Where impacts cannot be adequately mitigated at the closest receptors, the Applicant will need to establish a suitable buffer between the mine and the affected receptor(s). This will need to be achieved by either purchasing or leasing the property or a part thereof or alternatively compensating the receptor(s). This will be subject to agreement between the Applicant and the landowner or occupier.	Construction Phase	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
161	Physical displacement and potential loss of family ties		• Communication and collaboration with the Mogalakwena Municipality in ensuring that additional housing is planned in areas close by and making provision for those who will be affected by the mine activities. • Properties or parts thereof of landowners who are directly affected by the proposed mine infrastructure and activities will need to be leased or purchased by the Applicant. This will be subject to agreement between the Applicant and the landowner. • Where impacts cannot be adequately mitigated at the closest receptors, the Applicant will need to establish a suitable buffer between the mine and the affected receptor(s). This will need to be achieved by either purchasing or leasing the property or a part thereof or alternatively compensating the receptor(s). This	Construction Phase	N/A

			will be subject to agreement between the Applicant and the landowner or occupier.		
162	Economic displacement of disadvantaged communities		• Adhere to the Social and Labour Plan that will establish mitigation measures for such instances	Construction Phase	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
163	Increased pressure on local services and infrastructure		• Clearly inform the local municipality of the potential impact of the proposed project in order for the necessary preparations to take place. • Provide public transportation service for workers in order to reduce congestion on roads. • Partner with local municipalities and other prominent users of the local roads to upgrade them to meet the required capacity and intensity of the vehicles related to the planned construction activities.	Construction Phase	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
Operational Phase					
164	Sustainable stimulation of economy	N/A	• Where feasible, procure goods and services required for the operation of the mine from the local economy.	Operational Phase	N/A
165	Creation of employment		• Where feasible, aim to fill all the positions with labour from the local community	Operational Phase	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
166	Impact on government revenue		• No mitigation measures are required.	Operational Phase	N/A
167	Change to the sense of place		• Recommendations and mitigation measures provided in the Visual Impact Assessment must be adhered to.	Operational Phase	NEMA

168	Increase in household income during operation		• Where feasible, aim to fill all the positions with labour from the local community	Operational Phase	N/A
169	Improved living standards of positively affected households		• Employing locally will increase benefit to local households and the local area.	Operational Phase	N/A
170	Skills development of permanently employed workers		• In order to maximise the positive impact, it is suggested that the project company provide training courses for employees where feasible to ensure that employees gain as much as possible from the work experience. • Facilitate the transfer of knowledge between experienced employees and the local staff. • Perform a skills audit to determine the potential skills that could be sourced in the area. • Where possible train and empower local communities for employment in the operations of the mine.	Operational Phase	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Skills Development Act (No. 97 of 1998), Skills Development Levies Act (No. 9 of 1999). SLP
171	Local economic development benefits derived through mine's social responsibility programme		• No mitigation measures are required.	Operational Phase	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
172	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts		• Recommendations and mitigation measures provided in the Air Quality, Noise and Visual Impact Assessments must be adhered to.	Operational Phase	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008,

					SANS 10357:2004
Closure and Decommissioning Phase					
173	Temporary stimulation of economy	N/A	• No mitigation measures are required.	Closure and Decommissioning Phase	N/A
174	Temporary employment		• Adhere to the Social and Labour Plan that will establish mitigation measures	Closure and Decommissioning Phase	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
175	Temporary increase in household income		• No mitigation measures are required.	Closure and Decommissioning Phase	N/A
176	Impact on government revenue		• No mitigation measures are required.	Closure and Decommissioning Phase	N/A
177	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts		• Recommendations and mitigation measures provided in the Air Quality, Noise and Visual Impact Assessments must be adhered to.	Closure and Decommissioning Phase	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004,

					SANS 10328:2008, SANS 10357:2004
Post-Closure & Rehabilitation Phase					
178	Temporary stimulation of economy		• No mitigation measures are required.	Post-Closure Phase	N/A
179	Temporary employment		• Adhere to the Social and Labour Plan that will establish mitigation measures	Post-Closure Phase	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
180	Temporary increase in household income		• No mitigation measures are required.	Post-Closure Phase	N/A
181	Impact on government revenue		• No mitigation measures are required.	Post-Closure Phase	N/A
182	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts		• Recommendations and mitigation measures provided in the Air Quality, Noise and Visual Impact Assessments must be adhered to.	Post-Closure Phase	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008,

					SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
183	Improved quality of life due to rehabilitation activities		• Recommendations and mitigation measures provided in the Rehabilitation Plan must be adhered to.	Post-Closure Phase	N/A
Traffic Impacts					
Construction Phase					
18	Increase in traffic	N/A	Mitigation measures proposed based on the results of the capacity analyses at the various intersections analysed: • R101 and Road D1231: 60m left-slip lane on R101 western approach; • Road D1603 and D1231: 60m left-slip lane on D1231 southern approach; • Road D1603 and Mine access: 60m left-slip lane on D1603 eastern approach; and • Upgrade of Road D1603: The structural capacity of this gravel road does not form part of the traffic impact assessment. Based on the number of trips and the loads this road will require mitigation measures to accommodate the expected traffic	Construction Phase	National Road Traffic Act No. 93 of 1996, South African National Roads Agency Limited and National Roads Act 07 of 1998
18	Improved access points	±7 ha		Construction Phase	
18	Impeded access	±7 ha		Construction Phase	
187	Improved road quality	±7 ha		Construction Phase	
188	Deterioration of road quality	±7 ha		Construction Phase	
18	Traffic accidents	N/A	• Develop and implement a Traffic Safety Policy and apply to contractor and subcontractors	Construction Phase	National Road Safety Act 9 of
Operational Phase					
190	Increase in traffic	N/A	Mitigation measures proposed based on the results of the capacity analyses at the various intersections analysed:	Operational Phase	National Road Traffic Act No. 93 of 1996, South African National Roads Agency

191	Deterioration of road quality	±7 ha	• Use of N11 Ring Road once commissioned to reduce impact on regional roads. • R101 and Road D1231: 60m left-slip lane on R101 western approach; • Road D1603 and D1231: 60m left-slip lane on D1231 southern approach; and • Road D1603 and Mine access: 60m left-slip lane on D1603 eastern approach. • Upgrade of Road D1603: The structural capacity of this gravel road does not form part of the traffic impact assessment. Based on the number of trips and the loads this road will require mitigation measures to accommodate the expected traffic demand from the Mine's access to Road D1231. It is recommended that Road D1603 be upgraded with the relevant road pavement design to an appropriate standard. • The structural capacity of Road D1231 needs to be assessed to determine if this road can accommodate the expected traffic demand from the mine. • The loading and off-loading of passengers should take place on site in proximity of the access control points and not along Road D1603. • The proposed haulage road between the Mine Infrastructure north of the proposed N11 Ring Road and the Open Pit, • Topsoil and Overburden areas south of the proposed N11 Ring Road will need to be approved by SANRAL. • A formal access application will also need to be made to Limpopo Road Agency (RAL) for access off Road D1603.	Operational Phase	Limited and National Roads Act 07 of 1998
192	Traffic accidents	N/A	• Develop and implement a Traffic Safety Policy and apply to visitors also. • Compile a Traffic Management Plan.	Operational Phase	National Road Safety Act 9 of 1972

37.8. Impact Management Outcomes

Table 44: Management Outcomes Table

No	Activity	Impact	Mitigation Type	Roles & Responsibility	Compliance with Standards
Ecological Impacts					
Planning Phase					
1	Obtaining of IWUL for crossings and mining through water courses	Delay of mining onset	Compliance measure	Contractor / ECO	National Water Act (Act No 36 of 1998) (NWA)
2	Obtaining permits for the eradication of protected trees / flora	Delay of plant construction	Compliance measure	Contractor / ECO	National Forest Act (Act 84 of 1998) (NFA)
Construction Phase					
3	Clearing of vegetation for open pit, construction of infrastructure, access roads etc. causing direct habitat destruction / fragmentation	Habitat destruction / fragmentation of fauna habitats	Control/reduction measure	Contractor / ECO	National Environmental Management Act No. 107 of 1998 (NEMA); National Environmental Management: Biodiversity Act No. 10 of 2004 (NEMBA); Limpopo Environmental Management Act No. 7 of 2003 (LEMA)
4	Topsoil & subsoil stripping, exposure of soils, ore and rock to	Soil erosion and sedimentation	Control/reduction measure	Contractor / ECO	NEMA, NEMBA

	wind and rain during construction causing erosion and sedimentation				
5	Vegetation clearing / vehicle movement	Spreading and establishment of alien invasive species	Control/reduction measure Control/reduction measure	Ecologist / ECO	NEMA, NEMBA, Alien and Invasive Species Lists, GNR 599/2014 & GNR 864/2016
6	Vegetation clearing / vehicle movement	Habitat degradation due to dust	Control/reduction measure	Contractor / ECO	NEMA, NEMBA, National Dust Control Regulations (GNR 827/2013), National Ambient Air Quality Standards (GNR 1210/2009)
7	Heavy machinery and vehicle movement on site	Spillages of harmful substances	Avoidance/Prevention measure	Contractor / ECO	Hazardous Substances Act (Act No. 15 of 1973)
8	Clearing of vegetation for open pit through water courses as well as road crossings	Impediment of flow patterns	Avoidance/Prevention measure	Contractor / ECO	NEMA, NWA
9	Heavy machinery and vehicle movement on site; Construction of infrastructure, roads etc. on site	Road mortalities of fauna / impact of human activities on site	Avoidance/Prevention measure	Contractor / ECO	NEMA
Operational Phase					
10	Laydown areas of overburden facility and topsoil stockpile	Habitat destruction / fragmentation of fauna habitats	Control/reduction measure Control/reduction measure	Contractor / ECO	NEMA Regulation 543 Section 32 NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) NEMA Regulation 543 Section 32

					Limpopo Environmental Management Act
11	Increased hardened surfaces around infrastructure and exposed areas around open pits, laydown areas of overburden facility and topsoil stockpile	Soil erosion and sedimentation	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
12	Heavy machinery and vehicle movement on site	Spreading and establishment of alien invasive species	Control/reduction measure	Contractor / ECO	Alien and Invasive Species Regulations (GNR 599 of 2014) as part of the National Environmental Management: Biodiversity Act (10/2004)
13	Heavy machinery and vehicle movement on site	Habitat degradation due to dust	Control/reduction measure Control/reduction measure	Contractor / ECO	National Environmental Management Air Quality Act 39 of 2004 Section 32
14	Heavy machinery and vehicle movement on site	Spillages of harmful substances	Avoidance/Prevention measure	Contractor / ECO	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) Section 11(1)
15	Heavy machinery and vehicle movement on site; workers accommodated on site causing poaching, wood collection, fires etc.	Road mortalities of fauna / impact of human activities on site	Avoidance/Prevention measure	Contractor / ECO	NEMBA Section 56 (1), 57 (1), 57 (2) and 57 (4) NEMA Regulation 543 Section 32 NEMA Regulation 543 Section 32
Closure and Decommissioning Phase					
16	Rehabilitation of mining site	Improvement of habitat through revegetation / succession over time	Enhancement	Ecologist / ECO	NEMA, NEMBA, NEMA Financial Provisioning Regulations GNR 1147/2015, as amended

17	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	Control/reduction measure	Ecologist / ECO	NEMA, NEMBA
18	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Spreading and establishment of alien invasive species	Control/reduction measure	Ecologist / ECO	NEMA, NEMBA, Alien and Invasive Species Lists, GNR 599/2014 & GNR 864/2016
19	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site / vehicle movement on site	Habitat degradation due to dust	Control/reduction measure	Contractor / ECO	NEMA, NEMBA, National Dust Control Regulations (GNR 827/2013), National Ambient Air Quality Standards (GNR 1210/2009)
20	Heavy machinery and vehicle movement on site	Spillages of harmful substances	Avoidance/Prevention measure	Contractor / ECO	Hazardous Substances Act (Act No. 15 of 1973)
21	Heavy machinery and vehicle movement on site	Road mortalities of fauna / impact of human activities on site	Avoidance/Prevention measure	Contractor / ECO	NEMA
Post-Closure & Rehabilitation Phase					
22	Natural Successional processes	Improvement of habitat through revegetation / succession over time	Enhancement	Contractor / ECO	NEMA, NEMBA, NEMA Financial Provisioning Regulations GNR 1147/2015, as amended
23	Exposed surfaces / unrehabilitated areas on site post closure / poor monitoring during LoM	Soil erosion and sedimentation	Control/reduction measure	Contractor / ECO	NEMA, NEMBA

24	Exposed surfaces / poor monitoring of revegetation on site	Spreading and establishment of alien invasive species	Control/reduction measure	Contractor / ECO	NEMA, NEMBA, Alien and Invasive Species Lists, GNR 599/2014 & GNR 864/2016
Soils, Agricultural Potential and Land Capability Impacts					
Planning Phase					
25	Obtaining of IWUL for crossings (hydric soils) and mining layout on sensitive soils	Delay of mining onset	Compliance measure	Contractor / ECO	National Water Act (Act No 36 of 1998) (NWA)
Construction Phase					
26	Topsoil & subsoil stripping	Soil destruction and sterilization	Avoidance/Prevention measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
27	Heavy machinery and vehicle movement on site	Soil compaction	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
28	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation of water courses	Soil erosion and sedimentation	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
29	Heavy machinery and vehicle movement on site	Spillages of harmful substances	Avoidance/Prevention measure	Contractor / ECO	Hazardous Substances Act (Act No. 15 of 1973)

30	Topsoil & subsoil stripping	Loss of land capability	Avoidance/Prevention measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
Operational Phase					
31	Topsoil & subsoil stripping, opencast mining	Soil destruction and sterilization	Remediation/corrective measure	Contractor / ECO	NEMA, NEMBA
32	Heavy machinery and vehicle movement on site, laydown areas of overburden and topsoil facilities	Soil compaction	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
33	Laydown areas of overburden and topsoil facilities, crushing and stockpiling	Increased Soil erosion and sedimentation	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
34	Heavy machinery and vehicle movement on site	Spillages of harmful substances to the soils	Avoidance/Prevention measure	Contractor / ECO	Hazardous Substances Act (Act No. 15 of 1973)
35	Topsoil & subsoil stripping	Loss of land capability	Remediation/corrective measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
Closure and Decommissioning Phase					

36	Demolition of mining infrastructure; Heavy machinery and vehicle movement on site	Improvement of eroded soils and compaction	Enhancement	Contractor / ECO	NEMA Regulation 543 Section 32
37	Demolition of mining infrastructure / Cessation of mining / rehabilitation of mining site	Soil erosion and sedimentation	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
38	Demolition of mining infrastructure, Heavy machinery and vehicle movement on site	Soil compaction	Control/reduction measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
39	Heavy machinery and vehicle movement on site	Spillages of harmful substances	Avoidance/Prevention measure	Contractor / ECO	Hazardous Substances Act (Act No. 15 of 1973)
Post-Closure & Rehabilitation Phase					
40	Rehabilitation	Improvement of land capability	Enhancement	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983 NEMA Regulation 543 Section 32
41	Rehabilitation	Soil erosion and sedimentation	Remediation/corrective measure	Contractor / ECO	CONSERVATION OF AGRICULTURAL RESOURCES ACT 43 OF 1983
Heritage Impacts					
Planning Phase					

42	Siting of Open Pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	N/A	Contractor / ECO	National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
43	Siting of Overburden Facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	N/A	Contractor / ECO	
44	Siting of Mine Plant, Open Pit and Mine Roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	
45	Siting of Mine Plant, Open Pit and Mine Roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	Avoidance/Prevention measure	Contractor / ECO	
Construction Phase					
46	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	N/A	Contractor / ECO	National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
47	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	N/A	Contractor / ECO	
48	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	

49	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	Avoidance/Prevention measure	Contractor / ECO	
Operational Phase					
50	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	N/A	Contractor / ECO	National Heritage Resources Act (Act No. 25 of 1999) (NHRA)
51	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	N/A	Contractor / ECO	
52	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	
53	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	Avoidance/Prevention measure	Contractor / ECO	
Closure and Decommissioning Phase					
54	Rehabilitation of Open Pit footprint	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	N/A	Contractor / ECO	NHRA
55	Rehabilitation of Overburden footprint	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	N/A	Contractor / ECO	

56	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	
57	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	
Post-Closure & Rehabilitation Phase					
58	Rehabilitation of Open Pit footprint	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	N/A	Contractor / ECO	NHRA
59	Rehabilitation of Overburden footprint	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Over Burden	N/A	Contractor / ECO	
60	Rehabilitation of plant, open pit and mine road footprints	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	
61	Rehabilitation of plant, open pit and mine road footprints	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	N/A	Contractor / ECO	
Palaeontological Impacts					
Construction Phase					
62	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	Avoidance/Prevention measure	ECO, palaeontologist	NHRA

63	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of fossils.	Avoidance/Prevention measure	ECO, palaeontologist	
64	Construction of buildings, dams, roads, pylons. Exploration for mining	Preservation of fossils.	Avoidance/Prevention measure	ECO, palaeontologist	
Hydrogeological Impacts					
Construction Phase					
65	Oil, grease and diesel spillages from construction vehicles	Contamination to ground- and surface water systems	Avoidance/Prevention measure	Contractor, ECO and / or SHEQ Officer	NWA, NEMWA, Hazardous Substances Act (Act No. 15 of 1973)
66	On-site sanitation	Contamination to ground- and surface water systems	Avoidance/Prevention measure	Contractor, ECO and / or SHEQ Officer	NWA, NEMWA
67	Storage of chemicals and building materials during construction of mine infrastructure	Contamination to ground- and surface water systems	Avoidance/Prevention measure	Contractor, ECO and / or SHEQ Officer	NWA, NEMWA, Hazardous Substances Act (Act No. 15 of 1973)
Operational Phase					
68	Mine dewatering	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receive very low if any groundwater inflows	Remediation/ corrective measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA

69	Spillages of hydrocarbons & reagents, use of explosives	Contamination to ground- and surface water systems	Control measure	Contractor, ECO and / or SHEQ Officer	NWA, NEMWA, Hazardous Substances Act (Act No. 15 of 1973)
70	Acid Mine Drainage (AMD) from the mine and overburden facility	Contamination to ground- and surface water systems	N/A	Contractor, ECO and / or SHEQ Officer	NEMA, NWA, NEMWA
71	Mass transport and seepage from overburden facility at the proposed mine along surface drainages and groundwater pathways	Contamination to ground- and surface water systems	Avoidance/Prevention measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA
Closure and Decommissioning Phase					
71	Oxidation of backfilled material for example sulphates	Groundwater and surface water contamination	Control measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA
72	The formation of a pit lake during backfilling which will create elevated salt concentrations from higher evaporation on surface	The deterioration of the groundwater environment	Control measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA, NEMWA
73	Seepage and mass transport from overburden not yet backfilled and open-pit mine impacting on groundwater and surface water quality	Contamination to ground- and surface water systems	Control measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA
Post-closure and Rehabilitation Phase					
74	Contamination from the open pit and backfilled material not yet backfilled	Groundwater and surface water contamination	Control measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA

75	Formation of a pit lake after backfilling	Elevated salt concentrations from higher evaporation on surface leading to the deterioration of the groundwater environment contamination	Control measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA, NEMWA
76	Seepage and mass transport from opencast mine pit impacting on groundwater quality	Contamination to ground- and surface water systems	Control measure	Contractor, ECO and / or SHEQ Officer	NEMA, NWA, NEMWA
Air Quality Impacts					
Planning Phase					
77	Existing ambient baseline	Particulate emissions; fugitive dust	Avoidance/Prevention measure	Mine engineer	National Environment Management: Air Quality Act No. 39 of 2004 (NEM:AQA), Ambient Air Quality Standards
Construction Phase					
78	Transport and general construction activities	Gaseous and particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	National Environment Management: Air Quality Act No. 39 of 2004 (NEM:AQA), Ambient Air Quality Standards, National Dust Control Regulations
79	Clearing of groundcover and levelling of area	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
80	Materials handling	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
81	Wind erosion from open areas	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
Operational Phase					
82	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust	Control/reduction measure		National Environment Management: Air Quality

				Contractor, ECO and / or SHEQ Officer	Act No. 39 of 2004 (NEM:AQA), Ambient Air Quality Standards, National Dust Control Regulations
83	Crushing and screening	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
84	Materials handling	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
85	Wind erosion	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
Closure and Decommissioning Phase					
85	Dust generated during rehabilitation activities	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	National Environment Management: Air Quality Act No. 39 of 2004 (NEM:AQA), Ambient Air Quality Standards, National Dust Control Regulations
86	Demolition of infrastructure	Particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
87	Tailpipe emissions from the vehicles used during the closure phase	Gaseous and particulate emissions; fugitive dust	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
Post-Closure & Rehabilitation Phase					
88	Wind erosion from open areas	Particulate emissions; fugitive dust	Remediation/corrective measure		National Environment Management: Air Quality

				Contractor, ECO and / or SHEQ Officer	Act No. 39 of 2004 (NEM:AQA), Ambient Air Quality Standards, National Dust Control Regulations
Noise Impacts					
Construction Phase					
89	Overburden Stockpile	Noise impact on R1, R2 and R6	Control/reduction measure	ECO, Environmental Coordinator	NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
90	Topsoil Stockpile	Noise impact on R1, R2 and R7	Control/reduction measure	ECO, Environmental Coordinator	
91	Open Cast Pit	Noise impact on R4 and R5	Control/reduction measure	ECO, Environmental Coordinator	
92	Open Cast Pit	Noise impact on R4 and R6	Control/reduction measure	ECO, Environmental Coordinator	
93	Open Cast Pit	Noise impact on R4 and R7	Control/reduction measure	ECO, Environmental Coordinator	
94	Overburden Stockpile	Noise impact on R1, R2 and R6	Control/reduction measure	ECO, Environmental Coordinator	

95	Plant	Noise impact on R7, R8 and R10	Control/reduction measure	ECO, Environmental Coordinator	
96	Plant	Noise impact on R7, R8 and R11	Control/reduction measure	ECO, Environmental Coordinator	
97	Plant	Noise impact on R7, R8 and R12	Control/reduction measure	ECO, Environmental Coordinator	
98	Haul Roads	Noise impact on R7 and R10	Control/reduction measure	ECO, Environmental Coordinator	
99	Topsoil Stockpile	Noise impact on R1, R2 and R7	Control/reduction measure	ECO, Environmental Coordinator	
Operational Phase					
100	Overburden Stockpile	Noise impact on R1, R2 and R6	Control/reduction measure	Contractor, SHEQ Officer, Noise specialist	NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
101	Topsoil Stockpile	Noise impact on R1, R2 and R6		Contractor, SHEQ Officer, Noise specialist	

102	Open Pit	Noise impact on R4 and R5		Contractor, SHEQ Officer, Noise specialist	
103	Open Pit	Noise impact on R4 and R6		Contractor, SHEQ Officer, Noise specialist	
104	Open Pit	Noise impact on R4 and R7		Contractor, SHEQ Officer, Noise specialist	
105	Overburden Stockpile	Noise impact on R1, R2 and R6		Contractor, SHEQ Officer, Noise specialist	
106	Plant	Noise impact on R7, R8 and R10		Contractor, SHEQ Officer, Noise specialist	
107	Plant	Noise impact on R7, R8 and R10		Contractor, SHEQ Officer, Noise specialist	
108	Plant	Noise impact on R7, R8 and R10		Contractor, SHEQ Officer, Noise specialist	
109	Haul Roads	Noise impact on R7 and R10			

				Contractor, SHEQ Officer, Noise specialist	
110	Topsoil Stockpile	Noise impact on R1, R2 and R6		Contractor, SHEQ Officer, Noise specialist	
Blasting & Vibration Impacts					
Operational Phase					
111	Open cast mining activities: blasting	Ground Vibration impact on Chicken Broilers	Control/reduction measure	Mine engineer, Blasting specialist	Minerals and Petroleum Resources Development Act No. 28 of 2002 (MPRDA)and Regulations (GNR 527/2004), NEMA, Explosives Act No. 26 of 1956 and Regulations (GNR 1604/1972), Mine Health and Safety Act No. 29 of 1996 and Regulations (GNR 93/1997)
112	Open cast mining activities: blasting	Ground Vibration impact on Farm Buildings with various residences/sheds	Control/reduction measure		
113	Open cast mining activities: blasting	Ground Vibration impact on Houses	Control/reduction measure		
114	Open cast mining activities: blasting	Ground Vibration impact on Structures	Control/reduction measure		
115	Open cast mining activities: blasting	Ground Vibration impact on SANRAL Road	Control/reduction measure		
116	Open cast mining activities: blasting	Air blast Impact on Chicken Broilers	Control/reduction measure		
117	Open cast mining activities: blasting	Air blast Impact on Farm Buildings/Structures	Control/reduction measure		

118	Open cast mining activities: blasting	Air blast Impact on Heritage Site	Control/reduction measure		
119	Open cast mining activities: blasting	Air blast Impact on Houses	Control/reduction measure		
120	Open cast mining activities: blasting	Air blast Impact on Hydrocensus Borehole	Control/reduction measure		
121	Open cast mining activities: blasting	Air blast Impact on Informal Housing	Control/reduction measure		
122	Open cast mining activities: blasting	Air blast Impact on Planned SANRAL Road	Control/reduction measure		
123	Open cast mining activities: blasting	Air blast Impact on Ruins	Control/reduction measure		
124	Open cast mining activities: blasting	Air blast Impact on Structure	Control/reduction measure		
125	Open cast mining activities: blasting	Fly rock Impact on Building/Structure	Control/reduction measure		
126	Open cast mining activities: blasting	Fly rock Impact on Cement Dam	Control/reduction measure		
127	Open cast mining activities: blasting	Fly rock Impact on Chicken Broilers	Control/reduction measure		

128	Open cast mining activities: blasting	Fly rock Impact on Farm Buildings/Structures	Control/reduction measure		
129	Open cast mining activities: blasting	Fly rock Impact on Gravel Road	Control/reduction measure		
130	Open cast mining activities: blasting	Fly rock Impact on Heritage Site	Control/reduction measure		
131	Open cast mining activities: blasting	Fly rock Impact on Houses	Control/reduction measure		
132	Open cast mining activities: blasting	Fly rock Impact on Hydrocensus Borehole	Control/reduction measure		
133	Open cast mining activities: blasting	Fly rock Impact on Informal Housing	Control/reduction measure		
134	Open cast mining activities: blasting	Fly rock Impact on Pivot Irrigation	Control/reduction measure		
135	Open cast mining activities: blasting	Fly rock Impact on Planned SANRAL Road	Control/reduction measure		
136	Open cast mining activities: blasting	Fly rock Impact on Railway Line	Control/reduction measure		
137	Open cast mining activities: blasting	Fly rock Impact on Reservoir	Control/reduction measure		

138	Open cast mining activities: blasting	Fly rock Impact on Road	Control/reduction measure		
139	Open cast mining activities: blasting	Fly rock Impact on Ruins	Control/reduction measure		
140	Open cast mining activities: blasting	Fly rock Impact on Structures	Control/reduction measure		
Visual Impacts					
Construction Phase					
141	Preparation of earthworks for pit area, mine infrastructure and topsoil and overburden facility areas and the construction of the offices, plant and infrastructure.	Build access roads to site, exposure of earth to create terraces for the construction activities - the building of the plant and office infrastructure. Prestrip site to establish open pit area. The exposure of earth and rock (stark contrast with existing landscape character) results in the altering of the visual quality and sense of place of areas around the project site. These activities which will also generate dust and will be visible in foreground and middleground views from residential areas and farmstead accommodation and public roads. Night lighting during this phase.	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMA
142	Removal of vegetation, topsoil and soft overburden from mining (open pit) areas.	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMA
Operational Phase					

143	Removal of vegetation, topsoil and soft overburden from mining (open pit) areas.	Exposure of earth and rock (stark contrast with existing landscape character) resulting in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMA
144	Excavation of the mining areas using drill rigs, blasting, excavators and dozers.	Exposure of rock through blasting that would contrast with the existing natural landscape in the immediate vicinity of the open pit as the mining operation advances along with the movement of trucks and excavators that would generate dust. The result is the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads.	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
145	Trucks moving overburden to the overburden facility in the first 13 years of operation, graders maintaining the haul roads and water tankers wetting the roads	Dust generated by moving trucks that is visible from surrounding residential areas and public roads will result in the altering of the visual quality and sense of place of the study area. These activities which will also generate dust and will be intrusive in foreground views and visible in the middleground and background from residential areas and farmsteads and sections of public roads. Night lighting during this phase.	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
146	Growth of the overburden facility as the mining progresses. Concurrent backfilling and rehabilitation of open pit areas.	Physical presence of the overburden facility that alters the visual quality and sense of place of the study area. These activities which will also generate dust that will be intrusive in foreground views and visible in the middleground and background from residential	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	

		areas and farmsteads and sections of public roads.			
147	Lighting of the plant and office areas including security lighting.	Light pollution resulting in the alteration of the baseline visual quality and sense of place of the project site and its environs. Lights will be visible from nearby residential areas and public roads.	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	
Closure and Decommissioning Phase					
148	Backfilling of overburden into open pit areas and final grading (shaping with graders) , laying of topsoil in selected areas and hydroseeding.	The final shaping (dust creation) and rehabilitation process that alters the visual quality and sense of place of the study area. These activities will be visible from nearby residential and homestead areas as well as public roads.	Remediation/corrective measure	Contractor, ECO and / or SHEQ Officer	NEMA
149	Removal of topsoil from the stockpile to rehabilitate damaged areas including the open pit, overburden and the mine infrastructure footprint areas	Improvement of the visual quality and sense of place of the project area visible from nearby residences areas and public roads.	Enhancement	Contractor, ECO and / or SHEQ Officer	
Post-Closure Phase					
150	Rehabilitation of exposed areas and growth of grasses and vegetation (management and maintenance)	Improvement of the visual quality and sense of place of the project area visible from nearby residences as well as public roads.	Enhancement	Contractor, ECO and / or SHEQ Officer	NEMA
Socio-economic Impacts					
Construction Phase					
151	Construction activities	Temporary stimulation of economy	Enhancement	Project Proponent	N/A
152	Construction activities	Temporary creation of employment	Enhancement	Project Proponent	Employment Equity Act (No. 55 of 1998) and the

					Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
153	Construction activities	Skills development due to the creation of new employment opportunities	Enhancement	Project Proponent	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
154	Construction activities	Government revenue increase due to capital expenditure	N/A	Project Proponent	N/A
155	Construction activities	Temporary increase in household income during construction	N/A	Project Proponent	N/A
156	Construction activities	Loss of commercial activities - agriculture and tourism	Control/reduction measure	Project Proponent	NEMA
157	Construction activities	Change to the sense of place	Control/reduction measure Control/reduction measure	Project Proponent	NEMA
158	Construction activities	Temporary increase in crime and social conflicts associated with influx of people	Control/reduction measure Control/reduction measure	Project Proponent	N/A
159	Construction activities	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	Control/reduction measure Control/reduction measure	Project Proponent	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004,

					SANS 10328:2008, SANS 10357:2004
160	Construction activities	Impact on property values	Avoidance/Prevention measure	Project Proponent	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
161	Construction activities	Physical displacement and potential loss of family ties	Avoidance/Prevention measure	Project Proponent	N/A
162	Construction activities	Economic displacement of disadvantaged communities	Avoidance/Prevention measure	Project Proponent	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
163	Construction activities	Increased pressure on local services and infrastructure	Avoidance/Prevention measure	Project Proponent	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
Operational Phase					
164	Mining and processing activities	Sustainable stimulation of economy	Enhancement	Project Proponent	N/A
165	Mining and processing activities	Creation of employment	Enhancement	Project Proponent	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
166	Mining and processing activities	Impact on government revenue	N/A	Project Proponent	N/A

167	Mining and processing activities	Change to the sense of place	Enhancement	Project Proponent	NEMA
168	Mining and processing activities	Increase in household income during operation	Enhancement	Project Proponent	N/A
169	Mining and processing activities	Improved living standards of positively affected households	Enhancement	Project Proponent	N/A
170	Mining and processing activities	Skills development of permanently employed workers	Enhancement	Project Proponent	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Skills Development Act (No. 97 of 1998), Skills Development Levies Act (No. 9 of 1999). SLP
171	Mining and processing activities	Local economic development benefits derived through mine's social responsibility programme	N/A N/A	Project Proponent	Mogalakwena Local Municipality Integrated Development Plan (IDP) 2019/20
172	Mining and processing activities	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	Control/reduction measure Enhancement	Project Proponent	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
Closure and Decommissioning Phase					

173	Decommissioning of mine	Temporary stimulation of economy	N/A	Project Proponent	N/A
174	Decommissioning of mine	Temporary employment	Enhancement	Project Proponent	Employment Equity Act (No. 55 of 1998) and the Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
175	Decommissioning of mine	Temporary increase in household income	N/A	Project Proponent	N/A
176	Decommissioning of mine	Impact on government revenue	N/A	Project Proponent	N/A
177	Decommissioning of mine	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	Control/reduction measure	Project Proponent	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
Post-Closure & Rehabilitation Phase					
178	Mine rehabilitation and aftercare	Temporary stimulation of economy	N/A	Project Proponent	N/A
179	Mine rehabilitation and aftercare	Temporary employment	Enhancement	Project Proponent	Employment Equity Act (No. 55 of 1998) and the

					Labour Relations Act (No. 66 of 1995), Social and Labour Plan (SLP)
180	Mine rehabilitation and aftercare	Temporary increase in household income	N/A	Project Proponent	N/A
181	Mine rehabilitation and aftercare	Impact on government revenue	N/A	Project Proponent	N/A
182	Mine rehabilitation and aftercare	Deterioration of quality of life due to dust, noise, visual, water supply and water pollution and other environmental impacts	Control/reduction measure	Project Proponent	NEMA, NHRA, NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
183	Mine rehabilitation and aftercare	Improved quality of life due to rehabilitation activities	Enhancement	Project Proponent	N/A
Traffic Impacts					
Construction Phase					
184	Vehicular operation and usage of roads	Increase in traffic	Avoidance/ Prevention measure	Mine engineer	National Road Traffic Act No. 93 of 1996, South African National Roads Agency Limited and National Roads Act 07 of 1998
185	Construction of access roads and road upgrades	Improved access points		Mine engineer	

186	Construction of access roads and road upgrades	Impeded access		Mine engineer	
187	Construction of access roads and road upgrades	Improved road quality		Mine engineer	
188	Use of existing gravel roads	Deterioration of road quality		Mine engineer	
189	Traffic accidents	Traffic accidents	Avoidance/ Prevention measure	Mine engineer	National Road Safety Act 9 of 1972
Operational Phase					
190	Vehicular operation and usage of roads	Increase in traffic		Mine engineer	
191	Use of existing gravel roads	Deterioration of road quality	Avoidance/ Prevention measure	Mine engineer	National Road Traffic Act No. 93 of 1996, South African National Roads Agency Limited and National Roads Act 07 of 1998
192	Traffic accidents	Traffic accidents	Avoidance/ Prevention measure	Mine engineer	National Road Safety Act 9 of 1972

37.9. Impact Management Actions

Table 45: Impact Management Actions Table

The necessary content required for this table has been included to Table 43 and Table 44 above.

Table 43 includes the activity, Size and scale of disturbance, Mitigation Measures, Compliance with Standards, Time period for implementation and Table 44 the Mitigation Type, Roles & Responsibility, and Standard to be achieved.

38. FINANCIAL PROVISION

38.1. Determination of the amount of Financial Provision

38.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in section 11 herein

The overarching mine closure objectives aim to ensure sustainability beyond mine closure and leave a positive legacy post closure. This is supported by the following closure criteria and gives effect to the physical, biophysical, and social closure objectives which are:

- The total mining footprint must be cleared of any mining-related surface infrastructure that is not earmarked for social upliftment and/or community development;
- As and when required topsoil and/or a growth medium must be used to assist with the establishment of indigenous grass species similar to that of the surrounding natural environment;
- A topsoil and/or a growth medium will not be trucked in, this will be generated onsite during the LoM;
- Erosion or loss of soil must be limited to acceptable levels through functional rehabilitation;
- The groundwater quality in the monitoring boreholes must comply with water quality standards relevant to the proposed end land-use and in line with the water use license conditions;
- The open cast pit will be partially backfilled and made safe;
- The rehabilitated footprint must be stable and safe for humans and animals, from a security perspective as well as from a stability perspective;
- Any potential residual/latent pollution remaining on site must fall within the legislated levels associated with the proposed agricultural grazing end land-use;
- Rehabilitation and the environmental features on the site must be stable and sustainable for a monitoring period which can be determined 5 years prior to closure.

Soils in the study area have low to moderate or no agricultural potential. Only the soils in the north-western section of the project area which are under irrigation (pivots) are classified as having a High Agricultural Potential (Henning, 2020). The site will be rehabilitated to an agricultural grazing post-closure land use. Suitable indigenous grass species similar to that of the surrounding natural environment will be established in order to ensure a stable and self-sustaining vegetation regime.

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

The environmental objectives in relation to closure were reported upon in the Draft Scoping Report which was made available to all registered I&AP's for comment for a period of 30 days (31 October till 2 December 2019). The closure objectives were also discussed in more detail with the relevant landowner's and I&AP's during the Scoping Phase Open Days which took place on the 14th of November 2019, as well as the various focus group meetings with the key I&AP's. All comments received and the relevant meeting minutes are appended to this report (Appendix 7.10: Comments and Response Register).

In addition, this Draft EIA&EMPR with the closure objectives as well as the Financial Provisioning Report (Appendix 6.13: Financial Closure Provision and Rehabilitation Plan) will be made available to I&AP's for review and comment for 30 days (18 November 2020 to 8 January 2021), I&AP's will also be invited to a public meeting where the closure objectives will be discussed.

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

The Financial Provisioning Report and Rehabilitation Plan are attached as Appendix 6.13 of this report. Appendix 4: Site Plan provides an overview of the scale and aerial extent of the main/largest mining infrastructure footprints.

A brief summary of the measures provided in the abovementioned report is provided below:

- Open Pit (40 ha): The open cast pit will be partially backfilled and made safe. Once all of the overburden stockpiled on surface and the berms have been backfilled, the pit will have a void of approximately 9,533,634 m3 (approximately 60.57 m deep)..
- Overburden Facility and Topsoil Stockpile (44 ha and 20 ha): Overburden material is to be backfilled into the open pit. Overburden footprint is to be rehabilitated with topsoil and revegetated with indigenous grass species similar to that of the surrounding natural environment.

Mine Infrastructure (33 ha): All mining infrastructure is planned to be dismantled and/or demolished. The total mining footprint must be cleared of any mining-related surface infrastructure that is not earmarked for social upliftment and/or community development. The mine infrastructure footprint is to be rehabilitated with topsoil and revegetated with indigenous grass species similar to that of the surrounding natural environment.

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

The rehabilitation plan (Appendix 6.13: Financial Closure Provision and Rehabilitation Plan) has been compiled in accordance with the objectives and goals listed in section 38.1.1 and is deemed to be satisfactory according to the Mine and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) as amended and GNR 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998).

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

As per the GNR 1147 of the NEMA, the calculated provision for closing for the mining operations is as follows:
The mine's environmental liability is estimated at R 167 801 932.32 (Incl. VAT) over an estimated 30 year Life of Mine (scheduled closure).

38.1.6 Confirm that the financial provision will be provided as determined

The Immediate Closure Provision amount as determined will be provided by means of a financial guarantee from a South African registered bank or any other bank or financial institution approved by the Director-General, guaranteeing the financial provision relating to implement the Environmental Management Plan (EMP) in the format approved by the Director-General from time to time.

39. MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON

39.1. Environmental Monitoring and Auditing

DEAT (2004) defines environmental auditing as "a process whereby an organisation's environmental performance is tested against its environmental policies and objectives." Monitoring and auditing is an essential environmental management tool which is used to assess, evaluate and manage environmental and sustainability issues:

In order to ensure that the objectives of sustainable development and integrated environmental management are met and in order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the proposed operations.

Monitoring and management actions associated with the project are contained in Table 46 of this report as well as in the various specialist reports associated with this project. This section provides a summary of the critical monitoring aspects per specific environmental field.

39.2. General Monitoring and Management

The appointment of a suitably qualified on-site Environmental Control Officer (ECO) is essential to the successful implementation of this project, although this role can be fulfilled by or in conjunction with the Safety, Health, Environment and Quality (SHEQ) Officer. The ECO will be responsible for the implementation of the EMP, applicable environmental legislation and any stipulations/conditions set by the relevant competent authorities (including but not limited to the DMRE and DWS). The ECO will conduct daily site inspections and compile monthly reports as well as internal annual audits during the construction and operational phases.

An independent ECO should also be appointed to conduct monthly audits for the duration of the construction phase and quarterly audits during the operational phase. The independent ECO should monitor the success and effective implementation of the environmental management measures stipulated by the applicable legislation, the EMPR, and any conditions set by the competent authorities. Following each site visit, the ECO should submit a report to the DMRE documenting the success/failure of the implementation of the management measures at the operations.

39.3. Roles and Responsibilities

A number of role-players will be responsible to ensure responsible environmental practices as described in this report are implemented on the proposed development site throughout each of the project cycles and throughout the project lifespan.

Key individuals are briefly discussed in this section, and are identified in the table below where specific responsibility is assigned to each.

39.3.1 Project Proponent

The project proponent assumes overall responsibility for the development and its repercussions on the environment. Duty of care in respect of environmental management as, inter alia, explained in the National Environmental Management Act, Section 28 and other relevant provisions as contained in this and other applicable laws.

39.3.2 **Environmental Mine Manager**

The Environmental Mine Manager (as appointed by the Project Proponent) is responsible for the overseeing of the environmental management of all aspects of all the phases of the project. The Environmental Mine Manager will provide feedback to the Project Proponent, and will approve any changes to the EMPR; changes to the designs, etc in conjunction with the Project Proponent. The Environmental Mine Manager will be responsible for overseeing any environmental incidents and the proper mitigation thereof.

39.3.3 **Contractor or Sub-Contractors**

All contractors have the responsibility to implement and adhere to the EMP and ensure that the factors which may compromise the achievements of the objectives of sustainable development and environmentally responsible operations are brought to the attention of the Project Proponent. The contractor must comply with all orders pertaining to environmental management issues (whether verbal or written) given by the Environmental Mine Manager or directly by the Project Proponent. Contractors also have the responsibility to ensure that their employees are fully cognizant of, and abide by the EMPR. Workers should be properly trained and informed of construction, operational and maintenance responsibilities and environmental liabilities. The contractor is responsible for the completion of method statements to be signed off by the project engineers as well as the Environmental Mine Manager.

39.3.4 **Environmental Control Officer (ECO)**

The ECO is appointed by the Project Proponent and is responsible to verify compliance to the Environmental Authorisation, EMPR and relevant Water Use Licence and Atmospheric Emissions Licence conditions; as well as any provisions of legislation relevant to the operations. In the event that non-compliances are observed, the ECO may advise the Environmental Mine Manager on reaching compliance. The ECO is also responsible for liaison with relevant authorities as well as contractors on matters relating to environmental management.

The independent ECO should be an independent individual or company, which does not stand to gain by the success of the development (other than remuneration received for work carried out to ensure environmental compliance on the proposed development site). The independent ECO should have the right to enter the site(s) and do monitoring and auditing at any time, subject to the health and safety requirements applicable to the site. The independent ECO will be responsible for reporting non-compliances to the relevant authorities.

The ECO should be familiar with the palaeontological material that occurs in the project area and must together with the mine geologist survey for fossils after blasting, digging and excavation (ground breaking). A palaeontologist could assist in training of the ECO or in an advisory capacity.

39.4. Specific Monitoring Requirements

Monitoring of the proposed development (both on site and where appropriate in the surrounding environment) should be considered a high priority and should be conducted in accordance with the relevant specialist recommendations as summarized below.

39.5. Monitoring Protocol

It is essential that during the construction and operational phase of the proposed development that the monitoring of certain elements is carried out to ensure compliance with regulatory bodies. A monitoring protocol for both the construction phase and the operational phase will be required. The monitoring only includes those activities identified in the EMPR and excludes any monitoring that should take place according to conditions in the water use license or atmospheric emissions licence.

39.5.1 Monitoring Requirements and Record Keeping

To ensure that the procedures outlined throughout the EMPR are implemented effectively it will be necessary to monitor the implementation of the EMPR and evaluate the success of achieving the objectives listed in the EMPR. To ensure that all personnel on site are aware of their obligation to protect the environment, induction training will also include environmental awareness.

The audit procedure will include an annual internal compliance audit conducted by an on-site ECO, as well as monthly compliance audits during construction and quarterly compliance audits conducted by an independent ECO . Where the objectives of the EMPR are not being met the reasons will be determined and remedial action or variation to the tasks will be recommended. Major residual effects shall be documented in a Non-Conformance Report, during the construction, operational and closure phases.

39.5.1.1 Construction phase

The following monitoring needs to be conducted:

Refer to Table 46.

Baseline monitoring must commence at least one year prior to construction so that seasonal variations are further accounted for over and above what is already known for the site.

39.5.1.2 Operational Phase

The following monitoring must be conducted:

Refer to Table 46.

39.5.1.3 Closure and Decommissioning Phase

The following monitoring must be conducted:

Refer to Table 46.

39.5.2 Audit Protocol

It is essential that during the construction, operational and closure phases of the proposed development, the monitoring and auditing of certain elements are carried out to ensure compliance with regulatory bodies. An Audit Protocol for the above phases will be required. The auditing only includes those activities identified in the EMPR and excludes any auditing that should take place according to the conditions in the water use license or atmospheric emissions licence.

39.5.2.1 Construction phase

The following audits need to be completed:

- EMPR, EA and licence compliance internal audits annually

- EMPR, EA and licence compliance on a monthly basis by an independent ECO.

39.5.2.2 Operational Phase

The following audits must be completed:

- EMPR, EA and licence compliance internal audits annually.
- EMPR, EA and licence compliance quarterly by an independent ECO.

39.5.3 **Environmental incidents**

An environmental incident is defined as any unplanned event that results in actual or potential damage to the environment, whether of a serious or non-serious nature. An incident may involve non-conformance with environmental legal requirements, the requirements of the EMPR, or contravention of written or verbal orders given by the ECO or relevant authority.

In the event of any incident, an Environmental Incident Log should be completed and these reports should be kept on file by the Environmental Mine Manager. Such reports should provide the following details:

- Date of the Incident (and time if relevant)
- Description of the nature of the incident (what happened)
- Explanation for current conditions (why it happened), responsible person, supporting photographs etc.
- Description of corrective actions taken

Corrective action to mitigate the impact (appropriate to the nature and scale of the incident) should be conducted immediately and affected parties notified.

In the case of serious incidents or emergencies, the incident report should be sent to the relevant authority as soon as possible after the incident has been recorded as per Section 30 of the NEMA.

39.5.4 **Penalties and Fines for Non-Compliance or Misconduct**

This EMPR forms part of the contract agreement between the Project Proponent and the Principal Contractor. As such, non-compliance with conditions of the EMPR will amount to a breach of contract. Penalties will be issued directly to the contractor by the Project Proponent in the event of non-compliance to the EMPR specifications. The issuing of a penalty will be preceded by a verbal warning by the Project Proponent, as well as strict instruction in at least one monthly ECO report to rectify the situation. The ECO and Project Proponent will communicate with regards to realistic timeframes for possible rectification of the contravention, and possible consequences of continued non-compliance to the EMPR.

Penalties incurred do not preclude prosecution under any other law. Cost of rehabilitation and/or repair of environmental resources that were harmed by the actions of the contractor if such actions were in contravention of the specifications of the EMPR will be borne by the contractor himself. Penalties may be issued over and above such costs. The repair or rehabilitation of any environmental damage caused by non-compliance with the EMPR cannot be claimed in the Contract Bill, nor can any extension of time be claimed for such works. Penalty amounts shall be deducted from Certificate payments made to the Contractor.

The following categories of non-compliance are an indication of the severity of the contravention, and the fine or penalty amounts may be adjusted depending on the seriousness of the infringement.

- Category One – Acts of non-compliance that are unsightly, a nuisance or disruptive to adjacent landowners, existing communities, tourists or persons passing through the area.
- Category Two – Acts of non-compliance that cause minor environmental impact or localised disturbance.
- Category Three – Acts of non-compliance that result in significant environmental impact extending beyond point source.
- Category Four – Acts of non-compliance that result in major environmental impact affecting large areas, site character, protected species or conservation areas.

Table 46: Environmental Monitoring Table

No	Activity	Impact	Roles & Responsibility	Functional Requirements for Monitoring	Monitoring and Reporting Frequency and Time Periods for implementing Impact Management Actions
Ecological Impacts					
5	Vegetation clearing / vehicle movement	Spreading and establishment of alien invasive species	Ecologist / ECO	Monitoring of alien invasive species (AIS)	Annual ongoing alien vegetation management throughout area
Operational Phase					
12	Heavy machinery and vehicle movement on site	Spreading and establishment of alien invasive species	Contractor / ECO	Monitoring of alien invasive species (AIS)	Annual ongoing alien vegetation management throughout area
Closure and Decommissioning Phase					
18	Demolition of mining infrastructure / cessation of mining / rehabilitation of mining site	Spreading and establishment of alien invasive species	Ecologist / ECO	Monitoring of alien invasive species (AIS)	Annual ongoing alien vegetation management throughout area
Post-Closure & Rehabilitation Phase					
24	Exposed surfaces / poor monitoring of revegetation on site	Spreading and establishment of alien invasive species	Contractor / ECO	Monitoring of alien invasive species (AIS)	Annual ongoing alien vegetation management throughout area
Soils, Agricultural Potential and Land Capability Impacts					
Operational Phase					
33	Laydown areas of overburden and topsoil facilities, crushing and stockpiling	Increased Soil erosion and sedimentation	Contractor / ECO	The vegetative (grass) cover on the soil stockpiles (berms) must be continually	Continually

				monitored in order to maintain a high basal cover.	
35	Topsoil & subsoil stripping	Loss of land capability	Contractor / ECO	Develop and implement Rehabilitation and Monitoring Plan to monitor rehabilitated areas.	Ongoing (concurrent), and upon completion of rehabilitation
Closure and Decommissioning Phase					
36	Demolition of mining infrastructure; Heavy machinery and vehicle movement on site	Improvement of eroded soils and compaction	Contractor / ECO	Develop and implement Rehabilitation and Monitoring Plan to monitor rehabilitated areas.	Ongoing (concurrent), and upon completion of rehabilitation
Post-Closure & Rehabilitation Phase					
40	Rehabilitation	Improvement of land capability	Contractor / ECO	Develop and implement Rehabilitation and Monitoring Plan to monitor rehabilitated areas.	Ongoing (concurrent), and upon completion of rehabilitation
Heritage Impacts					
Planning Phase					
Construction Phase					
46	Construction of open pit	Exigo-ZNM-SA01 (Stone Age) impacted by Open Pit	Contractor / ECO	Frequent monitoring during construction by the heritage consultant or an ECO familiar with the heritage occurrences of the site.	Monitor as frequently as practically possible
47	Construction of overburden facility	Exigo-ZNM-SA02, Exigo-ZNM-SA03 (Stone Age) impacted by Overburden	Contractor / ECO	Frequent monitoring during construction by the heritage consultant or an ECO familiar with the heritage occurrences of the site.	Monitor as frequently as practically possible

48	Construction of plant, open pit and mine roads	Exigo-ZNM-HP01 - Exigo-ZNM-HP04 (Historical Period) impacted by Mine Plant, Open Pit and Mine Roads	Contractor / ECO	Frequent monitoring during construction by the heritage consultant or an ECO familiar with the heritage occurrences of the site.	Monitor as frequently as practically possible
49	Construction of plant, open pit and mine roads	Exigo-ZNM-BP01 - Exigo-ZNM-BP05 (Burials) impacted by Mine Plant, Open Pit and Mine Roads	Contractor / ECO	Strict weekly monitoring during construction by the heritage consultant or an ECO familiar with the heritage occurrences of the site.	Weekly during construction
Palaeontological Impacts					
Construction Phase					
62	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of stromatolites	ECO, palaeontologist	ECO to monitor the construction activities. Should a fossil be unearthed the ECO must notify the relevant department and paleontological specialist to further investigate.	Monitor as frequently as practically possible
63	Construction of buildings, dams, roads, pylons. Exploration for mining	Destruction of fossils.	ECO, palaeontologist		
64	Construction of buildings, dams, roads, pylons. Exploration for mining	Preservation of fossils.	ECO, palaeontologist		
Hydrogeological Impacts					
Construction Phase					
65	Oil, grease and diesel spillages from construction vehicles	Contamination to ground- and surface water systems	Contractor, ECO and / or SHEQ Officer	Groundwater Monitoring and Surface water monitoring (refer to Appendix D of the Geohydrological Impact Assessment Report)	All Boreholes- monthly for water levels and quarterly for chemical analysis Potable Water Sources - Monthly for chemical analysis and Faecal & Total coliform bacteria
66	On-site sanitation	Contamination to ground- and surface water systems			

			Contractor, ECO and / or SHEQ Officer		Process Water Sources – Monthly for chemical analysis
67	Storage of chemicals and building materials during construction of mine infrastructure	Contamination to ground- and surface water systems	Contractor, ECO and / or SHEQ Officer		Boreholes downstream from sanitation facilities – Quarterly for chemical analysis and Faecal & Total coliform bacteria Surface water (CSWUS, CSWDS) - quarterly (as flow permits) for chemical analysis
Operational Phase					
68	Mine dewatering	Increased abstraction/inflows from groundwater resource with possible impact on surrounding groundwater users. The Rooisloot would likely also be impacted by mine dewatering. The Rooisloot is however not a perennial river with limited baseflow and given the current groundwater dewatering receive very low if any groundwater inflows	Contractor, ECO and / or SHEQ Officer	Groundwater Monitoring and Surface water monitoring (refer to Appendix D of the Geohydrological Impact Assessment Report)	All Boreholes- monthly for water levels and quarterly for chemical analysis Potable Water Sources - Monthly for chemical analysis and Faecal & Total coliform bacteria Process Water Sources – Monthly for chemical analysis Boreholes downstream from sanitation facilities – Quarterly for chemical analysis and Faecal & Total coliform bacteria Surface water (CSWUS, CSWDS) - quarterly (as flow permits) for chemical analysis
69	Spillages of hydrocarbons & reagents, use of explosives	Contamination to ground- and surface water systems	Contractor, ECO and / or SHEQ Officer	Implementation of Stormwater Management Plan (Refer to the Stormwater Management Plan in Appendix 6.7)	Ongoing monitoring of stormwater management systems and infrastructure
71	Mass transport and seepage from overburden facility at the proposed mine along surface	Contamination to ground- and surface water systems	Contractor, ECO and / or SHEQ Officer	Groundwater Monitoring and Surface water monitoring (refer to Appendix D of the	All Boreholes- monthly for water levels and quarterly for chemical analysis

	drainages and groundwater pathways			Geohydrological Impact Assessment Report)	Potable Water Sources - Monthly for chemical analysis and Faecal & Total coliform bacteria Process Water Sources – Monthly for chemical analysis Boreholes downstream from sanitation facilities – Quarterly for chemical analysis and Faecal & Total coliform bacteria Surface water (CSWUS, CSWDS) - quarterly (as flow permits) for chemical analysis
Closure and Decommissioning Phase					
71	Oxidation of backfilled material for example sulphates	Groundwater and surface water contamination	Contractor, ECO and / or SHEQ Officer	Groundwater Monitoring and Surface water monitoring (refer to Appendix D of the Geohydrological Impact Assessment Report)	All Boreholes- monthly for water levels and quarterly for chemical analysis Potable Water Sources - Monthly for chemical analysis and Faecal & Total coliform bacteria Process Water Sources – Monthly for chemical analysis Boreholes downstream from sanitation facilities – Quarterly for chemical analysis and Faecal & Total coliform bacteria Surface water (CSWUS, CSWDS) - quarterly (as flow permits) for chemical analysis
72	The formation of a pit lake during backfilling which will create elevated salt concentrations from higher evaporation on surface	The deterioration of the groundwater environment	Contractor, ECO and / or SHEQ Officer		
73	Seepage and mass transport from overburden not yet backfilled and open-pit mine impacting on groundwater and surface water quality	Contamination to ground- and surface water systems	Contractor, ECO and / or SHEQ Officer		
Post-closure and Rehabilitation Phase					
74	Contamination from the open pit and backfilled material not yet backfilled	Groundwater and surface water contamination	Contractor, ECO and / or SHEQ Officer	Groundwater Monitoring and Surface water monitoring (refer to Appendix D of the Geohydrological Impact Assessment Report)	All Boreholes- monthly for water levels and quarterly for chemical analysis Potable Water Sources - Monthly for chemical

75	Formation of a pit lake after backfilling	Elevated salt concentrations from higher evaporation on surface leading to the deterioration of the groundwater environment contamination	Contractor, ECO and / or SHEQ Officer		analysis and Faecal & Total coliform bacteria Process Water Sources – Monthly for chemical analysis Boreholes downstream from sanitation facilities – Quarterly for chemical analysis and Faecal & Total coliform bacteria Surface water (CSWUS, CSWDS) - quarterly (as flow permits) for chemical analysis
76	Seepage and mass transport from opencast mine pit impacting on groundwater quality	Contamination to ground- and surface water systems	Contractor, ECO and / or SHEQ Officer		
Air Quality Impacts					
Construction Phase					
78	Transport and general construction activities	Gaseous and particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer	Implement air quality monitoring 1 year prior to construction to determine ambient baseline. Dust fallout network to comprise 5 single dust buckets at locations as stipulated in section 6.2.3.2 of the AQIA. A PM10 sampling campaign should be undertaken should it not be possible to relocate the receptors in the impacted area (area indicated as being in exceedance of the NAAQS).	Ongoing, continuous dust fallout monitoring with monthly data collection. Continuous PM10 sampling.
79	Clearing of groundcover and levelling of area	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
80	Materials handling	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
81	Wind erosion from open areas	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
Operational Phase					
82	Vehicle activity on paved and unpaved roads	Gaseous and particulate emissions; fugitive dust		Implement air quality monitoring 1 year prior to construction to determine ambient	Ongoing, continuous dust fallout monitoring with

			Contractor, ECO and / or SHEQ Officer	baseline. Dust fallout network to comprise 5 single dust buckets at locations as stipulated in section 6.2.3.2 of the AQIA. A PM10 sampling campaign should be undertaken should it not be possible to relocate the receptors in the impacted area (area indicated as being in exceedance of the NAAQS).	monthly data collection. Continuous PM10 sampling.
83	Crushing and screening	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
84	Materials handling	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
85	Wind erosion	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
Closure and Decommissioning Phase					
85	Dust generated during rehabilitation activities	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer	Implement air quality monitoring 1 year prior to construction to determine ambient baseline. Dust fallout network to comprise 5 single dust buckets at locations as stipulated in section 6.2.3.2 of the AQIA. A PM10 sampling campaign should be undertaken should it not be possible to relocate the receptors in the impacted area (area indicated as being in exceedance of the NAAQS).	Ongoing, continuous dust fallout monitoring with monthly data collection. Continuous PM10 sampling.
86	Demolition of infrastructure	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
87	Tailpipe emissions from the vehicles used during the closure phase	Gaseous and particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer		
Post-Closure & Rehabilitation Phase					
88	Wind erosion from open areas	Particulate emissions; fugitive dust	Contractor, ECO and / or SHEQ Officer	Implement air quality monitoring 1 year prior to construction to determine ambient baseline. Dust fallout network to comprise 5 single dust buckets at locations as stipulated in section 6.2.3.2 of the AQIA. A PM10 sampling campaign should be undertaken should it not be possible to	Ongoing, continuous dust fallout monitoring with monthly data collection. Continuous PM10 sampling.

				relocate the receptors in the impacted area (area indicated as being in exceedance of the NAAQS).	
Noise Impacts					
Construction Phase					
89	Overburden Stockpile	Noise impact on R1, R2 and R6	ECO, Environmental Coordinator	Monitoring Programme) needs to be implemented according to section 8.2 of the Noise Impact Assessment	Quarterly monitoring during the construction period and during the first 2 years of operations. This frequency can be reviewed thereafter depending on noise monitoring results and closest receptors.
90	Topsoil Stockpile	Noise impact on R1, R2 and R7	ECO, Environmental Coordinator		
91	Open Cast Pit	Noise impact on R4 and R5	ECO, Environmental Coordinator		
92	Open Cast Pit	Noise impact on R4 and R6	ECO, Environmental Coordinator		
93	Open Cast Pit	Noise impact on R4 and R7	ECO, Environmental Coordinator		
94	Overburden Stockpile	Noise impact on R1, R2 and R6	ECO, Environmental Coordinator		
95	Plant	Noise impact on R7, R8 and R10	ECO, Environmental Coordinator		
96	Plant	Noise impact on R7, R8 and R11	ECO, Environmental Coordinator		
97	Plant	Noise impact on R7, R8 and R12	ECO, Environmental Coordinator		
98	Haul Roads	Noise impact on R7 and R10			

			ECO, Environmental		
99	Topsoil Stockpile	Noise impact on R1, R2 and R7	ECO, Environmental Coordinator		
Operational Phase					
100	Overburden Stockpile	Noise impact on R1, R2 and R6	Contractor, SHEQ Officer, Noise specialist	Monitoring Programme) needs to be implemented according to section 8.2 of the Noise Impact Assessment	Quarterly monitoring during the construction period and during the first 2 years of operations. This frequency can be reviewed thereafter depending on noise monitoring results and closest receptors.
101	Topsoil Stockpile	Noise impact on R1, R2 and R6	Contractor, SHEQ Officer, Noise specialist		
102	Open Pit	Noise impact on R4 and R5	Contractor, SHEQ Officer, Noise specialist		
103	Open Pit	Noise impact on R4 and R6	Contractor, SHEQ Officer, Noise specialist		
104	Open Pit	Noise impact on R4 and R7	Contractor, SHEQ Officer, Noise specialist		
105	Overburden Stockpile	Noise impact on R1, R2 and R6	Contractor, SHEQ Officer, Noise specialist		
106	Plant	Noise impact on R7, R8 and R10	Contractor, SHEQ Officer, Noise specialist		
107	Plant	Noise impact on R7, R8 and R10	Contractor, SHEQ Officer, Noise specialist		
108	Plant	Noise impact on R7, R8 and R10	Contractor, SHEQ Officer, Noise specialist		

109	Haul Roads	Noise impact on R7 and R10	Contractor, SHEQ Officer, Noise specialist		
110	Topsoil Stockpile	Noise impact on R1, R2 and R6	Contractor, SHEQ Officer, Noise specialist		
Blasting & Vibration Impacts					
Operational Phase					
111	Open cast mining activities: blasting	Ground Vibration impact on Chicken Broilers	Mine engineer, Blasting specialist	The following elements should be part of such a monitoring program: • Ground vibration and air blast results; • Blast Information summary; • Meteorological information at the time of the blast; • Video Recording of the blast; • Fly rock observations. Twelve monitoring positions were identified as possible locations that will need to be considered. Twelve monitoring positions were identified as possible locations that will need to be considered. 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. Monitoring positions are indicated in Figure 21 and Table 27 of the Blasting and Vibration Impact Assessment. These points will need to be re-defined after the first blasts done and the monitoring programme defined.	Active monitoring and observation of where blasting is undertaken.
112	Open cast mining activities: blasting	Ground Vibration impact on Farm Buildings with various residences/sheds			
113	Open cast mining activities: blasting	Ground Vibration impact on Houses			
114	Open cast mining activities: blasting	Ground Vibration impact on Structures			
115	Open cast mining activities: blasting	Ground Vibration impact on SANRAL Road			
116	Open cast mining activities: blasting	Air blast Impact on Chicken Broilers			
117	Open cast mining activities: blasting	Air blast Impact on Farm Buildings/Structures			
118	Open cast mining activities: blasting	Air blast Impact on Heritage Site			
119	Open cast mining activities: blasting	Air blast Impact on Houses			
120		Air blast Impact on Hydrocensus Borehole			

	Open cast mining activities: blasting				
121	Open cast mining activities: blasting	Air blast Impact on Informal Housing			
122	Open cast mining activities: blasting	Air blast Impact on Planned SANRAL Road			
123	Open cast mining activities: blasting	Air blast Impact on Ruins			
124	Open cast mining activities: blasting	Air blast Impact on Structure			
125	Open cast mining activities: blasting	Fly rock Impact on Building/Structure			
126	Open cast mining activities: blasting	Fly rock Impact on Cement Dam			
127	Open cast mining activities: blasting	Fly rock Impact on Chicken Broilers			
128	Open cast mining activities: blasting	Fly rock Impact on Farm Buildings/Structures			
129	Open cast mining activities: blasting	Fly rock Impact on Gravel Road			
130	Open cast mining activities: blasting	Fly rock Impact on Heritage Site			
131	Open cast mining activities: blasting	Fly rock Impact on Houses			
132	Open cast mining activities: blasting	Fly rock Impact on Hydrocensus Borehole			
133		Fly rock Impact on Informal Housing			

	Open cast mining activities: blasting				
134	Open cast mining activities: blasting	Fly rock Impact on Pivot Irrigation			
135	Open cast mining activities: blasting	Fly rock Impact on Planned SANRAL Road			
136	Open cast mining activities: blasting	Fly rock Impact on Railway Line			
137	Open cast mining activities: blasting	Fly rock Impact on Reservoir			
138	Open cast mining activities: blasting	Fly rock Impact on Road			
139	Open cast mining activities: blasting	Fly rock Impact on Ruins			
140	Open cast mining activities: blasting	Fly rock Impact on Structures			

39.5.5 Indicate the frequency of the submission of the performance assessment report

Yearly performance assessment reports are recommended.

40. ENVIRONMENTAL AWARENESS PLAN

Environmental awareness training is critical for two primary reasons:

a) The workforce must understand how they can play a role in achieving the objectives specified in the EMPR; and
b) The workforce must understand their obligations in terms of the implementation of the EMPR and adherence to environmental-legislative requirements.

An environmental awareness plan should be developed aimed at ensuring that employees, contractors, subcontractors and other relevant parties are aware of and able to meet their environmental commitments. This plan is to be updated on a yearly basis during the construction and operational phases of the project in light of operational changes, learning experiences and identified training needs.

All full time staff and contractors are required to attend an induction session when they start, which session should include environmental aspects.

It is therefore recommended that the ECO/Environmental Mine Manager be involved in induction training. The induction sessions may be modified / adapted based on the audience attending the specific session, but it should ensure that all employees gain a suitable understanding of:

- Environmental requirements of the project, and how these will be implemented and monitored, including each employee’s responsibilities with respect to environmental issues;
- Contents and commitments of the EMPR, including no-go areas, employee conduct, pollution prevention (prohibitions against littering, unauthorized fires, loud music, entry to adjacent properties, road conduct etc.);
- Environmentally sensitive areas on and around the proposed development sites, including why these are deemed important and how these are to be managed. Employees will also be made aware of protected species found on the site and how these are to be conserved, as well as alien invasive species potentially found on the site and how these should be managed; and
- Incident identification, remediation and reporting requirements: what constitutes an environmental incident (spillages, fire etc.) and how to react when such an incident occurs.

Environmental training will not be restricted to induction training sessions alone, but will be conducted on an on-going basis throughout the life of mine as and when required. Records are to be kept of the type of training given (matters discussed and by whom), date on which training was given and the attendees of each training session.

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

Refer to section 40.

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

environment

Refer to Table 43 for the recommended mitigation measures to limit environmental impacts.

41. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The Immediate Closure Provision will be updated yearly as part of the annual liability assessment required by the MPRDA and GNR 1147 in terms of the NEMA, once operations commence.

42. UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports ☒

b) the inclusion of comments and inputs from stakeholders and I&APs ; ☒

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

-END-

43. REFERENCES

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44. APPENDIX 1: EAP'S CURRICULUM VITAE & QUALIFICATIONS

45. APPENDIX 2: COMPANY PROFILE

46. APPENDIX 3: LOCALITY MAP

47. APPENDIX 4: SITE PLAN

48. APPENDIX 5: DMRE CORRESPONDENCE

49. APPENDIX 6: SPECIALIST REPORTS

50. APPENDIX 6.1: SOCIO-ECONOMIC IMPACT ASSESSMENT

51. APPENDIX 6.2: HERITAGE IMPACT ASSESSMENT

52. APPENDIX 6.3: ECOLOGICAL IMPACT ASSESSMENT AND WETLAND/RIPARIAN DELINEATION

53. APPENDIX 6.4: SOILS, AGRICULTURAL POTENTIAL AND LAND CAPABILITY IMPACT ASSESSMENT

54. APPENDIX 6.5: HYDROGEOLOGICAL IMPACT ASSESSMENT

55. APPENDIX 6.6: ENVIRONMENTAL MINE WATER BALANCE AND WATER SUPPLY OPTIONS ANALYSIS

56. APPENDIX 6.7: ENVIRONMENTAL STORMWATER MANAGEMENT PLAN (SWMP)

57. APPENDIX 6.8: AIR QUALITY IMPACT ASSESSMENT

58. APPENDIX 6.9: NOISE IMPACT ASSESSMENT

59. APPENDIX 6.10: TRAFFIC IMPACT ASSESSMENT

60. APPENDIX 6.11: VISUAL IMPACT ASSESSMENT

61. APPENDIX 6.12: BLASTING AND VIBRATION ASSESSMENT

62. APPENDIX 6.13: FINANCIAL CLOSURE PROVISION AND REHABILITATION PLAN

63. APPENDIX 7: PUBLIC PARTICIPATION DOCUMENTATION

64. APPENDIX. 7.1: ADVERTISEMENT

65. APPENDIX 7.2: SITE NOTICE

66. APPENDIX 7.3: BACKGROUND INFORMATION DOCUMENT

67. APPENDIX 7.4: NOTIFICATION LETTER

68. APPENDIX 7.5: PROOF OF NOTIFICATION

Will be submitted along with the Final EIA&EMPR to the DMRE in terms of the POPIA

69. APPENDIX 7.6: CONSULTATION MEETING RESULTS AND ATTENDANCE REGISTERS

Will be submitted along with the Final EIA&EMPR to the DMRE in terms of the POPIA

70. APPENDIX 7.7: FOCUS GROUP MEETING MINUTES

71. APPENDIX 7.8: OPEN DAY PRESENTATION AND ATTENDANCE REGISTER

72. APPENDIX 7.9: I&AP CORRESPONDENCE

Will be submitted along with the Final EIA&EMPR to the DMRE in terms of the POPIA

73. APPENDIX 7.10: COMMENTS AND RESPONSE REGISTER

74. APPENDIX 8: POLICY AND LEGISLATIVE CONTEXT

75. APPENDIX 9: VISUAL ASSESSMENT VIEWS, POTENTIAL RECEPTORS AND LANDSCAPE CHARACTER

The Landscape Character of the study area was described by Graham Young Landscape Architects (see section 11.1.11 above). Photographic panoramas are presented in the figures below to illustrate the nature and character of the study area's landscape.