mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

DRAFT FOR COMMENTING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
AND
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FOR LISTED ACTIVITIES ASSOCIATED WITH MINING RIGHT AND/OR BULK SAMPLING ACTIVITIES INCLUDING TRENCHING IN CASES OF ALLUVIAL DIAMOND PROSPECTING.

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

Name of Applicant	Bauba A Hlabirwa Mining Investments (Pty) Ltd
Project	Moeijelijk Mine Tailings Backfilling Project
Tel No	(011) 699 5720
Fax No	(011) 388 3962
Postal Address	PO Box 1658, Witkoppen, Johannesburg, 2068
Physical Address	Cube Workspace, 1 Wedgewood Link, Bryanston, Johannesburg, 2191
File Reference Numbers SAMRAD	LP10096 MR

June 2020

BAUBA

MOEIJELIJK MINE

IMPORTANT NOTICE

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

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

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

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

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

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;

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

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

(f) Identify suitable measures to manage, avoid or mitigate identified impacts; and

(g) Identify residual risks that need to be managed and monitored.

Table of Contents

Page

PART A: ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME

List of Tables

Page

Table of Figures

Page

List of Appendices

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 DETAILS

1.1.1 Details of the EAP

Name of the Practitioner:	Nicole Upton
Tel No.:	079 555 2433
Fax No.:	N/A
Postal address:	PostNet Suite 0111, Private Bag X37, Lynwood Ridge, 0040
E-mail address:	nicole@redkiteconsulting.co.za

1.1.2 Expertise of the EAP

1.1.2.1 The Qualifications of the EAP (With Evidence)

Please refer to Table 1 for a summary of the qualification and experience of the EAP. Refer to Appendix 1 and 2 for more details (CV).

1.1.2.2 Summary of the EAPs Past Experience (In Carrying Out the Environmental Impact Assessment Procedure)

*(Attached the EAP's curriculum vitae as **Appendix 2**)*

Please refer to Table 1 for a summary of the qualification and experience of the EAP. Refer to Appendix 2 for more details (experience).

Table 1: Details of EAP

Name	Nicole
Surname	Upton
Company	Red Kite Environmental Solutions (Pty) Ltd
Position	Director – Environmental Assessment Practitioner
Location	2055 Cura Avenue, Equestria, Pretoria
Email	nicole@redkiteconsulting.co.za
Telephone Number	079 555 24334
Education	• B.Sc. Environmental Management (Cum Laude) • BSc Honors Animal, Plant and Environmental Sciences
Professional summary	Ms. Nicole Upton has 9 years working experience as an Environmental Consultant and she has specialised in Environmental Management and Analysis and Botany. Ms. Upton currently holds the position of Director at Red Kite Environmental Solutions. Nicole has extensive experience in environmental monitoring, rehabilitation, environmental authorisations, and environmental impact assessment experience. Her main focus is the mining industry and has worked with various project teams, often as project manager. She has undertaken various Environmental Impact Assessments, ecology studies, surface water assessments, rehabilitation plans, Water Use License Applications, Integrated Water and Waste

	Management Plans, Waste Management License Applications and Alien Invasive Plant Management Plans.
Skills	• Mine Closure financial quantum determination, mine rehabilitation. • Management and coordination of environmental compliance aspects for opencast and underground mining. • Alien Invasive Plant monitoring, control and reporting. • Water quality monitoring, measurement, reporting and data analyses including surface water, ground water, process water, sewage water and biological indicators. • Legal compliance auditing and reporting in accordance with the National Environmental Management Acts and other associated environmental related legislation (NEMA listed activities, Water Use Licensing, Waste Licensing, etc.) • Environmental impact assessments and Integrated Water Use License Applications, including rehabilitations plans and IWWMPs. • Environmental Control Officer Site inspections and associated reporting and compliance. • Specialist impact assessments for surface water and ecology. • Conceptual and operational water balances and Water Conservation and Demand Management Plans

2 DESCRIPTION OF THE PROPERTY

2.1 SITE LOCATION

Table 2: Property description and surveyor codes

Farm Names:	Moeijelijk 412 KS	
Application area (Ha):	2270,9632 ha	
Magisterial district:	Fetakgomo Local Municipality	Sekhukhune District Municipality
Distance and direction from nearest town:	The mining right area is located 42 km south of Misty Crown (Haenertsburg) and 25 km north-east of Ga-Nkoana. The nearest village is Tsibeng, which is located on the farm Moeijelijk 412 KS.	
21-digit Surveyor General Code for each farm portion:	T0KS00000000041200000	

2.2 LOCALITY MAP (SHOW NEAREST TOWN, SCALE NOT SMALLER THAN 1:250 000)

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

Please refer to Appendix 3 for the Locality Maps for the project area.

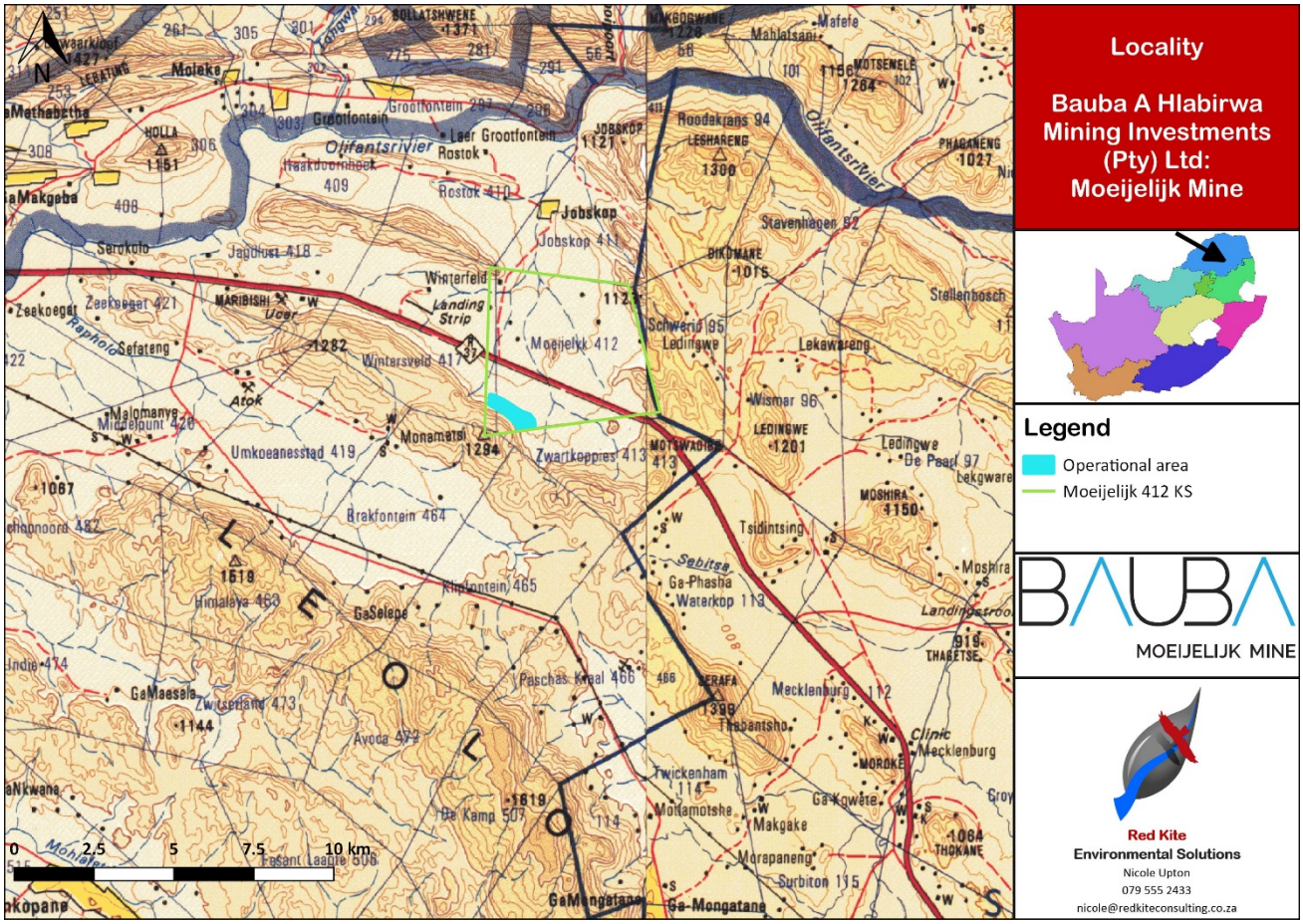


Figure 1: Moeijelijk 412 KS Regional Locality

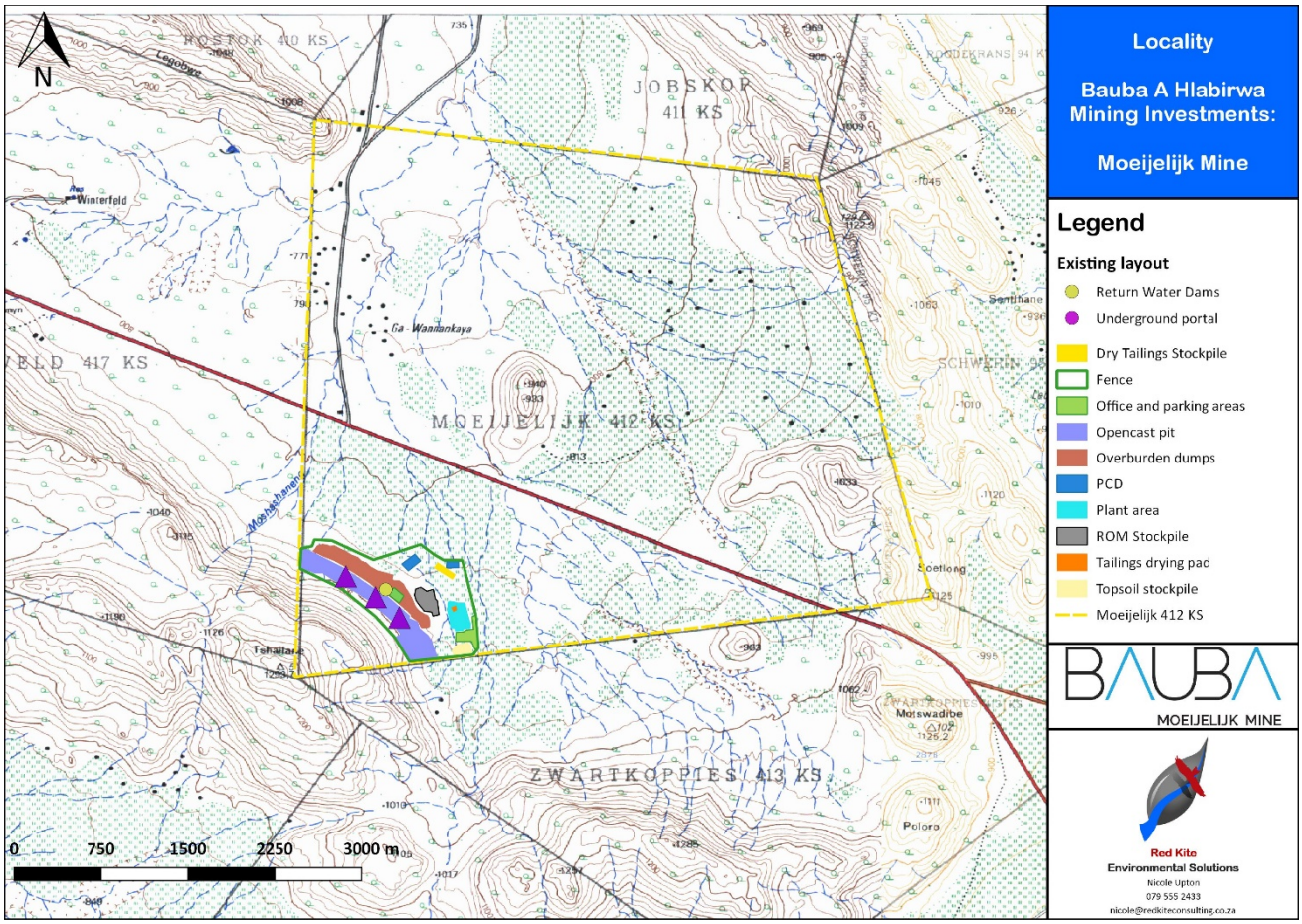


Figure 2: Locality of Moeijelijk Mine

3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

3.1 LISTED AND SPECIFIED ACTIVITIES

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 and attach as Appendix 4.

Table 3: Proposed activities for Moeijelijk Mine Tailings Backfill Project

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route, **etc.** **E.g. for mining**, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)	**AERIAL EXTENT OF THE ACTIVITY (Ha or m²)**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** ***(GNR 324, 325, or GNR 327)***	**WASTE MANAGEMENT AUTHORISATION** (Indicate whether an authorisation is required in terms of the Waste Management Act). **(Mark with an X)**
CATEGORY B – Activity 2: The reuse or recycling of hazardous waste in excess of 1 ton per day, excluding reuse or recycling that takes place as an integral part of an internal manufacturing process within the same premises. CATEGORY B – Activity 11: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). **Backfilling of the opencast void with tailings as part of rehabilitation initiatives.**	7.5 ha	N/A	GN 921 Category B – Activity 2 Category B – Activity 11	X
CATEGORY B – Activity 2: The reuse or recycling of hazardous waste in excess of 1 ton per day, excluding reuse or recycling that takes place as an integral part of an internal manufacturing process within the same premises. CATEGORY B – Activity 11: The	1 ha (extent of current and authorised tailings stockpile)	N/A	GN 921 Category B – Activity 2 Category B – Activity 11	X

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route, **etc.** **E.g. for mining**, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)	**AERIAL EXTENT OF THE ACTIVITY (Ha or m²)**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** **(*GNR 324, 325, or GNR 327)***	**WASTE MANAGEMENT AUTHORISATION** (Indicate whether an authorisation is required in terms of the Waste Management Act). **(Mark with an X)**
establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). **Selling of tailings material for reclamation by third parties, off-site.**				
CATEGORY B – Activity 2: The reuse or recycling of hazardous waste in excess of 1 ton per day, excluding reuse or recycling that takes place as an integral part of an internal manufacturing process within the same premises. **Reuse of tailings material for brick-making.**	1 ha (extent of current and authorised tailings stockpile)	N/A	GN 921 Category B – Activity 2	X
CATEGORY B – Activity 2: The reuse or recycling of hazardous waste in excess of 1 ton per day, excluding reuse or recycling that takes place as an integral part of an internal manufacturing process within the same premises. **Reuse of tailings material for cement.**	1 ha (extent of current and authorised tailings stockpile)	N/A	GN 921 Category B – Activity 2	X
CATEGORY A - (13) The expansion of a waste management activity listed in Category A or B of this Schedule	4 ha (12 ha of	N/A	GN921 Category A –	

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route, **etc.** **E.g. for mining**, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)	**AERIAL EXTENT OF THE ACTIVITY (Ha or m²)**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** **(*GNR 324, 325, or GNR 327)***	**WASTE MANAGEMENT AUTHORISATION** (Indicate whether an authorisation is required in terms of the Waste Management Act). **(Mark with an X)**
which does not trigger an additional waste management activity in terms of this Schedule. **Expansion of waste rock and overburden stockpile**	overburden and waste rock stockpiles authorised under existing EMPr and IEA)		Activity 13	
Supporting Facilities/Activities (pre-existing and/or formed part of a prior application process) - Below Activities are defined however it should be noted that these activities are pre-existing and not considered part of this application. The activities do however form essential supporting facilities to the proposed backfilling of the opencast mine void.				
Hauling and transporting	-	Pre-existing (does not form part of proposed project scope)		
Fences	2,500 m	Pre-existing (does not form part of proposed project scope)		
Pollution Control Dams and related storm water management infrastructure (i.e. clean and dirty water channels)	PCD 1 – 22,400 m^2 PCD 2 - 9,600 m^2	Pre-existing (does not form part of proposed project scope)		
Opencast and underground mining	36 ha (approximate)	Pre-existing (does not form part of proposed project scope)		
Wash plant	1 ha (approximate)	Pre-existing (does not form part of proposed		

NAME OF ACTIVITY **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route, **etc.** **E.g. for mining**, - excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)	**AERIAL EXTENT OF THE ACTIVITY (Ha or m²)**	**LISTED ACTIVITY** (Mark with an **X** where applicable or affected).	**APPLICABLE LISTING NOTICE** **(*GNR 324, 325, or GNR 327)***	**WASTE MANAGEMENT AUTHORISATION** (Indicate whether an authorisation is required in terms of the Waste Management Act). **(Mark with an X)**
		project scope)		
Crushing, screening and washing of ore	1 ha (approximate))	Pre-existing (does not form part of proposed project scope)		
Tailings drying facility	0.5 ha	Pre-existing (does not form part of proposed project scope)		
Tailings stockpile	1 ha	Pre-existing (does not form part of proposed project scope)		

3.2 EXISTING MINING OPERATIONS

Bauba: Moeijelijk Mine is an existing operation and holds a Mining Right (LP10096MR) and Integrated Environmental Authorisation (LP 10096 (58 MR)) on the farm Moeijelijk 412 KS for the opencast and underground mining of chrome as well as a Water Use Licence (Licence No. 01/B71B/ACGI/5052).

During 2014 Bauba A Hlabirwa Mining Investments (Pty) Ltd obtained a Mining Permit (No. 64/2014) for a small-scale mining operation on the Farm Moeijelijk 412 KS (under reference LP30/5/1/3/2/10546MP).

Current authorisations at that stage (2014) limited the mine to exclusively small scale opencast methods of mining. As such, Bauba A Hlabirwa Mining Investments (Pty) Ltd lodged a Mining Right Application with the Department of Mineral Resources under reference LP30/5/1/2/2/10096 MR in 2015 to expand the current opencast section of the mine and to utilise the underground section of the mine below the pit as well.

The open pit area was to be located along the entire strike length of the ore body. A mining portal was to be established to access underground mining operations.

The open cast pit will be mined in a typical grid by grid truck and shovel method. Initially there will be topsoil stripping and stockpiling, then subsequent drilling and blasting of rock (interburden etc.) thereafter. Handling of Run of Mine (ROM) with large front-end loaders and trucks will complete the open cast mining. Waste rock will be stockpiled until such time as there is sufficient space available inside the pit for storage of waste. Then the waste rock will be placed in mined out areas as the face is advanced. ROM will be transferred to an off-site processing plant via haul trucks for further processing. The Run-of-Mine material from both the underground and opencast mining activities will be processed through a mobile crushing plant. The crushing will be a dry process and the plant will only be on site as and when necessary. No other beneficiation processes were envisaged at that stage of the initial application.

Below the pit, underground mining would have targeted two distinct horizons, the LG7 and LG6. The LG6 reef horizon was to be mined with a conventional board and pillar methodology, and the LG7 horizon with a conventional breast methodology.

The initial application indicated that the project includes the following infrastructure:

- Offices and workshops;
- Diesel Storage;
- Storm water dam and related infrastructure;
- Change house and sanitation facilities;
- Topsoil Storage;
- Overburden stockpiles;
- Mobile crushing plant (as and when necessary);
- Waste rock stockpiles; and
- Possible water extraction from Opencast and Underground.

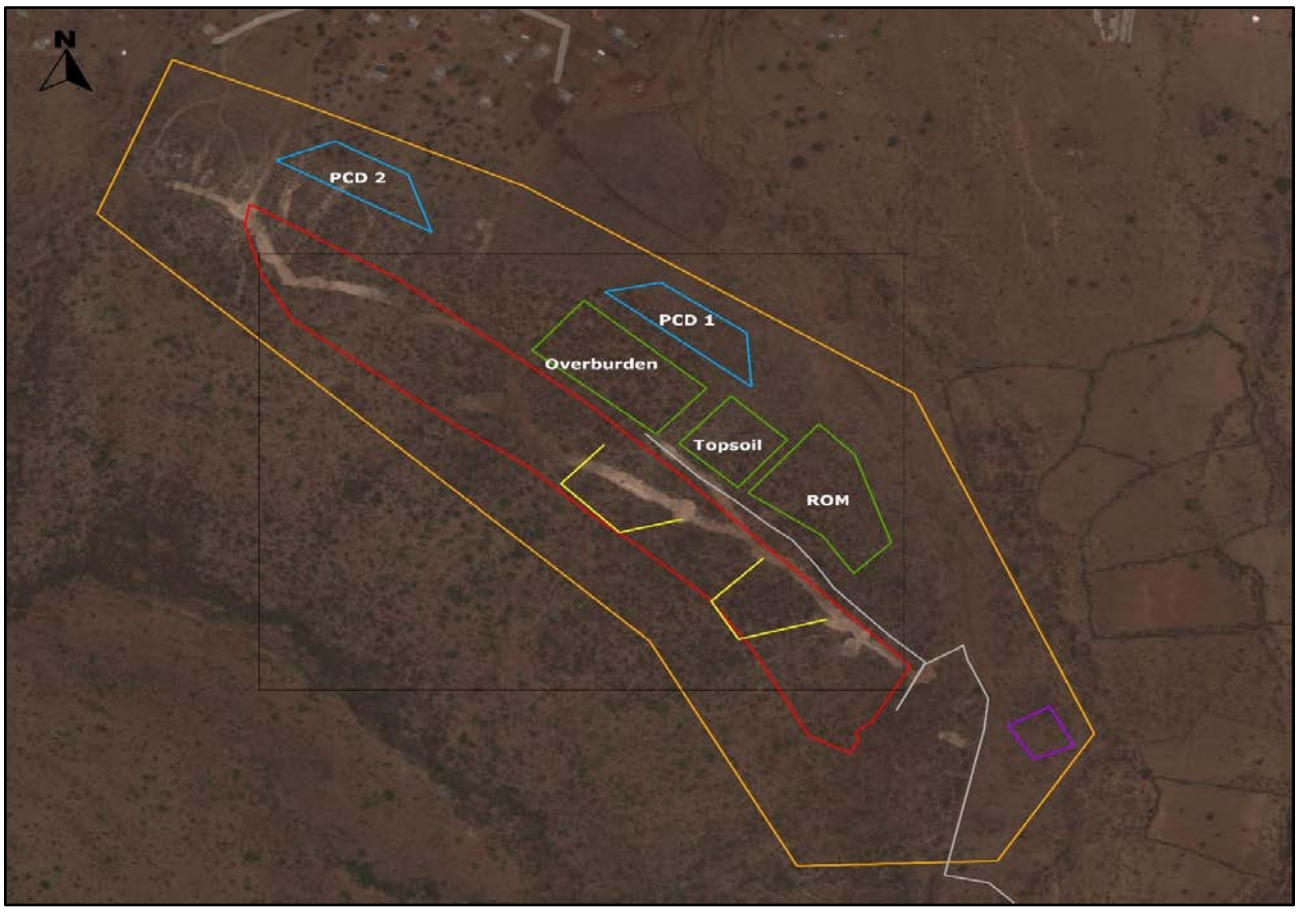


Figure 3: Initial infrastructure layout for the application made in 2015

A Section 102 Amendment of the existing Mining Right (LP 10096MR) and associated NEMA application for the expansion activities was initiated in October 2017, with reference LP 000 58 MR/102. A Water Use Licence Application (27/2/2/B72B/001) was also submitted for water uses related to the expansion activities in October 2017. Both the Environmental Authorisation and Water Use Licence for the Moeijelijk Mine Expansion Project were subsequently issued in 2018.

The following infrastructure and activities were applied for and authorised as part of the expansion project (LP 000 58 MR/102):

- The extension of the existing opencast pit across various watercourses to access the remainder of the LG6 on the Mining Right area;
- Mining of all UG on the slope above the current opencast pit;
- The development of a new opencast pit across various watercourses to access the LG2 chromitite on the Mining Right area;
- The extension of the ROM stockpile area;
- The construction of a river crossing (culvert);
- Construction of wash plant (Appendix 5 provides full details on this); and
- Construction of residue drying and stockpiling facilities.

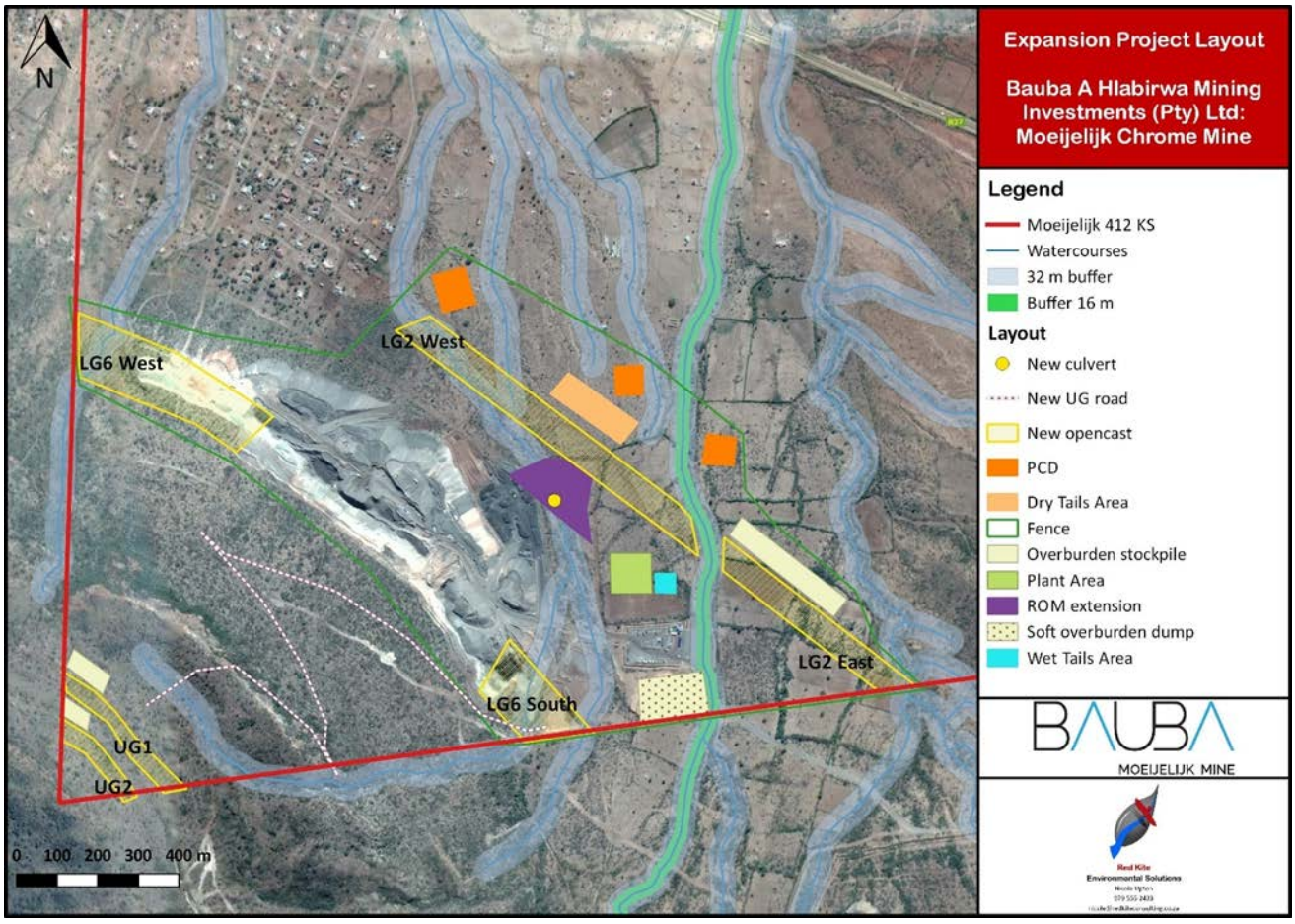


Figure 4: Layout of Moeijelijk Mine Expansion Project (LP 000 58 MR/102)

During 2018 Bauba applied for a Section 102 amendment of the EMP and Mining Right to extend the underground mining area into the adjoining farm Brakfontein 464 KS in order to access the LG6 on the farm (LP10096 MR). The amendment and associated Environmental Authorisation was granted in 2018. The expansion of the underground operations will not

require any new surface infrastructure as the activity will only entail the extension of the underground shaft on the farms Moeijelijk 412 KS into the adjoining farm Brakfontein 464 KS. Existing surface infrastructure will be utilised.

The extension of the mining right, to include Brakfontein 464 KS, will increase the LOM from 12 years to the maximum mining right period of 30 years.

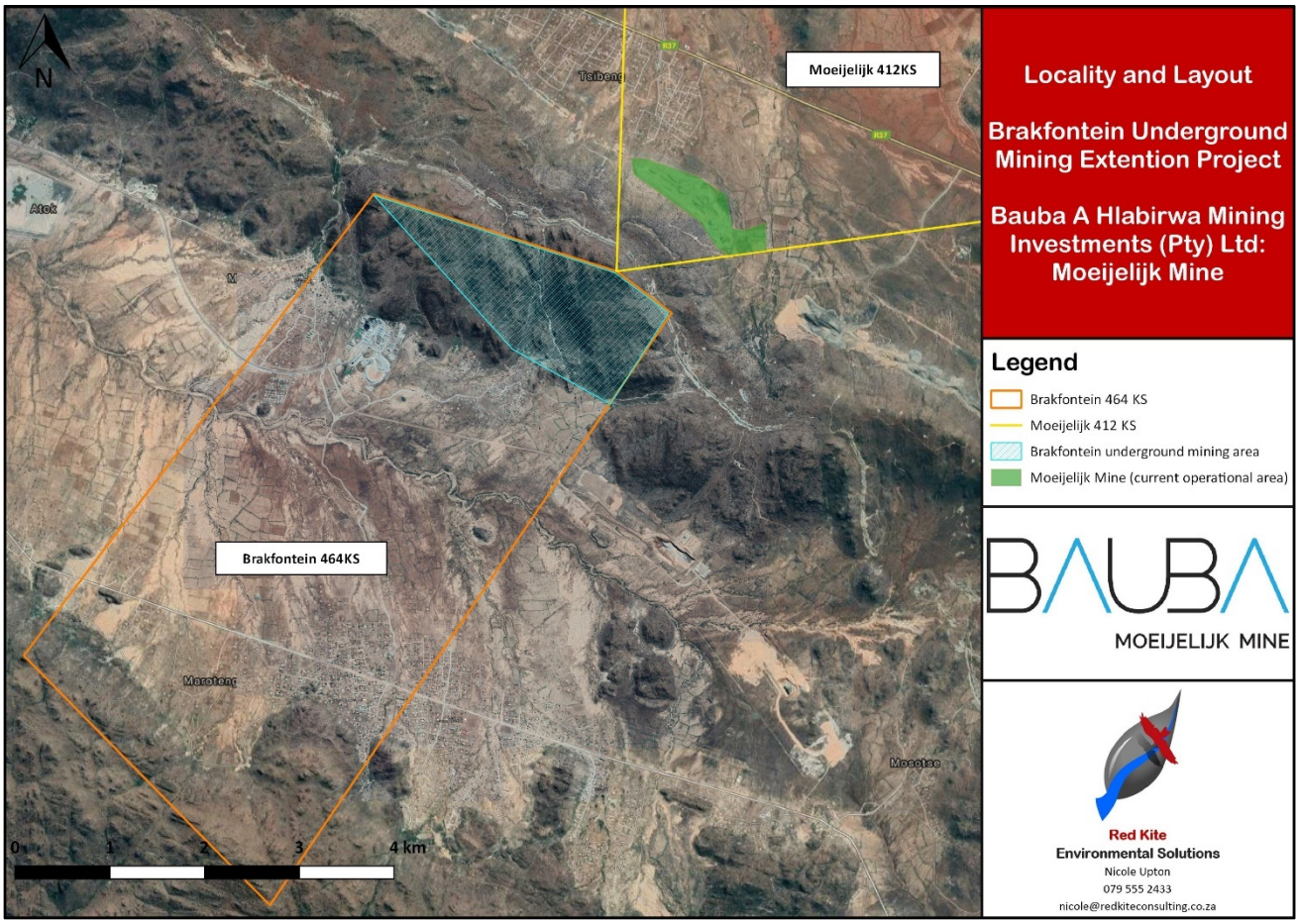


Figure 5: Underground mining area layout on Brakfontein 464 KS

Current mining operations consist of opencast and underground mining. The opencast void is 26 ha in extent with the mining operations covering an area of approximately 58 ha. Bauba has finalised the opencast mining of the LG6 chromitite package on the farm Moeijelijk 412 KS.

The mine has also established a wash plant and associated facilities such as a tailings drying facility and dry tailings stockpile. The residue material from the wash plant is allowed to dry, where after it is stockpiled, thus no tailings dam will/has been constructed for the project.

3.2.1 Mining Method

Resources situated close to surface are mined via open pit type mining up to a depth of approximately 50 m. The open cast pit is mined in a typical grid by grid truck and shovel method. Initially there is topsoil stripping and stockpiling, then subsequent drilling and blasting of rock (interburden etc.) thereafter. Handling of Run of Mine (ROM) with large front-end loaders and trucks completes the opencast mining. Waste rock and overburden is stockpiled until such time as there is sufficient space available inside the pit for storage of waste. Then the waste rock is placed in mined out areas as the face is advanced.

The LG2 outcrop position needs to be accurately identified in the field, through detailed exploration activities. Once

demarcated, the opencast operations will commence. The estimated location of the opencast pit is indicated in Figure 4: Layout of Moeijelijk Mine Expansion Project (LP 000 58 MR/102).

Opencast production on the UG1 is set to start earlier than the UG2 production due to the access road reaching the UG1's expected position first. Exploration on the UG1 has to be performed to clearly define the outcrop, whilst the UG2 outcrop is exposed on hilly terrain.

The production methods used are typical of open pit operations and consist of the following steps daily:

- Strip the 70 cm of top soil and stockpile for future rehabilitation work
- Strip overburden until solid rock is encountered and stockpile this for future rehabilitation
- Drill and blast the solid overburden, remove for stockpiling and at a later stage, perform back filling of the pits
- On encountering the ore seams reduce bench height and drill and blast the ore
- Load the ore into trucks using hydraulic shovels or front-end loaders
- Transport the ore to the processing plant ROM for stockpiling
- Drill and blast the internal solid overburden and remove for stockpiling

Underground mining is currently undertaken on the farm Moeijelijk 412 KS with future underground mining planned to extend into the adjacent farm of Brakfontein 464 KS. For the LG6 target zone a Conventional Board and Pillar Mining method is used. Mining proceeds using a double cut method for safety concerns due to the height and to mine the waste parting separate. The LG6 target horizon is accessed via a cluster decline system, to access the defined levels.

The principal characteristics of the decline system are as follows:

- A main decline for the transport of the workforce and vehicle access.
- A trucking decline for the transport of rock from underground to surface silo;
- The decline cluster will be sunk on an apparent dip of 9° to facilitate the efficient and reliable use of mechanised vehicles
- The entrance to the decline is via a combined box cut from the pit
- The decline will extend from surface to a final depth of 280m below surface
- The decline systems are placed on both the LG6 and LG7 mining horizons, providing separate access to each horizon
- From the decline, on each level, a station is established and connects to a trackless haulage that is placed on reef
- The decline systems are connected to a return air way (RAW) at the top of the mine, which is placed on the LG6 reef, 40 m below the old LG6 workings
- A maximum of 4 production levels are developed out of the decline system
- For planning purposes each level is split into two half levels

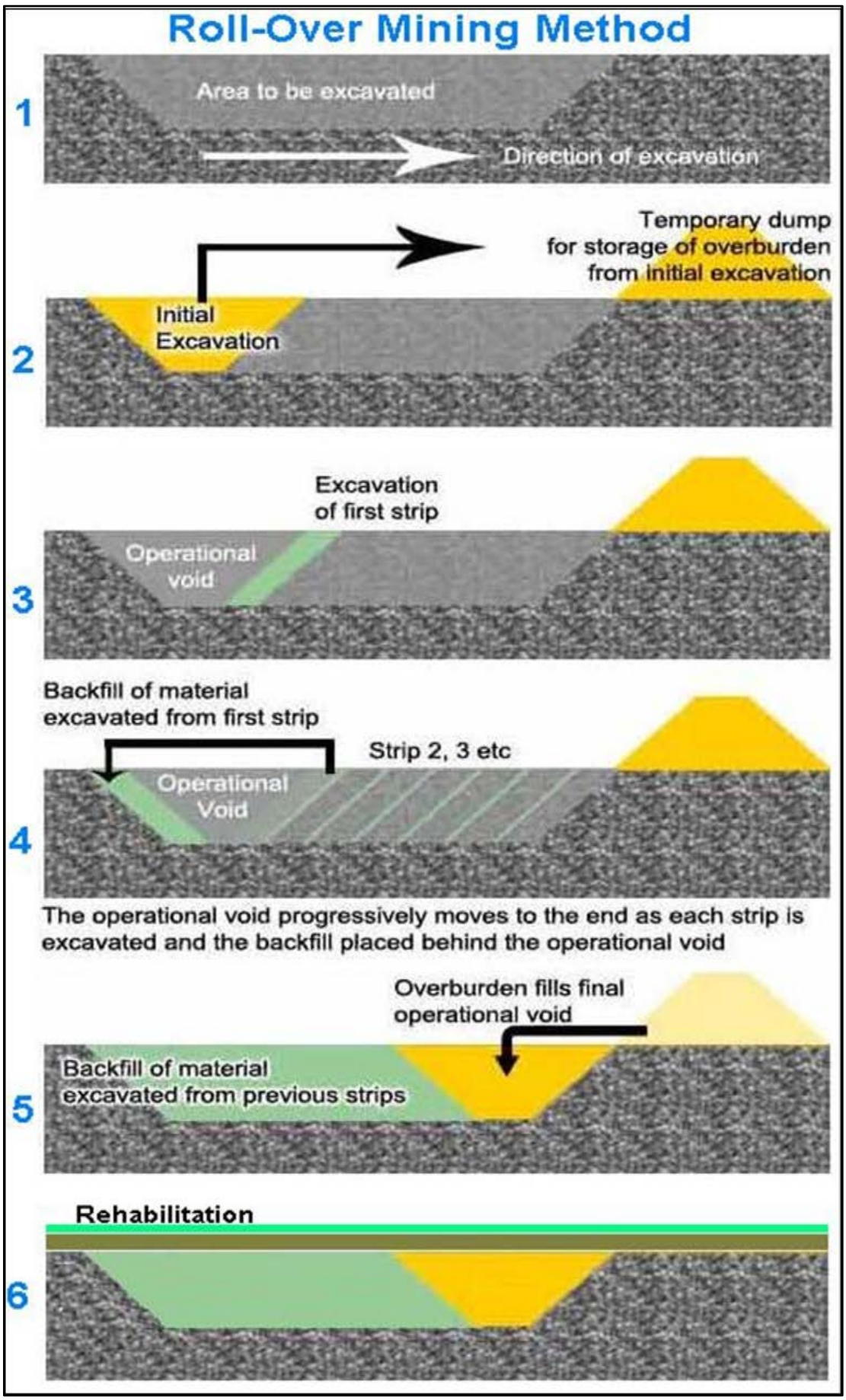


Figure 6: Roll-over mining method

3.2.2 Mine Infrastructure

The Bauba A Hlabirwa Mining Investments Moeijelyk Mine project is an existing operation and the current infrastructure and activities at Moeijelijk Mine include the following:

- Opencast mining
- Underground mining
- Loading, hauling and transporting
- Blasting
- Stockpiling of overburden, waste rock and topsoil
- Backfilling of the opencast void with waste rock and overburden
- ROM and product stockpiling
- Crushing, screening and wash plant
- Tailings drying pad
- Dry tailings stockpiling facility
- Return Water Dams
- Offices, workshops, stores, parking areas and change houses
- Scrap and waste storage areas
- Diesel storage facilities
- Septic tanks
- Fences and security offices
- Boreholes and water storage tanks
- Dust suppression
- Clean and dirty storm water channels and Pollution Control Dams
- Culverts and low water bridges

3.2.3 Water supply

The current mining operation uses groundwater abstracted from 9 boreholes on site, for which a Water Use Licence was obtained. Abstracted groundwater is used for potable water, dust suppression, process water and ablution facilities/ change houses. The water to be used at the mine will be sourced either from the boreholes on site, groundwater inflows into the underground workings, storm water dam or a combination of the above. A geohydrological study has been undertaken to assess the groundwater regime.

- Pollution Control Dams: The current storm water infrastructure is sufficient for the current and proposed mining activities and no new infrastructure will be necessary. Two pollution control dams (PCD) have been constructed for the storage of contaminated water originating from the mining activities and plant area. Water contained within the PCDs is utilised for dust suppression, when available. The PCDs were designed by an engineer as part of the Storm Water Management Plan and is lined and constructed in accordance with the requirements of NEMWA.
- Clean and Dirty Water Systems: The current storm water infrastructure is sufficient for the current and proposed mining activities and no new infrastructure will be necessary. Clean and dirty water systems have been constructed in order to ensure clean and contaminated water is kept separated within the mine areas. A Storm Water Management Plan was compiled and implemented as part of the Moeijelijk Expansion Project (LP000 58 MR/102).
- Boreholes: No new boreholes will be required for the operation. Existing monitoring and abstraction boreholes will be used.
- Water treatment: A waste water treatment works (30 m^3 /day capacity) will be constructed for the treatment of sewage and grey water from the underground ablution and change house facilities. The treated water will be used as process water in the underground operations as well as to irrigate revegetated areas as part of the mines rehabilitation efforts.

3.2.4 Roads

Existing access and haul roads service the current mining operations.

3.2.5 Waste Rock Dump

No additional waste rock and overburden dumps will be created as part of the tailings backfilling project. In total 16 ha of waste rock and overburden dumps are located on the Moeijelijk Mine project footprint.

3.2.6 Offices, Ablution Facilities and Parking

Existing administration facilities will be utilised.

3.2.7 Wash plant

The chrome wash plant consists of a crushing and screening circuit and wash plant. The purpose of the primary crushing circuit is to reduce the ROM material to a processable size fraction to process further through gravity separation spirals (refer to Figure 9). The purpose of the Spiral Circuit (wash plant) (refer to Figure 9) is to remove impurities; mainly SiO2 from the ROM material to produce a sellable Chemical/Foundry and Metallurgical Grade Cr2O3 end product.

The wash plant involves two main processes namely crushing and washing. The Crushing Circuit is designed to have 150 tonnes per hour capacity. Bauba is currently producing LG7, LG6 and LG6A chrome ore from their current mining operations and the mined ROM is stockpiled close to the plant area. The purpose of the primary crushing circuit is to reduce the ROM material to a size fraction suitable for the process to then be further processed through gravity separation spirals.

The wash plant currently processes 30 000 tons of ROM per month, but will be increasing the processing rate to 100 000 tons of ROM ore per month. Bauba produces mainly a chemical grade Cr_2O_3 end product as well as either a foundry grade or a metallurgical grade product. The purpose of the spiral circuit (wash plant) is to remove impurities; mainly SiO_2 from the ROM material to produce a saleable chemical/foundry and metallurgical grade Cr_2O_3 end product. Tailings (SiO_2) will be stockpiled for future processing for the removal of PGMs. The wash plant processing is described in the flow diagram

Wash plant infrastructure includes:

- Crushing and screening circuits for various feed material sizes
- Plant feed stockpiles
- Foundry grade shed
- Product storage pad
- Spiral circuit
- Wet tailings pad (tailings drying pad)
- Staff accommodation
- Offices, parking areas and workshop
- Diesel bay
- Pollution Control dam
- Dry tailings stockpile

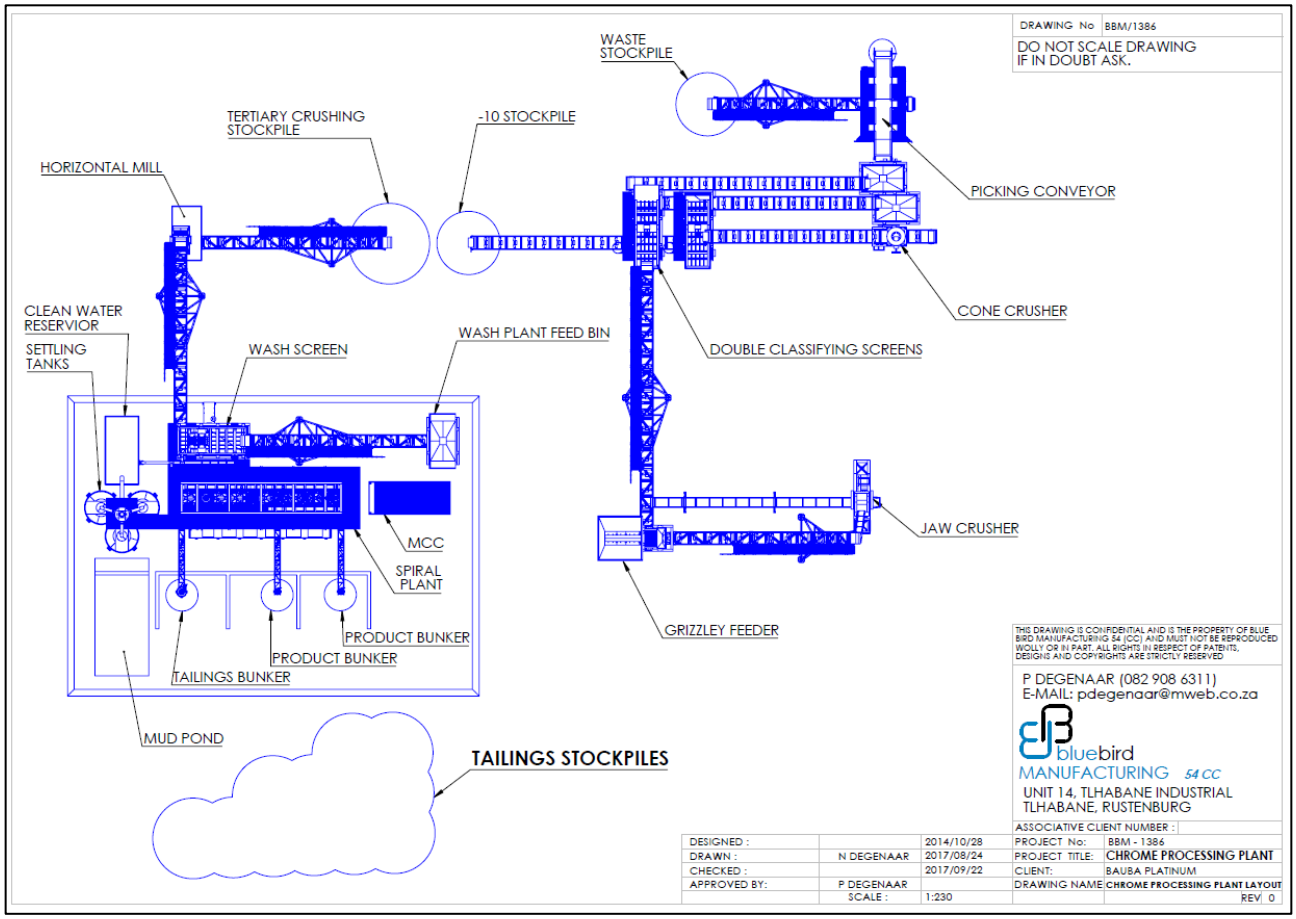


Figure 7: Basic Plant Layout for the wash plant

3.2.8 Waste management

Waste rock and overburden produced by the project is transferred to existing dumps, where after it is used for backfilling of the opencast void.

The waste generated by the operations is divided into 3 main categories and is discussed below in summary.

3.2.8.1.1 GENERAL WASTE

The identified general waste types to be generated on site are the following:

- Scrap metal & timber
- Cans, paper, plastic and cardboard
- Inert waste
- Garden waste

3.2.8.1.2 TAILINGS

An Integrated Environmental Authorisation for the tailings facilities and wash plant was previously been applied for and authorised under reference LP000 58 MR/102.

The tailings produced by the was plant is dewatered by a belt press and screen, thereafter the wet tailings are deposited onto the wet tailings pad. This is done to facilitate the maximum recovery of water to be reused at the plant. Once tailings have dried sufficiently it is transferred to the dry tailings stockpile, from where a portion is sold to third parties for reclamation, when necessary or economically viable.

The tailings drying pad is a concrete facility and the dry tailings stockpile is constructed with the appropriate barrier as

prescribed by the Competent Authority, i.e. a Class 4 barrier type. The wash plant and tailings facilities are considered dirty areas and such all water emanating from these areas are contained in a PCD for reuse in the wash plant processes.

As part of this application, Bauba proposes to use tailings for use in backfilling of the opencast voids as part of the rehabilitation efforts of the mine. In order to maximise recycling, and thereby reducing waste materials stockpiled on site, the operation also proposes to reuse the tailings for the making of bricks and cement for use in building materials for use at the operation as well as the nearby communities. It is estimated that the brickmaking will utilise a maximum of 60 m^3 of tailings material per month and a maximum of 20 m^3 per month of tailings will be used for the mixing of cement.

When economically viable the mine also proposes to sell the tailings material to third parties for further reclamation at off-site operations.

3.2.8.1.3 HAZARDOUS WASTE

Potential hazardous waste types that may occur on site include:

- Any tar containing waste
- Any resin containing waste
- Fluorescent light tubes
- Oil (used and clean)
- Degreaser
- Explosives
- Brake and transmission fluid
- Sewage

All the above-mentioned wastes will be handled to guidelines given by the competent authority.

3.3 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN (THIS APPLICATION)

Bauba A Hlabirwa Mining Investments (Pty) Ltd proposes to reuse or reclaim the tailings material produced by the existing wash plant on site in order to minimise the residue stockpiled on site and to maximise recycling.

The tailings material is proposed to be reclaimed or reused in the following ways:

- A portion of the material will be used to backfill the opencast voids of the operation as part of the rehabilitation efforts of the mine. Backfilling with tailings will mainly take place in voids situated on the farm Moeijelijk 412 KS. However, the boundary pillar between Sefateng Chrome Mine and Moeijelijk Mine has been mined and as such a portion of the tailings being used for backfilling by Bauba will take place on the farm Zwartkoppies 412 KS (Sefateng Chrome Mine).
- A portion of the material will be used in brick-making (approximately 60 m^3 per month of tailings) . The bricks will potentially be used for on-site for the construction of infrastructure, as well as for community projects.
- A portion of the tailings material will be used in cement mixing (approximately 20 m^3 per month) for use in onsite construction.
- When necessary or economically viable, Bauba proposes to sell tailings to third parties for further reclamation at off-site operations.

To facilitate the reuse of the tailings, whilst minimising the potential environmental impacts of the reuse of the tailings material, a preconcentrator will be installed in the existing wash plant. The purpose of the preconcentrator is to maximize the extraction of chrome in the wash plant process, which reduces the chrome content in the tailings material. After implementation of the preconcentrator it is expected that the tailings material produced by the wash plant will largely comprise of silica, representative of the waste rock and overburden material found on the mining area.

A block flow diagram of the proposed tailings reticulation is provided in the figure below. In summary, the tailings will be completely dewatered and de-gritted with an incline dewatering screen situated next to the wet tailings pad, a conveyor will discharge the dewatered tailings onto the wet tailings pad. Once the tailings are sufficiently dry, the tailings are either stored on the existing dry tailings stockpile or transported to the opencast void for use in backfilling.

As part of the application a Section 102 amendment of the EMP will be applied for in terms of the MPRDA. The Section 102 amendment will entail the consolidation of previous EMPs (refer to section 3.2 above) approved for the project as well as update the current layout of the authorised activities associated with the Moeijelijk Mine project, to reflect the layout of current operations, specifically the current location and dimensions of the overburden stockpiles and Pollution Control Dams (refer to Figure 9).

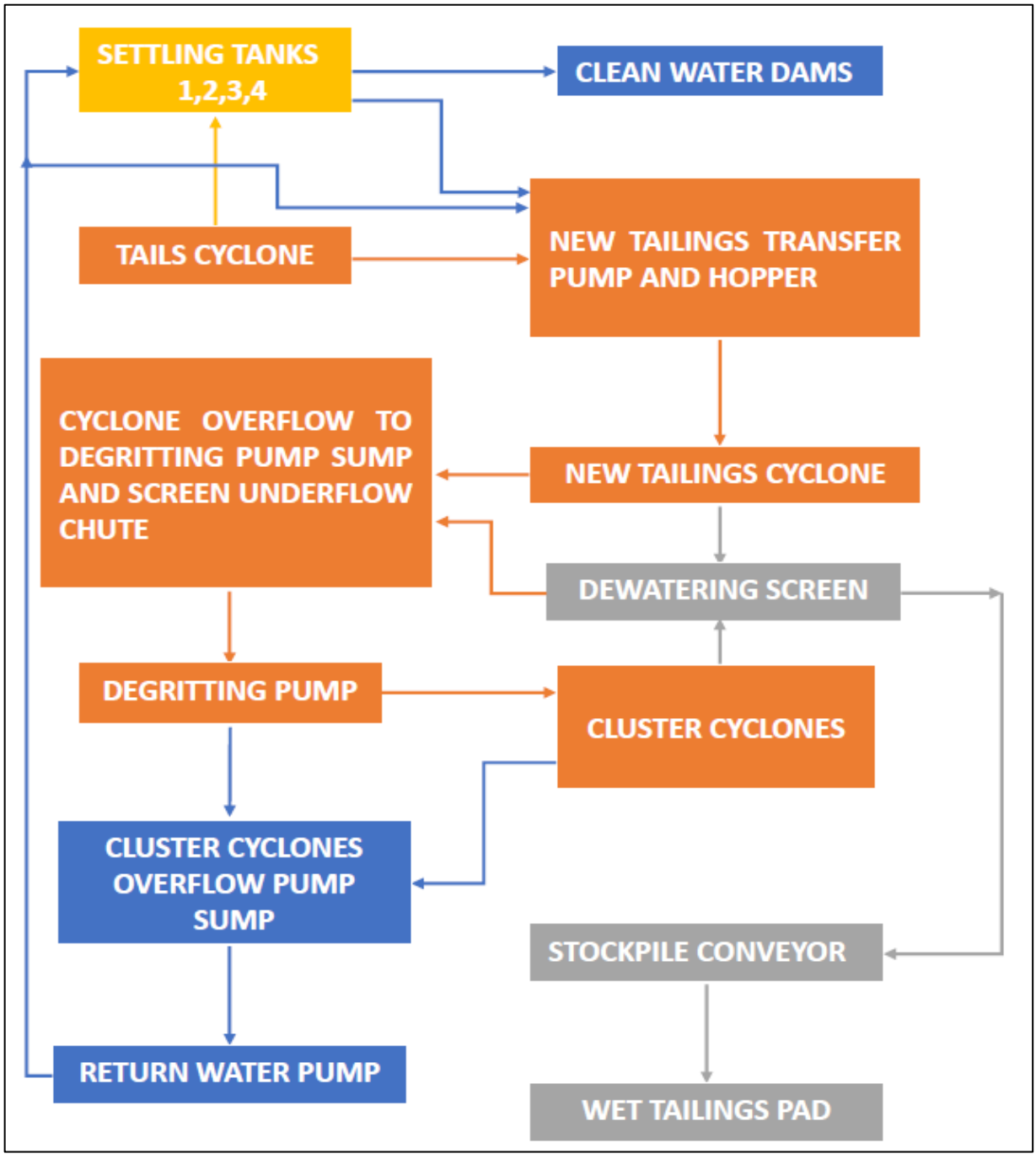


Figure 8: Tailings reticulation block flow diagram

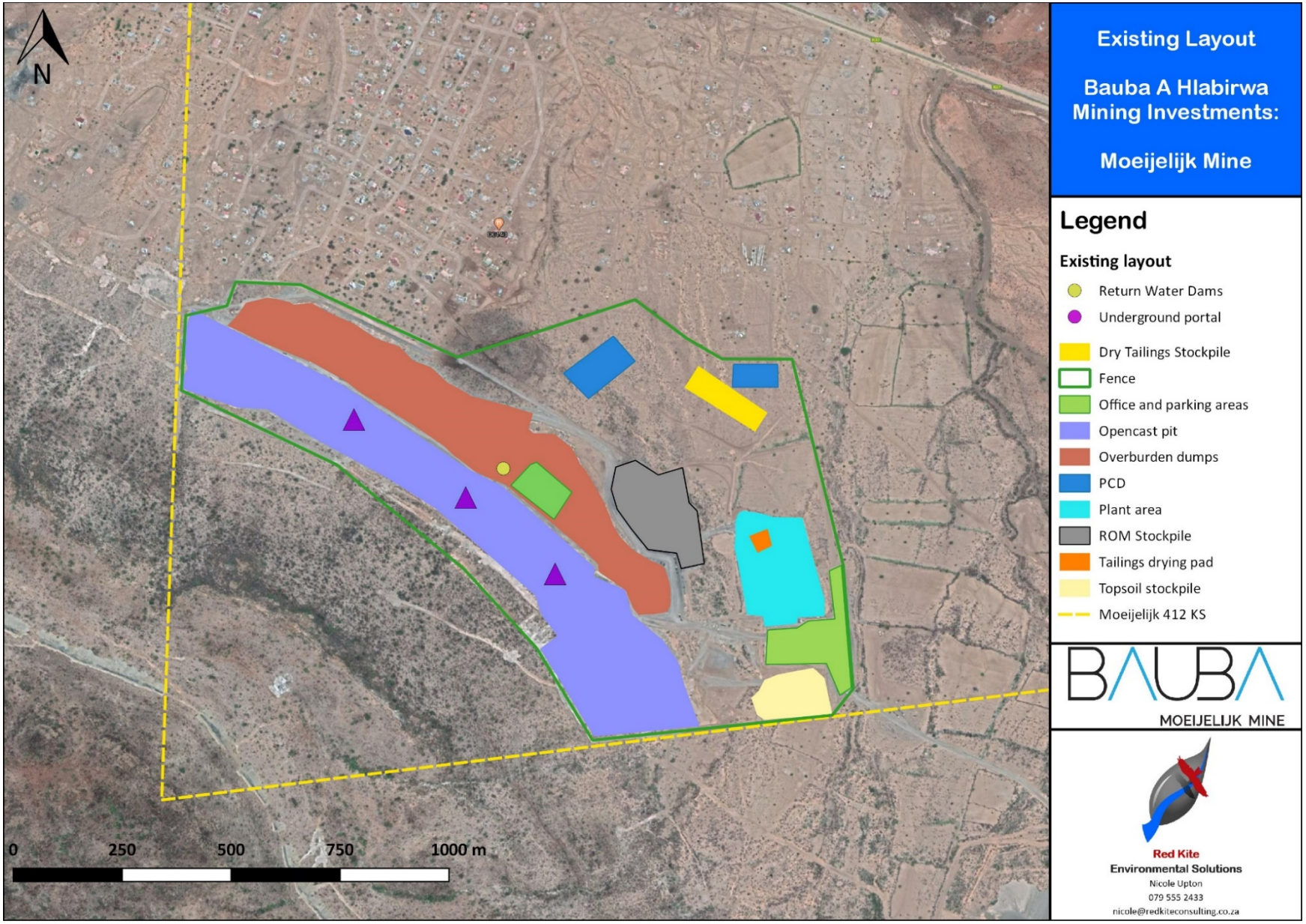


Figure 9: Layout of proposed tailings backfill project and current operational layout (opencast pit to be used for tailings backfilling)

4 POLICY AND LEGISLATIVE CONTEXT

Relevant South African legislation requires various authorisations prior to the commencement of the Proposed Project. Although cognisance of all applicable legislation is being taken, the following table details the relevant environmental authorisations, which are required:

Table 4: Competent Authorities

Authorisation	Responsible Department	Relevant Act
Section 102 Amendment of the EMP	DMR	MPRDA
Waste Management Licence		NEMWA

As part of the Environmental Impact Assessment Phase, and to ensure all relevant South African legislation was taken into consideration, the following legislation was considered relevant as part of the overall ESIA Process to ensure legal compliance and best practice:

- The Constitution of the Republic of South Africa (No. 108 of 1996)
- Mineral and Petroleum Resources Development Act (No. 28 of 2002)
- National Environmental Management Act (No. 107 of 1998)
- National Water Act (No. 36 of 1998)
- National Environmental Management Biodiversity Act (No. 10 of 2004)
- National Environmental Management Protected Areas Act (No. 57 of 2003)
- National Environmental Management Air Quality Act (No. 39 of 2004)
- National Environmental Management Waste Act (No. 59 of 2008)
- National Heritage Resources Act (No. 25 of 1999)
- National Forests Act (No. 84 of 1998)
- Fencing Act (No. 31 of 1963)
- Hazardous Substances Act (No. 15 of 1979)
- Occupational Health and Safety Act (No. 85 of 1993)
- Mine Health and Safety Act (No. 29 of 1996)
- Provincial Ordinances and Municipal By-laws
- Guidelines

Table 5 : Applicable Legislation and guidelines

Applicable legislation and guidelines used to compile the report	Reference where applied
Constitution of the Republic of South Africa (No. 108 of 1996) Since 1994 South African legislation, including environmental legislation, has undergone a large transformation and various new laws and policies was promulgated with a strong emphasis on environmental concerns and the need for sustainable development. The Constitution of the Republic of South Africa (No. 108 of 1996) (the Constitution), the supreme law in South Africa, contains far reaching clauses relevant to the environment including the environmental right, the administrative justice clause, the access to information right as well as the liberalisation of *locus standi* rule.	The purpose of the ESIA Process is to identify activities that may cause environmental and socio-economic damage from the associated impacts occurring as a result of the proposed project. The impacts will be assessed, evaluated and mitigation measures developed to minimise the negative impacts and promote positive impacts associated with the proposed project,

Applicable legislation and guidelines used to compile the report	Reference where applied
In terms of Section 24, a positive obligation is placed on the State to give effect to the environmental right. The environmental right states that: *"Everyone has the right -* *To an environment that is not harmful to their health or well-being; and* *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* - *Prevent pollution and ecological degradation;* - *Promote conservation; and* - *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."*	thereby ensuring that the project is undertaken in a sustainable manner. This also ensures that Bauba does not contravene Section 24 of the Constitution. The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an ongoing basis throughout South Africa. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
Mineral and Petroleum Resources Development Act (No. 28 of 2002) The primary aim of the MPRDA is to recognise the sovereignty of the State over all the mineral and petroleum resources in South Africa and to promote equitable access to the Country's resources. The MPRDA has a number of objectives, including to: • Promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa; • Substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources; • Promote economic growth and mineral and petroleum resources development in the country; • Provide for security of tenure in respect of prospecting, exploration, mining and production operations; • Give effect to Section 24 of the Constitution of South Africa by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and • Ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating.	In accordance with Section 102 of the MPRDA, Bauba is required to conduct an EIA and submit an EMPR for approval to the Limpopo DMR. Red Kite Environmental Solutions has compiled the Environmental Impact Assessment and Environmental Management Programme Report in accordance with the MPRDA and NEMA. As part of the application a Section 102 amendment of the EMP will be applied for in terms of the MPRDA. The Section 102 amendment will entail the consolidation of previous EMPs (refer to section 3.2 above) approved for the project as well as update the current layout of the authorised activities associated with the Moeijelijk Mine project, to reflect the layout of current operations, specifically the current location and dimensions of the

Applicable legislation and guidelines used to compile the report	Reference where applied
The MPRDA concerns equitable access to, and sustainable development of, South Africa's mineral and petroleum resources. The MPRDA makes provision for sustainable mining and requires: • That every person who has applied for a mining right must conduct an EIA, determine the environmental baseline, and submit an EMPR to the DMR; • That every holder of a mining reconnaissance permit, prospecting right, mining right, mining permit or retention permit must assess and communicate the impacts of the activity on the environment; • The need to rehabilitate the environment affected by prospecting or mining operations to its natural or predetermined state; and • That the directors of the mining company are liable for unacceptable impacts on the environment.	overburden stockpiles and Pollution Control Dams (refer to Figure 8).
National Environmental Management Act (No. 107 of 1998) The NEMA is South Africa's overarching environmental statute concerned with integrated environmental management (IEM) and the underlying principles by which environmental management must be undertaken. Its primary objective is to provide for co-operative governance, thus binding all organs of State by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance, and procedures for co-ordinating environmental functions exercised by organs of State and to provide for matters connected therewith (Government Gazette, 1998). The NEMA provides for the Constitutional right to an environment that is not harmful to the health and well-being of South African citizens, the equitable distribution of natural resources, sustainable development, environmental protection, and the formulation of environmental management frameworks (Government Gazette, 1998). Section 2 of NEMA sets out principles for sustainable integrated environmental governance; the principles are further detailed in subsequent sections of NEMA. Section 24(5), 24M and 44 of the NEMA enables the Minister to publish regulations pertaining to environmental impact assessments. The current Environmental Impact Assessment Regulations, GNR.326 (EIA Regulations), were published on 7 April 2017. Sections 24(2) and 24D of the NEMA make provision for the Minister to publish listed activities that would require environmental authorisation prior to commencement of that activity. The Minister published the following three Regulations in terms of Sections 24(2) and 24D of the NEMA on 4 December 2014:	The proposed activities being applied for as part of this application do not trigger any of the listed activities as set out in GNR 325, GNR 327 and GNR 324 in terms of Sections 24(2) and 24D of the NEMA.

Applicable legislation and guidelines used to compile the report	Reference where applied
• Regulation GNR.327 of 2017 which sets out a list of identified activities which may not commence without environmental authorisation from the competent authority and which must follow the Basic Assessment (BA) procedure as provided for in Chapter 4, Part 2 of the EIA Regulations; • Regulation GNR.325 of 2017 which sets out a list of identified activities which may not commence without environmental authorisation from the competent authority and which must follow the scoping and EIA procedure as provided for in Chapter 4, Part 3 of the EIA Regulations; and • Regulation GNR.324 of 2017, which sets out a list of identified activities per geographical area, which may not commence without environmental authorisation from the competent authority and which must follow the BA procedure as, provided for in Chapter 4, Part 2 of the EIA Regulations.	
National Water Act (No. 36 of 1998) The NWA provides for fundamental reformation of legislation relating to water resources and use. The preamble to the Act recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The purpose of the Act is stated, in Section 2 as, inter alia: • Promoting the efficient, sustainable and beneficial use of water in the public interest; • Facilitating social and economic development; • Protecting aquatic and associated ecosystems and their biological diversity; • Reducing and preventing pollution and degradation of water resources; and • Meeting international obligations. The NWA presents strategies to facilitate sound management of water resources, provides for the protection of water resources, and regulates use of water by means of Catchment Management Agencies, Water User Associations, Advisory Committees and International Water Management. As this Act is founded on the principle that the government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, an industry (including mines) is only entitled to use water if the use is permissible under the NWA.	No water uses, in terms of Section 40 of the NWA, are applicable to the Moeijelijk Mine Tailings Backfilling Project. However, exemption from the requirements of GN 704 (specifically section 4 (c)), promulgated on the 4th of June 1999 in terms of the National Water Act (Act no 36 of 1998), for the backfilling of the opencast voids with tailings material has been applied for.

Applicable legislation and guidelines used to compile the report	Reference where applied
Section 21 of the NWA provides a list of water uses which require a WULA prior to commencement, unless listed in Schedule 1 (of the NWA) as an existing lawful use. Applying for a WULA triggers NEMA listed activities as contemplated in terms of GNR.984 and GNR.985 of 2014. Water use includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. A water use must be licensed unless it is listed in Schedule 1 (of the NWA), is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a license.	
Government Notice Regulation 704 of 1999 GNR.704 of 1999 under the NWA provides regulations on the use of water for mining and related activities aimed at the protection of water resources (requirements for clean and dirty water separation). GNR.704 requires inter alia the following: • Separation of clean (unpolluted) water from dirty water; • Collection and confinement of the water arising within any dirty area into a dirty water system; • Design, construction, maintenance and operation of the clean water and dirty water management systems so that it is not likely for either system to spill into the other more than once in 50 years; • Design, construction, maintenance and operation of any dam that forms part of a dirty water system to have a minimum freeboard of 0.8m above full supply level, unless otherwise specified in terms of Chapter 12 of the Act; and • Design, construction, and maintenance of all water systems in such a manner as to guarantee the serviceability of such conveyances for flows up to and including those arising as a result of the maximum flood with an average period of recurrence of once in 50 years. GNR.704 also stipulates that no person in control of a mine or activity may: • Locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100 year flood line or within a horizontal distance of 100 m from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor the pollution of groundwater, or on water-logged ground, or on ground	Cognisance has also been taken with regards to Regulation 4, Regulation 6 and Regulation 7 of GNR.704. Exemption from the requirements of GN 704, specifically section 4 (c), for the backfilling of the opencast voids with tailings material has been applied for with the Department of Water and Sanitation as the Competent Authority. Adequate storm water management infrastructure has been implemented for the operation.

Applicable legislation and guidelines used to compile the report	Reference where applied
likely to become water-logged, undermined, unstable or cracked; • Place or dispose of any residue or substance which causes or is likely to cause pollution of a water resource, in the workings of any underground or opencast mine excavation, prospecting diggings, pit or any other excavation; or • Use any area or locate any sanitary convenience, fuel depots, reservoir or depots for any substance which causes or is likely to cause pollution of a water resource within the 1:50 year flood line of any watercourse or estuary.	
National Environmental Management Air Quality Act (No. 39 of 2004) The National Environmental Management Air Quality Act (No. 39 of 2004) (NEMAQA) allows for national, provincial and local air quality standards to be established as well as the declaration of priority areas. In addition, the NEMAQA requires that Air Quality Management Plans (AQMP) form part of the environmental implementation plan or environmental management plans to be prepared by national departments or the Province as required by Chapter 3 of the NEMA. Furthermore, the NEMAQA requires municipalities to include an AQMP into its integrated development plan (IDP). The NEMAQA requires the Minister of the DEA to publish a list of activities which results in atmospheric emissions which may have a detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions, ecological conditions or cultural heritage. The NEMAQA requires that an atmospheric emissions licence (AEL) be obtained for such listed activities. Such a list of activities was published in GNR.248 of 2010.	No activities requiring authorisation in terms of GNR.248 of 2010 of NEMAQA will be undertaken.
National Environmental Management Protected Areas Act (No. 57 of 2003) The National Environmental Management Protected Areas Act (No. 57 of 2003) (NEMPAA) concerns the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes, and includes inter alia: • The establishment of a national register of all national, provincial and local protected areas; • The management of those areas in accordance with national standards; and • Inter-governmental co-operation and public consultation in matters concerning protected areas. The ESIA will take cognisance of the NEMPAA in order to ensure compliance with South African legislation.	Cognisance will be taken of existing and proposed protected environments.

Applicable legislation and guidelines used to compile the report	Reference where applied
The NEMPAA defines various kinds of protected areas, namely: special nature reserves, national parks, nature reserves (including wilderness areas) and protected environments, world heritage sites, marine protected areas, specially protected forest areas, forest nature reserves and forest wilderness areas declared in terms of the National Forests Act (No. 84 of 1998), and mountain catchment areas declared in terms of the Mountain Catchment Areas Act (No. 63 of 1970). Part 4 of Chapter 4 of the NEMPAA (Sections 48 to 53) lists restrictions of activities that may not be conducted in a protected area (as described above). Activities that are restricted include: • Prospecting and mining activities; o Activities that are restricted by: • Regulations made by the Minister; • Regulations made by the MEC, in the case of provincial and local protected areas; • By-laws of the relevant municipality, in the case of local protected areas; and • Internal rules made by the managing authority of the area; o Commercial and community activities where the survival of any species is negatively affected, or the integrity of an ecosystem is significantly disrupted; and o Any development or other activity that is inappropriate for the area given the purpose for which the area was declared.	
National Heritage Resources Act (No. 25 of 1999) The National Heritage Resources Act (No. 25 of 1999) (NHRA) established the South African Heritage Resources Agency (SAHRA) in 1999. SAHRA is tasked with protecting heritage resources of national significance. With regard to heritage sites, sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, dolomitic land and ridges, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. A heritage site means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.	Section 34 and 38 of the NHRA details specific activities that require a heritage impact assessment that will need to be approved by SAHRA. The proposed tailings backfilling project does not trigger any of the stipulated activities. Previous heritage studies were performed on the project area and the activities being applied for are restricted to areas already totally transformed by the existing mining operation.
Hazardous Substances Act (No. 15 of 1979) The object of the Act is inter alia to 'provide for the control of substances which may cause injury or ill health to, or death of, human beings by	Dangerous substances contained onsite during the construction, operation and

Applicable legislation and guidelines used to compile the report	Reference where applied
reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances; for the control of electronic products; for the division of such substances or products into groups in relation to the degree of danger; for the prohibition and control of such substances.' In terms of the Act, substances are divided into schedules, based on their relative degree of toxicity, and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule.	closure phases of the Proposed Project will need to be management in accordance with the Act and safety data sheets (SDS) will need to accompany all dangerous goods (hydrocarbons, cleaning chemicals, paints, etc.).
Mine Health and Safety Act (No. 29 of 1996) The Mine Health and Safety Act (No. 29 of 1996) (MHSA) aims to protect and promote the health and safety of employees and persons that may be affected by the activities at a mine and outlines both the rights and responsibilities of an employer, as well as the obligations of employees working thereat. The MHSA was developed "to provide for protection of the health and safety of employees and other persons at mines". That said the Act also provides and/ or promotes the following: • A culture of health and safety; • The enforcement of health and safety measures; • For appropriate systems of employee, employer and State participation in health and safety matters; • The establishment of representative tripartite institutions to review legislation, promote health and enhance properly targeted research; • For effective monitoring systems and inspections, investigations and inquiries to improve health and safety; • Promotion of training and human resources development; • Regulation of employers' and employees' duties to identify hazards and eliminate, control and minimise the risk to health and safety; • Entrenchment of the right to refuse to work in dangerous conditions; • To give effect to the public international law obligations of the Republic relating to mining health and safety; and • To provide for matters connected therewith.	The following principles are considered applicable to the Proposed Project and are detailed below: • The primary responsibility for ensuring a health and safe working environment in the mining site is placed on the mine owner. The Act sets out in detail the steps that employers must take to identify, assess records and control health and safety hazards in the mine; • The right of workers to participate in health and safety decisions, the right to receive health and safety information, the right to training and the right to withdraw from the workplace in face of danger; • The Act requires the establishment of institutions to promote a culture of health and safety and develop policy, legislation and regulations; and • The responsibility for enforcing MHSA lies with the Mine Health and Safety Inspectorate. The Inspectorate's powers are recast and include the power to impose administrative fines upon employers who contravene the MHSA. The Act also contains innovative approaches to the investigation of accidents, diseases and other occurrences that threaten health and safety.

Applicable legislation and guidelines used to compile the report	Reference where applied
	Bauba will be required to comply with all obligations contained in the MSHA.
Occupational Health and Safety Act (No. 85 of 1993) The Occupational Health and Safety Act (No. 85 of 1993) (OHSA) provides a legislative framework for the provision of reasonably healthy and safe conditions in the workplace. It also places extensive legal duties on employees and users of machinery and makes major inroads on employers' and employees' common law rights. OHSA contains provisions that impose general obligations with regard to health and safety. More detailed and specific obligations can be found in the regulations published in terms of OHSA. These include environmental, general safety, electrical machinery, driven machinery, electrical installation, construction, asbestos, hazardous chemicals substances and noise. The OHSA addresses, amongst others: • Safety requirements for the operation of plant machinery; • Protection of persons other than persons at work against hazards to health and safety, arising out of, or in connection with, the activities of persons at work; • Establishment of an advisory council for occupational health and safety; and • Provisions for matters connected herewith.	The OHSA is applicable and states that any person involved with construction, upgrades or developments for use at work or on any premises shall ensure as far as reasonably practicable that nothing about the manner in which it is installed, erected or constructed makes it unsafe or creates a risk to health when properly used.
Promotion of Access to Information Act (No. 2 of 2000) The Promotion of Access to Information Act (No. 2 of 2000) (PAIA) recognises that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. The purpose of the Act is to promote transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their right.	Cognisance will be made of the PAIA.
Promotion of Administrative Justice Act (No. 3 of 2000) The purpose of the Promotion of Administrative Justice Act (No. 3 of 2000) (PAJA) is to govern the actions of the administration and to ensure good administrative practice, by laying down the minimum procedural requirements related to decision-making. As such, PAJA applies to all actions of the administrators, in particular environmental administrators. Section 1 of PAJA deals with procedures to be followed in the granting, suspending or revoking of permissions (licences, grants, permits). Sections 3 and 4 of PAJA deal with fair procedure, which requires the administrator to act in a fair manner when making a decision. Section 5 of PAJA governs the provision of reasons by the administrator and	Cognisance will be made of the PAJA.

Applicable legislation and guidelines used to compile the report	Reference where applied
determines that an administrator provide reasons after a decision has been made (or whilst taking it), in order to justify the decision.	
Provincial Ordinances and Municipal By-laws In addition to national legislation, some of South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution of South Africa.	<u>Limpopo Environmental Management Act (No. 7 of 2003):</u> The Act aims to manage and protect the environment in the Province; to secure ecologically sustainable development and responsible use of natural resources in the Province; generally, to contribute to the progressive realisation of the fundamental rights contained in Section 24 of the Constitution of the Republic of South Africa; and to give effect to international agreements effecting environmental management which are binding on the Province.
Applicable Guidelines and Forums Relevant guidelines have been developed in order to assist in sustainable development within South Africa. The following guidelines are considered applicable to the Proposed Project: • Department of Water Affairs: Best Practice Guideline Series - DWAF: Best Practice Guideline G1: Storm Water Management; - DWAF: Best Practice Guideline G2: Water and Salt Balances; August 2006; - DWAF: Best Practice Guideline A4: Pollution Control Dams (PCDs); - DWAF: Best Practice Guideline GH: Water Reuse and Reclamation, June 2006; - DWAF: Minimum Requirements Guideline for the Handling, Classification and Disposal of Hazardous Waste, 1998; - DWAF: Minimum Requirements Guideline for the Water Monitoring at Waste Management Facilities; - SA Water Quality Guidelines – Aquatic Ecosystems, 1996, and - SA Water Quality Guidelines – Domestic Water Use, 1996. • The Mining and Biodiversity Forum of South Africa • Mining and Biodiversity Guideline • Mining and Biodiversity Forum of South Africa • Mining and Biodiversity Guideline • National Spatial Biodiversity Assessment • South Africa's National Biodiversity Strategy and Action Plan • Threatened, Protected, Alien and Invasive Species Regulation • National Aquatic Ecosystem Health Monitoring Programme and River Health Programme	Cognisance will be made of the applicable guidelines.

Applicable legislation and guidelines used to compile the report	Reference where applied
• Limpopo Conservation Plan	
Principles of Sustainability According to the DMR (formerly known as the Department of Minerals and Energy) (Swart, 2007), the mining sector in South Africa aims to promote its vision of 'sustainable development' by enabling South Africans to make balanced and informed decisions regarding the extraction and utilisation of mineral resource, by measuring and assessing progress towards sustainable development objectives and by minimising negative impacts and optimising environmental management in the mining sector. The most widely accepted definition of sustainable development is provided in the World Commission of Environment and Development in its landmark report Our Common Future (the Brundtland Report) 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' A core principle in sustainable development is the 'precautionary principle' which implies that where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. According to the Australian Centre for Sustainable Mining Practices (2011), sustainable development in the mining sector suggests that investments in mining projects should be financially profitable, technically appropriate, environmentally sound and socially responsible (i.e. balance economic, environmental and social aspects and guarantee the advantage for humanity at present and in the future). Businesses involved in extracting non-renewable resources should embrace the concept of sustainability into strategic decision-making processes and operations. In addition, responsible corporations can theoretically move towards sustainability by developing a range of appropriate socio-economic initiatives. Economic development, environmental impact and social responsibilities should be well managed, and productive relationships should exist between governments, industry and stakeholders.	It is understood that the definition of sustainability may not necessarily encompass the underlying factor that a non-renewable resource will be extracted. However, principles of sustainability should be incorporated into Bauba's corporate philosophy, including: aspects such as economy (e.g. chrome export, etc.), social (e.g. long-term job employment, skills development, implementation of the Social and Labour Plan, etc.) and environmental programmes (e.g. adequate implementation of mitigation measures, environmental offsets, etc.) in order to benefit future generations whilst meeting the needs of present citizens.

5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

Limpopo has rich mineral resources, making mining a critical sector of the economy of the province, contributing 22% to its GDP. Unemployment in the region is high with an estimated 42% of the economically active population in the Fetakgomo-Greater Tubatse Local Municipality being unemployed.

Although there are several mines in the area, the existing resources remain unexploited. Investment in this sector is important as it brings with it investment in infrastructure, results in creation of job opportunities and generates many other economic spin-offs. The lack of economic growth in the region warrants special attention and support to optimize the available opportunities. However, cognizance should be taken of the outflow of money from the mines in Greater Tubatse to other regions.

Fetakgomo-Greater Tubatse Local Municipality has significant mining and manufacturing (ferrochrome smelters) sectors, but unemployment is still significantly above the provincial average. Information from different sources suggests that the new mining developments that have already been around could reduce unemployment from 73% (expanded unemployment rate definition) in 2001 to 44% in 2010 and 23% in 2015. Further reduction in the unemployment rate will depend on effective intervention by public sector institutions to facilitate economic sector diversification through competitive cluster value-chain development. This implies upstream development in the manufacturing and trade sector to provide essential items in the mining supply chain by local entrepreneurs. It also implies side-stream development in the form of construction and Urban renewal. This approach is consistent with the Limpopo Employment Growth and Development Plan (Fetakgomo Greater Tubatse Municipality , 2016).

The economy of the Sekhukhune District is a mixture of very negative features (such as the highest unemployment rate in Limpopo) and very positive opportunities (like the enormous mining potential within the area). The region is also characterised by a high level of male absenteeism, a weak economic base, poor infrastructure, major service backlogs, dispersed human settlements and high poverty levels.

The Moeijelijk Mine project is a contributor to the South African Chrome industry. South Africa is the world's largest producer of ferrochrome. The country holds about 70% of the world's total chrome reserves, mostly located in the Bushveld Igneous Complex (BIC) ores, and produces 75% of the world’s ferrochrome. India and Kazakhstan are other major producers.

South Africa is the leading producer of chromite ore, having produced an estimated ~45% of global chromite production in 2015. South African chromite production is primarily made up of chromite with less than 44% Cr_2O_3, with a smaller fraction of its production being made up of chromite with a Cr_2O_3 content of between 44% and 48%.

Chromite is mined primarily from the UG2, and LG and MG chromite seams of which the UG2 also contains significant amounts of PGE's. Thus, several platinum mines produce chromite as a by-product. There are several primary chrome mines, specifically maintained to provide chromite feed to the developing ferrochrome industry.

South African PGM reserves are one of the most significant globally, followed by the reserves of the USA.

The table below is an indicator of how South Africa dominates the industry of chrome mining and shipping.

World Mine Production and Reserves:

	Mine production[8]		Reserves[9]
	2015	2016[e]	(shipping grade)[10]
United States	—	—	620
India	3,200	3,200	54,000
Kazakhstan	5,490	5,500	230,000
South Africa	14,000	14,000	200,000
Turkey	3,500	3,500	12,000
Other countries	4,220	4,200	NA
World total (rounded)	30,400	30,400	500,000

Figure 10: Global chrome mine production (USGS, 2017b)

Chrome metal is mainly used in the production of specialty alloys, nickel and cobalt -based alloys (super alloys) where low iron is required. Due to their unique high temperature and corrosion resistance properties, these high-performance alloys are used in the most critical environments, such as aeronautic, oil & gas production, land-based turbines, petrochemical and chemical processing.

Introduction of increasingly stringent emission standards for the automotive industry in some countries is expected to result in increased demand for Palladium, Platinum, and Rhodium for use in catalytic converters. In addition, Russian supplies are expected to decrease. The auto catalyst demand was at an eight-year high during 2016. With automobile production increasing in developing countries such as India, the demand for PGE's for the automotive industry is expected to continually increase in 2017 and beyond (Johnson Matthey, 2017).

In addition, chromium metal powder is used in the production of welding electrodes and cored wires, aluminium briquettes and master alloys. (ICDACR 2015).

The Moeijelijk Mine operations entail the following positive impacts:

- Social upliftment;
- Job Creation with area;
- Growth of economy;
- Increased health services and medical assistance;
- Contribution of infrastructure within in area; and
- Educational upliftment.

Mine tailings represent one of the two largest sources of mine waste from the minerals industries (the other being waste rock). Given the problems of declining ore grades and growing production, tailings generation is increasing exponentially across the global mining industry. Common practice is for mines to build large containment dams to store tailings during operations, which are then rehabilitated following mine closure. As recent tailings dam failures have shown, there are legitimate questions being raised about the long-term viability of leaving tailings above ground due to the risks of collapse and failure.

In-pit tailings storage can provide many advantages when compared to typical above-ground tailings storage facilities (TSFs). As regulations become more restrictive and existing mines expand into new pits, the motivation and opportunities for in-pit tailings disposal is increasing.

The approach of in-pit tailings has numerous advantages, such as inherent physical stability, low to negligible acid and metalliferous drainage (AMD) risks, as well as allowing more productive use of formerly mined land.

Thus, from all the information given above the current and proposed activities by Bauba A Hlabirwa Mining Investments' Moeijelijk Mine, if executed according to environmental guidelines and legislation should benefit the economy of SA as a whole, the people living in proximation to the mine, and all other industries dependent on mining for their income.

According to DEA (2017), Guideline on Need and Desirability, Department of Environmental Affairs, to describe the need for a development, it must be determined whether it is the right time for locating the type of land use and/or activity being proposed. To describe the desirability for a development, it must be determined, whether it is the right place for locating the type of land use and/or activity being proposed. Need and desirability can be equated to the concept of wise use of land which can be determined through asking the question: "what is the most sustainable use of land?" Considering the above, the need and desirability of an application must be addressed separately and in detail answering inter alia the questions in the table below.

Table 6: Need and desirability considerations

Securing ecological sustainable development and use of natural resources		
1. 1.1	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area? How were the following ecological integrity considerations taken into account? 1.1.1 Threatened Ecosystems, 1.1.2 Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure, 1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4 Conservation targets, 1.1.5 Ecological drivers of the ecosystem, 1.1.6 Environmental Management Framework, 1.1.7 Spatial Development Framework, and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	Since Moeijelijk Mine is an existing mine with existing surface infrastructure. The site has already been transformed ecologically within the footprint. The baseline information provided within the document described all the ecological aspects as assessed for the construction and operation of the existing infrastructure, storage facilities, dumps and opencast areas. Sensitive landscapes and features have been assessed and described within the section regarding Sensitive Landscapes (Table 7).
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what	Since Moeijelijk Mine is an existing mine with existing surface infrastructure, the site has already been transformed ecologically within the footprints. The activities proposed for this application, i.e. backfilling of opencast voids with tailings, will not increase or modify the existing footprint of the mine. The ecological systems have been assessed and ecologically

	measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	sensitive areas and species have been pointed out and mitigation and management measures have been described within the Impact Management Tables in Section B: Environmental Management Programme.
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Since Moeijelijk Mine is an existing mine with existing surface infrastructure, the site has already been transformed ecologically and in terms of other environmental aspects. It is not foreseen that any other sensitive ecosystems will be adversely affected due to the new activities being applied for, i.e. backfilling of opencast voids with tailings. The use of tailings material for backfilling of opencast voids may have the potential to pollute the underground water system. The impacts to groundwater was determined through a comprehensive geohydrological and waste contamination study. The aforementioned study found that impacts to groundwater quality are expected to be of low to moderate significance. Management measures have been described within the Impact Management Tables in Section B: Environmental Management Programme. Positive benefits include: • No separate final waste deposit for tailings material, as the material will be used for backfilling of the opencast void as part of the rehabilitation activities. • A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings. • Maximised reuse and recycling of waste materials through use of the tailings for backfilling, brick-making and concrete mixing. • Maximising economical value of the tailings material through selling to third parties for reclamation off-site. This also ties in with aspects such as reduction of mining footprint and avoidance of a final tailings stockpile at the end of LoM. No offset strategies are relevant for this operation.
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	All possible impacts that may occur as a result of the activities being applied for have been mitigated and will be subjected to a monitoring framework as prescribed within the Environmental Management Programme. By considering the negative impact of tailings deposition this project has been specifically developed to avoid, where possible, negative environmental impacts while taking into

		account the need to reduce and recycle wastes produced by the operation. The following positive impacts and measures to reduce impacts are applicable to the project: • Backfilling of the pit with tailings material provides the opportunity to reduce the footprint of mining operations, e.g. precluding the need to construct additional tailings storage facilities. • A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings. • Maximised reuse and recycling of waste materials through use of the tailings for backfilling, brick-making and concrete mixing. • Maximising economical value of the tailings material through selling to third parties for reclamation off-site. This also ties in with aspects such as reduction of mining footprint and avoidance of a final tailings stockpile at the end of LoM.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Since Moeijelijk Mine is an existing mine with existing surface infrastructure. The site footprint has already been transformed. It is not foreseen that any heritage or cultural aspects will be affected. Heritage and Ecological assessments have been conducted for the existing activities.
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Non-renewable resources relate to the ore and geology removed from the existing opencast and underground sections, which do not form part of the activities being applied for as part of this application. The tailings may also be considered as non-renewable resources. The project specifically considers the best available uses of these resources by implementing the best economic use, reuse and recycling through: • Maximised reuse and recycling of waste materials through use of the tailings for backfilling, brick-making and concrete mixing. • Maximising economical value of the tailings material through selling to third parties for reclamation off-site. This also ties in with aspects such as reduction of mining footprint and avoidance of a final tailings stockpile at the end of LoM. Within this document the No-Go alternative was included for assessment and the No-Go alternative is rejected, as it is not

		the best suited scenario for the use or storage of the tailings material produced by the wash plant.
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life). 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources within the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	Since Moeijelijk Mine is an existing mine with existing surface infrastructure, the site has already been transformed ecologically and in terms of other environmental aspects. It is not foreseen that any other sensitive ecosystems will be adversely affected due to the new activities being applied for, i.e. backfilling of opencast voids with tailings. By considering the negative impact of tailings deposition this project has been specifically developed to avoid, where possible, negative environmental impacts while taking into account the need to reduce and recycle wastes produced by the operation. The following positive impacts and measures to reduce impacts are applicable to the project: • Backfilling of the pit with tailings material provides the opportunity to reduce the footprint of mining operations, e.g. precluding the need to construct additional tailings storage facilities. • A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings. • Maximised reuse and recycling of waste materials through use of the tailings for backfilling, brick-making and concrete mixing. • Maximising economical value of the tailings material through selling to third parties for reclamation off-site. This also ties in with aspects such as reduction of mining footprint and avoidance of a final tailings stockpile at the end of LoM.
1.8	How was a risk-averse and cautious approach applied in terms of ecological impacts? 1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2 What is the level of risk associated with the limits of current knowledge?	Since Moeijelijk Mine is an existing mine with existing surface infrastructure, the site has already been transformed ecologically and in terms of other environmental aspects. It is not foreseen that any other sensitive ecosystems will be adversely affected due to the new activities being applied for, i.e. backfilling of opencast voids with tailings.

	1.8.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Ecological aspects have been assessed as part of previous applications for existing activities, however, other indirect impacts such as incidental water pollution and thereby polluting the natural environment and ecology may occur and risk will be managed and mitigated to prevent this from happening. The use of tailings material for backfilling of opencast voids may have the potential to pollute the underground water system. The impacts to groundwater was determined through a comprehensive geohydrological and waste contamination study. The aforementioned study found that impacts to groundwater quality are expected to be of low to moderate significance. Management measures have been described within the Impact Management Tables in Section B: Environmental Management Programme. Ecological aspects were included in the Impact Assessment, which is a quantifying tool to calculate risk for environmental aspects.
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following. 1.9.1 Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2 Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	Impacts such as noise, dust and other health and safety aspects were assessed within this document; however, the risk is low. Since Moeijelijk Mine is an existing operation with Environmental policies and Standard Operating Procedures (SOPs) in place to avert impacts of the existing operations, these should be extended to include the reuse of the tailings as well. This will ensure that negative impacts associated with the mining and related activities are not adverse and managed to the best level possible. Monitoring of impacts related to dust, noise and water (monitoring frameworks) exist and will incorporate any impacts that may be created as a result of the reuse and backfilling with tailings, which is expected to be insignificant to low due to management of impacts. Positive benefits include: • No separate final waste deposit for tailings material, as the material will be used for backfilling of the opencast void as part of the rehabilitation activities. • A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings. • Maximised reuse and recycling of waste materials through use of the tailings for backfilling, brick-making and concrete mixing.

		• Maximising economical value of the tailings material through selling to third parties for reclamation off-site. This also ties in with aspects such as reduction of mining footprint and avoidance of a final tailings stockpile at the end of LoM.
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Ecosystem services will not be affected by the activities being applied for. The existing mining and associated activities has contributed to the transformation of the natural habitat on which the activities being applied for will be undertaken. Further information will be made available in the EIA and EMP Report once the results of the Contamination and Geohydrology Study is available.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	Refer to all the comments made above as positive and negative aspects have been addressed.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Alternatives have been assessed within Section 7 below. No other feasible alternatives exist and the best suited alternatives are the ones included within this application.
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Cumulative impacts will be those associated with the existing mining operations within the area, such as the existing Moeijelijk Mine and the adjacent Sefateng Chrome Mine. Cumulative impacts as a result of the reuse and backfilling of the tailings will insignificant, since the activities being applied for are located on the existing footprint of the mine. Cumulative impacts related to groundwater pollution will be addressed once the contamination and geohydrological study for the project is available. As already mentioned, through the implementation of good practice environmental management measures as well as mitigation measures, all direct and cumulative impacts which may result from the proposed development will be addressed and ensure that the environment is affected to the minimum.
Promoting justifiable economic and social development"		

2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations? 2.1.1 The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area, 2.1.2 Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.), 2.1.3 Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and 2.1.4 Municipal Economic Development Strategy ("LED Strategy").	The project is aligned with the objectives of the municipal Spatial Development Framework (SDF) and Integrated Development Plan (IDP) and will not compromise the integrity of these respective forward planning documents.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	Considering the key sectors identified in Greater Tubatse Municipality LED Strategy advocates four programmes for economic development. This comprises (1) Sector Development, (2) Economic Infrastructure Support, (3) Social Development, and (4) Institutional/Governance Reform. The projects that have been identified in the LED are aimed at economic development by ensuring job opportunities are created, jobs security is created, skills development takes place and that opportunities are created for SMME development. Mining plays an important part in the sector development of the LED strategy. The mine also contributes towards the socio-economic development of the region through social-upliftment and job creation as primary agents.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	Refer to comments made above. The activities being applied for, i.e. reuse of tailings and backfilling with tailings will allow the current mining operations to continue whilst maximising the economic viability of the project and use of resources. As a result the positive effects associated with the socio-economic environment in terms of employment stability and local economic benefits will be increased.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	The activities being applied for, i.e. reuse of tailings and backfilling with tailings will allow the current mining operations to continue whilst maximising the economic viability of the project and use of resources. As a result the positive effects associated with the socio-economic

		environment in terms of employment stability and local economic benefits will be increased. Moeijelijk Mine has an existing SLP which is being implemented for the project.
2.5	In terms of location, describe how the placement of the proposed development will; 2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other, 2.5.2. reduce the need for transport of people and goods, 2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport), 2.5.4. compliment other uses in the area, 2.5.5. be in line with the planning for the area, 2.5.6. for urban related development, make use of underutilised land available with the urban edge, 2.5.7. optimise the use of existing resources and infrastructure, 2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), 2.5.9. discourage "urban sprawl" and contribute to compaction/densification, 2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs, 2.5.11. encourage environmentally sustainable land development practices and processes 2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), 2.5.13. the investment in the settlement or area in question will generate the highest socio-	Moeijelijk Mine is an existing mine with existing surface infrastructure. Alternatives have been assessed within Section 7 below. Moeijelijk Mine is an existing mine and the best suited alternative is the one included within this application, since it will utilise all the existing surface infrastructure on the mine and will not lead to an increase of the development's footprint (leading to less additional surface impacts). This is the preferred option and location and it is favourable in terms of the existing infrastructure and services currently present within the site and local vicinity. The existing infrastructure will complement the activities being applied for as it will optimise the use of existing resources and infrastructure. No opportunity costs associated with spatial reconstruction priorities, bulk infrastructure developments and urban sprawl issues are expected. Local workers and services are utilised and will continue to be utilised to ensure local development and contribution to the correction of the historically distorted spatial patterns and optimum use of existing infrastructure etc. Investment will be in the local settlement area to generate the highest socio-economic returns. No impacts on the sense of history, sense of place and heritage are expected and an impact assessment on the existing project has been conducted by a Heritage specialist to confirm this. If at any stage during the development artefacts or historical aspects are uncovered, a specialist will be consulted immediately to ensure that possible heritage aspects remain conserved. The activities being applied for, i.e. reuse of tailings and backfilling with tailings will allow the current mining operations to continue whilst maximising the economic viability of the project and use of resources. As a result the positive effects associated with the socio-economic

	economic returns (i.e. an area with high economic potential), 2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and 2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	environment in terms of employment stability and local economic benefits will be increased.
2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts 2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? 2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	No updated Socio-Economic report was done or required for the compilation of this report. Socio-Economic aspects have been adequately assessed and addressed within this document and the Environmental Management Programme as mitigation measures. Updated information from the Integrated Development Plan was used to inform the Baseline assessment as well as the impact prediction. A Social and Labour Plan (SLP) has been developed for the mine. It is important to keep in mind that the Moeijelijk Mine is an existing mine and no sudden large-scale influx of workers or activities are associated or predicted for the activity applied for. Also refer to the comments below.
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: 2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	<u>Crime, Health and HIV</u> Influx of foreigners and job seekers and increase in disposable income for local people may create negative social impacts such as crime, alcoholism and prostitution in and around the project area. This will usually result in moderate to high negative impacts to the surrounding communities. The Moeijelijk Mine is an existing mine which required approval for new activities as outlined in this report. Therefore, a large influx of new workers and foreigners is **<u>not expected</u>** as the mine has been already established. An insignificant to low negative impact is expected, with several positive impacts as well. The reuse and of tailings and backfilling using tailings are not expected to add to the existing negative impacts of the existing mining activities in terms of social impacts as the footprint of the mining area will not be increased. The impact will therefore be insignificant as mining and tailings disposal is currently taking place on the project footprint.

		The activities being applied for, i.e. reuse of tailings and backfilling with tailings will allow the current mining operations to continue whilst maximising the economic viability of the project and use of resources. As a result the positive effects associated with the socio-economic environment in terms of employment stability and local economic benefits will be increased. Moeijelijk Mine has an existing SLP which is being implemented for the project.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Ecosystem services are not expected to be affected by the reuse of the tailings. The existing mining and associated activities has contributed to the transformation of the natural habitat. However, the proposed reuse of tailings and backfilling with tailings will be on the existing authorised areas associated with Moeijelijk Mine. The impacts and management features will be included in the EMPr. Assessed socio-economic aspects have already been described within previous comments and reports will be addressed in the EIA and EMP Report.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to comments made above. Moeijelijk Mine is an existing operation and the activities being applied for, i.e. reuse of tailings and backfilling with tailings will allow the current mining operations to continue whilst maximising the economic viability of the project and use of resources. As a result the positive effects associated with the socio-economic environment in terms of employment stability and local economic benefits will be increased. It is the preferred option in terms of socio-economic considerations.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental	There is no need for additional alternatives to be further considered as the option included within this document is the best suited and preferred option in terms of both environmental and social impacts. The mine has and will continue to employ local workers and source services from the local area where possible to ensure social equity and benefits to disadvantaged persons. The Moeijelijk Mine has an approved Social and Labour Plan,

	option" to be selected, or is there a need for other alternatives to be considered?	which is also adhered to and implemented in accordance with the law.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	Refer to all the comments made within this section of the report as it has already been addressed. Workers sources by Moeijelijk Mine are in accordance with the Social and Labour Plan. Skills development and socio-economic upliftment forms part of the legal obligations as approved by Moeijelijk Mine's Social and Labour Plan.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	The Moeijelijk Mine is an existing mine with all the required operational features and procedures as well as a SHEQ officer to ensure that all Health and Safety aspects are adhered to. A comprehensive environmental monitoring plan is currently implemented for the operation and a rehabilitation plan has been developed for implementation.
2.13	What measures were taken to: 2.13.1. ensure the participation of all interested and affected parties, 2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, 2.13.3. ensure participation by vulnerable and disadvantaged persons, 2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, 2.13.5. ensure openness and transparency, and access to information in terms of the process, 2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and 2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were being promoted?	The public participation process has been followed as prescribed and has been described in Section 8. All Interested and Affected parties will be provided a chance to register and comment on the project. All comments received during the Public Participation Phase will be included within the final documentation to be submitted to DMR for their consideration and assessment.
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for	Refer to comments made above regarding the Public Participation Process. Traditional communities have been

	opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	involved and community meetings will be scheduled during the EIA consultation process.
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	Refer to the above comments made regarding the community involvement. If the decision is approved, all I&APs registered need to be informed within 14 days. Moeijelijk Mine also has an approved Social and Labour Plan, which is implemented to ensure community upliftment and local economic development. The Moeijelijk Mine is an existing mine with all the required operational features and procedures as well as a SHEQ officer to ensure that all Health and Safety aspects are adhered to.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects: 2.16.1. the number of temporary versus permanent jobs that will be created, 2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), 2.16.3. the distance from where labourers will have to travel, 2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and 2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	Moeijelijk Mine is an existing operation and the activities being applied for, i.e. reuse of tailings and backfilling with tailings will allow the current mining operations to continue whilst maximising the economic viability of the project and use of resources. As a result the positive effects associated with the socio-economic environment in terms of employment stability and local economic benefits will be increased. No additional jobs or changes to current employment is expected as a result to the activities being applied for.
2.17	What measures were taken to ensure: 2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and 2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	Since the Public Participation Process involves all the relevant departments, no conflicts of interests are foreseen and none was recorded during the Scoping phase of the project.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that	Refer to all comments made above regarding socio-economic benefits that may result from the project as well as those already present due to the existing mining activities.

	the environment will be protected as the people's common heritage?	
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Yes. Mitigation measures as well as long term monitoring will be included in the EMPR, which will ensure that impacts remained managed and monitored (to prevent both short and long term impacts). Financial provision for rehabilitation of the current mining activities has been made and the rehabilitation plan as contained in the EMP should minimise any environmental legacies remaining after closure.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	Financial Provisioning forms part of the DMR EIA/EMPR requirements and is to be provided either by Financial Guarantee/ Bank Security before the operation may commence. These funds are to be used for Closure and Rehabilitation costs, to restore the natural environment. The "Polluter Pays principle" also describes the concept which will ensure that the Moeijelijk Mine restores and control pollution in the event that it becomes necessary.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Alternatives have been assessed within Section 7 below. The best suited alternative is the one included within this application. This is the preferred option and location and it is favourable in terms of the existing infrastructure and services currently present within the site and local vicinity (transport etc.). Local workers and services are utilised and will continue to be utilised to ensure local development and contribution to the correction of the historically distorted spatial patterns and optimum use of existing infrastructure etc. Investment will be in the local settlement area to generate the highest socio-economic returns. No impacts on the sense of history, sense of place and heritage are expected.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to comments made above, specifically those made for point 2.7. within this table.

6 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The operation of the wash plant and associated production of tailings will coincide with the LoM, which is currently estimated as 30 years. Therefore the Waste Management Licence is required for a period of 30 years.

7 DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED SITE

The areas for the proposed backfilling with tailings material on the farm Moeijelijk 412 KS were selected based on availability of the remaining opencast voids. Only existing pits can be backfilled, therefore it was not practical to select any other sites. An existing tailings stockpile is located on Moeijelijk Mine and alternatives for the storage of tailings would entail the extension of the current storage facility, the development of additional storage facilities, using tailings for the backfilling of the opencast voids or transportation of tailings material off-site for storage by third-parties.

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation and the preferred alternative for storage of additional tailings is located entirely on the current mining footprint, thus reducing the impacts on the biophysical and social environment. No extension of the mining footprint will be required for the proposed activities.

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

1. The property on which or location where it is proposed to undertake the activity
2. The type of activity to be undertaken
3. The design or layout of the activity
4. The technology to be used in the activity
5. The operational aspects of the activity
6. The option of not implementing the activity

The details of the alternatives considered are described in the sections below.

7.1 SITE ALTERNATIVES

The areas for the proposed backfilling with tailings material on the farm Moeijelijk 412 KS were selected based on availability of the remaining opencast voids. Only existing pits can be backfilled, therefore it was not practical to select any other sites. An existing tailings stockpile is located on Moeijelijk Mine and alternatives for the storage of tailings would entails the extension of the current storage facility, the development of additional storage facilities or transportation of tailings material off-site for storage by third-parties.

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation the preferred alternative is located entirely on the current mining footprint, thus reducing the impacts on the biophysical and social environment. No extension of the mining footprint will be required for the proposed activities.

The preferred alternative for the project is the backfilling of the opencast void with tailings material. Benefits of backfilling the pits with tailings, as opposed to other alternative disposal methods, are the following:

- Worked out voids can be filled at a fraction of the costs associated with designing, constructing and operating a conventional, thickened, paste or dry stack facility.
- The tailings do not require retaining walls, thus the risks associated with embankment instability are eliminated. Thereby reducing risks to nearby communities, employees and the biophysical environment.
- No separate final waste deposit for tailings material, as the material will be used for backfilling of the opencast void as part of the rehabilitation activities.
- A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings.
- Maximised reuse and recycling of waste materials through use of the tailings for backfilling.
- Little to no amendments required to existing infrastructure in order to support the proposed activities.
- The farm is currently being mined which ensures that the proposed project falls into the current sense of place and

land use.
- No significant surface water bodies (i.e. perennial streams or large dams/ponds) are within close proximity to the existing opencast pits.

Alternatives related to surface deposition of tailings at either a new facility or expanding the current storage facility have the following attributes:
- Expansion of the currently tailings facility will require the expansion of the operational footprint and additional clearance of vegetation and disturbance to the natural environment. The current tailings stockpile is upstream of the nearby community and expansion of this facility may increase potential health and safety impacts.
- The construction of an additional, separate tailings facility will lead to site clearance and thereby additional impacts to the biophysical environments. If the tailings facility is sited toward the south-eastern portion of the farm, away from communities, the site will be in close proximity to surface water resources. Additional haul roads and infrastructure will also be required in support of an additional, separate facility.
- Surface deposition of tailings entails high economic cost in terms maintenance of the facility, design and construction. Thereby reducing the economic viability of the mining project.

7.2 THE TYPE OF ACTIVITY TO BE UNDERTAKEN

The Moeijelijk Mine is an existing operation with an existing wash plant and tailings storage facilities. The type of activity to be undertaken therefore relates to the method of the storage of tailings. Alternatives for the storage of tailings would entails the extension of the current storage facility, the development of additional storage facilities or transportation of tailings material off-site for storage by third-parties.

The preferred alternative for the project is the backfilling of the opencast void with tailings material. Benefits of backfilling the pits with tailings, as opposed to other alternative disposal methods, are the following:
- Worked out voids can be filled at a fraction of the costs associated with designing, constructing and operating a conventional, thickened, paste or dry stack facility.
- The tailings do not require retaining walls, thus the risks associated with embankment instability are eliminated. Thereby reducing risks to nearby communities, employees and the biophysical environment.
- No separate final waste deposit for tailings material, as the material will be used for backfilling of the opencast void as part of the rehabilitation activities.
- A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings.
- Maximised reuse and recycling of waste materials through use of the tailings for backfilling.
- Little to no amendments required to existing infrastructure in order to support the proposed activities.
- The farm is currently being mined which ensures that the proposed project falls into the current sense of place and land use.
- No significant surface water bodies (i.e. perennial streams, wetlands or large dams) are within close proximity to the existing opencast pits.

Alternatives related to surface deposition of tailings at either a new facility or expanding the current storage facility have the following attributes:
- Expansion of the currently tailings facility will require the expansion of the operational footprint and additional clearance of vegetation and disturbance to the natural environment. The current tailings stockpile is upstream of the nearby community and expansion of this facility may increase potential health and safety impacts.
- The construction of an additional, separate tailings facility will lead to site clearance and thereby additional impacts to the biophysical environments. If the tailings facility is sited toward the south-eastern portion of the farm, away from communities, the site will be in close proximity to surface water resources. Additional haul roads

and infrastructure will also be required in support of an additional, separate facility.

- Surface deposition of tailings entails high economic cost in terms maintenance of the facility, design and construction. Thereby reducing the economic viability of the mining project.

7.3 DESIGN OR LAYOUT OF ACTIVITY

Refer to Sections 7.1 and 7.2, above.

7.4 THE TECHNOLOGY TO BE USED IN THE ACTIVITY

The technology used will be limited to the technology currently used within the Moeijelijk Mine Operation wash plant, which produces the tailings. Currently, wet tailings material is allowed to dry on slabs, prior to storage on the dry tailings stockpile. This allows for the maximum water recovery and recycling within the was plant process.

To facilitate the reuse of the tailings, whilst minimising the potential environmental impacts of the reuse of the tailings material, a preconcentrator will be installed in the existing wash plant. The purpose of the preconcentrator is to maximize the extraction of chrome in the wash plant process, which reduces the chrome content in the tailings material. After implementation of the preconcentrator it is expected that the tailings material produced by the wash plant will largely comprise of silica, representative of the waste rock and overburden material found on the mining area.

7.5 THE OPERATIONAL ASPECTS OF THE ACTIVITY

Currently, wet tailings material produced by the wash plant is allowed to dry on slabs, prior to storage on the dry tailings stockpile. This allows for the maximum water recovery and recycling within the was plant process. The preferred alternatives is for the dry tailings material to then be transported to the opencast void for use in backfilling.

7.6 NO GO OPTION

The no-go option refers to the alternative of the proposed development (reuse of tailings material) not going ahead at all. Should the project not go ahead, the storage and disposal of tailings at the Moeijelijk Mine operation will continue as currently authorised, through storage of the tailings on surface stockpiles and selling of tailings to third parties when economically viable or necessary. This may lead to operational and economical constraints for the operation. The operation will need to sell tailings when the capacity of the storage area is reached whether the market is optimal or not. Should no buyer be available at such a time the wash plant will be forced to shut-down, leading to economic losses for the mine as well as possible job losses for employees. Closure of the wash plant may further affect the viability of the mining operation as a whole, leading to possible closure of the mine as a whole.

The no-go options also means that the tailings material will not be used for concrete mixing or brick-making. The bricks and concrete is to be used for construction of on-site infrastructure as well as for community projects. The reuse of the tailings in construction material is expected to reduce the related costs thereby promoting more construction initiatives in the community by both the mine and community members. Should the reuse of the tailings not occur, these initiatives may be reduced.

The implications of the no-go option will be evaluated as part of the EIA, focusing on comparing potential impacts from the proposed project with the status quo and will be particularly relevant should it be found that detrimental impacts cannot be managed to an acceptable level.

8 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

The purpose of this Public Participation Process is:

- To provide Background Information to the proposed activity;
- To provide a locality map indicating the locality of the proposed activity;
- To notify potential Interested and Affected Parties of the Environmental Process to be followed in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
- To notify potential Interested and Affected Parties of the Environmental Process to be followed in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended;
- To notify potential Interested and Affected Parties of the Environmental Process to be followed in terms of the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008); and
- To notify potential Interested and Affected Parties of the Environmental Process to be followed in terms of the National Water Act, 1998 (Act No. 36 of 1998);
- To obtain issues and concerns from potential Interested and Affected Parties regarding the Environmental Processes to be followed and the proposed activity, which will be addressed as part of the Public Participation Process.

Public Participation is important for the following reasons:

- It provides an opportunity for Interested & Affected Parties (I&APs), Environmental Assessment Practitioners (EAPs) and the competent authority (CA) to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
- It provides I&APs with an opportunity to voice their support, concerns and questions regarding the project application or decision;
- It provides I&APs with the opportunity of suggesting ways for reducing or mitigating any negative impacts of the project and for enhancing its positive impacts;
- It enables an applicant to incorporate the needs, preferences and values of affected parties into its application;
- It provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests;
- It is an important aspect of securing transparency and accountability in decision-making; and
- It contributes toward maintaining a healthy, vibrant democracy.

8.1 IDENTIFICATION OF I&APS

The following groups were identified as potential Interested and Affected Parties (I&APs):

- Community Representatives and Members;
- Relevant Government Departments;
- Relevant Institutional/Organisational Representatives;
- Relevant Municipal Representatives, including the Ward Councillor;
- Landowners/Occupiers;
- Directly affected Surrounding Landowners/Occupiers;
- Land Claimants; and
- Non-Government Organisations and Agencies.

It should be noted that following the project initiation period no further public advertisements (i.e. in newspapers) were undertaken. Accordingly, to ensure that all potential I&APs were made aware of the project and had the opportunity to register, the notification process was as thorough as possible. Registration remained open throughout the Public Participation

Process, so as to allow affected parties to register and submit their input throughout. For the list of identified I&APs refer to Appendix 1 of the PP Report.

8.2 NOTIFICATION OF I&APS

8.2.1 Site Notices

To inform surrounding and immediate communities, landowners, mine workers and passers-by of the proposed project, four A2 notices were erected at visible and accessible locations. Two site notices, one English and one Sepedi were placed at the gated entrance to the mine and two site notices, one English and one Sepedi were place where the mine's access road intersects the R37 road. Furthermore, two additional Sepedi notices were provided to the Community Representative for placement within Tsibeng Town. Photographic evidence of the site notices erected on 24 October 2019, is attached as Appendix 2 of the PP Report.

Table 7: Locality of Site Notices Placed

Site Notices	Place Name	Coordinates
1x English Site Notice 1x Sepedi Site Notice	Gate Entrance to the Mine	24°18'2.80"S 29°58'56.33"E
1x English Site Notice 1x Sepedi Site Notice	Mine Access Road intersection with R37 Route	24°17'51.05"S 29°59'6.70"E

8.2.2 Newspaper Advertisements

To inform a broad base of individuals who might want to register as I&APs, newspaper advertisements were placed in one local newspaper and one regional newspaper. For proof of advertisements placed, refer to Appendix 3 of the PP Report.

Advertisements were placed in the following newspapers:

- Wednesday, 23 October 2019: Page 13 of The Capricorn Voice (Regional), published in English.
- Thursday, 24 October 2019: Page 31 of The Weekend Review (Local), published in Sepedi.

8.2.3 Written Notifications

Identified I&APs were directly informed of the application processes and availability of the reports for Public Commenting by means of email and hand delivery, as well as by Text Message (SMS). Proof of written notifications sent is provided in the relevant Appendices as described in the sections to follow.

8.2.3.1 Hand Delivery

I&APs were notified via hand delivery as listed below. The Background Information Document (BID) has been attached to this report as Appendix 4 of the PP Report.

1. Hand Delivery of BIDs to the relevant Community Leaders for distribution to Community Members (24 October 2019)
2. Hand Delivery of BIDs to Departmental offices where no email addresses could be obtained (01 November 2019)

Proof of notifications hand delivered is attached as Appendix 5 of the PP Report.

8.2.3.2 Email Notification

I&APs were notified by means of email as indicated in Table 3 below. All email notifications sent provided the contact information for Red Kite Environmental Solutions and encouraged I&APs to provide any comments/questions/queries that

they might have.

Email of BIDs as notification of the application processes to identified potential Interested and Affected Parties was sent out on 24 October 2019, 25 October 2019 and 31 October 2019. Proof of notifications sent via email is attached as Appendix 6of the PP Report.

8.2.3.3 Text Message (SMS)

To ensure transparency, all I&APs registered as part of the initial EIA/EMPR process for the Moeijelijk Chrome Mine were notified by means of text message (SMS) where mobile numbers were available. Refer to Appendix 7 of the PP Report for proof of SMS notifications sent on 24 October 2019. The SMS notification highlighted the intention to lodge applications for a Water Use License and a Waste Management License (by means of a Scoping and EIA Process), the intention to amend the EMPr accordingly and indicated an invitation to register/provide comments as part of the Environmental Processes.

Proof of notifications sent via text message (SMS) is attached as Appendix 7 f the PP Report.

8.3 NOTIFICATION OF I&APS OF REPORTS AVAILABILITY

8.3.1 Draft Scoping Report and Draft WULA Report

Registered I&APs were informed of the availability of the following documents for Public Commenting on 12 December 2019:

- Draft Scoping Report for the Bauba A Hlabirwa Mining Investments: Moeijelijk Mine Tailings Backfilling Waste Management License (WML) Application; and
- Draft Integrated Water and Waste Management Plan (IWWMP) and Water Use License Application Report (WULAR) for the Bauba A Hlabirwa Mining Investments: Moeijelijk Mine Groundwater Abstraction Water Use License Application (WULA).

I&APs were encouraged to submit any comments or questions on or before the relevant closing date (03 February 2020). Notifications were sent by means of hand delivery, email and text message (SMS). It was indicated that hard copies of the documents listed above for public commenting was available at the following localities:

- Fetakgomo Atok Thusong Service Centre; and
- Tsibeng Community.

Acknowledgement of receipt for the hand delivered documents for Public Commenting is attached as Appendix 11 of the PP Report. Further to the hard copies left at the relevant Community, Departments, Municipalities and at a public locality, a Dropbox link to an electronic copy was also provided in all email and hand delivered notifications. Text Message notifications indicated that a Dropbox link could be provided upon request. For all notifications to I&APs of Reports Availability for Public Commenting refer to Appendix 11 of the PP Report.

8.3.2 Draft EIA Report

The Environmental Impact Assessment (EIA) Report for Public Comment is in the process of being compiled. As soon as the Report is finalised all Registered I&APs will be notified of its locality for Public Viewing along with the timeframes for commenting.

8.4 ACCESS AND COMMENTING OPPORTUNITY

Two 30-day (total 60 days) commenting periods have been provided for as part of this Public Participation Process. This was

conducted in line with Section 41(4)(ii) of the National Water Act (NWA), 1998 (Act No. 36 of 1998) which indicates that a commenting period of no less than 60 days should be provided for and in accordance with Clause 3(8) of the NEMA EIA Regulations (GN No. 326 of 07 April 2017) which indicates that any public participation process must be conducted for a period of at least 30 days . However, note that the entire process will remain transparent and will allow for I&APs to register and comment throughout.

The local community have been taken into consideration by distributing copies of the relevant documents for Public Commenting to the Representative for the affected community of Tsibeng. An additional hard copy was furthermore placed at the Fetakgomo Atok Thusong Service Centre to allow any members from the public to view the document here as well.

Furthermore, as mentioned earlier in this report a Dropbox link to an electronic copy was also provided to ensure easy access to the documents available for public commenting.

8.5 PUBLIC PARTICIPATION MEETING

A Public Participation Meeting was held on 16 February 2020 at the Tsibeng Community Hall at 09h00 am. As part of the Public Participation Meeting, opportunity was granted for I&APs to raise any comments/issues and questions they may have. These have been captured in the minutes of the meetings.

Information pertaining to the Public Participation Meeting is attached as Appendix 12 of the PP Report and includes the following information:

- Public Participation Meeting Minutes;
- Public Participation Meeting Presentation;
- Public Participation Meeting Attendance Register; and
- Public Participation Meeting Photographs.

8.6 REGULATORY CONSULTATION

8.6.1 Department of Mineral Resources (DMR)

A brief meeting was held with Nicolas Chavalala from Department of Mineral Resources (DMR) on 14 October 2019 at 09:30 am regarding the feasibility of backfilling with tailings and the DMR's requirements for the Waste Management License Application. DMR discussed the legislative requirements for the application as well as the specialist studies to be undertaken, i.e. waste contamination assessment (inclusive of a waste classification) and geohydrological assessment. DMR further confirmed that no engineering designs would be required for the application.

8.6.2 Department of Water and Sanitation (DWS)

A pre-application consultation meeting was held with the Department of Water and Sanitation (DWS) on 19 September 2019 at 10:00 to discuss the way forward regarding the Water Use License Application (WULA), information requirements and documentation to be submitted as part of the WULA for the proposed additional groundwater abstraction. The minutes of the meeting held is attached to this report as Appendix 8 of the PP Report.

8.6.3 Ward Councillor Communication

The Ward Councillor for Ward 32, Ms. R. Maisela, have been informed of the project and of the availability of the Draft Scoping Report and Draft WULA for commenting purposes. A telephonic discussion was furthermore held with Cllr. Maisela on 08 May 2020 regarding the project and the preferred communication method going forward. Refer to Appendix 9 of the PP

Report for all communications with the Ward Councillor.

8.7 REGISTRATIONS AND COMMENTS RECEIVED

Identified I&APs were encouraged to submit their Registration and Response forms to Red Kite Environmental Solutions for them to receive further correspondence regarding the Bauba A Hlabirwa Moeijelijk Mine project currently underway. However, comments and registrations received via all methods (Registration Forms/email/telephonic/public participation meeting) have been captured. For the comments received via registration forms and email thus far refer to Appendix 10 of the PP Report.

8.8 ADDRESSING COMMENTS AND CONCERNS

An Issues and Response Report has been compiled as part of the Public Participation Process for the Moeijelijk Chrome Mine projects currently underway. This document records the issues of concern, questions and suggestions contributed by stakeholders during the course of the Environmental Authorisation Process, the Water Use License Application Process and the EMPr Amendment Process. This report also includes the responses provided by relevant parties. Comments were received at meetings, telephonically, and by means of written methods (email). The Issues and Response Report is attached as Appendix 13 of the PP Report.

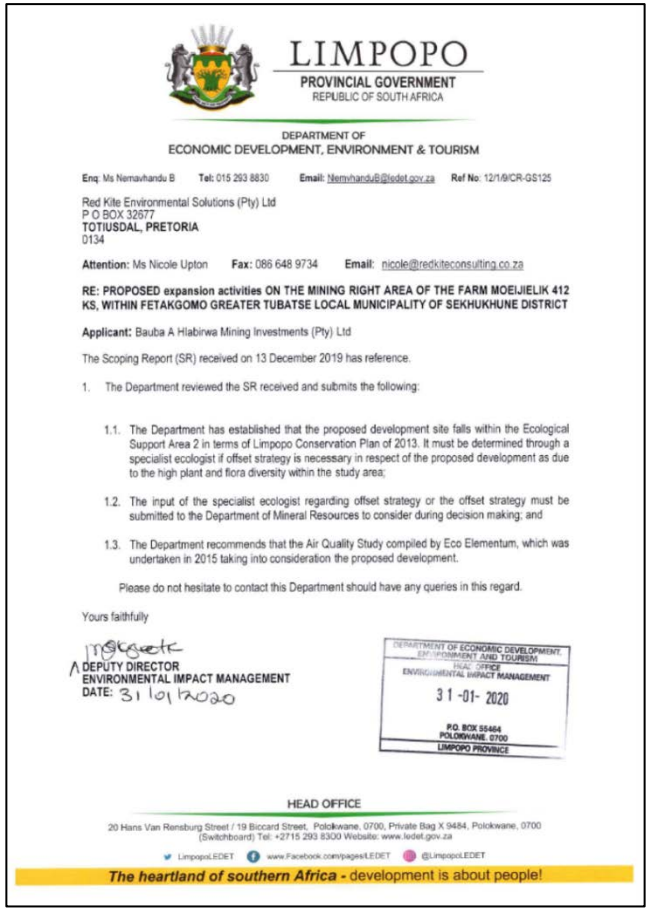
It should be noted that the Issues and Response Report is an active document which will be updated throughout the process as comments and concerns are received. However, following submission of all final documents to the Department of Mineral Resources, all additional comments should be directed directly to the Department.

8.9 ISSUES RAISED BY I&APS

8.9.1 Summary of Issues Raised By I&APs From Public Participation

Table 8: Summary of issues raised by I&APs

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
Date: 31 October 2019 Format: Email and attached Registration and Comment Sheet Name: Philipus Jacobus Roodt and Natalie Roodt	Red Kite Environmental Solutions (Pty) Ltd **REGISTRATION AND COMMENT SHEET** PROPOSED NEW ACTIVITIES PLANNED FOR THE EXISTING OPENCAST CHROME MINING ACTIVITIES ON THE FARM MOEIJELIJK 412 KS, SEKHUKHUNE DISTRICT, LIMPOPO PROVINCE Please complete and return no later than 25 November 2019 to: Ms. C. Muller/Ms. N. Upton | PO Box 32677, Totiusdal, 0134 | Cell: 084 444 2414/079 555 2433 Email: info@redkiteconsulting.co.za DATE: 29 OCTOBER 2019 TITLE: MR NAME: PHILIPUS JACOBUS SURNAME: ROODT TELEPHONE NUMBER: +27 82 493 4170 CELL NUMBER: +27 82 493 4170 FAX NUMBER: +27 86 677 0975 EMAIL: ROODTPJ@GMAIL.COM POSTAL/PHYSICAL ADDRESS: FARM MARGATE PORTION 8 HOEDSPRUIT, 1380 LIMPOPO ORGANISATION/FIRM/POSITION/NATURE OF INVOLVEMENT E.G. PROPERTY OWNER: OWNER PRODUCER OF MANGO'S, CITRUS, DRAGON FRUIT & BLUEBERRIES COMMENTS OR QUESTIONS: Although there is a need for growth in any business it is always a concern when it comes to mining of any sort that pumps waste water back into the river. The Olifants river is already one of the most poluted rivers in South Africa, with numerous heavy metals present in the river. The escalation of mining of any sort is a concern, especially when Chrome is mined. Red Kite Environmental Solutions (Pty) Ltd Tel: 084 444 2414 | Email: info@redkiteconsulting.co.za | PO Box 32677, Totiusdal, 0134 Red Kite Environmental Solutions (Pty) Ltd The carsinogenic effect is known and will affect animals as well as people downstream where some communities are reliant on the river for drinking water as well as bathing. The effect of the heavy metals taken up by crops, for consumption, is also a big concern.	Via email on 03 December 2019: Good day Mr. Roodt, Many thanks for your interest in this project. Please be assured that no activities involving the discharging of waste or water containing waste into a water resource will be applied for as part of the Water Use License Application. Nor are these currently exercised at the Moeijelijk Chrome Mine. The Moeijelijk Chrome mine implements the separation of clean and dirty storm water on site as per their Engineer Designed Storm Water Management Plan which has been approved by the Department of Water and Sanitation to prevent dirty water from entering the surrounding environment. The Moeijelijk Mine furthermore implements a comprehensive groundwater monitoring network which has been approved by both the Department of Water and Sanitation and the Department of Mineral Resources. Due to the dry, non-perennial nature of the natural surface water drainage system within the study area and the limited to no surface water present on site, the groundwater monitoring network acts as an early detection system for potential pollution sources from the Mine.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
Date: 31 January 2020 Format: Email Name: B. Nemavhandu (LEDET)		Via email on 07 May 2020: Dear Madam, Your letter dated 31 January 2020, under reference 12/1/9/CR-GS125, regarding the above-mentioned subject matter has relevance. Herewith our formal response to the points raised in the above-mentioned letter: **Response to Point 1.1.** The professional opinion of an adequately qualified SACNASP Registered Specialist have been obtained regarding whether an ecological offset strategy is necessary in respect of the proposed development taking plant and flora diversity within the study area into account. The Specialist concluded that such an offset agreement would not be necessary or warranted for the non-substantial changes and backfilling of the tailings. As indicated by the Specialist ecological the aspects have already been assessed as part of the previous application made (and approved) and no new impacts to the ecology have occurred or are proposed, which had not already been assessed, since no new footprints will be impacted. The formal Assessment compiled by the Specialist is attached to this letter. **Response to Point 1.2.** Kindly note that the attached formal Assessment compiled by the Specialist Ecologist will be submitted to the Department of Mineral Resources as part of the Draft Environmental Impact Assessment (EIA) Report and the Final EIA Report to follow the Scoping Phase which has been concluded. Proof of submissions could be made available to LEDET upon request. **Response to Point 1.3.**

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM

Enq: Ms Nemavhandu B Tel: 015 293 8830 Email: NemvhanduB@ledet.gov.za Ref No: 12/1/9/CR-GS125

Red Kite Environmental Solutions (Pty) Ltd
P O BOX 32677
TOTIUSDAL, PRETORIA
0134

Attention: Ms Nicole Upton Fax: 086 648 9734 Email: nicole@redkiteconsulting.co.za

RE: PROPOSED expansion activities ON THE MINING RIGHT AREA OF THE FARM MOEIJIELIK 412 KS, WITHIN FETAKGOMO GREATER TUBATSE LOCAL MUNICIPALITY OF SEKHUKHUNE DISTRICT

Applicant: Bauba A Hlabirwa Mining Investments (Pty) Ltd

The Scoping Report (SR) received on 13 December 2019 has reference.

1. The Department reviewed the SR received and submits the following:

1.1. The Department has established that the proposed development site falls within the Ecological Support Area 2 in terms of Limpopo Conservation Plan of 2013. It must be determined through a specialist ecologist if offset strategy is necessary in respect of the proposed development as due to the high plant and flora diversity within the study area;

1.2. The input of the specialist ecologist regarding offset strategy or the offset strategy must be submitted to the Department of Mineral Resources to consider during decision making; and

1.3. The Department recommends that the Air Quality Study compiled by Eco Elementum, which was undertaken in 2015 taking into consideration the proposed development.

Please do not hesitate to contact this Department should have any queries in this regard.

Yours faithfully

DEPUTY DIRECTOR
ENVIRONMENTAL IMPACT MANAGEMENT
DATE: 31/01/2020

DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT AND TOURISM
PROVINCIAL OFFICE
ENVIRONMENTAL IMPACT MANAGEMENT
31-01-2020
P.O. BOX 55464
POLOKWANE, 0700
LIMPOPO PROVINCE

HEAD OFFICE
20 Hans Van Rensburg Street / 19 Biccard Street, Polokwane, 0700, Private Bag X 9484, Polokwane, 0700
(Switchboard) Tel: +2715 293 8300 Website: www.ledet.gov.za
LimpopoLEDET www.Facebook.com/pages/LEDET @LimpopoLEDET

The heartland of southern Africa - development is about people!

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		We furthermore hereby confirm that the findings and recommendations of the Air Quality Assessment, undertaken in 2015 by Eco Elementum, will be included in the EIA and EMPr Report for the Moeijelijk Mine Tailings Backfilling Project. Specifically, the following findings and recommendations of the Air Quality Assessment Report will be incorporated into the EIA/EMPr Report: • Relevant legislation and guidelines; • Baseline air quality measurement results; • Potential air quality impacts and sources and the significance of the impacts, as per the impact assessment undertaken for the Air Quality Assessment; • Recommended mitigation measures throughout all phases of the project; and • Recommended air quality monitoring programme. We trust that the Department find the above and attached responses in order. Regards **<u>Attachment: Specialist Opinion (Refer to Appendix 10 for the Ecology Specialists Report)</u>** **1. Introduction** **1.1 Background and Project Information** Red Kite Environmental Solutions (Pty) Ltd ("Red Kite") appointed Enviridi Environmental Consultants Pty (Ltd) (Enviridi) to conduct an initial assessment and make recommendations based on a request received from Limpopo Department of Economic Development, Environment and Tourism (LDEDET) as part of the Environmental Authorisation Application of the Moeijelijk Mine.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		2. Scope of Work **2.1 Scope of Work and Objective** Enviridi Environmental Consultants (Pty) Ltd was appointed to assess the situation and risk based on a formal concern noted by LDEDET regarding risk to biodiversity and provide input for the need of an offset strategy based on the latest application submitted. LDEDET stated that the development falls within an Ecological Support Area 2. Information received from the client includes the following: Bauba A Hlabirwa Mining Investments (Pty) Ltd proposes to reuse or reclaim the tailings material produced by the existing wash plant on site in order to minimise the residue stockpiled on site and to maximise recycling. The tailings material is proposed to be reclaimed or reused in the following ways: • A portion of the material will be used to backfill the opencast voids of the operation as part of the rehabilitation efforts of the mine. Backfilling with tailings will mainly take place in voids situated on the farm Moeijelijk 412 KS. However, the boundary pillar between Sefateng Chrome Mine and Moeijelijk Mine has been mined and as such a portion of the tailings being used for backfilling by Bauba will take place on the farm Zwartkoppies 412 KS (Sefateng Chrome Mine). • A portion of the material will be used in brick-making. The bricks will potentially be used for on-site for the construction of infrastructure, as well as for community projects. • A portion of the tailings material will be used in cement mixing for use in onsite construction. When necessary or economically viable, Bauba proposes to sell tailings to third parties for further reclamation at off-site operations.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		To facilitate the reuse of the tailings, whilst minimising the potential environmental impacts of the reuse of the tailings material, a preconcentrator will be installed in the existing wash plant. The purpose of the preconcentrator is to maximize the extraction of chrome in the wash plant process, which reduces the chrome content in the tailings material. After implementation of the preconcentrator it is expected that the tailings material produced by the wash plant will largely comprise of silica, representative of the waste rock and overburden material found on the mining area. In summary, the tailings will be completely dewatered and de-gritted with an incline dewatering screen situated next to the wet tailings pad, a conveyor will discharge the dewatered tailings onto the wet tailings pad. Once the tailings are sufficiently dry, the tailings are either stored on the existing dry tailings stockpile or transported to the opencast void for use in backfilling. **3. Methodology** Information utilized in assessment for the need of the compilation of an Offset strategy included the following: • Background Information were assessed including comparison of the latest studies available and the extent of areas which were ecologically assessed; • The Scope of activities, current status of operations and if any new areas will be impacted, altered; • The nature of the additional activities proposed and if they inherently constitute risk to the environment in terms of Ecology. **4. Consideration of Impacts** **4.1 Consideration of Background Information**

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		Moeijelijk has been awarded with an Approved EIA/EMPr in 2015, for which an S102 Amendment were applicable and applied for in 2017. A new application to extend their workings towards underground was applied for in 2018. Several Ecological Assessments has taken place and has adequately assessed the nature and extent of impacts based on the Moeijelijk Chrome Mine workings. The latest specialist reports for ecology took place in 2017: • Environment Research Consulting (2017) Vegetation Diversity Assessment - Bauba A Hlabirwa Mining Investments – Moeijelijk Chrome Mine; • Prescali Environmental Consultants (Pty) Ltd (2017) Bauba A Hlabirwa Mining Investments (Pty) Ltd: Moeijelijk Fauna Terrestrial Biodiversity Assessment The following activities which necessitates the amendment of the Mining Right and Water Use License were assessed: • The extension of the existing opencast pit across various watercourses to access the remainder of the LG6 on the Mining Right area; • Mining of all UG on the slope above the current opencast pit; • The development of a new opencast pit across various watercourses to access the LG2 and LG3 chromitite on the Mining Right area; • The extension of the ROM stockpile area; • The construction of a river crossing (culvert); • Construction of wash plant; and • Construction of residue drying and stockpiling facilities. Both of these assessments included all footprints (as shown in Figure 1) and no new footprints will be developed and no new habitat will be cleared or altered other than which was originally assessed. The wash plant area, the opencast and the drying pads as described

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		within the latest scope and Figure 1 were included in the available Ecological (2017) assessments. A formal management plan for both the Flora and Fauna of the Moeijelijk Chrome Mine has been included devised by the specialists and incorporated into the existing EMPR and Audited in terms of compliance on an annual basis. **4.2 Nature and Risks associated with additional activities on existing footprints** As mentioned above, to facilitate the reuse of the tailings, whilst minimising the potential environmental impacts of the reuse of the tailings material, a preconcentrator will be installed in the existing wash plant. The purpose of the preconcentrator is to maximize the extraction of chrome in the wash plant process, which reduces the chrome content in the tailings material. After implementation of the preconcentrator, it is expected that the tailings material produced by the wash plant will largely comprise of silica, representative of the waste rock and overburden material found on the mining area. In summary, the tailings will be completely dewatered and de-gritted with an incline dewatering screen situated next to the wet tailings pad, a conveyor will discharge the dewatered tailings onto the wet tailings pad. Once the tailings are sufficiently dry, the tailings are either stored on the existing dry tailings stockpile or transported to the opencast void for use in backfilling. No additional risk to the ecology based on this information is expected, since the sensitive areas associated with the project falls within the Mountainous areas outside of the developed footprints. All the footprints of the Moeijelijk mine has been assessed in terms of Ecology and no new impacts on vegetation or habitat will be disturbed.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		The backfilling of the chrome-reduced dry tailings will have the following advantages: • Minimising the footprint and residue stockpiles remaining after rehabilitation; • Minimised the dirty footprint by preventing the large-scale development of a Tailings Storage Facility; • Recycling and Reuse of existing material for rehabilitation and reducing the Chrome content of the material in the process before rehabilitation. Backfilling should however take cognisance of the natural geological sequences and be covered by suitable layers overburden/subsoil and the top layer of topsoil to allow for vegetation re-establishment once the area has been sloped and rehabilitated. **5. Conclusion and Recommendations** Since several Ecological Assessments has taken place and has adequately assessed the nature and extent of impacts based on the Moeijelijk Chrome Mine workings. The latest specialist reports for ecology took place in 2017: • Environment Research Consulting (2017) Vegetation Diversity Assessment - Bauba A Hlabirwa Mining Investments – Moeijelijk Chrome Mine; • Prescali Environmental Consultants (Pty) Ltd (2017) Bauba A Hlabirwa Mining Investments (Pty) Ltd: Moeijelijk Fauna Terrestrial Biodiversity Assessment. Both of these assessments included all footprints (as shown in Figure 1) and no new footprints will be developed and no new habitat will be cleared or altered other than which was originally assessed. The wash plant area, the opencast and the drying pads as described within the latest scope and Figure 1 were included in the available Ecological (2017) assessments.

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		A formal management plan for both the Flora and Fauna of the Moeijelijk Chrome Mine has been included devised by the specialists and incorporated into the existing EMPR and Audited in terms of compliance on an annual basis. No additional risk to the ecology based on this information is expected, since the sensitive areas associated with the project falls within the Mountainous areas outside of the developed footprints. All the footprints of the Moeijelijk mine has been assessed in terms of Ecology and no new impacts on vegetation or habitat will be disturbed. Backfilling should however take cognisance of the natural geological sequences and be covered by suitable layers overburden/subsoil and the top layer of topsoil to allow for vegetation re-establishment once the area has been sloped and rehabilitated. Therefore, it is the opinion of the specialist that no Offset agreement will be necessary or warranted for the nonsubstantial changes and backfilling of the tailings since these aspects were already assessed and no new impacts to the ecology have occurred or are proposed that was not already assessed as part of the previous application made (and approved). No new footprints will be impacted.
Date: 16 February 2020 Format: Public Participation Meeting Name(s): Refer to Attendance Register	It was asked by which means the community were able to communicate their comments and questions to Red Kite Environmental.	Ms. Muller indicted that the community could provide comments and questions via the email address, info@redkiteconsulting.co.za and any of the mobile numbers available. Ms. Nicole Upton's number was available on the presentations distributed at the meeting and Ms. Chantel Muller's could be obtained from her following the meeting. However, all relevant contact information is also available on the BIDs distributed and the Draft Documentation available for commenting.
	It was asked how long it would take for the community to receive feedback on their comments and questions.	Ms. Muller indicated that feedback would be provided via the Public Participation Process aiming towards the end of February as part of the WULA submission and towards the end

DATE OF COMMENT, FORMAT OF COMMENT, NAME OF ORGANISATION/I&AP	COMMENT (VERBATIM)	RESPONSE FROM EAP/APPLICANT/SPECIALIST
		of March as part of the Draft EIA submission. Ms. Muller furthermore reminded the community of the importance to write down their contact information on the attendance register for all attendees to receive future information, including responses to comments and questions, regarding the environmental processes.
	It was asked whether the proposed new activities would affect boreholes.	Ms. Muller indicated that a Geohydrological Study has been undertaken with regard to the planned new activities and have indicated a moderate to low potential for impacts with no critical affects to groundwater predicted. She further indicated that this study would be made available to the community for perusing and commenting as part of the Draft EIA.
	It was requested that the irrigation water to be produced be used for small farmers in the community.	Ms. Muller indicated that the mine is currently in the process of testing grey water from the underground operation to determine whether it would be suitable for crop irrigation. Furthermore, tests would also have to be conducted to determine whether water from the planned new treatment plant would be suitable for crop irrigation.
	It was asked whether the mine would be able to assist with water conservation training and environmental management training/skills transfer.	Ms. Muller indicated that the mine has existing training programmes in place and the possibility of including water conservation training and environmental management training/skills transfer in the EMPr and their existing training programmes would be discussed with the mine.
	The community listed the following additional social and labour comments and/or questions: • Will the proposed new activities help with unemployment and skills transfer? • How would the mine develop community roads?	Ms. Muller indicated that these social and labour related questions would be included in the minutes of the meeting and discussed with the relevant mine representatives to provide adequate responses to the community.

9 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES

9.1 BASELINE ENVIRONMENT

This Section provides a brief description of the existing biophysical and built/ social environment within the immediate vicinity of the proposed activities. It draws on existing knowledge from previous investigations, discussions with various role-players, site visits and the project team's knowledge. It serves to present the context against which the potential positive and negative impacts associated with the various aspects of the proposed project can be identified.

The information in this section is largely sourced from the EIA and specialist studies performed for Moeijelijk Mine in 2015 and 2018.

9.2 REGIONAL LOCATION

Moeijelijk Chrome Mine is situated on the farm Moeijelijk 412 KS. The operation falls in the Limpopo Province under the jurisdiction of the Fetakgomo Local Municipality, situated within the Sekhukhune District Municipality.

The mining area is situated just off the R37 road and in close proximity to the administrative border between Greater Tubatse and Fetakgomo Local Municipalities. It is located approximately 85 km south-east from Polokwane, 56 km south, south-east from Tzaneen, 42 km south of Misty Crown (Haenertsburg), 25 km north-east of Ga-Nkoana and 50 km north west of Burgersfort. Refer to Figure 1 for the regional locality map of the project.

9.3 CLIMATE

A typical climatic description of the study area is hot summers and cold dry winters. The climate of the study area is, however influenced by the prevailing topography being the foothills of Sekhukhune and Leolo mountain ranges that creates microclimatic effects in the form of a hotter and drier climate. The maximum temperature is recorded as 30.4ºC and the minimum is 3.9ºC.

9.3.1 Temperature

The study area is characterised by very hot summer months accompanied by very little rain, and relatively cold winters. See the table below for minimum, and maximum temperatures recorded within a twelve-month period.

Table 9: Temperature

Month	Temperature(°C)	
	Max	Min
January	30.1	17.3
February	29.7	17.4
March	28.2	16.2
April	27.4	12.1
May	24.5	8.1
June	21.7	3.9
July	21.6	4.0
August	24.0	6.9
September	27.5	11.3
October	30.4	14.6
November	30.2	16.4
December	30.1	17.4
Annual	27.1	12.2

9.3.2 Precipitation and Evaporation

The Mean Annual Precipitation (MAP) for the area is approximately 559 mm per annum, with the monthly rainfall varying between 4 mm and 102 mm. The rainy season is usually from November to March. The project area furthermore falls within the 1600-1700 mm per year evaporation isolines. The minimum evaporation is 102 mm per month and the maximum is 259 mm/month.

Table 10: Table of Precipitation Data Relevant to the Property

Month	Rainfall				Expected maximum in 24 hrs	
	Average	Days	Maximum			
	mm	1mm	60 min	24 hrs	1:50 Y	1:100 Y
January	95	9.8	49	61	86	97
February	84	6.8	39	114	60	66
March	70	6.8	38	62	68	77
April	20	2.6	18	80	57	64
May	8	2.2	13	36	23	28
June	4	1.3	11	27	22	24
July	4	1.3	7	11	12	13
August	8	1.7	6	13	6	6
September	19	1.8	32	38	35	30
October	59	6.3	51	66	61	69
November	102	10.1	33	65	80	90
December	86	8.4	51	79	67	75
Annual	559 total	59.1				53.25 (mean)

Table 11: Evaporation Data relevant to the Property

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Evaporation (mm)	212	174	174	139	121	102	119	167	228	259	228	217	2140

9.3.3 Wind

The spatial and annual variability in the wind field for the Moeijelijk modelled data is clearly evident in the figure below. The predominant wind direction is from northeast, with the secondary component from the east northeast and east. Contributions from the NW and SE quadrant are observed. Calm conditions (wind speeds < 0.5 m/s) occurred for 4.2 % of the time. Wind class frequency distribution per sector is given in the following figure and table.

The spatial variability in the wind fields for the Moeijelijk modelled data is presented. The predominant wind direction is from the northeast, frequent winds mainly from the NW and SE quadrant. Although wind speeds are generally moderate during the period (average 3.66 m/s), predominant speeds between 3.6-5.4 m/s occurred 42 % of the time. Wind speeds greater than 5.4 m/s (i.e. threshold friction velocity of 0.26 m/s) have the ability to generate fugitive dust from open areas and storage piles. Wind speeds greater than 5.4 m/s in the Moeijelijk area account for 14.4% % during the period.

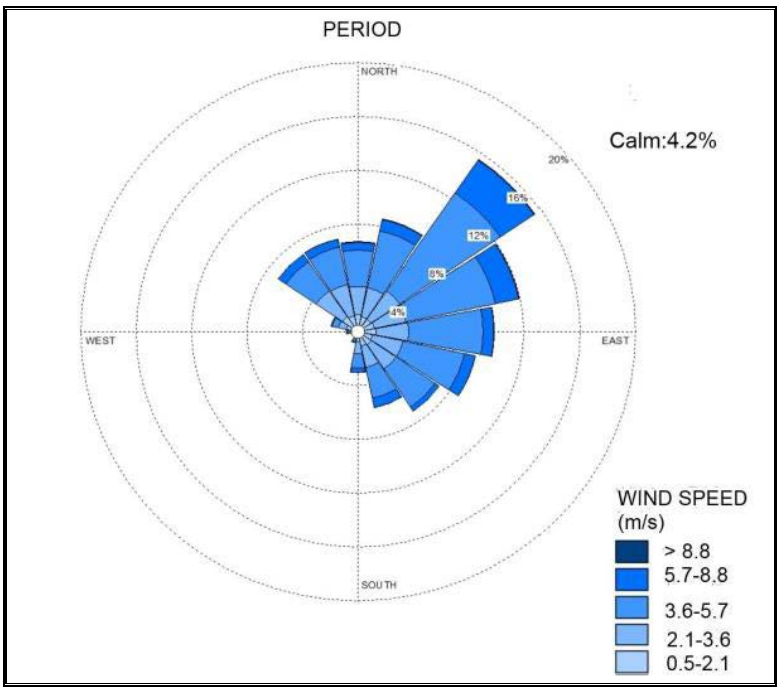


Figure 11:Surface wind rose modelled data (01 January 2009 – 31 December 2011)

9.4 TOPOGRAPHY

The general study area falls on the base of a curvilinear chain of mountains of which the elevation ranges between 820 m in the valley bottoms and 1399.5 meters above sea level on summits. The elevation of the project area is roughly 860 meters above sea level.

The cross sections, depicted below, for the proposed area, showing the differences in elevation of the area, provide an average slope value of 20% (0.21). The site forms part of an undulating landscape sloping downwards towards the north-east.

Figure 12: Cross section from South-West to North-East illustrating elevation

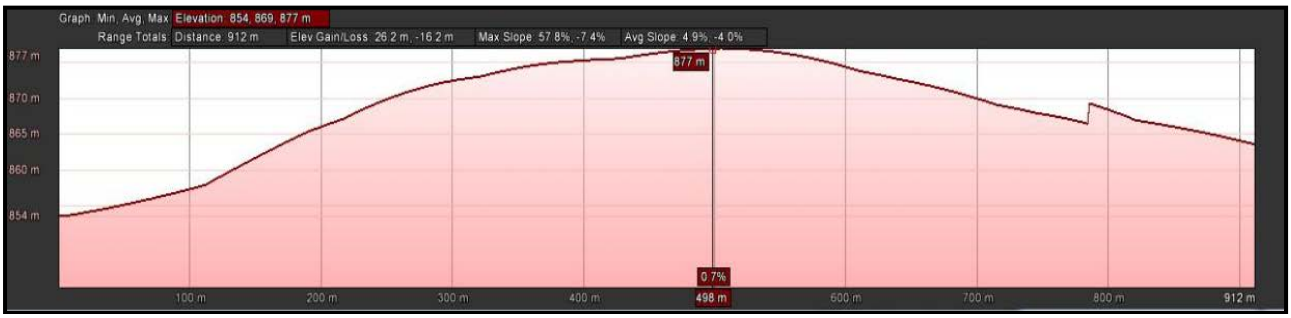


Figure 13: Cross section from North-West to South-East illustrating elevation

9.5 GEOLOGY

The investigated area falls within the 2430 Pilgrim's 4 Rest 1:250 000 geology series \ map and is situated approximately 65 km west of Burgersfort, in the Limpopo Province. An extract of this map is shown in Figure 4.

The mining area falls within the Rustenburg Layered Suite of the Bushveld Igneous Complex. On and around the farm portion which the mining activities are situated on, two different subsuites can be distinguished viz. the Rustenburg Layered Suite Lower Zone and the Rustenburg Layered Suite Critical Zone. The Rustenburg Layered Suite dips slightly to the southwest, following the emplacement geometry of the Bushveld Complex.

The Rustenburg Layered Suite Critical Zone, which is the youngest lithology in the mining area, is composed of anorthosite and pyroxenite indicating a predominantly mafic composition for this area.

The Rustenburg Layered Suite Critical Zone is underlain by the Rustenburg Layered Suite Lower Zone. This subsuite is composed of harzburgite and bronzitite. This indicates a less differentiated magma and a transition from mafic to ultramafic with depth.

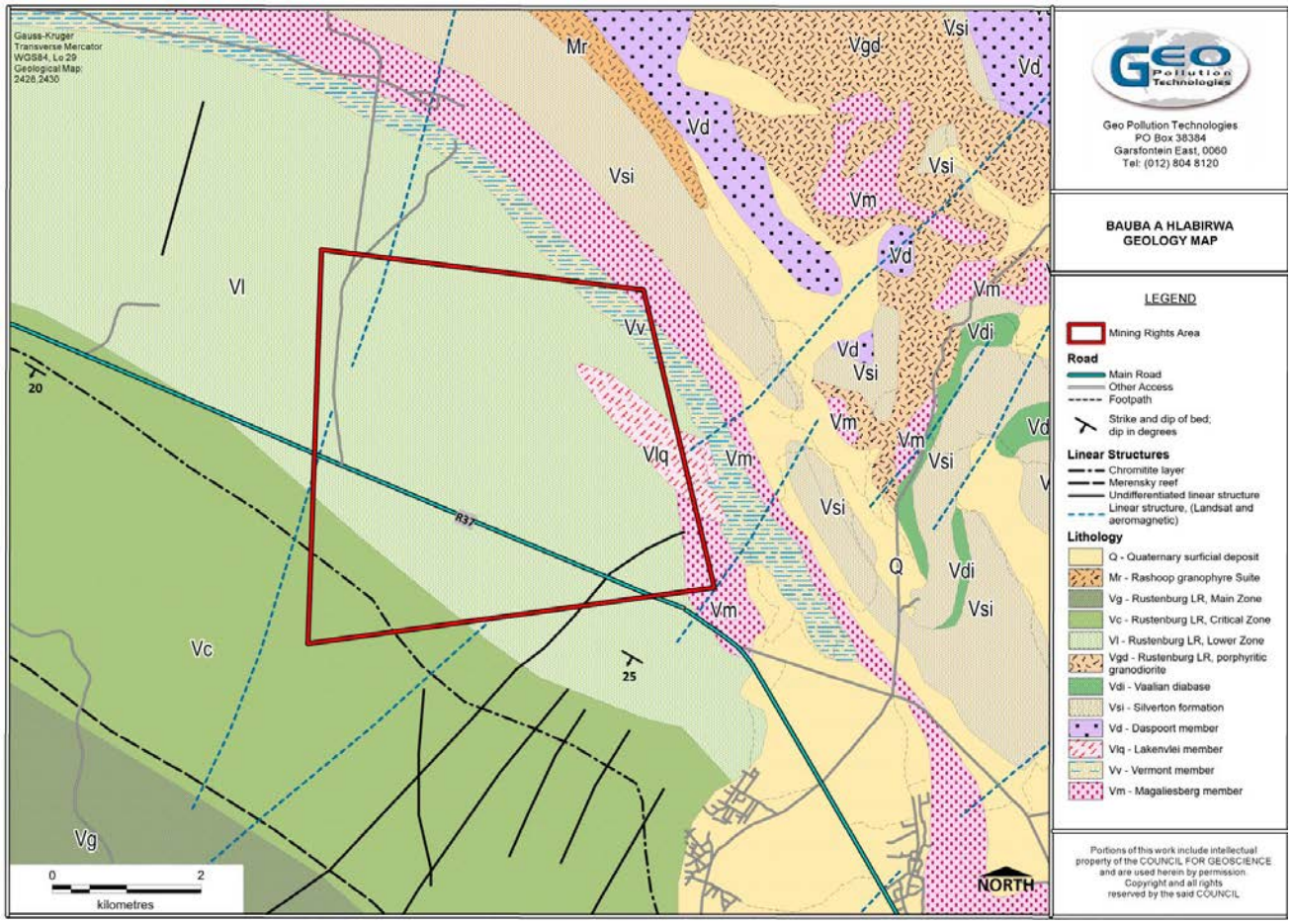


Figure 14: Regional Geology Map (1:250 000 geology series map)

9.6 HYDROGEOLOGY

A Groundwater and Contamination Impact Assessment was undertaken by Future Flow (2020)for the project and is appended to this report as Appendix 6.

9.6.1 Geochemical characterisation

Geochemical characterisation was done on two occasions:

- The 2019 GPT hydrogeological study; and
- This current study. The assessment included:
    - Geochemical analysis of the silica tailings sample provided by the client (the sample represents the material that is proposed to be used to backfill the opencast pit areas);
    - Geochemical modelling to determine the short to medium term (up to the end of life of the underground mine) and long term post-closure pollution source concentrations.

During the GPT study overburden material was analysed. This current Future Flow study focused on the tailings material. During the Future Flow study the interpretation of the geochemical results as well as the geochemical modelling was performed by Dr Meris Mills of Mills Water.

9.6.1.1 Total concentration testing

Total concentration analysis results are summarised in the table below.

A number of the elements analysed during the GPT study show a concentration value of 0 mg/kg. The analysis certificate is not included in the report. It is assumed that the 0 values are assigned to elements that fall below detection limit. None of the parameters from the GPT study exceed the TCT0 guideline values.

Results from the total concentration testing that was done on the silica tailings material as part of the Future Flow study show that the major oxide content of the silica tailings is dominated by silica, magnesium, chrome and iron, with lesser amounts of calcium and manganese.

Apart from fluoride, the reported trace element concentrations are below detection limits. Fluoride was detected at 80 mg/kg. Two things to note are:

- Chromite does not readily dissolve in the acid solution used to determine total trace elemental concentrations. Therefore trace elements associated with chromite would not be detected by this method. This effect can clearly be seen because the XRF-measured Cr is 14.879 wt%, equating to 148 790 mg/kg, and XRD reports 13 wt% chromite, equating to 78 022 mg/kg Cr, yet, <962 mg/kg is reported in the total trace element concentrations. Assuming the chromite in the silica tailings is stable and does not weather on backfilling, this is not a concern. However, low concentrations of total CrT and Cr6+ have been detected in process water, suggesting that chromite may be slightly soluble under the site conditions.
- The laboratory detection limits for some of the trace elements are high e.g. the detection limit for manganese is 962 mg/kg.

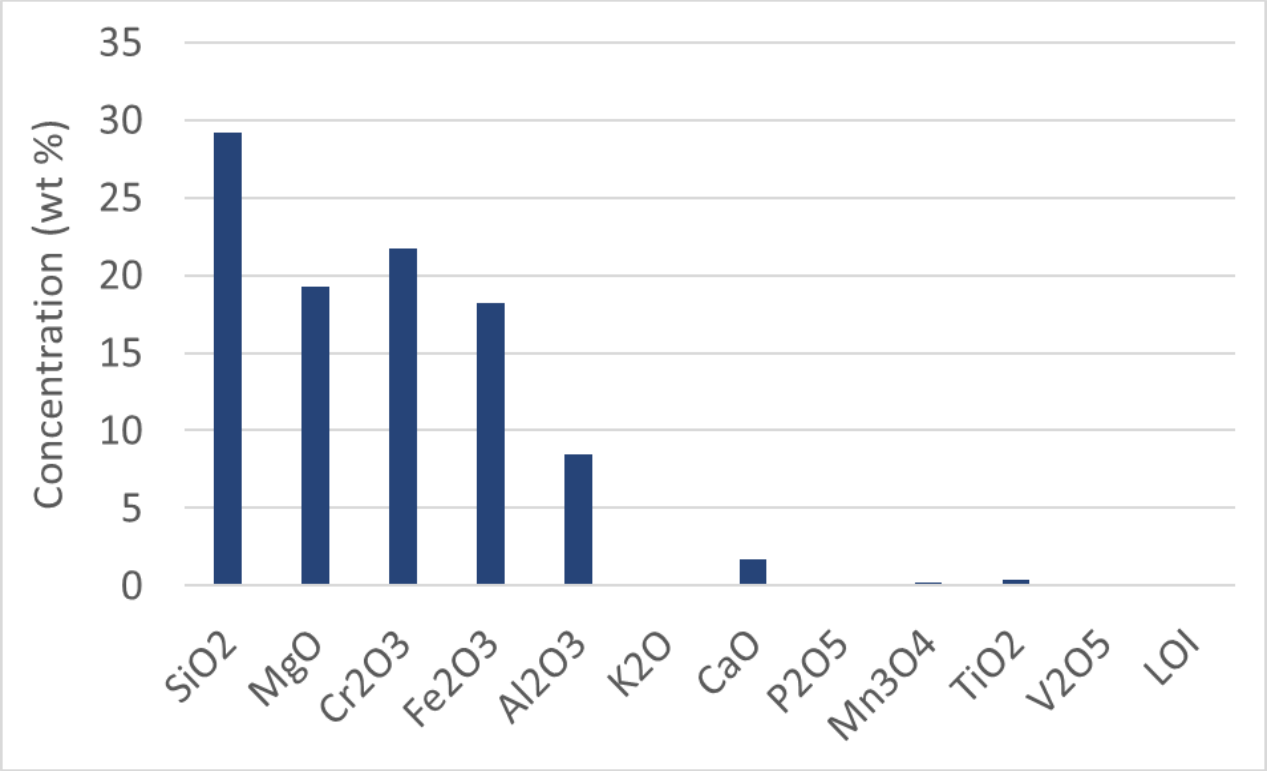


Figure 15: Major elemental content of the silica tails (after Mills, 2020)

9.6.1.2 Leach concentration testing

Leach testing results as summarised in Table 12. As with the total concentration results a number of the elements analysed during the GPT study show a concentration value of 0 mg/L. It is assumed that these values fall below the laboratory detection limits.

From the GPT study it is seen that barium (34.32 mg/L measured vs LCT0 of 0.7 mg/L), cobalt (14.15 mg/L measured vs LCT0 of 0.5 mg/L) and manganese (1.00 mg/L measured vs LCT0 of 0.5 mg/L) concentrations exceed the LCT0 guideline values, while the boron concentration 49.39 mg/L exceed the LCT1 guideline value of 25 mg/L.

Results from the Future Flow study show that the measured trace element and anion concentrations for the silica tails are all below detection limits, which are below their respective LCT0s. It should be noted that for many elements the detection limits are unusually high e.g. sulphate detection limit is 50 mg/L, therefore no detection does not mean that there is no sulphate present.

9.6.1.3 Waste classification

The waste classification as defined in Section 7 of GN 635 are summarised as:

- Wastes with any element or chemical substance concentration above LCT3 or TCT2 limits (LC>LCT3 or TC>TCT2) are Type 0 Wastes;
- Wastes with any element or chemical substance concentration above the LCT2 but below or equal to the LCT3 limits, or above the TCT1 but below or equal to the TCT2 limits (LCT2<LC<LCT3 or TCT1<TC<TCT2), are Type 1 Wastes;
- Wastes with any element or chemical substance concentration above the LCT1 but below or equal to the LCT2 limits, and all concentrations below or equal to the TCT1 limits (LCT1<LC<LCT2 or TC<TCT1), are Type 2 Wastes;
- Wastes with any element or chemical substance concentration above the LCT0 but below or equal to the LCT1 limits, and all concentrations below or equal to the TCT1 limits (LCT0<LC<LCT1 or TC<TCT1), are Type 3 Wastes; or

- Wastes with all elements and chemical substance concentration levels for metal ions and inorganic anions below or equal to the LCT0 and TCT0 limits (LC≤LCT0 and TC≤TCT0), and with all chemical substance concentration levels also below the relevant concentration limits for organics and pesticides, are Type 4 Wastes (no organics or pesticides are included in the waste rock material and therefore that requirement is not applicable);
- If a particular chemical substance in a waste is not listed with corresponding LCT and TCT limits in the norms and standards, and the waste has been classified as hazardous in terms of regulation 4(2) of the Regulations based on the health or environmental hazard characteristics of the particular element or chemical substance, the waste is considered to be Type 1 Waste (not applicable to this study);
- If the TC of an element or chemical substance is above the TCT2 limit, and the concentration cannot be reduced to below TCT2 limit, but the LC for the particular element or chemical substance is below the LCT3 limit, the waste is considered Type 1 Waste;
- Wastes listed in item (2)(b) of Annexure 1 to the regulations are considered to be Type 1 Waste, unless assessed and determined otherwise in terms of the Norms and Standards;
- Wastes with all element or chemical substances leachable concentration levels for metal ions and inorganic anions below or equal to the LCT0 limits are considered to be Type 3 Waste, irrespective of the total concentration of elements or chemical substances in the waste provided that:
    - The concentration levels are below the relevant limits for organics and pesticides;
    - The inherent waste and chemical character of the waste is stable and will not change over time; and
    - The waste is disposed of to landfill without any other waste.

As the TCs are less than the TCT0s, and the LCs are less than the LCT0s, the waste is assessed as a Type 4 waste. It should be noted that if the XRF chromium, vanadium and manganese values are used in place of the acid digest value, the waste would be classified as a Type 3 waste as the XRF values are between the TCT0 and the TCT1.

Table 12: Total concentration test results

Constituent	Units	TCT Guidelines Values			Overburden (GPT study)	Silica Tailings (Future Flow study)
		TCT0	TCT1	TCT2		
Arsenic (As)	mg/kg	5.8	500	2 000	0	<5.58
Boron (B)	mg/kg	150	15 000	60 000	49.30	<144
Barium (Ba)	mg/kg	62.5	6 250	25 000	34.20	<60.1
Cadmium (Cd)	mg/kg	7.5	260	1 040	0	<7.21
Cobalt (Co)	mg/kg	50	5 000	20 000	14.15	<48.1
Total Chromium (Cr)	mg/kg	46 000	800 000	N/A	238.50	<962
Copper (Cu)	mg/kg	16	19 500	78 000	14.12	<15.4
Mercury (Hg)	mg/kg	0.93	160	640	0	<0.865
Manganese (Mn)	mg/kg	1 000	25 000	100 000	139.40	<962
Molybdenum (Mo)	mg/kg	40	1 000	4 000	0	<9.62
Nickel (Ni)	mg/kg	91	10 600	42 400	59.16	<48.1
Lead (Pb)	mg/kg	20	1 900	7 600	0	<19.2
Antimony(Sb)	mg/kg	10	75	300	7.59	<9.62
Selenium (Se)	mg/kg	10	50	200	0	<9.62
Vanadium (V)	mg/kg	150	2 680	10 720	4.93	<96.2
Zinc (Zn)	mg/kg	240	160 000	640 000	12.71	<212
Total Cyanide (CN)	mg/kg	14	10 500	42 000	0	<9.62
Fluoride (F)	mg/kg	100	10 000	40 000	-	80

Exceed TCT0

Table 13: Leachable concentration test results

Constituent	Units	LCT Guidelines Values				Overburden (GPT study)	Silica Tailings (Future Flow study)
		LCT0	LCT1	LCT2	LCT3		
Total dissolved solids (TDS)	mg/L	1 000	12 500	25 000	100 000	0	<100
Chloride (Cl)	mg/L	300	15 000	30 000	120 000	0	<50.0
Sulphate (SO_4)	mg/L	250	12 500	25 000	100 000	0	<50.0
Nitrate (NO_3)	mg/L	11	550	1 100	4 400	0	<10.0
Fluoride (F)	mg/L	1.5	75	150	600	0	<1.00
Total cyanide (CN)	mg/L	0.07	3.5	7	28	0	<0.05
Arsenic (As)	mg/L	0.01	0.5	1	4	0.01	<0.01
Boron (B)	mg/L	0.5	25	50	200	49.39	<0.500
Barium (Ba)	mg/L	0.7	35	70	280	34.32	<0.700
Cadmium (Cd)	mg/L	0.003	0.15	0.3	1.2	0	<0.003
Cobalt (Co)	mg/L	0.5	25	50	200	14.15	<0.400
Total Chromium (Cr)	mg/L	0.1	5	10	40	0	<0.100
Hexavalent Chromium (Cr^{6+})	mg/L	0.05	2.5	5	20	0	<0.020
Copper (Cu)	mg/L	2.0	100	200	800	0	<1.00
Mercury (Hg)	mg/L	0.006	0.3	0.6	2.4	0	<0.006
Manganese (Mn)	mg/L	0.5	25	50	200	1.00	<0.500
Molybdenum (Mo)	mg/L	0.07	3.5	7	28	0.02	<0.070
Nickel (Ni)	mg/L	0.07	3.5	7	28	0.04	<0.070
Lead (Pb)	mg/L	0.01	0.5	1	4	0	<0.010
Antimony (Sb)	mg//L	0.02	1.0	2	8	0	<0.020
Selenium (Se)	mg/L	0.01	0.5	1	4	0	<0.010
Vanadium (V)	mg/L	0.2	10	20	80	0	<0.200
Zinc (Zn)	mg/L	5.0	250	500	2 000	0.02	<2.00

Exceed LCT0 guideline value
Exceed LCT1 guideline value

9.6.1.4 Acid-base-accounting testing

ABA involves a combined measurement of sulphur contents (total sulphur, sulphuric acid, sulphur, and organic sulphur), neutralisation capacity (NP), paste pH and the calculation of acid potential (AP), net neutralisation potential (NNP) and NP/AP ratio (NPR).

Table 14: Rock classification guidelines

Sample ID	Total S%	Sulphide S%	Sulphate S%	Paste pH	AP from sulphide S (kg/t CaCO3)	NP (kg/t CaCO3)	NPR	NNP	Type	Comment
Screening criteria	>0.3	>0.3		<5			<1	<-20	Type I: High	
	0.2 - 0.3	0.2 - 0.3		<7			1 - 2	-20 - 0	Type II: Possible/uncertain	
	0.01 - 0.2	0.01 - 0.2		>7			2 - 4	0 - 20	Type III: Low/uncertain	
	<0.1	<0.1		>7			>4	>20	Type IV: No risk	
Silica tails	0.013	bdl	0.013	8.6	bdl	12.4	39.7	12.4	IV	No sulphide S, no AP

The silica tails are classified as Type IV i.e. no risk of acid generation, because sulphide sulphur was not detected. The sulphur in the sample takes the form of sulphate, which can potentially be leached from the tailings by rainwater, resulting in sulphate occurring in leachate from the silica tails.

9.6.2 Aquifer description

An aquifer description is taken from the 2019 GPT hydrogeological study (GPT, March 2019).

There are two aquifers present in the study area as discussed below.

9.6.2.1 Upper weathered material aquifer

The main source of recharge into the shallow aquifer is rainfall that infiltrates the aquifer through the unsaturated (vadose) zone. Vertical movement of water is faster than lateral movement in this system as water moves predominantly under the influence of gravity. This aquifer may contain coarse, anorthositic sediment or turf clay sediment when underlain by anorthosite or gabbro-norite respectively.

9.6.2.2 Fractured, bedrock aquifer

Groundwater movement is predominantly associated with secondary structures in this aquifer (fractures, faults, dykes, etc.). Borehole yields in the Bushveld Complex fractured aquifers are generally low and can be expected to be between 0.1 and 2 L/s with regional flow resembling flow in the porous medium (i.e. obeying Darcy's law). These formations contain limited quantities of water resources due to the poor storage capacity of the igneous rock. Groundwater quality in the area is also expected to be intermediate to poor with EC values ranging from 4.4 to 120 mS/m and possibly elevated Ca, Mg, Cl, and SO4 as well as carbonate alkalinity concentrations.

Movement of groundwater in this aquifer will be preferential in secondary structures such as joints, faults and fractures.

9.6.3 Aquifer transmissivity

Aquifer transmissivity/ hydraulic conductivity values are obtained from the 2019 GPT hydrogeological study report (GPT, March 2019). No aquifer tests were done as part of the 2019 GPT hydrogeological study. Aquifer tests were done during the 2017 GPT water supply study (GPT, January 2018), but no aquifer transmissivity values are quoted in that report.

The hydraulic conductivity of the upper weathered material aquifer ranges between 10^{-8} and 10^{-2} m/day, while the porosity ranges between 0.4 and 0.7 for turf clay sediments. The hydraulic conductivity of the coarse, anorthositic sediment can reach up to 20 m/day with porosities ranging between values of 0.25 to 0.5.

Both the porosity and the hydraulic conductivity of the Bushveld Complex fractured bedrock aquifers are known to be low. The commonly expected values of porosity and permeability for igneous rock types, similar to those present in the Bushveld Complex, are 0.05 (porosity) and 10^{-5} m/d (hydraulic conductivity) respectively (Kruseman & de Ridder, 1994) as quoted in (GPT, January 2018).

9.6.4 Groundwater levels

The depth to groundwater level is being monitored on a monthly basis. A total of 15 boreholes are included in the monitoring program. The results from the monitoring program are summarised in Table 5.6. The groundwater levels since September 2017 are shown in Figure 5.3.

From the figures below it can be seen that the depth to groundwater level ranges between 19 and 56 metres below ground level (mbgl). The figure also shows that in general there groundwater levels in the area remain relatively constant over time. Boreholes where there are changing groundwater level trends are:

- Borehole MonBH2 show a sudden decrease in groundwater level between February and March 2019. This borehole is an abstraction borehole, which could explain the anomalous depth to groundwater level;
- Borehole WPBH2 is used for top-up water to the wash plant. This water abstraction could explain the increase in depth to groundwater level from around 28 m to 35 to 40 m depth between February 2019 and March onwards;
- The groundwater level in borehole BH4 rose from around 55 m to 35 m. This borehole is used for domestic use in the village; and
- The depth to groundwater level in boreholes OCBH1 and OCBH2 changed from around 40 to 41 m, to 47 m since July 2019.

Plotting the groundwater level elevation against topography normally indicates areas where external influences such as large scale mine dewatering influences the groundwater levels. Omitting the large scale abstraction boreholes which show anomalously deep groundwater levels in recent months (OCBH1 and UGBH2) a 71.71 % correlation is achieved between the surface elevations and the groundwater table elevations.

Bayesian interpolation is used to interpolate the groundwater levels throughout the study area. Groundwater flow directions are directed from the higher lying areas towards the low-lying streams.

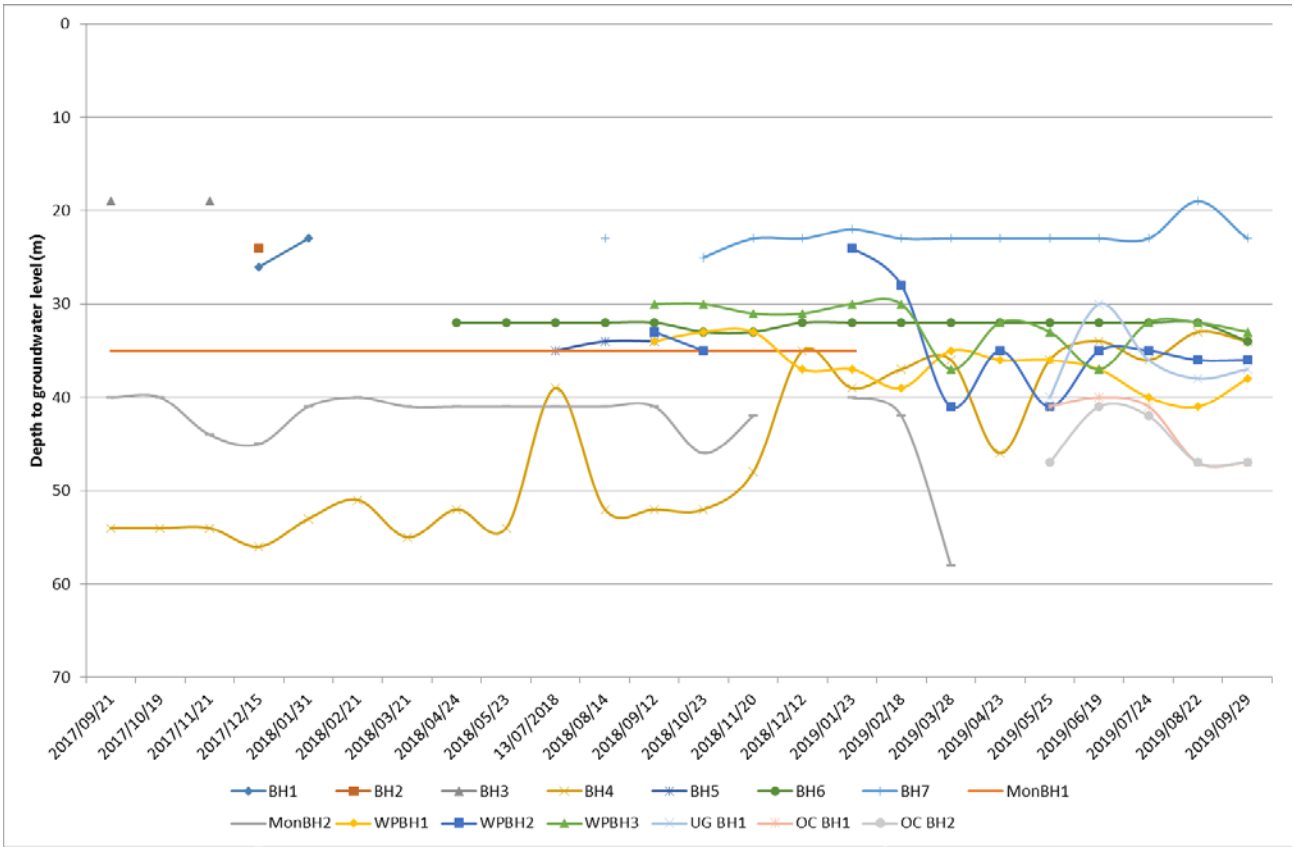


Figure 16: Depth to groundwater level trends

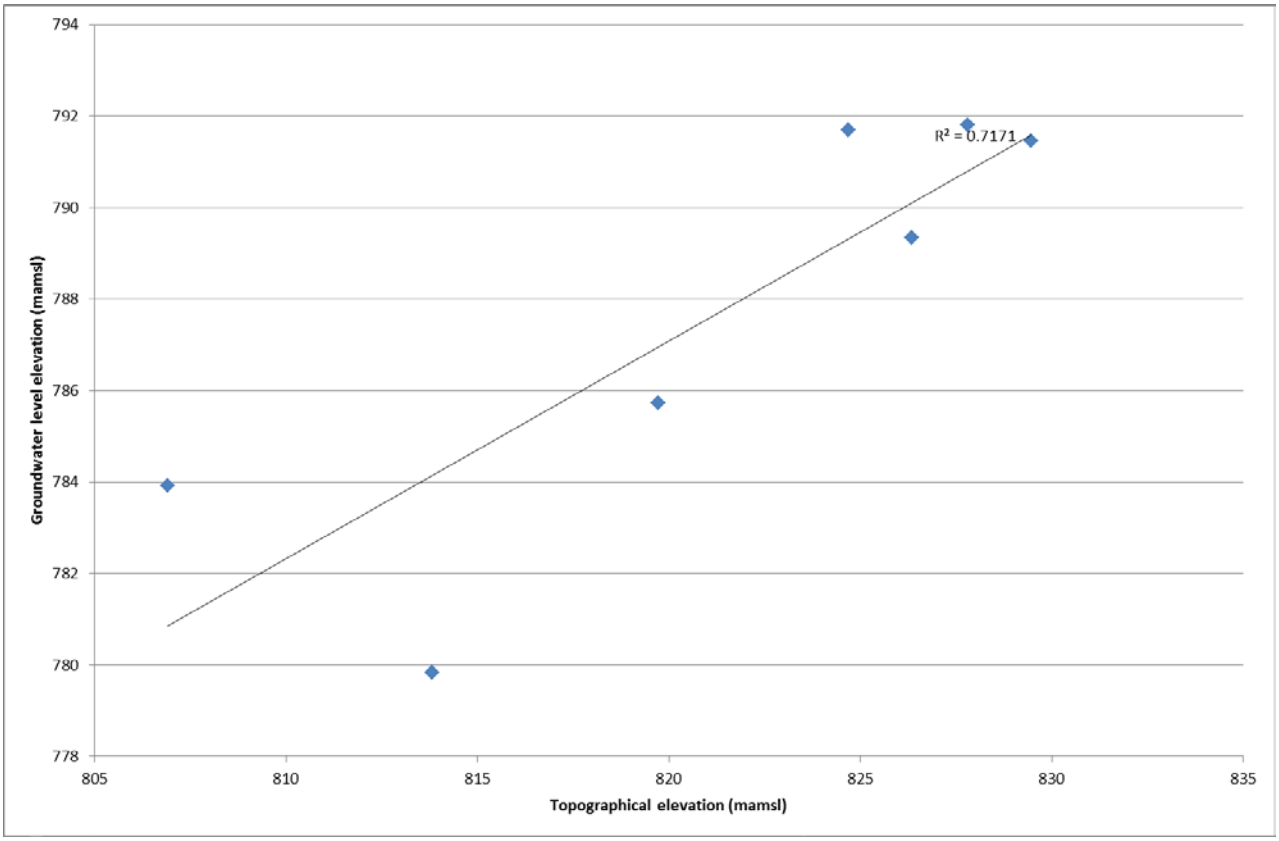


Figure 17: Topographical versus groundwater level elevations

Table 15: Hydrocensus results

Borehole	East	South	Elevation	SWL		Comment
	(WGS84, LO29)	(WGS84, LO29)	(mamsl	(mbgl)	(mamsl)	
BH1	96 915	-2 688 349	822.46			In community, at a residence. Downstream of mine. Domestic use.
BH2	96 880	-2 687 760	807.50			In community, at a residence. Downstream of mine. Domestic use.
BH3	97 469	-2 687 547	796.91			In community, at workshop. Downstream of mine. Domestic use.
BH4	94 493	-2 686 336	813.83	34	779.83	In community, at Mr. Moloto's residence. Downstream of mine. Domestic use.
BH5	96 830	-2 686 013	779.91			In community, north of the R37. Domestic use.
BH6	95 013	-2 686 842	819.72	34	785.72	Borehole for communal use in Tsibeng village.
BH7	97 005	-2 687 821	806.91	23	783.91	Borehole for communal use in Tsibeng village. Domestic use. Borehole well situated for groundwater pollution monitoring.
BH8	96 858	-2 687 537	801.29			
BH9	96 053	-2 687 554	815.17			
MonBH1	97 600	-2 689 481	856.98			Outside mining area. Upstream of mine.
MonBH2	97 709	-2 689 218	838.88			On mining site. Abstraction borehole.
WPBH1	97 860	-2 688 824	829.46	38	791.46	Borehole used for groundwater abstraction for top-up in wash plant. Downstream of mining area.
WPBH2	97 797	-2 688 754	827.80	36	791.80	Borehole used for groundwater abstraction for top-up in wash plant. Downstream of mining area.
WPBH3	97 889	-2 688 654	824.69	33	791.69	Borehole used for groundwater abstraction for top-up in wash plant. Downstream of mining area.
UG BH1	97 488	-2 688 783	826.35	37	789.35	Borehole used for groundwater abstraction for top-up in underground mining. Downstream of mining area.
OC BH1	97 812	-2 688 761		47	780.94	Borehole used for groundwater abstraction for dust suppression and potable water at the opencast section.
OC BH2						Borehole used for groundwater abstraction for dust suppression and potable water at the opencast section.

N/A = Not available

SWL = Static water level

mbgl = metres below ground level

mamsl = metres above mean sea level

All coordinates are provided in Transverse Mercator projection, LO29, and WGS84 datum

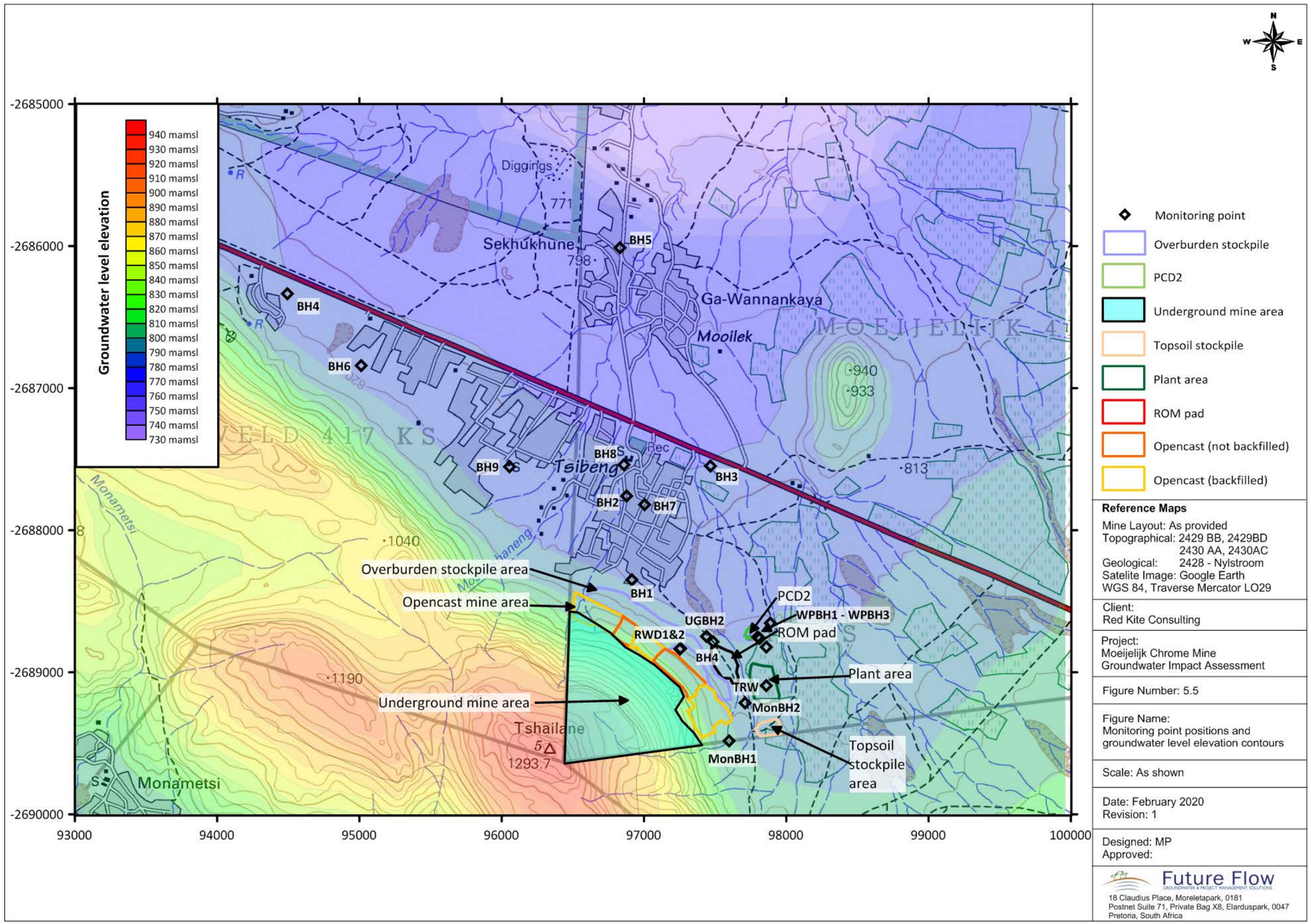


Figure 18: Hydrocensus point positions and groundwater level elevation contours

9.6.5 Groundwater potential contaminants

The opencast and underground mine areas and surface stockpiles act as potential sources of contamination to the aquifers in the area. It is assumed that good housekeeping such as storage of potentially hazardous material will be within properly constructed and lined or paved areas. Oil traps will be sized, operated and maintained to contain all discarded oil from working areas.

To supplement the leach test results which indicated a large number of elements below detection limit, it was decided to also reference the site water quality data to estimate the potential for leaching from the tailings material. Process water that is used to transport the tailings will have interacted with the tailings and will have a chemistry related to the tailings. In addition, on drying of the tailings, salts precipitating from the entrained process water will contribute to the contaminants that can leach from the tailings once backfilled.

The average plant return water (TRW) quality is given in the table below:
The average background groundwater quality (from upstream monitoring well MonBH1) is also given so that the difference in water quality due to the process and interactions with tailings can be identified. The ratio between the average process water and the average background groundwater is calculated to highlight those parameters which are highly enriched in the process water and could therefore pose a risk of contaminating groundwater. The parameters which have concentrations more than 10 times higher in the process water than in the background groundwater are Na, K, NH_3, NO_3^- and NO_2^-. Sulphate and chloride are around 5 times more concentrated and cadmium, chromium and Cr^{6+} are about twice as concentrated in the process water than the background groundwater. The values are also compared to SANS241:2015 drinking water limits in order to identify parameters that could pose a risk to users of groundwater for domestic purposes should they enter groundwater.

Chromium was detected in process water and groundwater. The concentrations of total chromium in groundwater are generally below the SANS241 limit (with two exceptions), but it should be noted that most of the detected chromium occurs as Cr^{6+}. In contrast, chromium detected in the process water appears to occur mostly as Cr^{3+}. It is clear that chromium can be mobilised into groundwater as Cr^{6+}, and therefore it is considered to be a potential contaminant of concern.

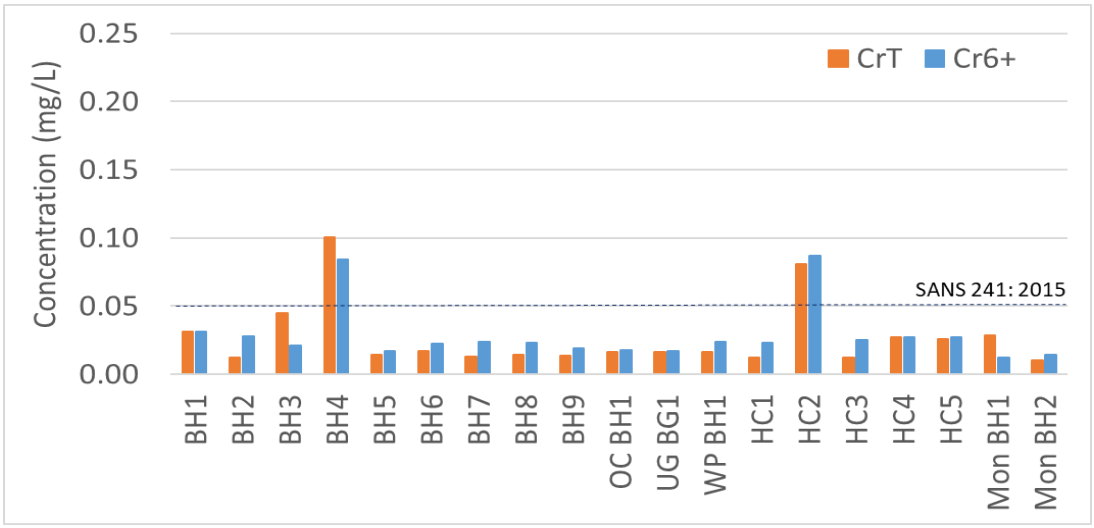
Based on analytical results, nitrogen occurs in process water and in groundwater predominantly as nitrate. Nitrite and ammonia concentrations are close to detection limits in the groundwater, and nitrite is close to detection in the process water, so they are not apparent on the graph.

Given the potential health risks associated with nitrate and Cr^{6+} and their presence in both site process water and groundwater, they are considered to be potential contaminants of concern.

Table 16: Average process and background groundwater concentrations compared to SANS241:2015 (after Mills, February 2020)

Analyte	Units	Average plant return water (TRW) (n=3)	Average background groundwater (MonBH1) (n=7)	Ratio process water : background groundwater	SANS241:2015
pH	-	7.9	7.5		5 – 9.7
Na	mg/L	177	16	***11***	200*
K	mg/L	9.7	1.0	***10***	-
Ca	mg/L	60	51	1.2	-
Mg	mg/L	43	62	0.7	-
NH_3	mg/L as N	***3.5***	0.2	***20***	1.5*
Cl	mg/L	103	24	4.3	300*

Analyte	Units	Average plant return water (TRW) (n=3)	Average background groundwater (MonBH1) (n=7)	Ratio process water : background groundwater	SANS241:2015
SO_4	mg/L	131	24	5.5	250*
NO_3	mg/L as N	***99***	2.8	***35***	11
NO_2	mg/L as N	0.9	0.1	***30***	0.9
Alkalinity (estimated)	mg/L as CaCO3	702	530	1.3	
Al	mg/L	***0.450***	0.549	0.8	0.300*
Ba	mg/L	0.025	0.015	1.7	0.700
B	mg/L	0.085	0.028	3.0	2.400
Cd	mg/L	***0.008***	<0.003	2.7	0.003
CrT	mg/L	***0.060***	0.029	2.0	0.050
Cr^{6+}	mg/L	0.019	<0.010	1.9	
Fe	mg/L	***0.330***	***0.416***	0.8	0.300*
Mn	mg/L	0.034	0.045	0.8	0.100*
Pb	mg/L	<0.01	<0.01	1.0	0.010
V	mg/L	<0.01	0.034	0.3	



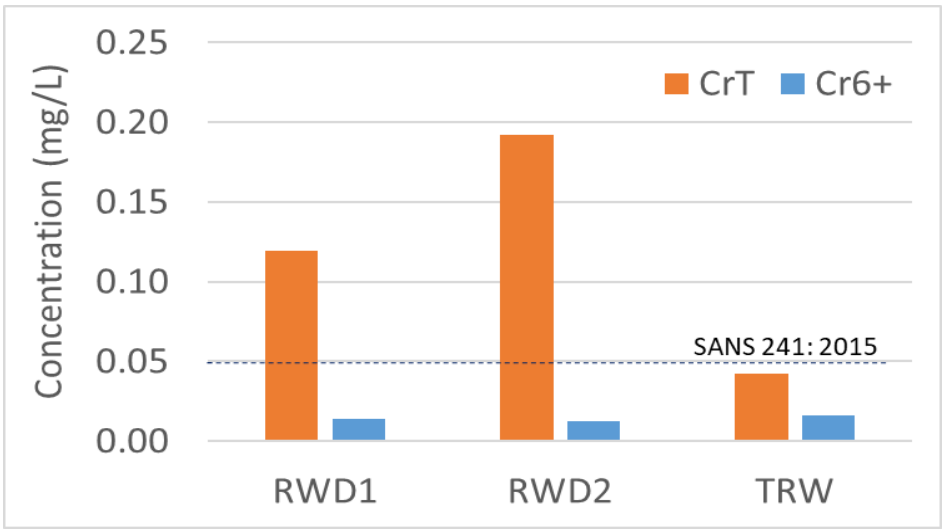
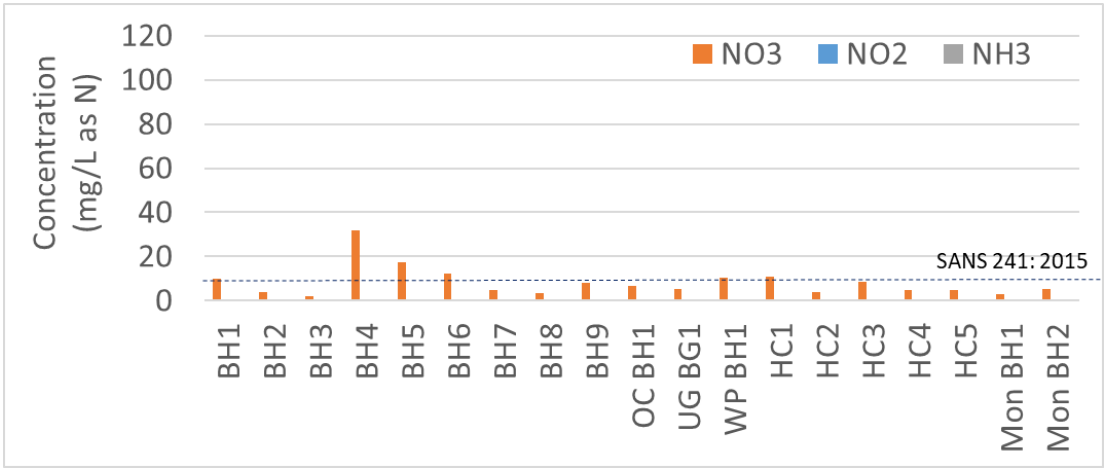


Figure 19: Concentrations of CrT and Cr6+ in groundwater (top) and process water (bottom) – taken from Mills, February 2020



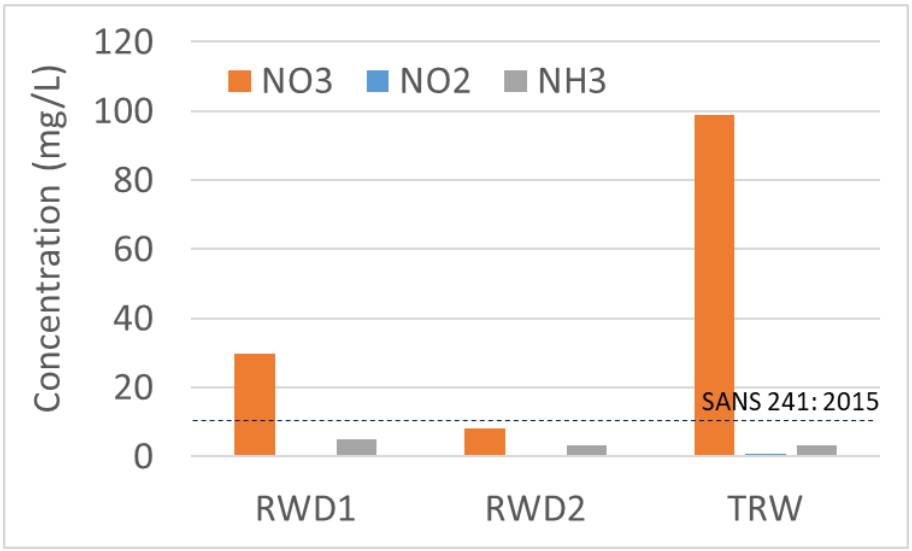


Figure 20: Concentrations of nitrogen species in groundwater (top_ and process water (bottom) – taken from Mills, February 2020

9.6.6 Groundwater quality

9.6.6.1 Element concentrations

There is an existing water monitoring program in place. A total of nine boreholes are currently included the program.

The water qualities are compared to the SANS 241:2015 drinking water standards. The standard represents a numerical limit of the listed element concentrations that will protect the health of the consumer over a lifetime of consumption. All elements that exceed the guidelines are highlighted.

From the table below it can be seen that in general the groundwater quality is good, with some individual parameters in individual samples exceeding the SANS241:2015 guideline values. Expected health impacts are discussed that the hand of domestic use guidelines published by the then Department of Water Affairs and Forestry (Department of Water Affairs and Forestry, 1996).

Elements that exceed the SANS241:2015 guideline values are:

- **Chloride:** The chloride concentrations at borehole BH4 (398 mg/L) and BH5 (393 mg/L) exceed the guideline value of 300 mg/L. At the measured concentrations, no health impacts are expected. At concentrations between 200 and 600 mg/L the water has a distinctly salty taste. There is a likelihood of noticeable increase in corrosion rates in domestic appliances.

- **Nitrate:** The nitrate concentrations in boreholes BH4 (37 mg/L) and BH6 (13.6 mg/L) exceed the guideline value of 11 mg/L. At concentrations greater than 10 mg/L methaemoglobinaemia may occur in infants. With increasing concentration to above 20 mg/L mucous membrane irritation in adults can occur.
- **Manganese:** The manganese concentration in borehole BH8 measured 93.7 mg/L. This exceeds the SANS241:2015 guideline value of 0.4 mg/L by 2 orders of magnitude.

- It has to be stated that this value is anomalous as all other groundwater points measured below detection level. In addition, previous results at borehole BH8 from December 2018 and March 2019 showed manganese concentrations below detection limit of 0.025 mg/L. It is possible that this is a laboratory error.
- **Chromium:** At borehole BH4 the total chromium measured 0.16 mg/L, which exceeds the SANS241:2015 guideline value of 0.05 mg/L.
- **Cadmium:** The cadmium concentration in borehole BH7 measured 0.02 mg/L. This exceeds the guideline value of 0.002 mg/L. As a precautionary measure it is recommended that concentrations of 0.005 mg/L not be exceeded due to the potentially acute and/or irreversible effects of cadmium on human health. A concentration of 0.02 mg/L is the threshold for health damage with continuous exposure. Single incidence of exposure will not have an observable effect. At concentrations greater than 0.02 mg/L there is a danger of kidney failure with long-term exposure (longer than 1 week).
- **Lead:** The lead concentration in borehole BH8 measured 7.88 mg/L which exceeds the guideline value of 0.01 mg/L by 2 orders of magnitude. As was the case with manganese this value for borehole BH8 is anomalous as it does not compare to previous sampling runs at BH8 from December 2018 and March 2019 when the lead concentrations measured below detection limit. Results for all other boreholes included in the sampling program also show lead concentrations below detection limit at all times.

Table 17: Groundwater chemical analysis results – September 2019 monitoring program results

Analysis	Units	SANS 241:2015 guideline value	BH4	BH5	BH6	BH7	BH8	BH9	OCBH1	UGBH1	WPBH1
pH		≥5 - ≤9.7	8.11	7.93	8.02	7.54	4.64	8.23	7.94	8.02	7.94
Total Dissolved Solids (TDS)	mg/L	≤1 200	1751	1050	599	649	26.6	601	486	481	467
Chloride (Cl)	mg/L	≤300	398	393	74.8	161	212	156	36.7	39.6	38.7
Sulphate (SO_4)	mg/L	≤500 (health)	389	114	30.3	28.6	52.9	26.2	26.5	22.7	22.2
Nitrate (NO_3)	mg/L	≤11	37	8.48	13.6	<0.01	<0.01	9.13	6.84	5.95	5.91
Nitrite (NO_2)	mg/L	N/G	<0.01	<0.01	<0.01	5.04	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium (Ca)	mg/L	N/G	54.9	30	44.9	80.5	81.6	65.5	68.6	65.9	60.3
Magnesium (Mg)	mg/L	N/G	282	177	107	87.9	<0.01	97.7	67.3	67.6	67.6
Sodium (Na)	mg/L	≤200	152	94.8	33.3	50.1	0.57	19.6	29.8	30	29.9
Potassium (K)	mg/L	N/G	5.73	4.95	2.03	0.67	<0.01	1.81	0.37	0.49	0.51
Aluminium (Al)	mg/L	≤0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01
Barium (Ba)	mg/L	≤0.7	0.02	0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Boron (B)	mg/L	≤2.4	0.43	0.15	0.09	0.02	0.02	0.02	0.02	0.02	0.02
Iron (Fe)	mg/L	≤2 (health)	0.09	<0.01	<0.01	<0.01	<0.09	<0.01	<0.01	<0.01	<0.01
Manganese (Mn)	mg/L	≤0.4 (health)	<0.01	<0.01	<0.01	<0.01	93.7	<0.01	<0.01	<0.01	<0.01
Chromium (Cr)	mg/L	≤0.05	0.16	0.02	0.02	<0.002	0.02	0.02	0.02	0.02	0.02
Hexavalent Chromium (Cr^{6+})	mg/L	N/G	0.12	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium (Cd)	mg/L	≤0.003	<0.002	<0.002	<0.002	0.02	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	mg/L	≤0.01	<0.01	<0.01	<0.01	<0.01	7.88	<0.01	<0.01	<0.01	<0.01
Vanadium (V)	mg/L	N/G	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
COD	mg/L	N/G	14	9	24	14	697	9	14	7	17

Exceed SANS241:2015 guideline value

mS/m = milliSiemens/metre

mg/L = milligram per litre

N/A = Not analysed

N/G = No guideline value specified

9.6.7 Aquifer characterisation

9.6.7.1 Groundwater vulnerability

For aquifer vulnerability reference is made to the aquifer vulnerability map of South Africa which shows a low aquifer vulnerability for the project area.

9.6.7.2 Aquifer classification

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

9.6.8 Conceptual model

9.6.8.1 Groundwater flows

There are two aquifers present in the area. These are associated with a.) the weathered material, and b.) the underlying competent, but fractured, bedrock, respectively.

The weathered material aquifer is recharged at an average rate of 3.9 % of the rainfall. The infiltrating rainwater joins the saturated zone and migrates down gradient to where it daylights as springs or baseflow contribution the numerous streams that characterise the area. The yield of this aquifer varies throughout the year depending on the rainfall recharge and it is possible that it is laid dry in some areas during the dry season. This aquifer is also most vulnerable to contamination from surface.

A portion of the water within the weathered material aquifer infiltrates into the underlying fractured rock aquifer. Groundwater flow in this aquifer is mostly associated with individual groundwater bearing zones (faults, fractures, and geological contacts).

Depth to groundwater level ranges between 19 and 56 mbgl. This indicates that the weathered material aquifer is dry in most places.

Groundwater flows from the topographical highs formed by the various ridges in the area where recharge occurs towards the low lying Olifants River in the west and northwest where the groundwater exit the system as baseflow contribution to the Olifants River.

9.6.8.2 Contaminant transport

The opencast and underground mines, as well as the surface stockpiles can act as potential sources of contamination to the aquifers.

In terms of contaminant production, the following risks exist:

- The opencast and underground mine areas are in direct contact with the upper weathered material and the fractured rock aquifers. This enables direct contamination of the aquifers from the mining areas. It is planned that the opencast areas be backfilled with silica tailings material;
- Leachate emanating from the surface stockpiles can contaminate the underlying aquifers;
- Leachate emanating from the overburden stockpiled on site, or the overburden exposed in the opencast pit walls, can be enriched in nitrate and hexavalent chromium.

Various surface stockpiles and water management dams are lined which mitigate contamination of the underlying aquifers. These surface areas which are lined include:

- The wet tailings area;
- The product stockpile area; and
- The pollution control dam.

Unlined areas which pose a greater risk to the underlying aquifers include:

- The oversized area;
- The run of mine (ROM) area (this essentially the same as the oversized area);

The geochemical modelling results show (Mills, 06 February 2020):

- Operational phase contaminants:
    - Nitrate concentrations are high (501 mg/L) under the oxidizing conditions associated with operation because nitrate is highly soluble and there are no sinks in this scenario. Nitrate can be removed from groundwater by denitrification, but this requires anaerobic conditions which are not anticipated to develop in unsaturated backfilled tailings;
    - Chromium is predicted by geochemical modelling to be present exclusively as Cr^{6+} at a concentration of 0.3 mg/L;
- Post-closure phase contaminants:
    - Nitrate concentrations are expected to reduce to 139 mg/L due to denitrification, which is more likely to occur in a saturated environment; and
    - The Cr^{6+} source term remains 0.3 mg/L.

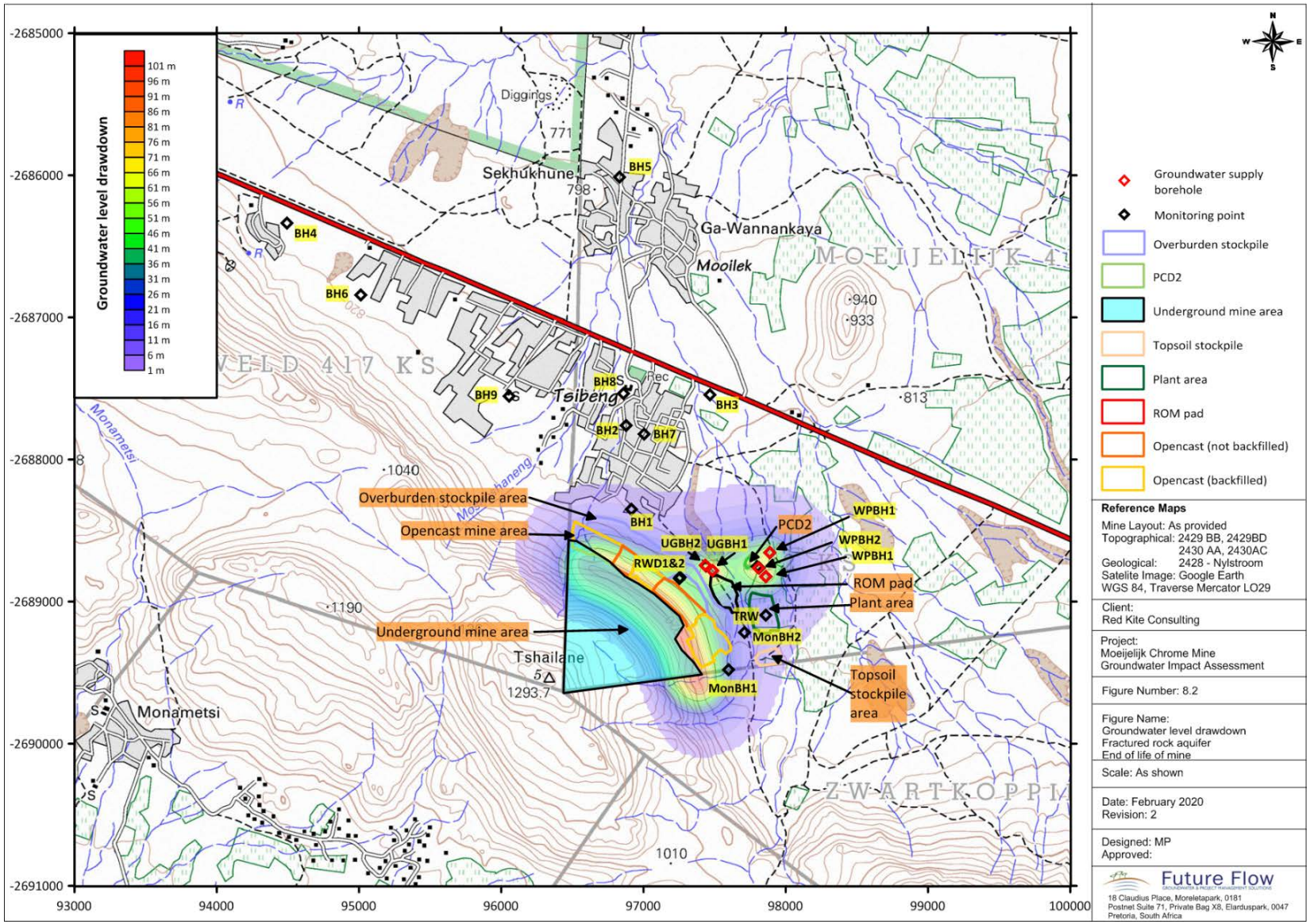


Figure 21: Groundwater level drawdown (end of LOM)

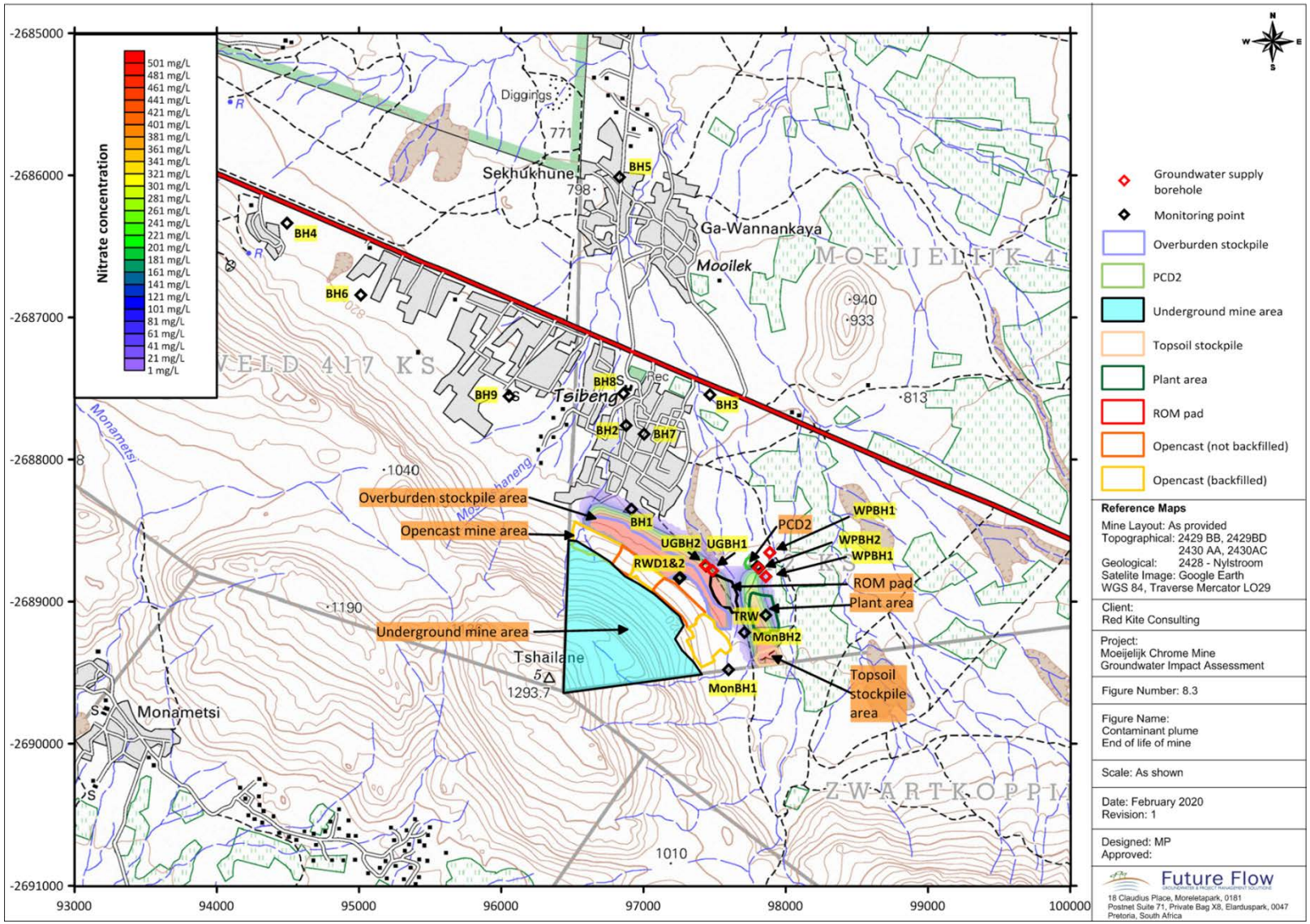


Figure 22: Contamination plume (end of LOM)

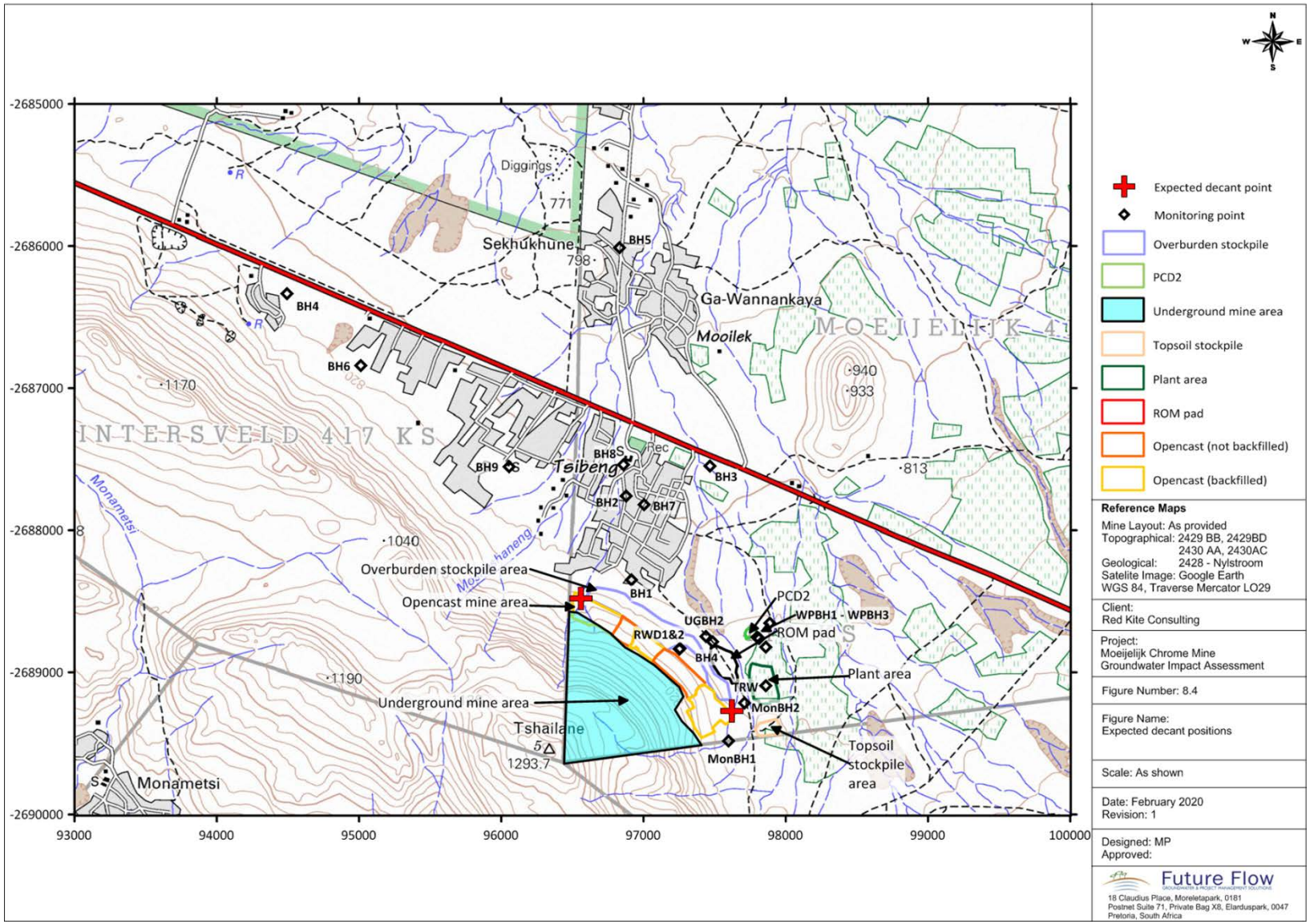


Figure 23: Expected decant positions

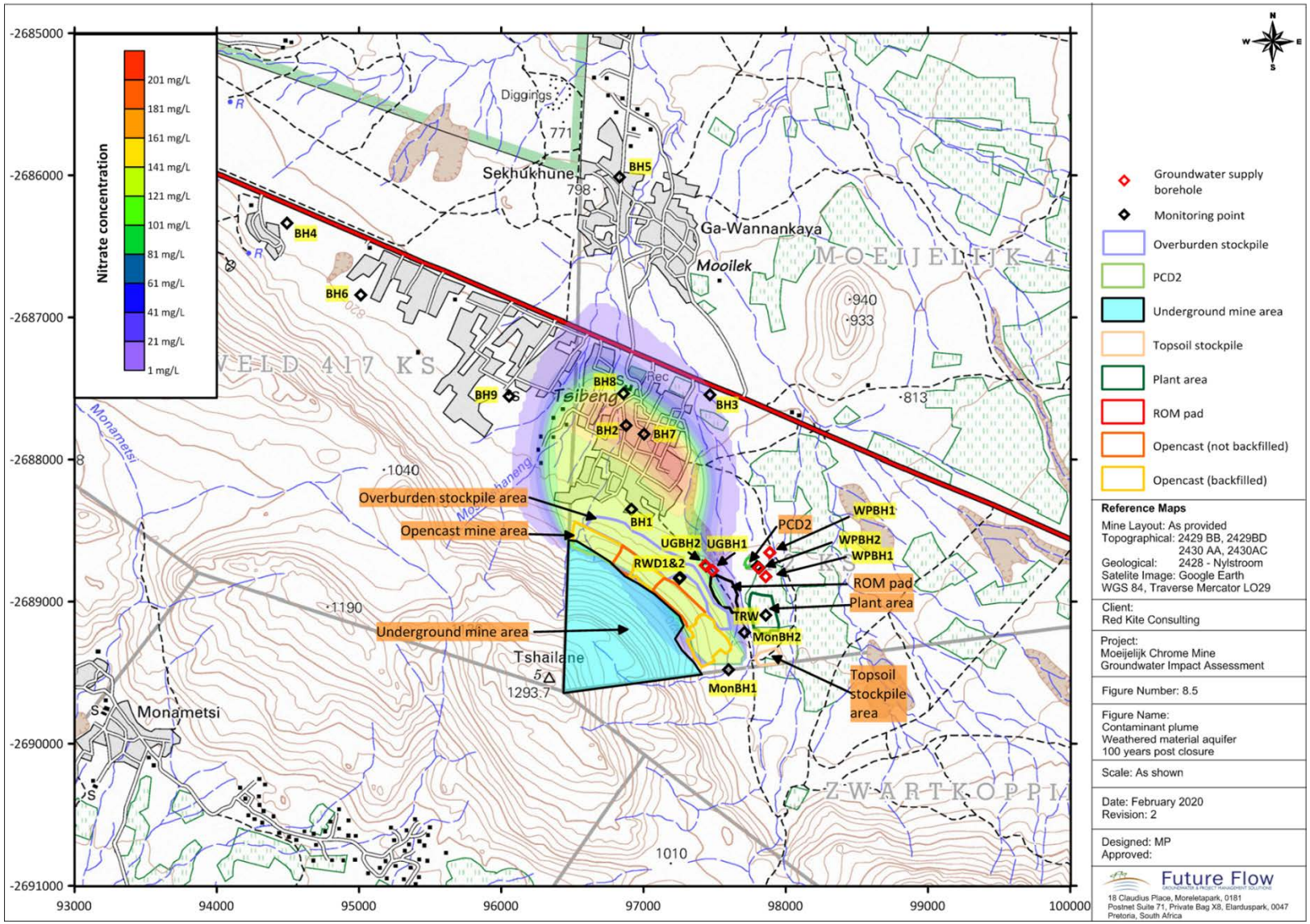


Figure 24: Contamination plume (100 years post closure)

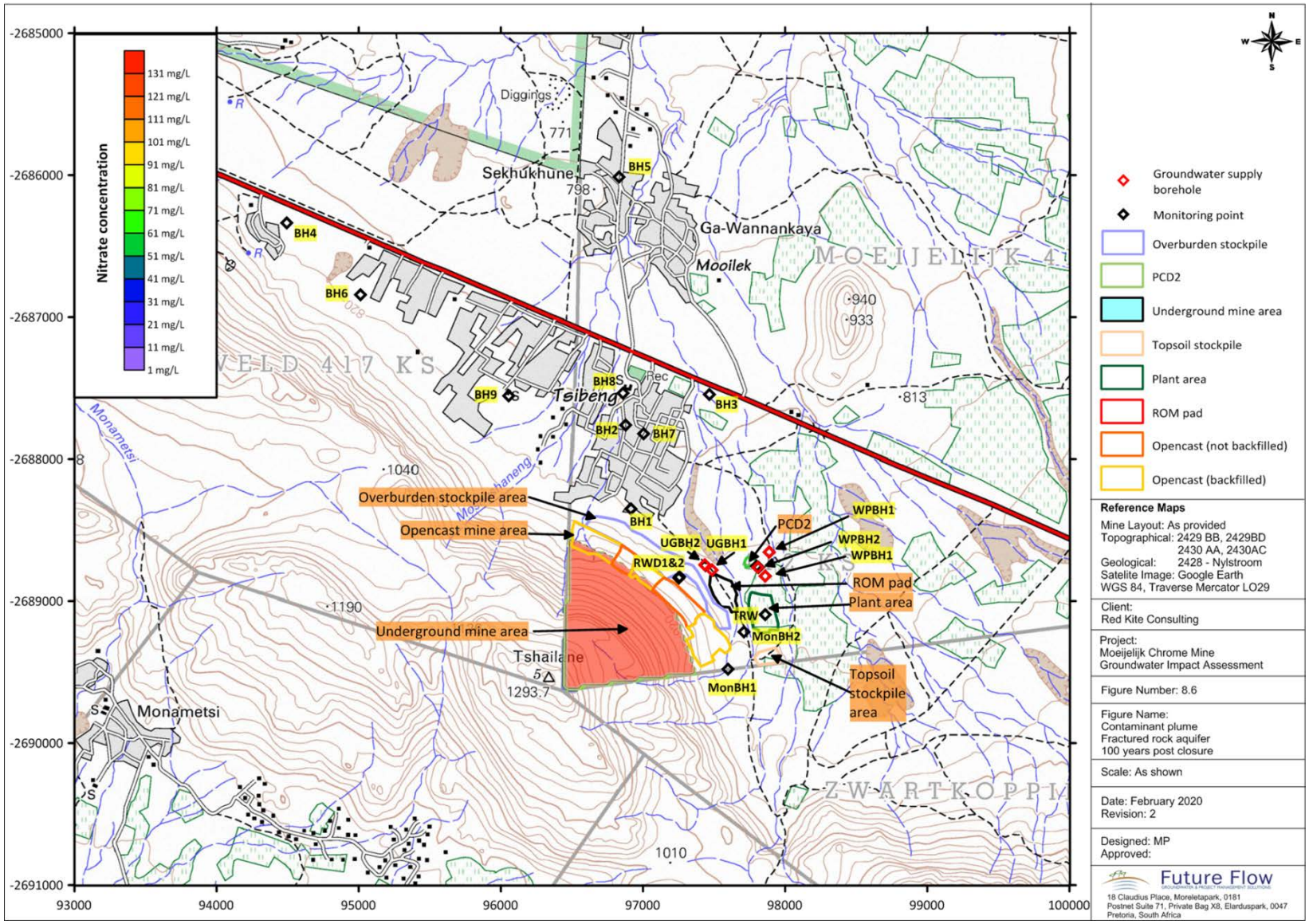


Figure 25: Contamination plume (100 years post closure)

9.7 SURFACE WATER

9.7.1 Regional Surface water characteristics

The proposed mining area falls within the Olifants Water Management Area, specifically the Middle Olifants management area, which is lately being characterised by a large number of platinum and chrome mines being developed. The mines have increased the water requirements in the area both due to their direct industrial water use and increased potable use caused by influx of people. Based on the water balance reconciliation study performed by the former Department of Water Affairs and Forestry it was predicted that the water deficit of 241 million m^3/a will grow to 279 million m^3/a by the year 2025. These figures highlight the shortage of water in this Water Management Area which is classed as severely stressed.

Runoff from the sites drains tributaries from the Sebitsa River to the Motse River which flows north-east before its confluence with the Olifants River, as well as unnamed tributaries of the Moshashaneng River that merge with the Olifants River. The mine falls within the B71B sub-catchment area of the Olifants River Water Management Area. The water courses in the mining areas are normally dry and only flows during rainy events. There is no Department of Water and Sanitation (DWS) water quality monitoring point downstream of the proposed mining area. Two upstream monitoring points were located in the Olifants River and in the Motse River. None of the target water quality parameters were exceed in the Olifants River, while in the Motse River total dissolved solids and magnesium are above the levels for domestic use as specified by DWS.

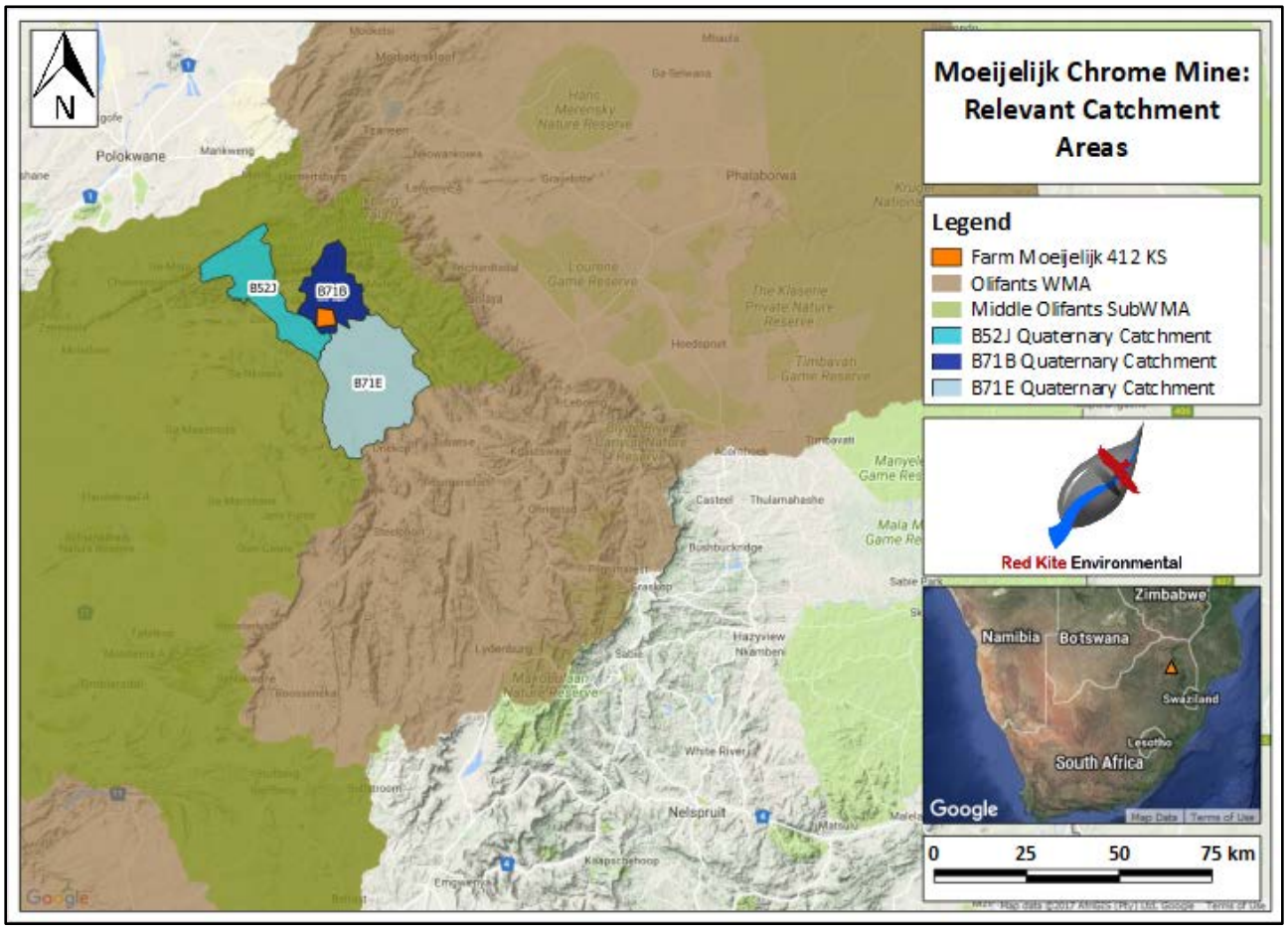


Figure 26: Catchment Areas applicable to the Study Area

9.7.2 Surface Water Features

As indicated in Figure 25 the study area is situated within the upper reaches (head waters) of Quaternary Catchment B71B of the Olifants Water Management Area. The B71B Quaternary Catchment is characterised by a network of unnamed non-perennial tributaries of the Moshashaneng River, all flowing in a general northern direction to ultimately feed into the perennial Olifants River. As indicated in Figure 26 it is evident that runoff from the Moeijelijk Chrome Mine feeds tributaries of the Moshashaneng River.

The unnamed tributaries from the adjacent farms (Zwartkoppies 413 KS) drains in a northerly direction and merge with unnamed tributaries on the farm Moeijelijk 412 KS flowing northerly still and merge with the Moshashaneng stream (originating on Wintersveld 417 KS) on the farm Jobskop 411 KS. After the merge, the Moshashaneng stream flows northerly to merge with the Olifants River on Jobskop 411 KS. The only other farm drained by unnamed tributaries of the Moshashaneng stream is Rostol 410 KS.

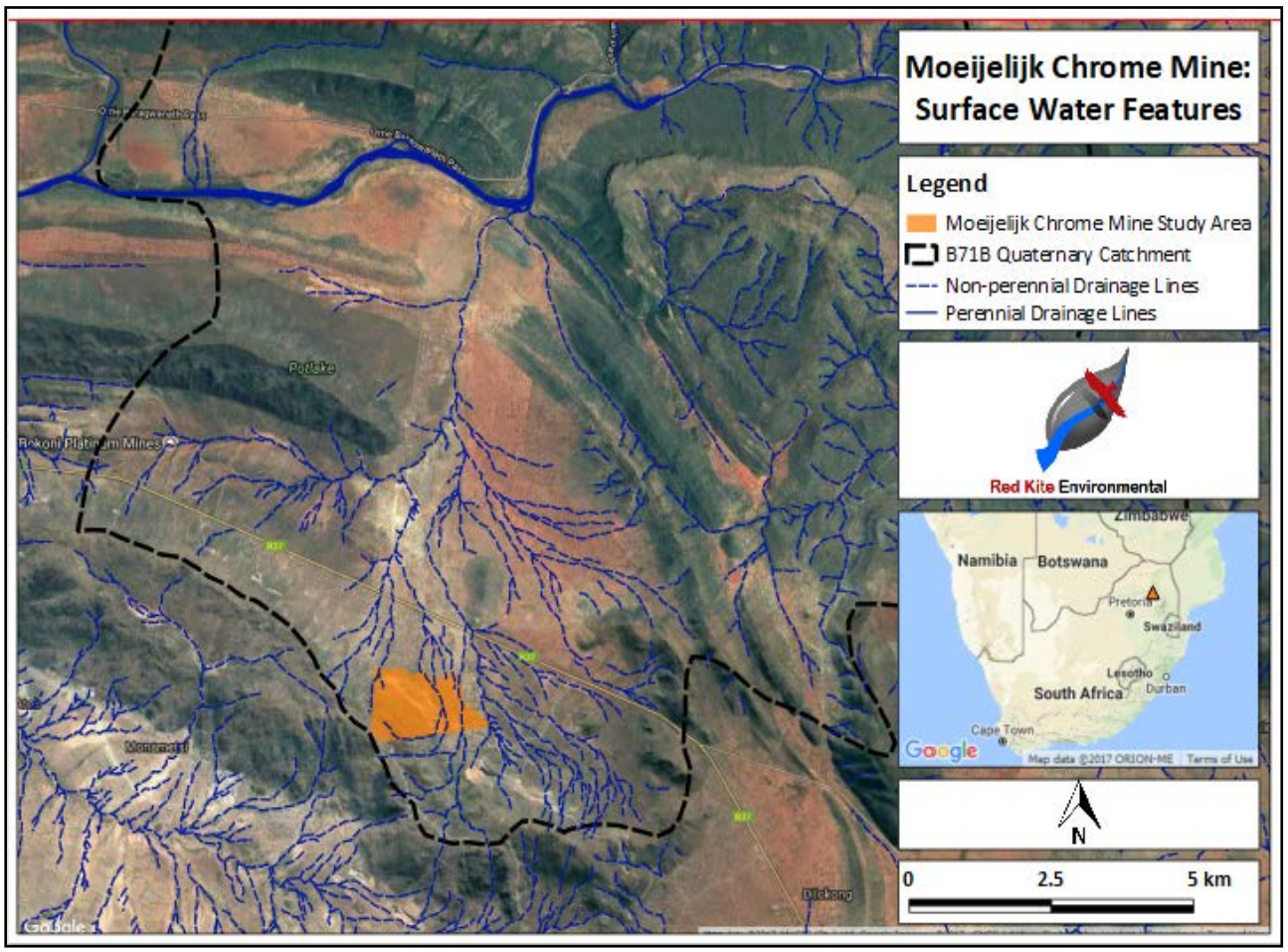


Figure 27: Surface Water Features applicable to the study area

9.7.3 Surface water Quantity

9.7.3.1 Drainage Density

The drainage density (refer to Table 16 below) for the Moeijelijk Chrome Mine area, inclusive of current and proposed activities, was determined by using the area indicated Figure 27.

Table 18: Drainage density of the Moeijelijk Chrome Mining Area (current and proposed activities)

Component	Moeijelijk (Mining Area)
Total area (km^2)	1.81
Total drainage line length (km)	3.93
Drainage density (km/km2)	2.17

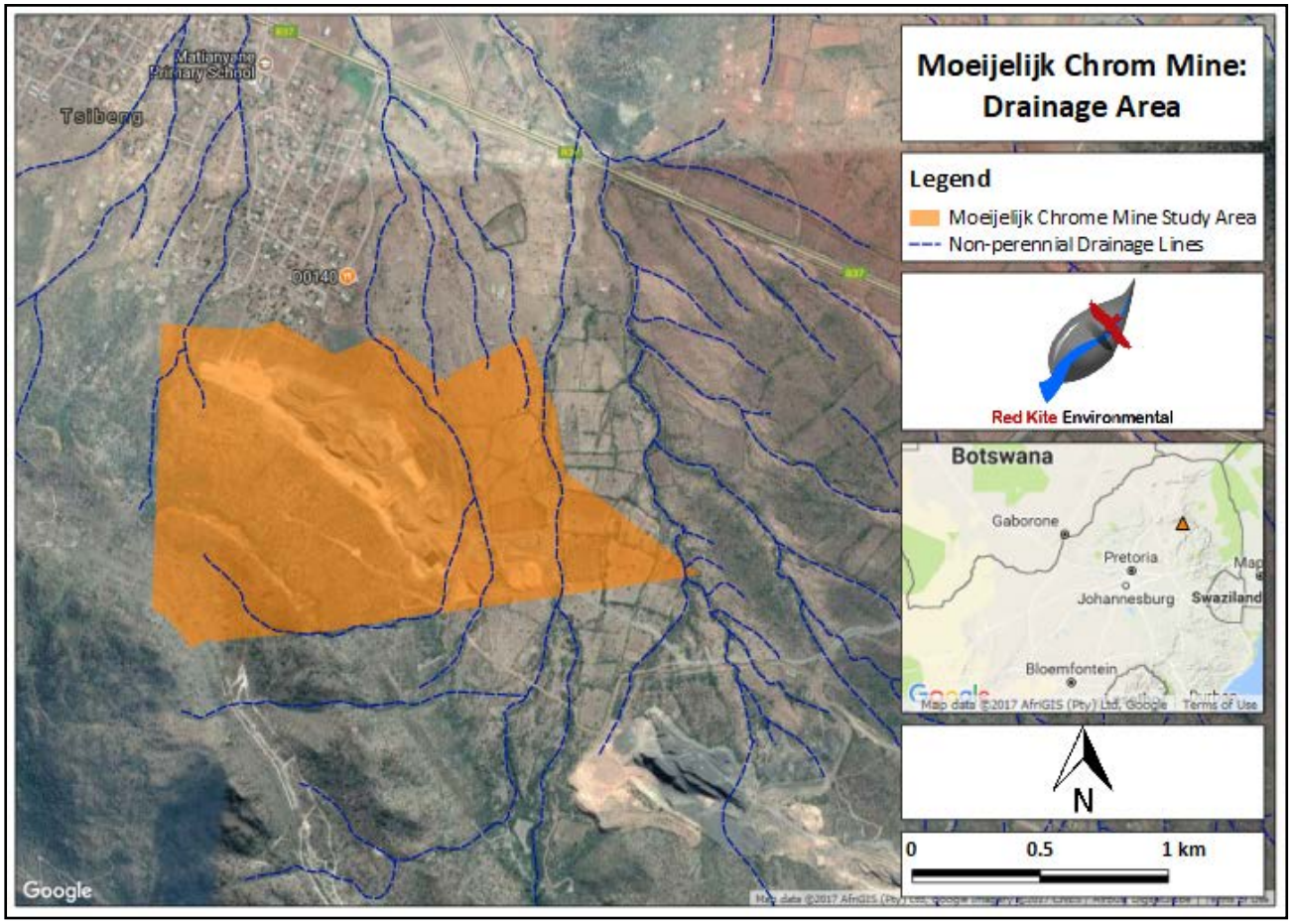


Figure 28: Area used to determine the drainage density for the mining area

9.7.3.2 Mean Annual Runoff (MAR)

Natural Mean Annual Runoff (MAR) for the Olifants WMA as per the National Water Resources Strategy (NWRS) 1st Edition (DWAF, 2004) equates to 2 705 million m^3/a of which 481 million m^3/a occurs within the Middle Olifants Sub-WMA relevant to the study area. Mean Annual Runoff for the relevant Quaternary Catchment as acquired from WR2012 is indicated in **Table 17** below. The figures in the table below indicate a 5.3 % decrease in MAR for the Quaternary Catchment from 1920 to 2009. MAR for the delineated Moshashaneng River sub-catchment is estimated at 2.149 million m^3/a, using the MAR reported for the B71B sub-catchment (Midgley *et al*, 1994).

Table 19: Quaternary Catchment Runoff Figures (WR2012)

Quaternary Catchment	Naturalised Flow MARs			
	1920 -1989 MAR (WR90) Net (mcm)	1920 - 2004 MAR (WR2005) Net (mcm)	1920 – 2009 MAR (WR2012) Net (mcm)	Change in MAR (%)
B71B	7.3	3.57	3.38	-5.30

9.7.4 Surface Water Quality

The field investigation confirmed that the non-perennial drainage lines transecting the mining area contain no water for the majority of the year. No flowing water was observed during the field investigation conducted during the wet season. No surface water samples were therefore collected for analyses.

No water quality monitoring sites are maintained by the Department of Water and Sanitation (DWS) within the

Moshashaneng River, or within the B71B Quaternary Catchment. The Moshashaneng River has its origin from out the ridge area upstream from the Moeijelijk Chrome Mine and is not influenced by, nor influences, the Olifants River upstream from its confluence. The Moshashaneng River, however, could have an impact on the Olifants River downstream from its confluence. A monitoring point, maintained by DWS, is available on the Olifants River downstream from the study area. Available background surface water quality data as obtained from the Directorate Resource Quality Services database for the above-mentioned monitoring point is presented in Table 18. All water quality data available for 2016 has been included as no data for 2017 is available.

Table 20: DWS surface water quality monitoring point downstream from the study area

Station: WMS B71_192537 Olifants River D/S of Confluence with Motse River at the Pump Station												
Date	**Parameters (mg/ℓ unless specified otherwise)**											
	Ca	**Cl**	**EC** mS/m	**F**	**K**	**Mg**	**Na**	**NH_4**	**N**	**pH** units	**PO_4**	**SO_4**
2016/01/20									0.213	8.6	0.010	85.836
2016/02/10									0.512	8.3	0.010	54.608
2016/03/16									0.430	8.3	0.010	36.116
2016/04/13									0.321	8.1	0.010	43.700
2016/05/05									0.243	8.4	0.010	48.400
2016/06/08	36.3	49.5	61.7	0.668	3.1	28.8	51	0.05	0.427	8.4	0.092	66.000
2016/07/06									0.050	7.8	0.010	74.000
2016/08/03									0.371	8.5	0.081	49.700
2016/09/07									0.225	8.4	0.099	64.600

It should be noted that no surface water will be abstracted for use in the activities. The above results have been compared to the Target Water Quality Range (TWQR) for domestic use as set out in Volume 1 of the DWS Water Quality Guidelines (DWAF, 1996a). The reason being that rural communities are found throughout the region and are most likely using water from rivers found in the region. All parameters in Table 18, excluding Calcium and Phosphorus, falls within the TWQR for domestic use and thus pose no adverse health effects to consumers.

Although calcium levels above 32 mg/ℓ up to 80 mg/ℓ show no health effect, increased scaling of household heating appliances and the associated partial obstruction of pipes occur and lathering of soap becomes impaired.

The water quality guidelines for domestic use (Volume 1) do not specify TWQR for Phosphate (PO_4). However, the water quality guidelines for Aquatic Ecosystems, Volume 7, (DWAF, 1996b) shed light in this respect. Phosphorus can occur in numerous organic and inorganic forms and may be present in waters as dissolved and particulate species. Elemental phosphorus does not occur in the natural environment. Orthophosphates, polyphosphates, metaphosphates, pyrophosphates and organically bound phosphates are found in natural waters. Phosphorus is an essential macronutrient and is accumulated by a variety of living organisms. It has a major role in the building of nucleic acids and in the storage and use of energy in cells. In unimpacted waters it is readily utilised by plants and converted into cell structures by photosynthetic action. Phosphorus is considered to be the principle nutrient controlling the degree of eutrophication in aquatic ecosystems.

In South Africa, phosphorus is seldom present in high concentrations in unimpacted surface waters because it is actively taken up by plants. Concentrations between 10 and 50 fg/ℓ are commonly found, although concentrations as low as 1 fg/ℓ of soluble inorganic phosphorus may be found in "pristine" waters and as high as 200 mg/ℓ of total phosphorus in some enclosed saline waters. The most significant effect of elevated phosphorus concentrations is its stimulation of the growth of aquatic plants. Inorganic phosphorus concentrations of less than 5 fg/ℓ are considered to be sufficiently low to reduce the likelihood of algal and other plant growth.

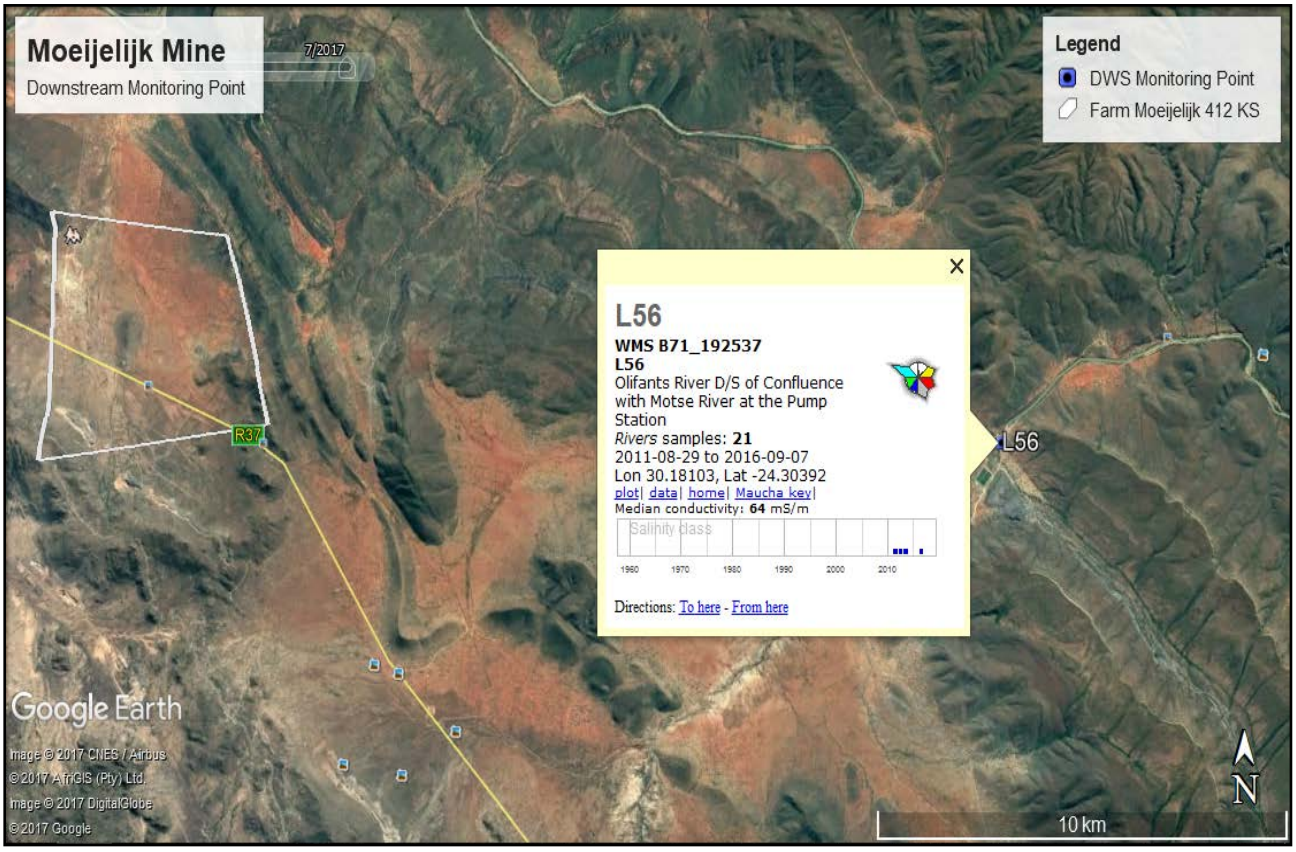


Figure 29: DWS surface water monitoring point downstream from the study area

9.7.5 Sources of Water

The current mining activities on the farm Moeijelijk 412 KS obtain water from a borehole situated on the mining site and it is expected that the expansion activities will make use of groundwater as well. An additional source of water that could be utilised for mining purposes is the contaminated water contained in the various pollution control/storm water dams. However, the area is very dry with the evaporation rate three times greater than the MAP and minimal dewatering of the opencast area is expected and as such very little water will be available for reuse from the PCDs.

9.7.6 National Freshwater Ecosystem Priority Areas

As per the National Freshwater Ecosystem Priority Areas (NFEPA) Atlas (Nel, *et.al.*, 2011) the Farm Moeijelijk 412 KS is situated within an Upstream Management Area (see **Figure 30**). Upstream Management Areas are sub-quaternary catchments in which human activities need to be managed to prevent degradation of downstream river Freshwater Priority Areas and Fish Support Areas.

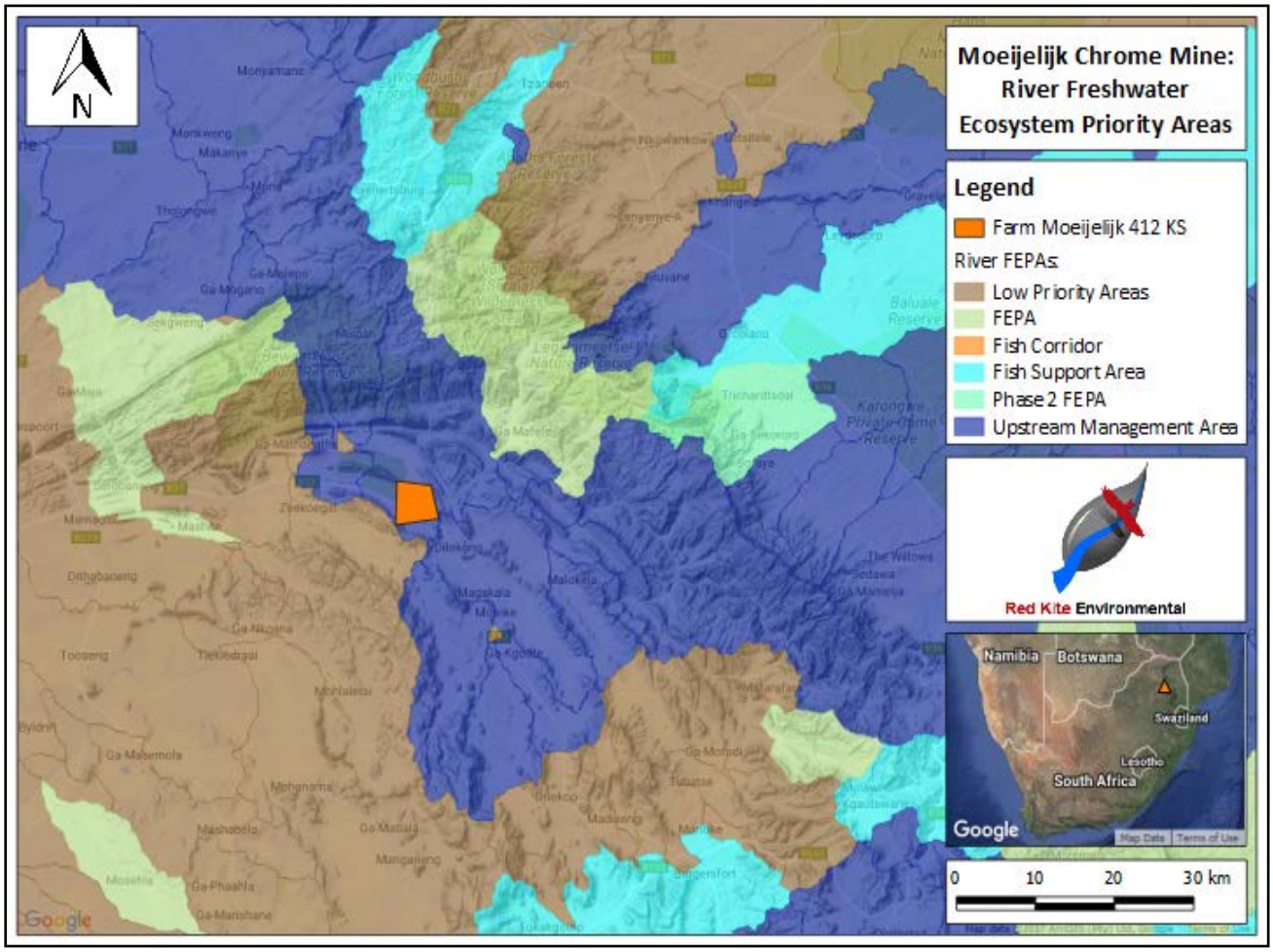


Figure 30: River FEPAs applicable to the mining right area

9.7.7 Wetlands

There are no wetlands on the study area this was confirmed by the 1:50,000 ortho-maps. However, each stream, including the riparian zone (approximately 100 meters from the centre of the stream) must be considered as a sensitive aquatic environment as seepage and drainage areas in close proximity to these seasonal streams qualify as hydromorphic grasslands.

9.8 SOILS

9.8.1 Land Types

A map was compiled using the site boundaries and land type, clay content and soil depth data obtained from the database of the ARC's Institute for Soil, Climate and Water. The map indicated that the study area consists of two land types namely Ib 190 and Ia 177. The average soil depth for the Ib 190 land type area (18.7 ha) is estimated to be shallower than 450 mm while the average soil depth for the land type Ia 177 area is estimated to be deeper than 750mm. The clay content indicated for this area shows a range of between 15 and 35% clay for land type Ia 177 and less than 15% for land type Ib 190.

It is anticipated that approximately 58% of the Ia 177 land type area is dominated by the Oakleaf soil form which consists of an orthic A horizon, overlying a neocutanic B horizon on unspecified material. Oakleaf soils have high agricultural production potential and are rather well-drained, permitting that the rainfall allows crop production. The fine sandy loam will be prone to both wind and water erosion when vegetation cover is removed during bulk sampling activities. Another 32% of the Ia 177 land type consists of red apedal, freely drained soils (dystrophic and/or mesotrophic) of the Hutton soil

form. The other prominent soil form in the land type consist of deep to very deep soil in which clay accumulation through time has resulted in the more structured soil profiles of the Valsrivier soil form (10%).

Approximately 70% of land type Ib 190 consists of rock, mainly on the hill tops. The slopes consist of shallow Hutton soil (20%) and very shallow Mispah soil form (9%).

Soil forms that may be present in smaller areas or frequency in the valley bottoms are:

- Oakleaf soil form which has been described above (approximately 0.5% of the land type unit).
- Yellow-brown apedal soils such as the Clovelly soil form (0.7%)
- Deeper lithocutanic soil of the Cartref soil form (0.2%).

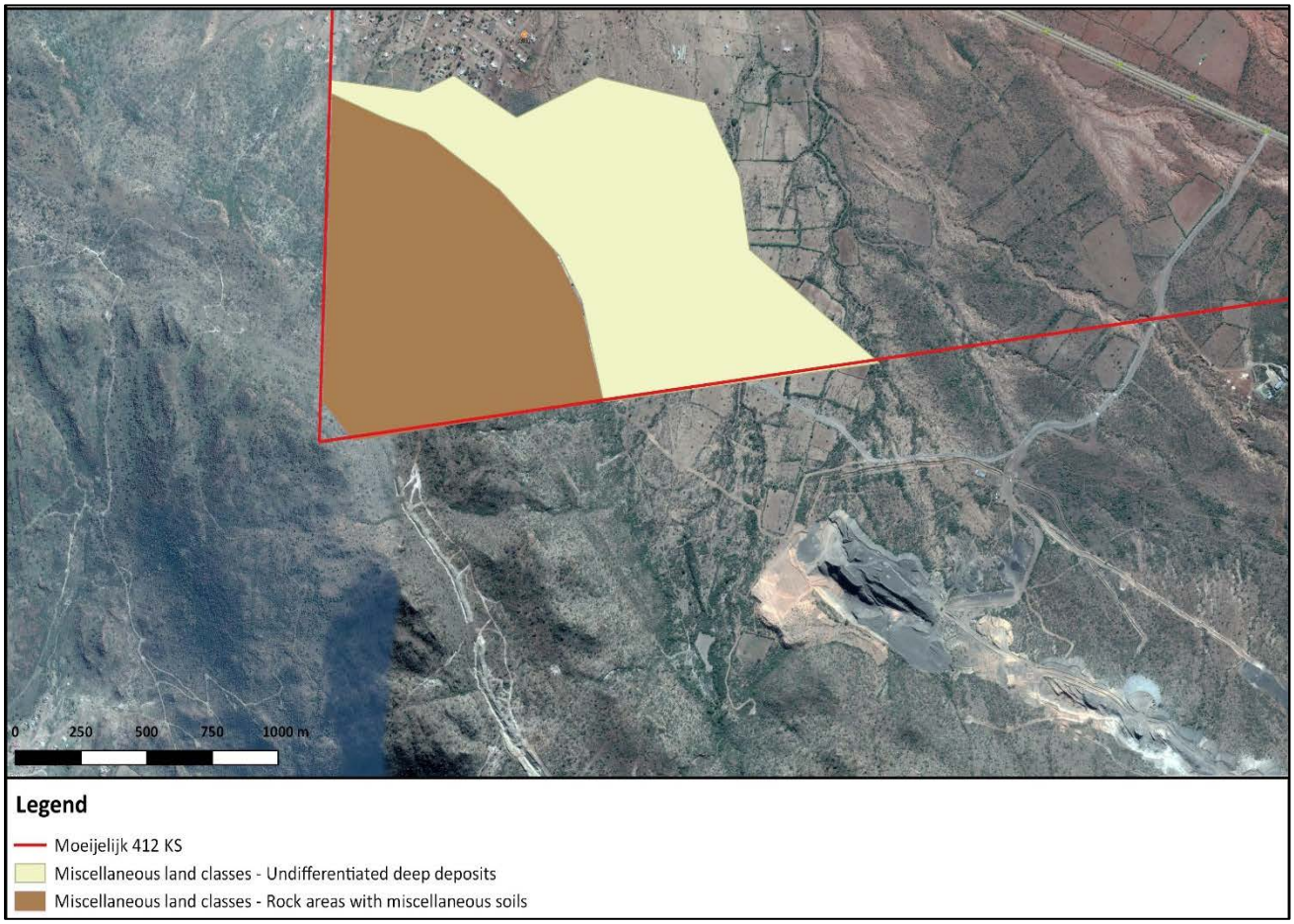


Figure 31: Land type map of the proposed Bauba A Hlabirwa Moeijelijk Project

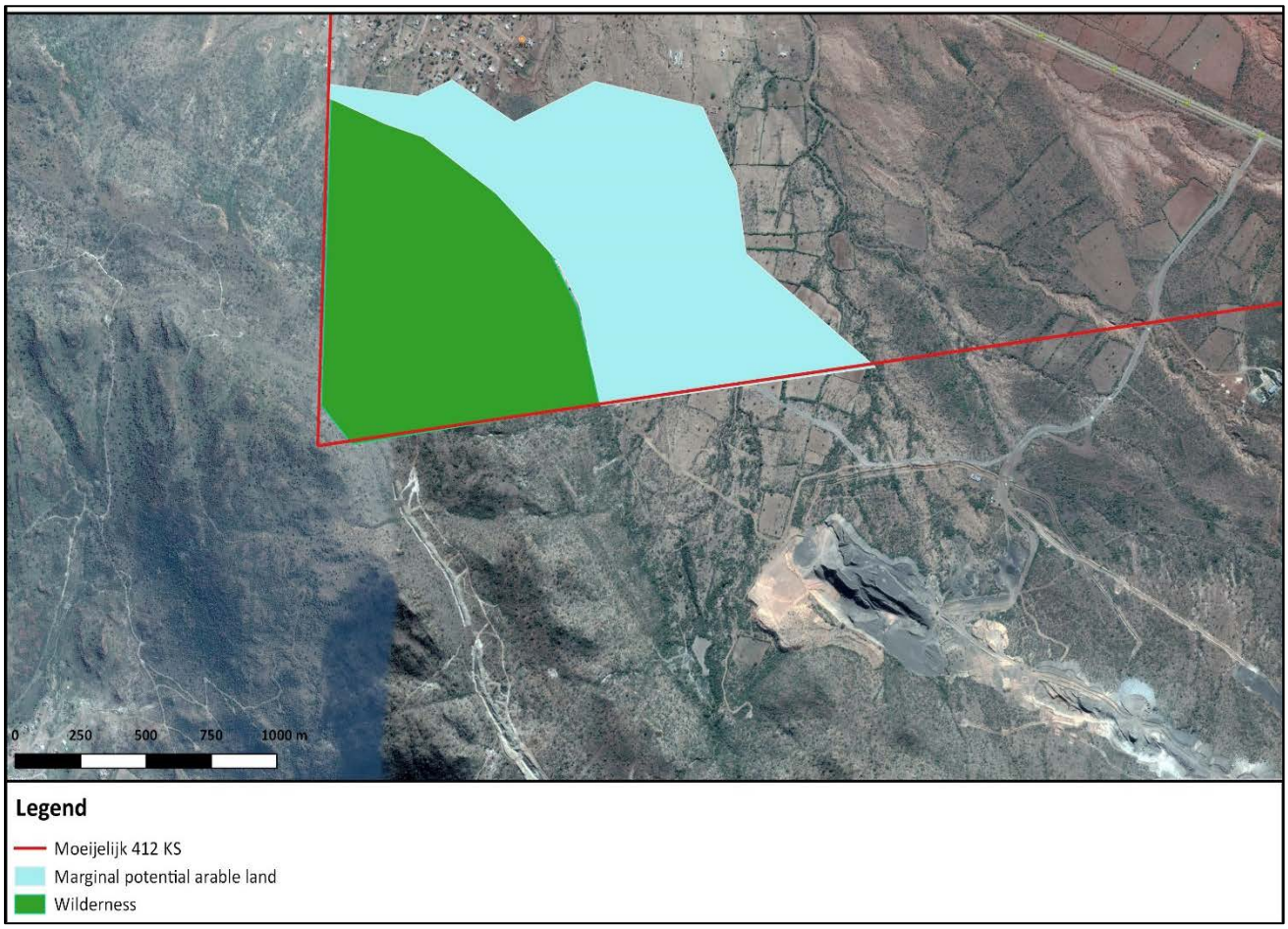


Figure 32: Soil potential map of the proposed Bauba A Hlabirwa Moeijelijk Project

1.1.1 Agricultural potential

The larger part of the site (60%) consists of deep soil with a medium to high arable agricultural potential. The Hutton and Oakleaf soil forms are highly suitable and the Valsrivier soil form medium suitable for the purpose of dry land crop production.

According to the Department of Agriculture in cooperation with the ARC–Grain Crops Institute, 350 to 450 mm of rain per annum is required for successful maize production. The study area is therefore suitable for rain fed maize production with its average annual rainfall of 559 mm. However, climatic factors like rainfall, temperature and evaporation rate may be limiting during years with drought spells or for crops with higher water requirements.

The grazing capacity for the area is 7 hectares per large stock unit. The proposed project area can thus provide grazing for around 7 head of cattle or large stock units. These large stock units can further be converted to include small grazers and browsers such as Boer goats or sheep. The equivalent for sheep or goat is 0.18 LSU.

1.1.2 Land Use

The site has a medium to high agricultural potential, depending on the rainfall. From aerial photography, old dry land crop fields can be observed to the east of the site which indicates that the surrounding land uses include rain fed crop production. In the middle of the study area is evidence of surface disturbance that might be as a result of erosion or mining and prospecting activities.

1.1.3 Land Capability

From a desktop soil evaluation, it can be derived that the land capability of about 60% of the area are soils with arable

land capability. The soil depth of more than 750 mm and the clay content of the soil make the area suitable for dry land crop production. The Hutton and Oakleaf soil forms have high arable land capability and the Valsrivier soil form has medium arable land capability. The exact land capability classification of different portions of the site will also depend on the current surface conditions of the land i.e. the presence of soil erosion.

9.9 FAUNA AND FLORA

The proposed activities associated with the reuse of the tailings material will be situated on areas already disturbed by the existing mining activities. Thus, little or no impact to terrestrial biodiversity (fauna and flora) resources are expected.

The proposed development is located within the Savanna Biome, the Central Bushveld Ecoregion and the Sekhukhune Plains Bushveld (SVcb27), and Sekhukhune Mountain Bushveld (SVcb28) vegetation unit.

Table 21: Summary of Local Municipality characteristics for Fetakgomo Municipality

Details	Fetakgomo Municipality
Farm portions	Moeijelijk 412 KS
District Municipality	Sekhukhune District Municipality
Natural Areas	74820.4 ha (67.6%)
Areas where no natural habitat remains	35926.7ha (32.4%)
Formally Protected Areas in Municipality	1 reserve covering 3113.5ha (2.8%)
Ramsar Sites in Municipality	None
Biomes	Savanna Biome
Vegetation units in study area	Sekhukhune Plains Bushveld (SVcb27), Sekhukhune Mountain Bushveld (SVcb28)
Critically Endangered Ecosystems	None
Endangered Ecosystems	None
Vulnerable Ecosystems	None
Water Management Areas (WMA)	Olifants WMA
Rivers in Municipality	3 Rivers: Lepellane; Mphogodima; Olifants
Number of wetlands in Municipality	31 covering 487 ha

9.9.1 Flora Evaluation

Two vegetation types according to Mucina & Rutherford (2006) occur in the studied area, namely the Sekhukhune Plains Bushveld (SVcb27) and the Sekhukhune Mountain Bushveld (SVcb28). About 7 km north-east of the study area, portions of the Ohrigstad Mountain Bushveld (SVcb26) vegetation type occurs.

The distribution of the Sekhukhune Plains Bushveld (SVcb27), stretches from the lower basin of the Steelpoort River and the lowland area of Burgersfort and the in the south, through the Motse River plains to Jobskop and Legwareng (south of the Strydpoort Mountains) in the north and continuing up the basin of the Olifants River to the area around Tswaing and also up the Lepellane River and Mohlaletsi River valleys. Rainfall occurs in the hot summer months with a MAP of between 500 to 700 mm, which is highly influenced over short distances by topographical features. Winters are dry with infrequent frost.

According to the Sekhukhune Mountain Bushveld (SVcb28) occurs on dry open to closed mixed micro-phyllous (small-leaved) and broad-leaved savanna in Limpopo and Mpumalanga on undulating hills and mountain sides that form concentric belts that run parallel to the north-eastern escarpment. SVcb28 is situated on high ground surrounding the vegetation of the Sekhukhune Plains Bushveld (SVcb27) and includes the steep slopes of the Leolo Mountains, the Dwarsrivier Mountains, Thaba Sekhukhune and the undulating small hills in the Steelpoort River Valley up to and

alongside the Klip River flowing past Roossenekal in the south-west.

A total of 312 plant species (from 71 plant families and 205 genera) were recorded in the studied area during the period of this study, which indicates high plant diversity in the studied area. Of this number, 101 are trees or woody shrubs (1 exotic), 59 are graminoids (none exotic) and 152 are herbs or herbaceous climbers, creepers or shrubs (11 exotic). 300 (96%) of the plant species that were recorded are indigenous to South Africa. At least 12 of these species are Red Data listed, endemic and/or protected in some or other capacity.

From available literature (Pujol 1988; Pooley, 1998; Schmidt et al 2002; Shearing & Van Heerden 1994; Van Wyk et al 1997; Van Wyk & Gericke 2003) it was established that at least 90 of the recorded plant species in the studied areas are to some extent used for some or other social activities (medicinal, food/nourishment and/or cultural).

The Sekhukhune Plains Bushveld consist of semi-arid and open valleys that are situated amongst chains of hills and small mountains that are parallel to the escarpment. Open to closed thornveld occur within the landscape. Erosion dongas have also formed in many areas especially in those areas associated with clay soils that are rich in heavy metals (Mucina & Rutherford, 2006).

Table 9 and 10 below gives a list of vegetation species that have been known to occur within the Sekhukhune Plains Bushveld biome, and the Sekhukhune Mountain Bushveld, respectively.

Figure 34:Distribution of vegetation types according to Mucina & Rutherford (2006) in the mining rights area of Moeijelijk Chrome Mine (red dotted polygon) and beyond

Table 22:Dominant and other taxa associated with SVcb27 (Mucina & Rutherford, 2006)

Trees and woody shrubs: [(d) = relatively dominant taxa]		
Vachellia erioloba	*Combretum imberbe*	*Mystroxylon aethiopicum*
V. grandicornuta	*Commiphora glandulosa*	*Philenoptera violacea*
V. nilotica (d)	*Dichrostachys cinerea*	*Ptaeroxylon obliquum*
V. tortilis subsp. *heteracantha (d)*	*Ehretia rigida subsp. rigida*	*Rhigozum brevispinosum*
Senegalia mellifera subsp. detinens (d)	*Grewia bicolor*	*Rhigozum obovatum*
Albizia anthelmintica	*Karomia speciosa*	*Schotia brachypetala*
Balanites maughamii	*Maerua angolensis*	*Searsia engleri (d)*
Boscia foetida ssp. *rehmanniana* (d)	*Maerua decumbens*	*Ziziphus mucronata*
Cadaba termitaria	*Markhamia zanzibarica*	
Herbaceous shrubs, climbers and herbs:		
Becium filamentosum (d)	*Hibiscus praeteritus*	*Pechuel-Loeschea leubnitziae*
Blepharis integrifolia	*Ipomoea magnusiana*	*Phyllanthus maderaspatensis* (d)
Coccinia rehmannii	*Jamesbrittenia atropurpurea*	*Plinthus rehmannii*
Corchorus asplenifolius	*Jatropha latifolia* var. *latifolia*	*Seddera suffruticosa* (d)
Decorsea schlechteri	*Lantana rugosa*	*Tinnea rhodesiana*
Felicia clavipilosa (d)	*Melhania rehmannii*	*Triaspis glaucophylla*
Gnidia polycephala	*Monechma divaricatum*	
Gossypium herbaceum	*Myrothamnus flabellifolius*	
Succulent trees, shrubs, climbers and herbs:		
Aloe castanea	*Euphorbia enormis* (d)	*Sarcostemma viminale*
Aloe cryptopoda (d)	*Euphorbia tirucalli* (d)	
Aloe globuligemma	*Kleinia longiflora* (d)	
Geophytic herbs:		
Drimia altissima	*Sansevieria pearsonii*	
Graminoids:		
Aristida adscensionis	*Eragrostis barbinodes*	*Stipagrostis hirtagluma*
Aristida congesta	*Panicum maximum (d)*	*Tragus berteronianus*
Cenchrus ciliaris (d)	*Paspalum distichum*	*Urochloa mosambicensis* (d)
Enneapogon cenchroides (d)	*Schmidtia pappophoroides*	
Bioreographically important taxa: (^{N} = Northern Sourveld Endemic; ^{CB} = Central Bushveld Endemic; ^{SK} = Sekhukhuneland endemic; ^{D} = Broadly disjunct distribution)		
Amphioglossa triflora ^{D} (low shrub)	*Chlorophytum cyperaceum* ^{SK} (geophytic herb)	*Orthosiphon fruticosus* ^{CB} (low shrub)
Aneilema longirrhizum ^{SK} (herb)	*Hibiscus barnardii* ^{SK} (low shrub)	*Petalidium oblongifolium* ^{CB} (low shrub)
Asparagus fourei ^{N} (low shrub)	*Lydenburgia cassinoides* ^{SK} (tree)	**Piaranthus atrosanguineus** ^{CB} (succulent herb)

The Sekhukhune Mountain Bushveld is located in the mountains and undulating hills above the lowlands of the Sekhukhune Plains Bushveld including the steep slopes of the Leolo Mountains, Dwars River Mountains and Thaba Sekhukhune as well as other small mountains.

According to Van Wyk and Smith (2001) this mountain bushveld forms part of the Sekhukhuneland Centre of Endemism, more specifically the Steelpoort Sub-centre. This vegetation is not heavily disturbed or degraded and its vast range of habitat still harbours high plant diversity with many endemics, many of which still await formal description.

Table 23:Dominant and other taxa associated with SVcb28 (Mucina & Rutherford, 2006)

Trees and woody shrubs: [(d) = relatively dominant taxa]		
Senegalia ataxacantha	*Croton gratissimus*	*Pappea capensis*
S. nigrescens (d)	*Cussonia transvaalensis*	*Pavetta zeyheri*
S. senegal var. *leiorachis* (d)	*Dichrostachys cinerea* (d)	*Rhoicissus tridentata* (d)
Bolusanthus speciosus	*Elephantorrhiza praetermissa* (d)	*Schotia latifolia*
Boscia albitrunca	*Euclea crispa subsp. Crispa* (d)	*Searsia keetii*
Brachylaena ilicifolia	*Euclea linearis*	*Sterculia rogersii*
Combretum apiculatum (d)	*Grewia vernicosa (d)*	*Terminalia prunioides* (d)
Combretum hereroense	*Hippobromus pauciflorus*	*Vitex obovata* subsp. *Wilmsii* (d)
Commiphora africana	*Kirkia wilmsii* (d)	*Ziziphus mucronata* (d)
Commiphora mollis	*Ozoroa sphaerocarpa*	
Herbaceous shrubs, climbers and herbs:		
Asparagus intricatus	*Cyphostemma woodii*	*Phyllanthus glaucophyllus*
Barleria saxatilis	*Hermannia glanduligera*	*Psiadia punctulata*
Barleria senensis	*Indigofera lydenburgensis*	*Rhynchosia komatiensis*
Berkheya insignis (d)	*Jatropha latifolia* var. *angustata*	*Senecio latifolius*
Clematis brachiata (d)	*Kyphocarpa angustifolia*	*Tinnea rhodesiana*
Clerodendrum ternatum	*Melhania prostrata*	*Triaspis glaucophylla*
Commelina africana (d)		
Succulent shrubs, climbers and herbs:		
Aloe castanea (d)	*Aloe marlothii* subsp. *marlothii*	*Sarcostemma viminale*
Aloe cryptopoda (d)	*Huernia stapelioides*	
Geophytic herbs:		
Hypoxis rigidula	*Sansevieria hyacinthoides*	
Graminoids:		
Aristida canescens (d)	*Enneapogon scoparius*	*Panicum maximum* (d)
Aristida transvaalensis	*Heteropogon contortus* (d)	*Setaria lindenbergiana* (d)
Cymbopogon pospischilii	*Loudetia simplex*	*Setaria sphacelata*
Diheteropogon amplectens	*Panicum deustum*	*Themeda triandra* (d)
Bioreographically important taxa: ([CB] = Central Bushveld Endemic; [SK] = Sekhukhuneland endemic; [Z] = Link to Zimbabwe))		
Asparagus sekhukhuniensis[SK] (woody climber)	*Lydenburgia cassinoides*[SK] (tree)	*Rhoicissus sekhukhuniensis*[S] (woody climber)
Chlorophytum cyperaceum[SK] (geophytic herb)	*Petalidium oblongifolium*[CB] (low shrub)	*Searsia batophylla*[SK] (low shrub)
Euclea sekhukhuniensis[SK] (low shrub)	*Searsia sekhukhuniensis*[SK] (tall shrub)	*Raphionacme chimanimaniana*[Z] (geophytic herb)
Taxa endemic to SVcb28:		
Acacia ormocarpoides (tree)	*Euphorbia sekhukhuniensis* (succulent tree)	*Plectranthus porcatus* (herb/shrub)

Information from SANBI's POSA data base lists 142 plant species for the QDS area (2429BD), which the mining rights area falls in.

Twelve plant species of conservation significance were recorded during the study and nine of these species were recorded on areas where proposed activities are planned at the mine. Seven of the species recorded are listed as red

data species, six tree species are listed as nationally protected and one species is provincially protected. Six of these species are also regarded as being endemic to Sekhukhuneland. No plant species listed as threatened or protected by the National Environmental Management: Biodiversity Act's list of Threatened or Protected Species, were recorded in the study area during the time of the study. The table below lists the floral species that bear conservational importance.

Table 24: List of plant species of conservation significance recorded in the study area

SPECIES NAME	COMMON NAME	SPECIES STATUS	GROWTH FORM	VU		
				1	2	3
Adenia fruticosa subsp. *fruticosa*	Sekhukhune Greenstem	NT, End	Shrub, climber		X	
Argyrolobium c.f *megarrhizum*		NT	Herb, dwarf shrub	X		
Asparagus sekukuniensis		End	Herbaceous shrub		X	
Balanites maughamii	Green-thorn	D, P(SA)	Tree		X	X
Boscia albitrunca	Shepherd's Tree	P(SA)	Tree		X	
Elaeodendron transvaalense	Bushveld Saffron / Forest Saffron	NT, P(SA)	Tree	X		X
Elephantorrhiza praetermissa	Sekhukhune Elephant- root	End	Tree	X	X	
Euphorbia sekukuniensis	Sekhukhuni-naboom	R, End	Succulent tree	X	X	
Lydenburgia cassinoides	Sekhukhune Bushman's-tea	NT, P(SA), End	Tree	X	X	
Rhoicissus sekhukhuniensis	Sekhukhune Grape	End	Woody climber	X	X	X
Sclerocarya birrea subsp. *caffra*	Marula	P(SA)	Tree	X	X	X

No plant species listed as threatened or protected by the National Environmental Management: Biodiversity Act's (Act No. 10 of 2004) list of Threatened or Protected Species (TOPS) as published in Government Gazette no. 36375 of 16 April 2013 (TOPS, 2013), were recorded in the study area during the time of the study.

Twelve exotic plant species were recorded in the study area. Four of these species are classified as alien weed and invader species and the remaining eight are common ruderal and agrestal weeds.

No species from the ToPS list (Threatened and Protected Species) as published in the Government Gazette (23 February 2007) as part of NEMBA, 2004 (Act 10 of 2004) is indicated from the list of species for the 2429BD QDS grid cell.

Two species from the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) list may occur within the area namely *Euphorbia* spp. (Family: Euphorbiaceae) and *Aloe* spp. (Family: Asphodelaceae). All these taxons are listed in Appendix II of CITES. Appendix II list species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. The taxons *Euphorbi*a spp. and *Aloe* spp. (succulent species only) are listed for all parts of the plants except for the parts as listed in CITES. The following *Euphorbia* spp. is known to occur within the QDS according to POSA online database: *Euphorbia cooperi var. cooperi, Euphorbia excelsa, Euphorbia inaequilatera var. inaequilatera, Euphorbia ingens, Euphorbia monteiroi subsp. ramosa, Euphorbia sekukuniensis and Euphorbia tirucalli*. Similarly, the following *Aloe* spp. may occur within the area: *Aloe castanea and Aloe cryptopoda*.

A sensitivity rating of High was attributed to VU1 and VU2. This is due to the relative undisturbed ("greenfields") nature of the natural habitat, high diversity of plant species and the number of red listed, protected and endemic species

occurring or potentially occurring in those areas. VU3, which is transformed from a habitat and floristic point of view is given a sensitivity rating of low. Only single individuals of some protected species still occur and it is overgrazed and overall in a poor ecological condition. Soil erosion is common in this VU and a large part thereof has been transformed as a result of cultivation or urban sprawl. Many exotic weeds and invaders further contribute to the transformed nature of this VU. The figure below presents the sensitivity of habitats in the study area relevant to the positions of proposed developments and extensions at the mine.

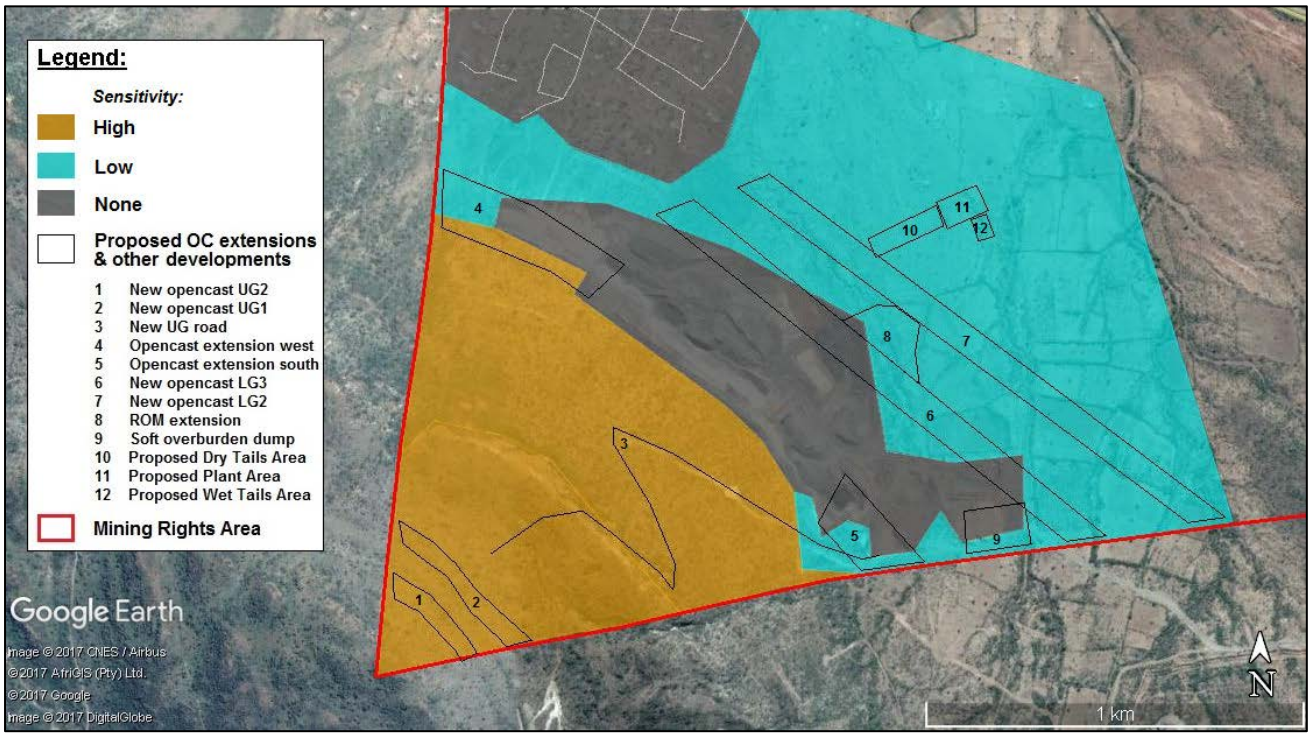


Figure 35: Relative flora habitat sensitivity map

9.9.2 Fauna Evaluation

An evaluation of the habitat type and the state of the environment leads to the assumption that there is a low wildlife diversity and low richness within this area. The indication of diversity and richness in numbers were mostly made on quantity of droppings and spoor (Stuart & Stuart, 2013) found in bare patches and visible routes travelled by these animals. The animals that could additionally occur within this area (porcupines, serval, jackals etc.) are known to have a predominant nocturnal nature and activity during daytime is not expected. The most dominant droppings found were those associated with the community domestic animals that forage in the area.

From an ecological point of view, the koppie had the most diverse habitat types and diversity of species.

- **Mammals**

The habitat type suggests sparse species diversity in terms of mammalian groups. The farm has been mostly cultivated and some of the natural habitat has been destroyed or is currently informal settlements where the communities are based, as confirmed by the CPlan and the field visit. The current land uses are subsistence farming, community settlements (houses), grazing and the existing mining activities. Sightings of mammals where limited, as was spoor or droppings. The dung pellets/droppings/scat and spoor were investigated (Stuart & Stuart, 2013). No obvious signs of a red listed mammal were found within the designated development areas. Jackal activity was found behind the koppie with droppings near the valley areas, which indicate that these animals are hunting in and about the more natural zones associated with Moeijelijk farm.

- **Aves**

Most birds expected to be seen within the area are those that utilise the unique vegetation structures and the mountainous areas which offer a variety of habitats in and surrounding the Sekhukhune mountains. Due to the disturbances of the existing mining related activities associated with Moeijelijk and the adjacent Sefateng mine, birds will prefer the more natural areas associated with the koppie and the valley to the other side of the koppie.

The area designated for the underground expansion activities and the existing infrastructure does not fall within an Important Birding and Biodiversity zone (refer to Figure 20 below) and even so, no known frog, threatened birds or known crane point localities are given within the NFEPA database for the site.

It may be concluded that all bird species recorded within the Desktop study is anticipated to occur within the areas visited (even if not confirmed during the field survey). It should be noted that habitat transformation has significantly decreased the available habitats for all species due to the community activities and the existing mines.

- **Protected Birds recorded**

Avi-fauna species that are red listed were found to occur within the koppies, specifically the cliffs. All vultures are protected in terms of either LEMA or ToPS listings. The species found in the 2017 study were the *Gyps coprotheres* (Cape Vulture). Other birds of prey, specifically the *Circaetus cinereus* (Brown Snake-Eagle) has been sighted in flight on the Koppie area.

Also, occurring on all sites investigated within the farm, were the *Corvus albus* (Pied Crow), which does not have a red listing status (Least Concern), but is listed as Protected wild animals in Schedule 3 ToPS (2015 Amendment). This bird is a regular sighting in the Limpopo province and prefers to seek habitat close to settlements over natural habitat, due to its scavenging nature.

There are several sensitive birds recorded in the baseline study that enjoys conservation status in the IUCN Red List. Species such as Cape Vulture (VU) *Gyps coprotheres,* White-backed Vulture, (EN) *Gyps africanus*, Tawny Eagle (VU) *Aquila rapax* are listed in the TOPS listing (2013). Other species such as the White-breasted Cormorant, *Phalacrocorax carbo* are listed as protected under the TOPS list (2013) and thereby enforceable under the National Environmental Management: Biodiversity Act, 2004.

- **Amphibians**

Dry tributaries which may or may not carry water after rainfall was sighted between the mine and the community, the connectivity of these are unknown and fell outside the scope of the study, but no amphibians were sighted here and the natural condition of these systems have been impacted. However, the following amphibian was given as an endemic species within the designated area during the desktop study: *Amietia delalandii* (Delalande's River Frog), but it has a status of Least Concern.

- **Reptiles**

Only two lizard species were encountered during the field survey, but the desktop study for the specific area is thought to include the species to be found within the area. The koppie area had a high availability of ridges or rocky formations which is the preferred niche for most of these species. General skink species such as the Rainbow skink (*Trachylepis quinquetaeniata*) and Eastern striped skink (*Trachylepis striata*) was readily found on all sites and has no red listed status.

The area has a red listed reptile species known to occur within the relevant QDS, namely the *Platysaurus orientalis fitzsimonsi* (FitzSimons' Flat Lizard), which is listed as Near Threatened (SARCA 2014).

Table 25:Summary List of Faunal Species Identified during the field assessment

Family	Species	Common Name	Status
INSECTA			
Pierinae	*Belenois creona severina*	African Common White	Not assessed
Pierinae	*Eurema brigitta*	Broad-Bordered Grass Yellow	
Pieridae	*Pontia helice*	Meadow white	Not assessed
Nymphalidae	*Hamanumida daedalus*	Guinea-fowl butterfly	Least Concern
Geometridae	*Rhodometra sacraria*	Vestal	Not assessed
Coleoptera	*Pachnoda sinuata*	Garden Fruit Chafer	Not assessed
Cicadidae	*unknown*	Cicadas	Not assessed
Formicidae	*Camponotus fulvopilosus*	Balbyter Sugar ants	Not assessed
Pyrgomorphidae Order: Orthoptera	*Zonocerus elegans*	Elegant Grasshopper	Not assessed
Orthoptera	*Catantops humeralis*	Grasshopper species	Least Concern
Orthoptera	*Locustana pardalina*	Brown Locust	Least Concern
Orthoptera	*Acanthacris ruficornis*	Garden Locust	Least Concern
Mantidae	*Sphodromantis gastrica*	Giant Praying Mantis	Not assessed
Coleoptera	*Mylabris oculata*	Bean Beetle	Not assessed
ARACHNIDA			
Eresidae	*Stegodyphus dumicola*	Social nest spider	Not assessed
Araneidae	*Orb spider.* spp unknown	Orb spider	Not assessed
DIPLOPODA			
Order: Spirostreptida	*Spirostreptidae* (species unknown)	Millipede	Not assessed
REPTILIA			
Scincidae	*Trachylepis punctatissima*	Montane Speckled Skink	Least Concern
Scincidae	*Trachylepis margaritifera*	Five-lined rainbow skink	Not assessed
Lacertidae	*Pedioplanis lineoocellata*	Spotted Sand Lizard	Least Concern
Colubridae	*Psammophis subtaeniatus*	Western stripe-bellied sand snake	Least Concern
MAMMALIA			
Bovidae	*Bos primigenius*	Cattle	Domesticated
Equidae	*Equus africanus*	Donkeys	Domesticated
Leporidae	*Lepus saxatilis*	Scrub Hare (Kolhaas)	Least Concern
Procaviidae	*Procavia capensis*	Rock hyrax	Least concern
Orycteropodidae	*Orycteropus afer*	Aardvark dropping sighted	Least Concern, but Protected in South Africa
Muridae	*Rhabdomys pumilio*	Four-striped grass mouse	Least Concern
AVES			
Coliidae	*Colius striatus*	Speckled Mousebird	Least Concern
Accipitridae	*Buteo vulpinus*	Steppe Buzzard	Least Concern
Dicruridae	*Dicrurus adsimilis*	Fork-tailed Drongo	Least Concern
Pycnonotidae	*Pycnonotus barbatus tricolor*	Dark-capped Bulbul	Least Concern
Ploceidae	*Ploceus ocularis*	spectacled weaver	Least Concern
Musophagidae	*Corythaixoides concolor*	Grey go-away bird (Kwêvoël/ Grey Loerie)	Least Concern
Corvidae	*Corvus albus*	Pied crow	Least Concern
Ploceidae	*Ploceus spp.*	Weaver, woven balls with no spout entrance	Least concern

- **IUCN Red Data, CITES and Endemic Species**

The only specific red listed faunal species identified to possible occur in the study area, was the lizard, *Platysaurus orientalis fitzsimonsi*, FitzSimons' Flat Lizard.

There are several sensitive birds recorded in the baseline study that enjoys conservation status in the IUCN Red List. Species such as Cape Vulture (VU) *Gyps coprotheres*, White-backed Vulture, (EN) *Gyps africanus*, Tawny Eagle (VU) *Aquila rapax* are listed in the TOPS listing (2013). Other species such as the White-breasted Cormorant, *Phalacrocorax carbo* are listed as protected under the TOPS list (2013) and thereby enforceable under the National Environmental Management: Biodiversity Act, 2004. None of these species was observed during the field assessment, but may occur in the larger area surrounding the Moeijelijk mining area.

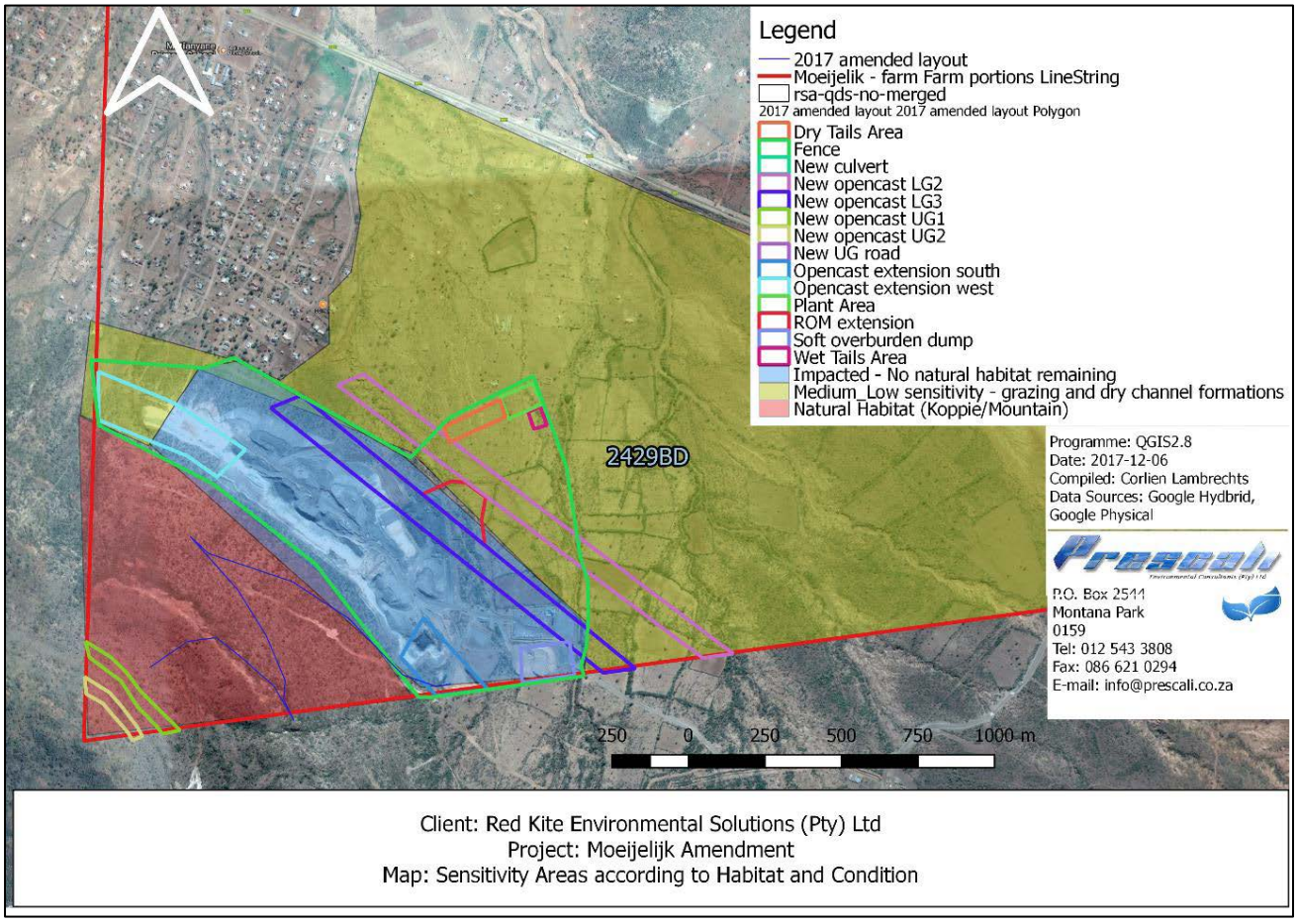


Figure 36: Sensitivity delineated according to habitat remaining and condition thereof

9.10 AIR QUALITY

No new Air Quality specialist report was conducted for the tailing backfilling project. The 2015 study for the Air Quality Impact Assessment made provision for the wash plant and tailings storage facilities, therefore the existing 2015 Air Quality Impact Assessment was deemed to be sufficient.

The 2015 Air Quality study which was used for the original application was to inform this section of the report (Eco Elementum (Pty) Ltd, 2015).

9.10.1 Regional Air Quality

South Africa is located in the sub-tropics where high pressures and subsidence dominate. However, the southern part of

the continent can also serve as a source of hot air that intrudes sub-tropics, and that sometimes lead to convective movement of air masses. On average, a low pressure will develop over the southern part of the continent, while the normal high pressures will remain over the surrounding oceans. These high pressures are known as Indian High-Pressure Cell and Atlantic High-Pressure Cell. The intrusion of continents will allow for the development of circulation patterns that will draw moisture (rain) from either tropics (hot air masses over equator) or from the mid-latitude and temperate latitudes.

Southern Africa is influenced by two major high-pressure cells, in addition to various circulation systems prevailing in the adjacent tropical and temperate latitudes. The mean circulation of the atmosphere over Southern Africa is anticyclonic throughout the year (except near the surface) due to the dominance of the three high pressure cells, namely South Atlantic High Pressure, off the west coast, the South Indian high pressure off the east coast and the continental high pressure over the interior.
It is these climatic conditions and circulation movements that are responsible for the distribution and dispersion of air pollutants within proposed Moeijelijk area and between neighbouring provinces and countries bordering South Africa

9.10.2 Baseline Data, Sampling Localities and Layout

The gravimetric dust fallout results taken during April-May 2015 over an exposure period of 30 days indicated values as little as 98mg/m^2/day to 174mg/m^2/day in general (excluding BM02 outlier) which is within the lower threshold of the residential limit of 600mg/m^2/day. The highest concentration of dust was observed next to areas of exposed soil and gravel roads which is currently being used by occupants of the land on the proposed development area.

The PM10 results taken during the May 2015 sampling period were also very low and ranged between 35ug/m^3 and 163ug/m^3. It should be noted that PM10 concentrations vary significantly as a result of not only fugitive dust emissions but also the atmospheric conditions on site. Currently all the sampling points were within the legal limit of 120ug/m^3 except BM08 at 163ug/m^3.

The results from the air quality recordings which has been taken during the month of May 2015 for active sampling and April 2015 to May 2015 for passive sampling, for all the sampled points that has been listed in the tables below.

9.10.2.1 Gravimetric Dust Fallout

Table 26: Gravimetric Dust Fallout in mg/m^2/day

Reference	Description	GPS Localities	Gravimetric Dust Fallout mg/m2/day
BM01	In proximity to office area and parking zone	24°18'12.02"S 29°57'55.21"E	174
BM02	Close to topsoil dumps and current operational area	24°18'0.37"S 29°57'39.07"E	3695
BM03	Future mining development area	24°17'49.06"S 29°57'22.18"E	Not retrievable
BM04	In close proximity to local community	24°17'43.68"S 29°57'7.08"E	124
BM05	Mountain area directly south of community	24°17'51.58"S 29°57'9.47"E	98
BM06	High up in mountain above current disturbance area	24°17'57.71"S 29°57'20.80"E	113
BM07	Close proximity to water tanks	24°18'20.87"S 29°57'40.22"E	149
BM08	On the border of the adjacent Swartkoppies mining area	24°18'21.52"S 29°57'50.14"E	103

The results obtained for the gravimetric dust fallout sampling period during the month of April - May 2015 for a 30-day exposure period on the proposed site indicated very low existing dust levels currently although the operation is already active. Only one sample was not retrievable BM03 which was situated on the Northern border between the operation and the community. The sampling stand was clearly driven over by mine vehicles during the moving of the fence line and construction of a new road. The seven remaining samples that has been obtain is however sufficient to make relevant findings regarding the baseline gravimetric dust fallout situation on site. The overall average for the samples obtained resulted in a value of 636mg/m^2/day which is almost within the lower residential threshold of 600mg/m^2/day. The dust levels currently on site is within the upper industrial limit of 1200mg/m2/day but would most probably increase as mining activities increase.

Sampling locality BM04 and BM05 which is in close proximity to the community was very low at 124mg/m^2/day and 98mg/m2/day which is a very good indication of no negative impacts as a result of the current mining during the sampling period. Sampling locality BM02 was extremely high and three times higher than the industrial limit of 1200mg/m^2/day at a level recorded 3695mg/m^2/day. This is a concern as it is within the current operational area and could be representative of future dust levels expected should no mitigation be implemented. Through implementing the management and mitigation measures contained further on in this report has it been observed previously on numerous sites that the dust fallout levels can quite easily be controlled to a level within the acceptable and/or tolerable level. The mine should investigate this further and ensure that the high dust fallout levels in this area be managed accordingly. During the sampling period active stripping and stockpiling of topsoil was taking place in very close vicinity to BM02 and has definitively contributed to the results obtained.

The remainder of the sampling points were well within the lower residential limit which. When excluding BM02 as an outlier in the data since it was placed as a control in the middle of the operational area to determine the dust generated on site, the remaining six sampling localities had an average of 126mg/m^2/day which is extremely good. It should be noted that neighboring mining activities and the various gravel roads being used in proximity to the site also contribute to the gravimetric dust fallout. There is currently no reason for concern related to gravimetric dust fallout on site except for the dust being generated in the direct vicinity of the active operation. The fugitive dust emanating from sampling locality BM02 at the operational area has dispersed to acceptable levels being sampled on the borders of the property where the dust is being blown out to the receiving environment. Increased levels of dust would therefore be expected during the windy months. The main wind directions according to the Wind Rose diagrams are in the South Western direction which is blowing away from the community and into the mountainous environment.

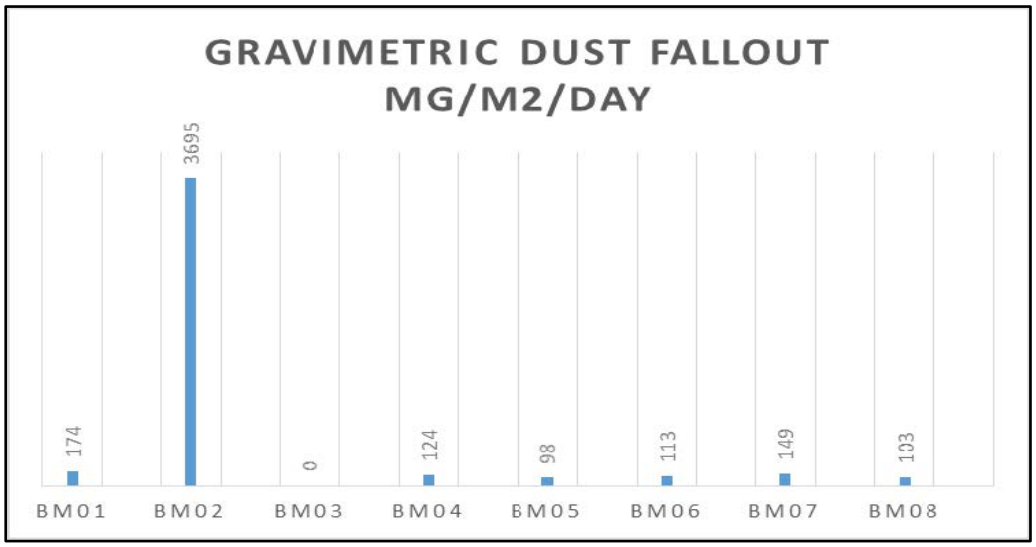
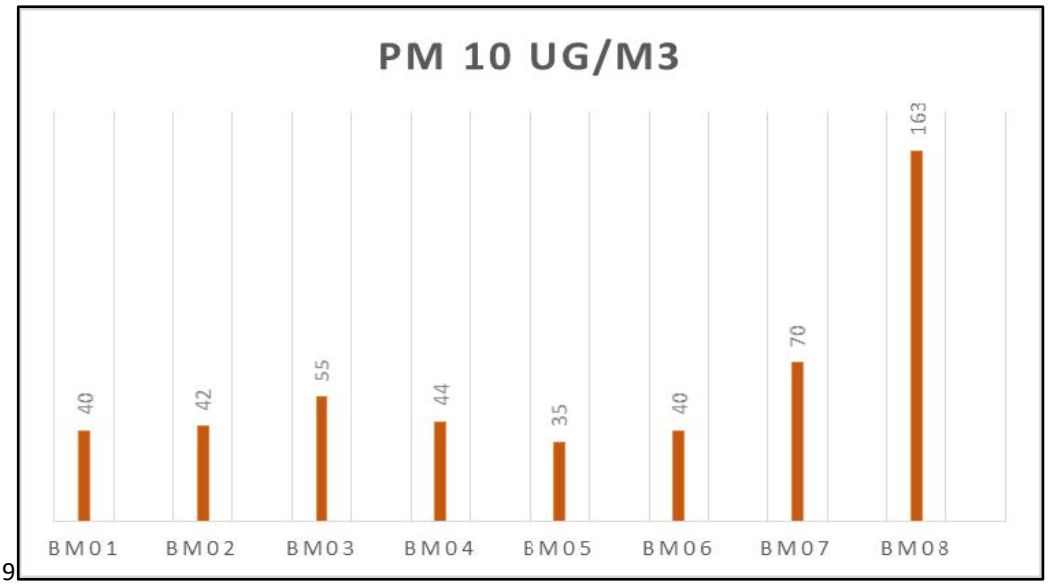


Figure 37: Gravimetric Dust Fallout in mg/m^2/day

9.10.2.2 Particular Matter PM10

Table 27: Particulate Matter PM10 in ug/m³

Reference	Description	GPS Localities	PM 10 ug/m3
BM01	In proximity to office area and parking zone	24°18'12.02"S 29°57'55.21"E	40
BM02	Close to topsoil dumps and current operational area	24°18'0.37"S 29°57'39.07"E	42
BM03	Future mining development area	24°17'49.06"S 29°57'22.18"E	55
BM04	In close proximity to local community	24°17'43.68"S 29°57'7.08"E	44
BM05	Mountain area directly south of community	24°17'51.58"S 29°57'9.47"E	35
BM06	High up in mountain above current disturbance area	24°17'57.71"S 29°57'20.80"E	40
BM07	Close proximity to water tanks	24°18'20.87"S 29°57'40.22"E	70
BM08	On the border of the adjacent Swartkoppies mining area	24°18'21.52"S 29°57'50.14"E	163



9

Figure 38: Particulate Matter PM10 in ug/m³

The particulate matter PM10 sampling that was undertaken on site during May 2015 resulted in very good and low values below the 120ug/m³ threshold overall except for one sampling locality BM08 which resulted in a value of 163ug/m³. Overall, the site performance during the sampling period in May 2015 was very good. It should be noted that grab samples were taken for 1-minute intervals at each point and results would vary during different atmospheric conditions. The site average for the eight samples taken is at 61ug/m³ which is 50% of the allowable limit and therefore within the compliance level.

The vast majority of dust from mining activities consists of coarse particles (around 40 per cent) and particles larger than

PM10, generated from activities such as the mechanical disturbance of rock and soil materials by dragline or shovel, bulldozing, blasting, and vehicles on dirt roads. Particles are also generated when wind blows over bare ground and stockpiles. These larger particles can have amenity impacts as well as health impacts. Fine particles can have health impacts and are also produced at mine sites, though they only account for about 5 per cent of the particles emitted during the mining process. Fine particles produced at mine sites are mainly from vehicle and mobile equipment exhausts. The results at BM08 was definitely influenced by vehicular movement on site as the sample was taken right next to the road on the border of the adjacent Zwartkoppies mining site which was fully operational during the sampling time.

9.10.3 Existing Sources of Emissions near Moeijelyk Chrome Mine

- **Vehicle exhaust gases**

Vehicle exhausts contain a number of pollutants including carbon dioxide (CO2), carbon monoxide (CO), hydrocarbons, oxides of nitrogen (NOx), sulphur and PM10. Tiny amounts of poisonous trace elements such as lead, cadmium and nickel are also present. The quantity of each pollutant emitted depends upon the type and quantity of fuel used, engine size, speed of the vehicle and abatement equipment fitted. Once emitted, the pollutants are diluted and dispersed in the ambient air. Pollutant concentrations in the air can be measured or modelled and then compared with ambient air quality criteria.

- **Veld fires**

Veld fires are widespread across the world, occurring in autumn, winter and early spring. In addition to controlled burning for fire-breaks and veld management, many fires are set deliberately for mischievous reasons. Some are accidental, notably those started by motorists throwing cigarettes out of car windows. Emissions from veld fires are similar to those generated by coal and wood combustion. Whilst veld fire smoke primarily impacts visibility and landscape aesthetic quality, it also contributes to the degradation of regional scale air quality. Dry combustible material is consumed first when a fire starts. Surrounding live, green material is dried by the large amount of heat that is released when there are veld fires, sometimes this material can also burn. The major pollutants from veld burning are particulate matter, carbon monoxide, and volatile organics. Nitrogen oxides are emitted at rates from 1 to 4 g/kg burned, depending on combustion temperatures. Emissions of sulphur oxides are negligible (USEPA, 1996).

- **Agricultural activities**

Little information is available with respect to the emissions generated due to the growing of crops. The activities responsible for the release of particulates and gasses to atmosphere would however include:

- Particulate emissions generated due to wind erosion from exposed areas;
- Particulate emissions generated due to the mechanical action of equipment used for tilling and harvesting operations;
- Vehicle entrained dust on paved and unpaved road surfaces;
- Gaseous and particulate emissions due to fertilizer treatment; and
- Gaseous emissions due to the application of herbicides and pesticides.

- **Current mining activities in the region of the project area**

Mining operations like drilling, blasting, hauling, collection, and transportation are the major sources of emissions and air pollution. The use of explosives releases carbon monoxide (CO). Dust particles stirred up during the mining process, as well as soot released during aggregate transport, contributes to emissions and respiratory problems.

- **Trucks passing on the gravel road, loading and offloading raw materials**

Dust emissions occur when soil is being crushed by a vehicle, as a result of the soil moisture level being low. Vehicles used on the roads will generate PM-10 emissions throughout the area and they carry soils onto the paved roads which would increase entrainment PM-10 emissions. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic.

9.10.4 Sensitive Receptors

Sensitive receptors which have been identified in the immediate vicinity of the study area and proposed project area have been listed in the table below.

Table 28: Sensitive Receptors

Sensitive Receivers	Locality	Distance from project area
Community residents	Tsibeng township	500 m
Agricultural small holdings	Surroundings	1 km

9.11 NOISE

The proposed activities associated with the reuse of the tailings material will be situated on areas already disturbed and operational areas of the existing mining activities. Thus, little or no additional noise impacts are expected.

9.11.1 Ambient sound level measurements

For ambient sound/noise level measurements within the study area historical data and was used. The measurement localities are presented in Figure 40. Measurements were conducted during 2017.

The sound level meter would measure "average" sound levels over 10 minutes periods, save the data and start with a new 10-minute measurement till the instrument was stopped.

Measurements and investigations within the community was limited by the safety concern for equipment and the consultant, rather making use of historical data and singular attended measurements taken during 29 September – 2 October 2017 in the Tsibeng community (historical data Bauba), and on 20 July 2017 near the Maandagshoek and Zeekoegat communities (singular attended measurements).

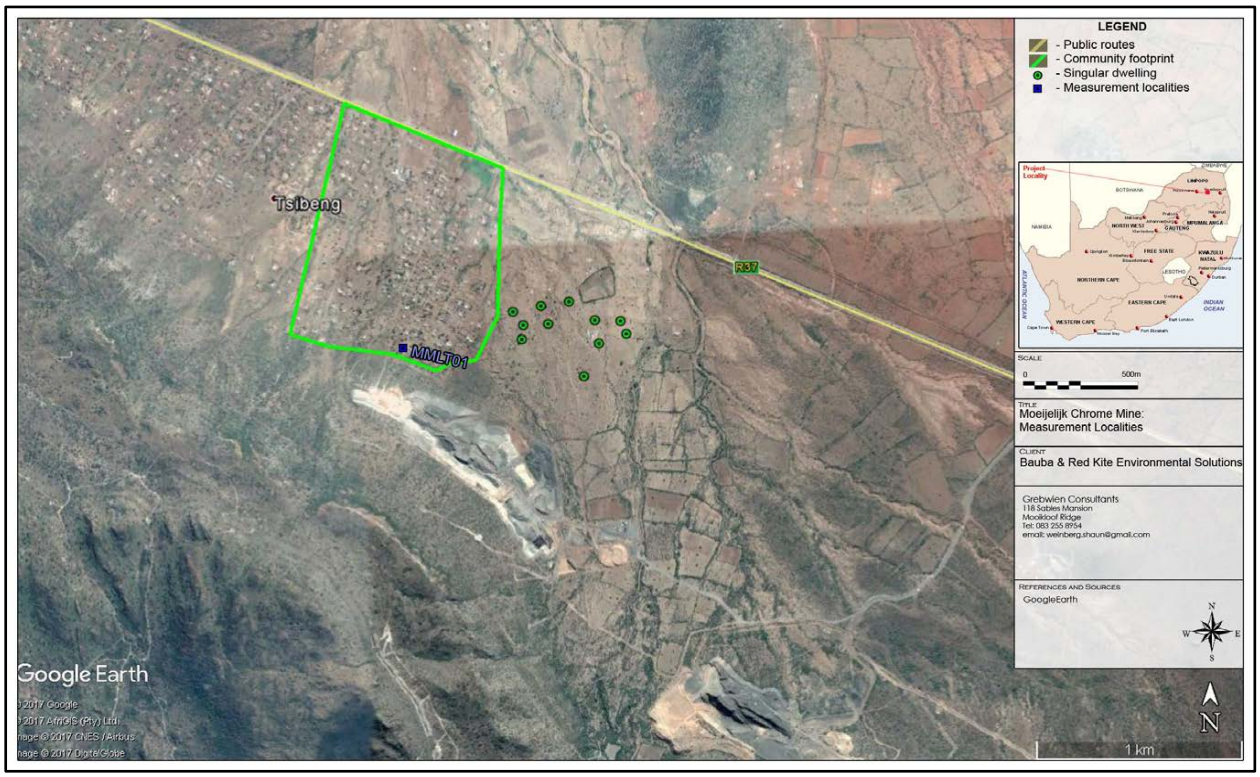


Figure 39: Measurement localities

9.11.2 Measurement Point MMLT01: Tsibeng Community

The equipment defined in Figure 31 was used for gathering data.

Table 29: Equipment used to gather data (SVAN 977)

Equipment	Model	Serial no	Calibration
SLM	Svan 977	34160	Yes
Microphone	ACO 7052E	54645	Yes
Calibrator	Quest CA-22	J 2080094	Yes

* Microphone fitted with the RION WS-03 outdoor all-weather windshield.

The measurement location was selected to be reflective of the environmental ambient sound levels within the community. Refer to Table 31 highlighting sounds heard during equipment setup, collection and days it was calibrated/inspected. It also provides information on intervening environmental factors as well as alternative measurement localities.

Table 30: Noises/sounds heard during site visits MMLT01

Selected measurement locality - intervening environmental factors			
Community member near open cast pits.	An open field in the community was sought, with the front garden of a dwelling close to operations selected. Domesticated animals (chickens, cows, dogs etc.) were seen around the dwelling (relevant for animal noise influences).		
Alterative measurement localities - intervening environmental factors			
Other dwellings	Above locality was deemed ideal for measurements as well as been a safe locality for the equipment.		
		During Deployment	**During Collection**
Magnitude Scale Code: **Barely Audible** **Audible** **Dominating or clearly audible**	**Faunal and natural**	Bird call	Bird call and insect communication.
	Residential	Domesticated animal sounds (dogs, cattle etc.). Community communication at dwelling and in surround areas. Music playing at a community dwelling.	Domesticated animal sounds (dogs, cattle etc.). Community communication at dwelling and in surround areas. Music playing at a community dwelling.
	Industrial & transportation	R37 and local traffic audible within the community	R37 and local traffic audible within the community

9.11.2.1 Impulse (SA Legislation), Fast (IFC Criteria) & Statically Values

Impulse equivalent sound levels $L_{AIeq,10min}$ (South African legislation in 10 min. bins) and fast equivalent sound levels $L_{AFeq,10min}$ (International guidelines in 10 min. bins) are presented in Figure 41 and Table 32 below. Also presented in the table below are the maximum (L_{Amax}), minimum (L_{Amin}) and 90th percentile (L_{A90}) values. The L_{A90} level is presented in this report to define the "background ambient sound level", or the sound level that can be expected if there were little single events (loud transient noises) that impacts on average sound level. $L_{Aeq,16hr}$ day and $L_{Aeq,8hr}$ night (South African Rating level $L_{Rd/n,}$ 16 & 8 hr. equivalent) and $L_{day,}$ $L_{evening}$ and L_{night} (ISO/European Union and IFC: General EHS Guidelines, 12, 4 & 8 hr. equivalent values) are presented in Figure 41 and Table 32.

L_{A90} levels indicated background noise levels could be low during the dead-of-night hours. Impulse events (L_{AMAx}) had the potential to influence 10 min fast and impulse data. There were less than 10 L_{AMax} events during the night-time period (event where the noise levels exceeded 65 dBA at least once during a 10 minute measurement) where it may become an

annoyance during a peaceful time or when rest is sought [1].

Table 31: Impulse (SA), fast (IFC) and satistical values

	L_{AMax}	L_{AIeq}	L_{AFeq}	L_{AF90}	L_{AFmin}
Day ave.	-	55	50	36	-
Night ave.	-	49	44	32	-
Day min.	-	36	29	-	17
Day max.	93	77	73	-	-
Night min.	avv-	28	23	-	17
Night Max.	93	73	68	-	-
LR.day 1	-	57	51	-	-
LR.night 1	-	57	53	-	-
LR.day 2	-	61	54	-	-
LR.night 2	-	56	51	-	-
LR.day 3	-	63	59	-	-
LR.night 3	-	58	53	-	-
LR.day 4	-	61	57	-	-

[1] World Health Organization, 2009, "*Night Noise Guidelines for Europe*"

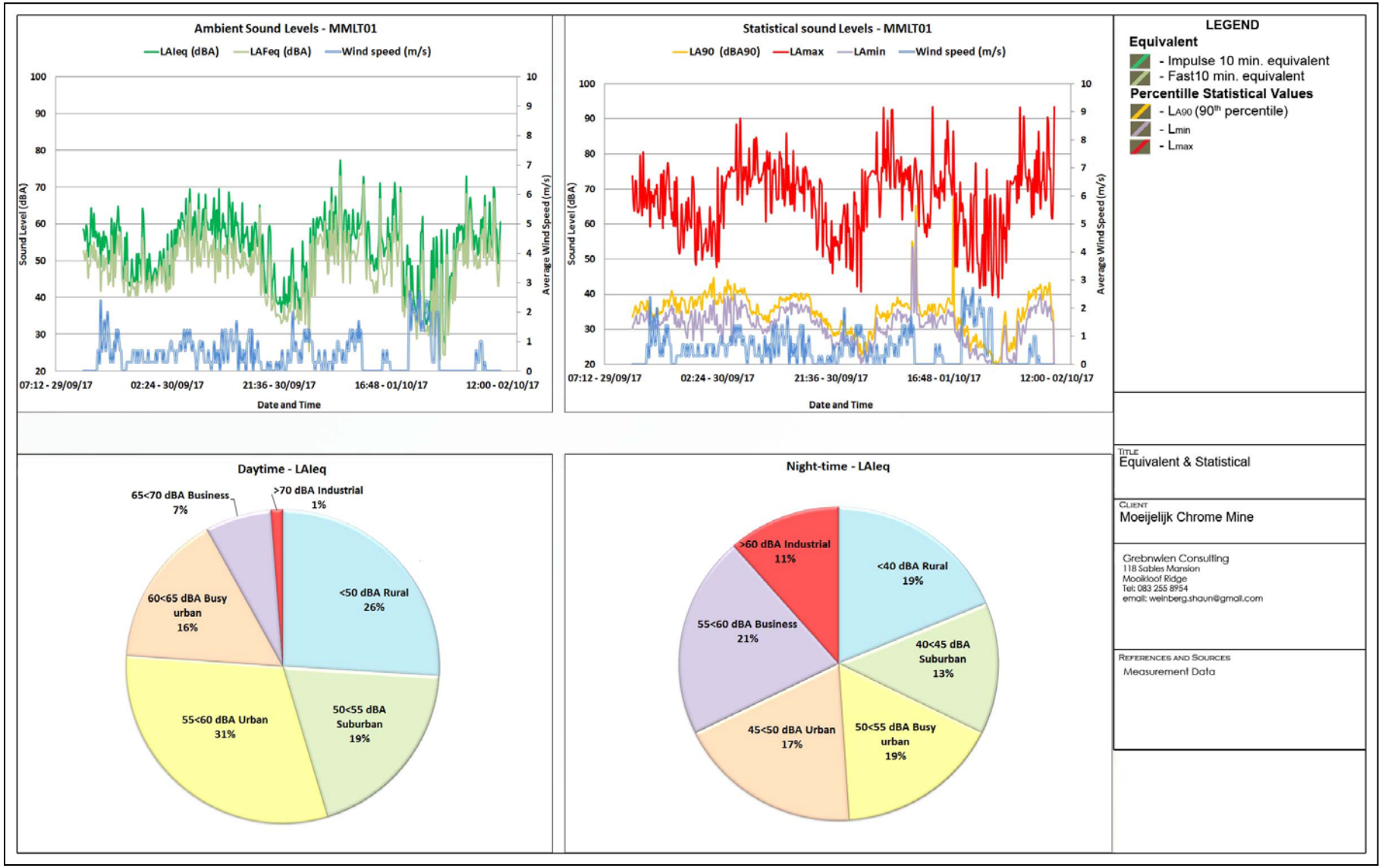


Figure 40: Impulse (SA), fast (IFC) & stastistical values

9.11.2.2 Octave Frequencies

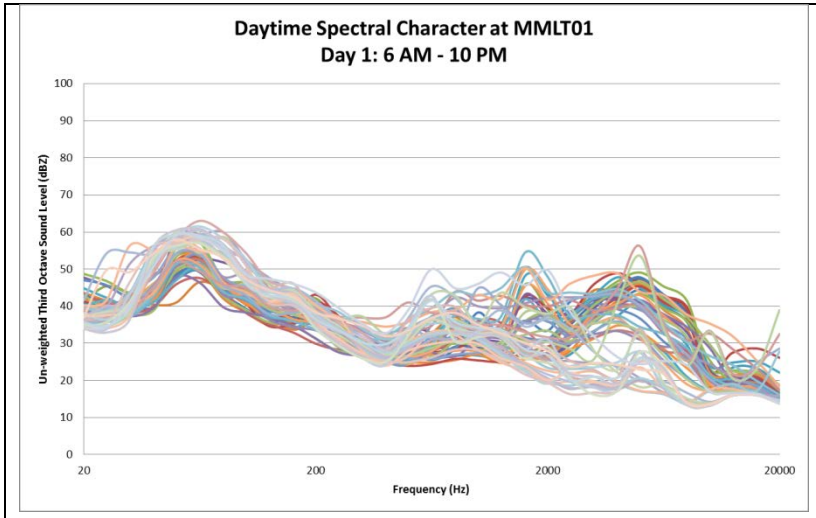
Octave data is presented in the tables to follow and discussed further below.

Lower frequencies (20 – 250 Hz, although low frequency is 100 Hz or below): This frequency band is generally dominated by noises originating from anthropogenic activities (vehicles idling and driving, pumps and motors, etc.) as well as certain natural phenomena (wind, ocean surf splash etc.). Motor vehicle engine RPM (revolutions per minute, 1000 - 6000 rpm [2]) mostly convert to this range of frequency. Lower frequencies also have the potential to propagate much further than the higher frequencies. Peaks and troughs were measured in this range, with the 50 Hz peak being the most constant. The peaks would be from local dwelling infrastructure (e.g. condenser unit from air-conditioning unit) as well as road traffic (vehicle RPM) from local or regional roads (e.g. R37 route).

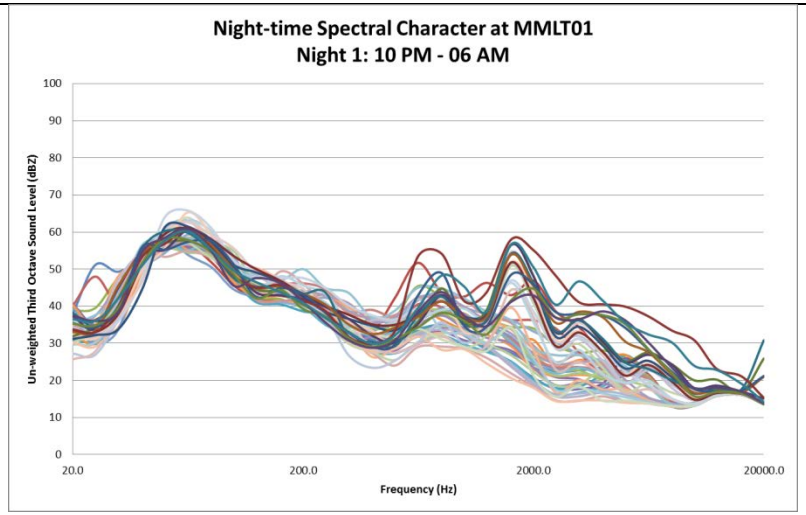
Third octave surrounding 1,000 Hz: This range contains energy mostly associated with human speech (350 Hz – 2,000 Hz; mostly below 1,000 Hz) and dwelling noises (including sounds from larger animals such as cattle, dogs, goats and sheep). Road tyre interaction also contributes to this range from road network activities. At times large magnitude peaks and troughs were measured. Peaks and troughs would be from dwelling related sounds (e.g. communications near the equipment, dogs barking) or from road tyre interaction from the R37 route.

Higher frequencies (2,000 Hz upwards until ultrasound range): Smaller faunal species, including animals, birds, frogs, crickets and cicada would use this range as the dominant frequency to communicate, hunt with etc. This could include male grasshoppers chirping at higher frequencies due to increased surrounding temperatures, mating season of a specific faunal species, insects near a wetland or before/during a drizzle/rain shower, cicada, chirping or dawn chorus from birds during early morning hours etc. Natural faunal noise fluctuates depending on seasonal changes. Tones and harmonics [3] are also likely to be measured in this range if faunal communication is prevalent. Ambient noise levels during early morning can also increase due to dawn chorus [4]. Peaks in the higher frequency and ultrasound range were measured (on occasion a potential associated tone). Faunal communication (birds, cicada, crickets etc.) would contribute to this range.

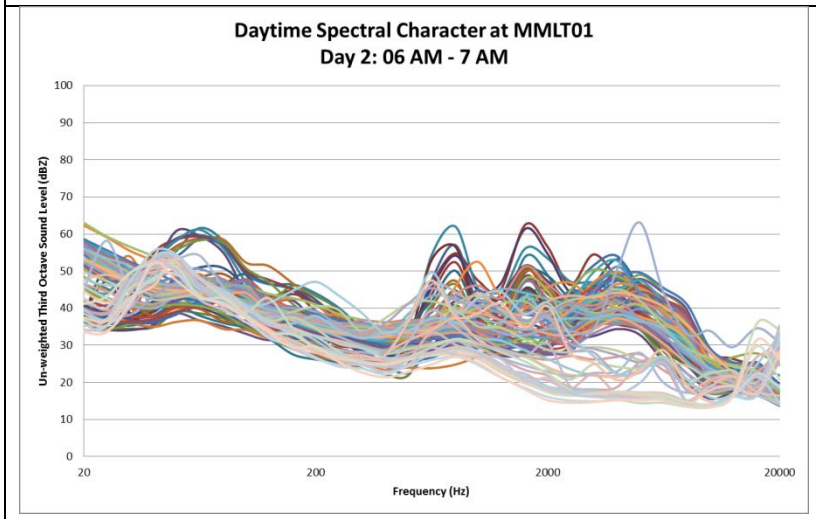
[2] Mechanical Engineering Conversion Factors, Dr. K. Clark Midkiff
[3] SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'. Pg. 34
[4] Manoj Singh *et al. 'Ambient noise levels due to dawn chorus different habitats in Delhi'*. Environment & We An International Journal of Science & Technology. Pg. 124 – 125.



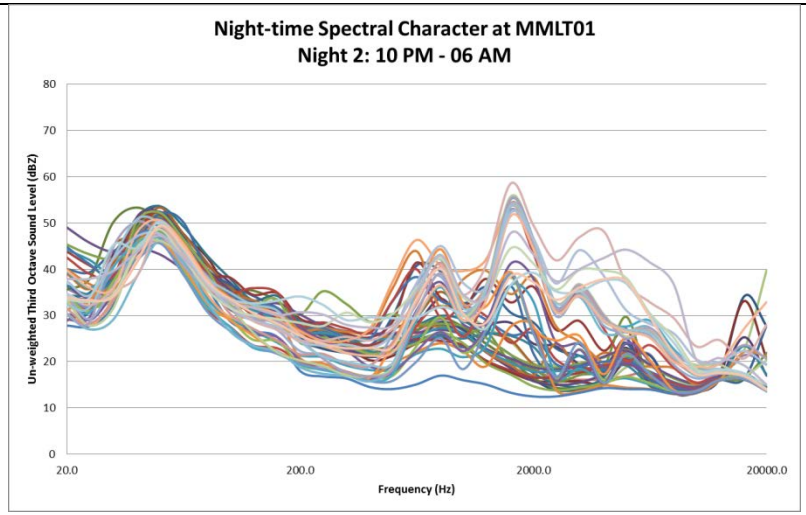
Spectral frequencies – MMLT01, Day 1



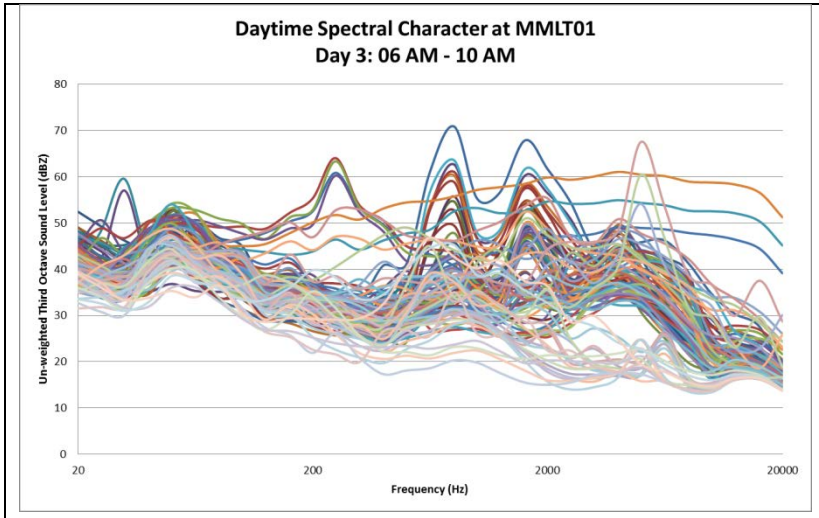
Spectral frequencies - MMLT01, Night 1



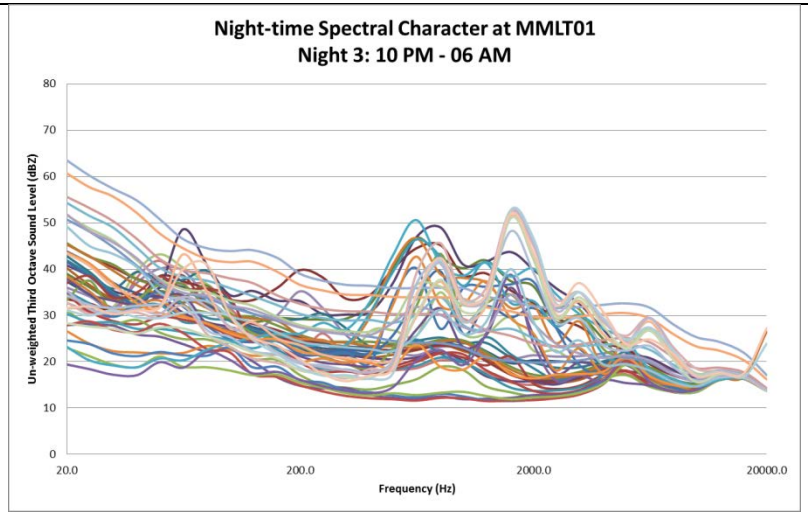
Spectral frequencies - MMLT01, Day 2



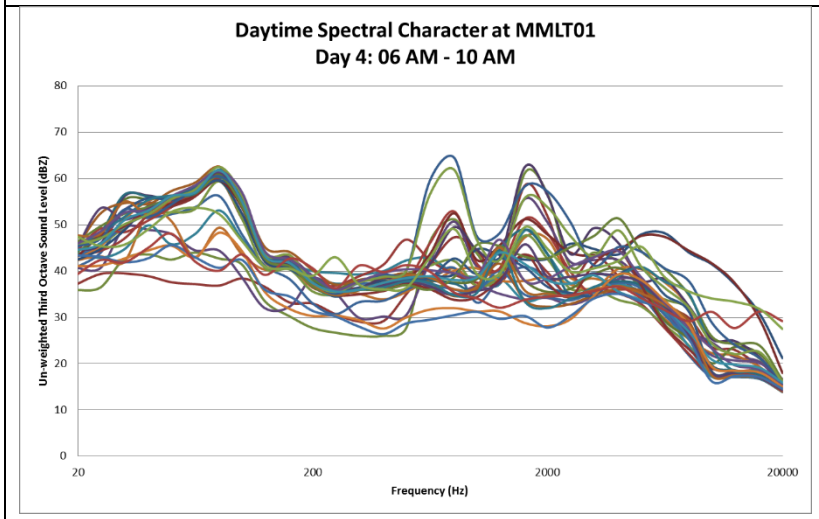
Spectral frequencies - MMLT01, Night 2



Spectral frequencies – MMLT01, Day 3



Spectral frequencies - MMLT01, Night 3



Spectral frequencies - MMLT01, Day 4

9.11.3 Ambient Sound Levels – Findings & Summary

A summary of all L_{Req} based on L_{AIeq} measurements is presented below.

9.11.4 SANS 10103:2008 typical Rating Levels & ISO/European Union and IFC: General EHS Guidelines

The resulting measurements indicated the following regarding the residual noise levels (baseline):

- 10-minute measurements indicated a rural or higher (suburban etc.) rating level, however as high as industrial was achievable during both day and nights;
- Considering $L_{Rd/n}$ measurements, the area would be high, such as an urban or busy urban setting;
- Based on the above a worst-case (precautions) low rating level of suburban was selected to define the baseline rating level.

The rating selected is therefore:

- "Suburban Noise Districts" (50 and 40 dBA day/night-time Rating Level - SANS 10103:2008);
- Certain areas (closer to road transportation networks) will have a higher rating than suburban;
- "Equator principles" (55 and 45 dBA day/night-time limits i.t.o. IFC Noise Limits).

9.11.5 Noise Sensitive Developments

Residential areas and potential noise-sensitive developments/receptors were identified using tools such as Google Earth® within up to 1,000 m (recommendation SANS 10328:2003) from closest development infrastructures. Receptors were further defined by site visits (during various measurement dates) as well as information obtained from discussions with the developer and surrounding receptors.and the potential noise sensitive receptors are presented in Figure 20 below One receptor/community is within the study area, namely the Tsibeng community.

9.11.6 Other Noise Sources

From available Google Earth® maps there exists mining operations further to the south-east of the study area. It is unsure of the scope of works of this industry and will be further investigated during the Environmental Impact Assessment phase. The mining operations are however well over 1,000 m from identified receptors.

Increased noise levels are directly linked with the various activities associated with the construction of the proposed facility and related infrastructure, as well as the operational phase of the activity.

9.11.7 Potential Noise Sources: Operational Phase

- **Haulage roads**

Two separate scenarios were investigated namely 10 and 30 heavy vehicles per hour. Road paving for the haul routes will consider unpaved (dirt) roads. From a noise perspective, unpaved roads can create louder noise levels than paved routes (especially if the unpaved route is badly maintained or if the paved route considers factors to reduce noise levels). However, noise levels relating to the road paving generally depends on traffic exceeding speeds of app. +60 km/h. Mine roads usually are managed at 60 km/h (health and safety related) and thus the paving option will not play a major role in the noise levels.

- **Discard/Mineral Residue Deposits Management**

For a designed scenario, the ADT will operate as close to the receptors as feasible, while remaining on the project footprint. It should also be noted that berms would likely be implemented on the footprint of the project (e.g. a 2-m high berm on project footprint), however noise sources can extend over these berms (e.g. exhaust port above cabin of heavy equipment). A correction for berms and stockpile slopes was considered.

During this phase surrounding berms, highwalls and stockpiles will have been developed. Berms and highwalls can provide an acoustical buffer to noise from noise source to receivers within the study area, if located correctly. As a

precautious approach, the modelled scenario considered the tip of the open cast with no berm (noise source on a high point above berms and developed highwalls). The SPL mentioned in the construction section was used for assessment.

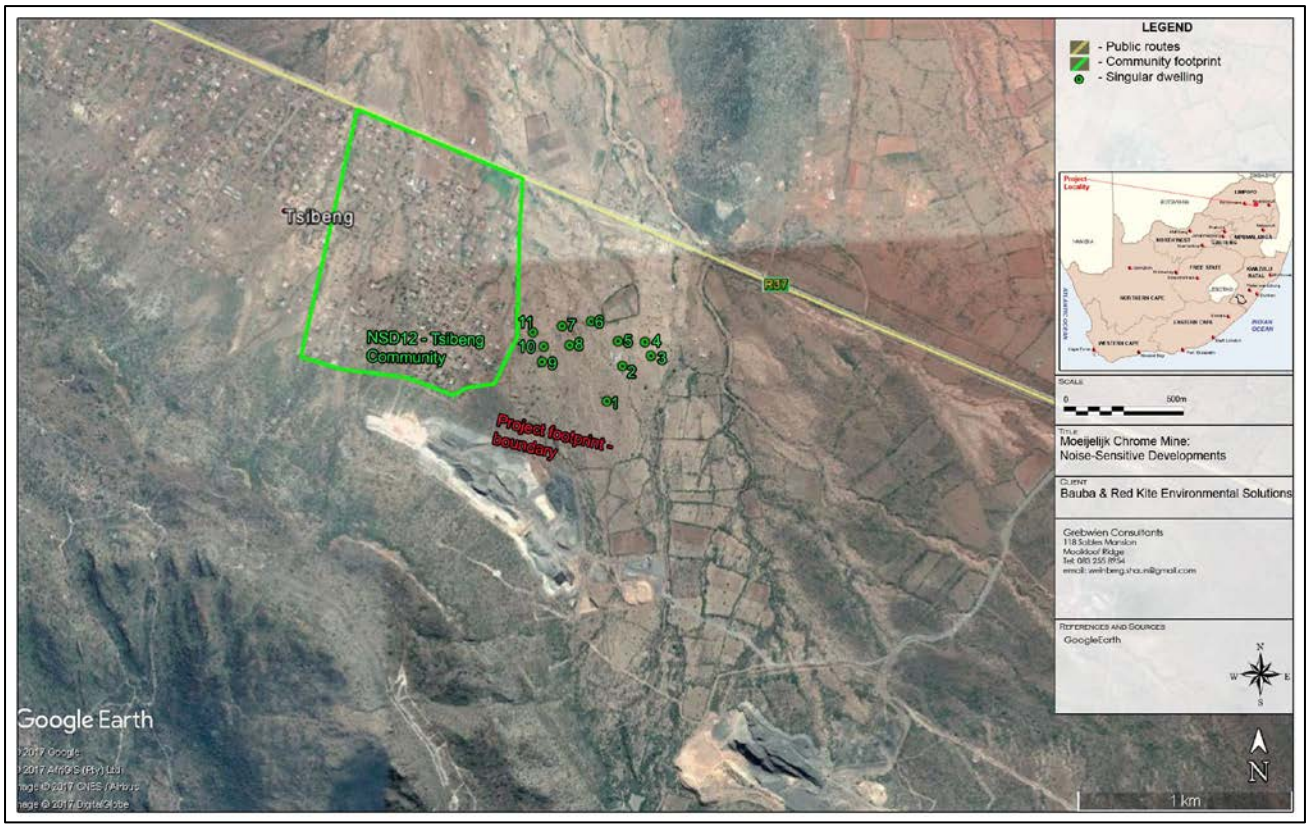


Figure 41: Map of Noise Sensitive Receptors within the study area

9.12 VISUAL AESTHETICS

The proposed activities associated with the reuse of the tailings material will be situated on areas already disturbed by the existing mining activities. Thus, little or no additional visual impacts are expected.

Visual resources originate from the natural environment, as it is shaped by topographical features and vegetation cover. The region is characterised by an undulating topography with prominent koppies and ridges (where the site location is located). Combined with wide plains of sourish grassland, and interspersed with mixed bushland, a unique landscape with coherent visual character is formed, providing aesthetically pleasing views in places.

The location of a town (Tsibeng) within 500 m from the development site, as well as existing infrastructure such as transmission lines, small agricultural lands and the existing opencast chrome mine (Zwartkoppies) to the South East of the proposed site have collectively established visual impacts in the region, which may provide some visual absorption capacity to mitigate the visual impact of the mining area.

Visual receptors include residents in Tsibeng Township and on farmsteads, visitors to guest houses and travellers on the R37 and other roads in the area.

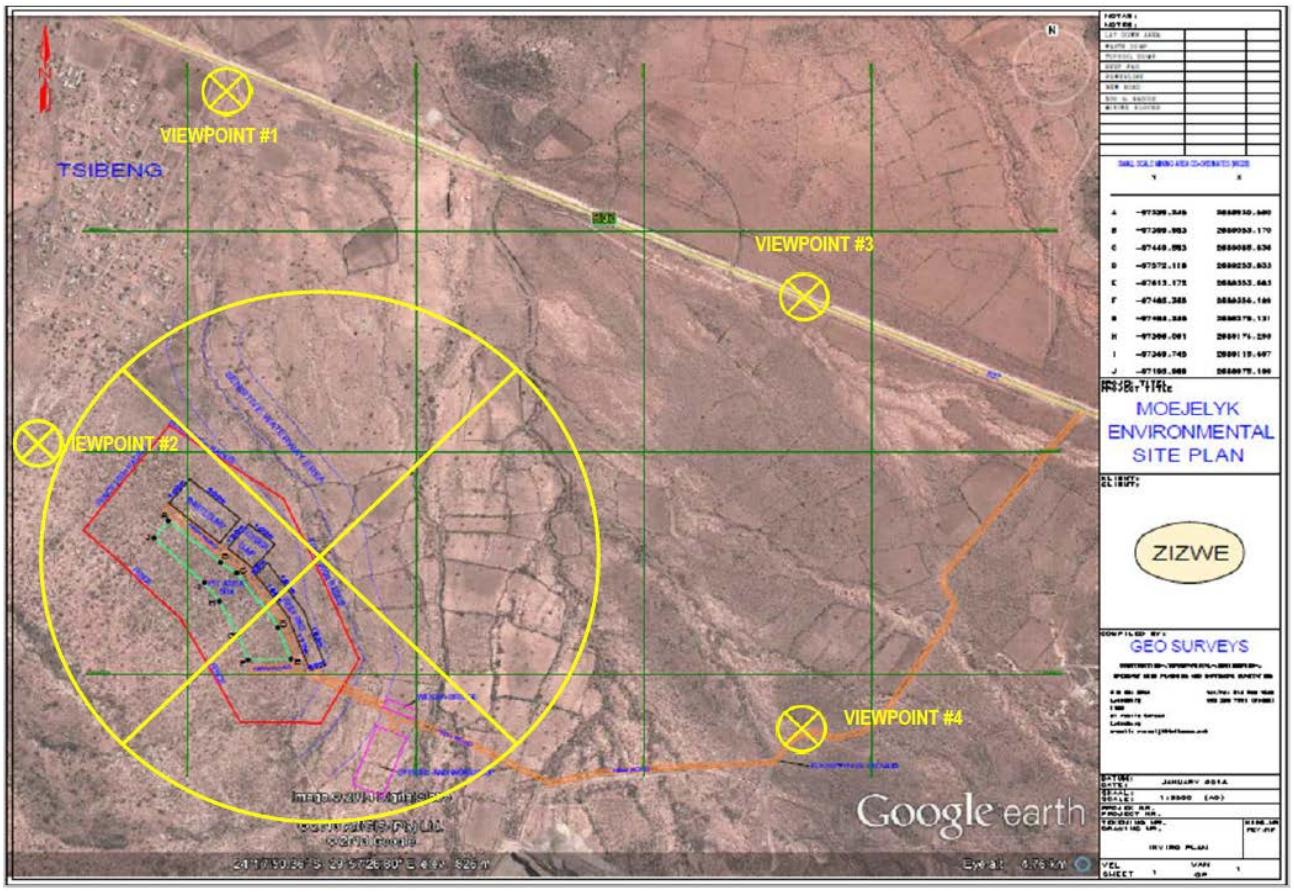


Figure 42: Proposed viewpoints of site layout

9.12.1 Visual Sensitivity

Residential areas and potential visual-sensitive receptors were identified using tools such as GIS Viewsheds and Google Earth® imagery with a 15km radius and height of 20m. This was supported by a site visit to confirm the status of the identified sensitive receptors.

Four receptors in the study area were numbered from VIEWPOINT01 to VIEWPOINT. Some of these numbers represent the closest dwelling from a community to the development.

The reason for the site visit was to establish visual confirmation of the identified sensitive receptors, game farms, guesthouses, nature reserves and the presence/existence of derelict or abandoned dwellings, small dwellings that could not be identified on the aerial image and dwellings that might have been constructed after the date of the aerial photograph. The status of the building (derelict, commercial, industrial or residential) needed to be established as well.

The study area concerns a number of dwellings or potential visual-sensitive receptors in the vicinity of the proposed development. The study area is further described in terms of the surface infrastructure and environment that may contribute or change the visual character in the area.

Sensitive receptors which have been identified in the immediate vicinity of the study area and proposed project area have been listed in the table below.

Small Local Community	North of study area	229 m
Closest subsistence farming	East of study area	200m
R 37 Regional Road	North east of the study area	1.430 Km
Adjacent Mine – Zwartkoppies Mine	East of the study area	1.6 Km
Small local community across the R37 – Ga- Wannankaya	North of study area	2.753 Km
Potlake Nature Reserve	North west of the study area	4Km

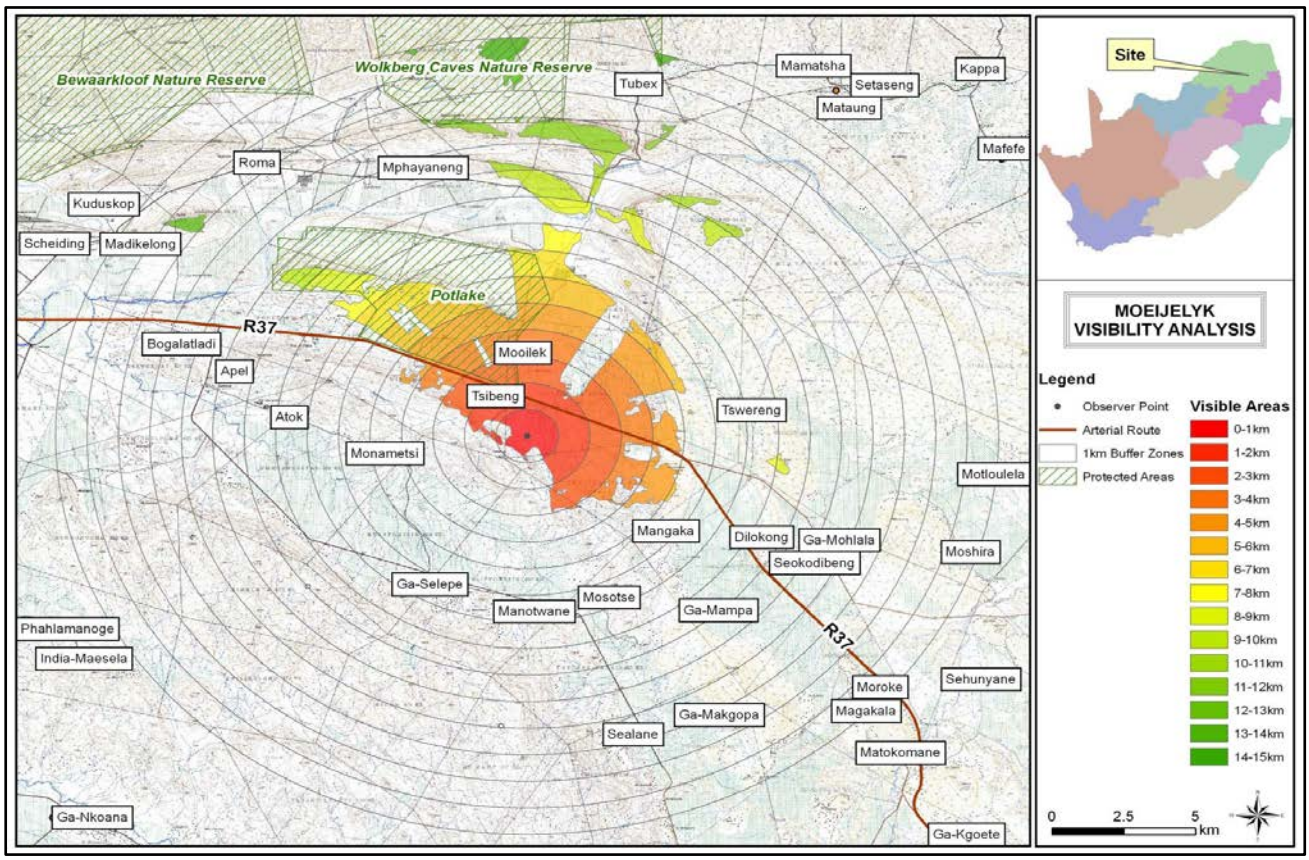


Figure 43: Visibility Analysis

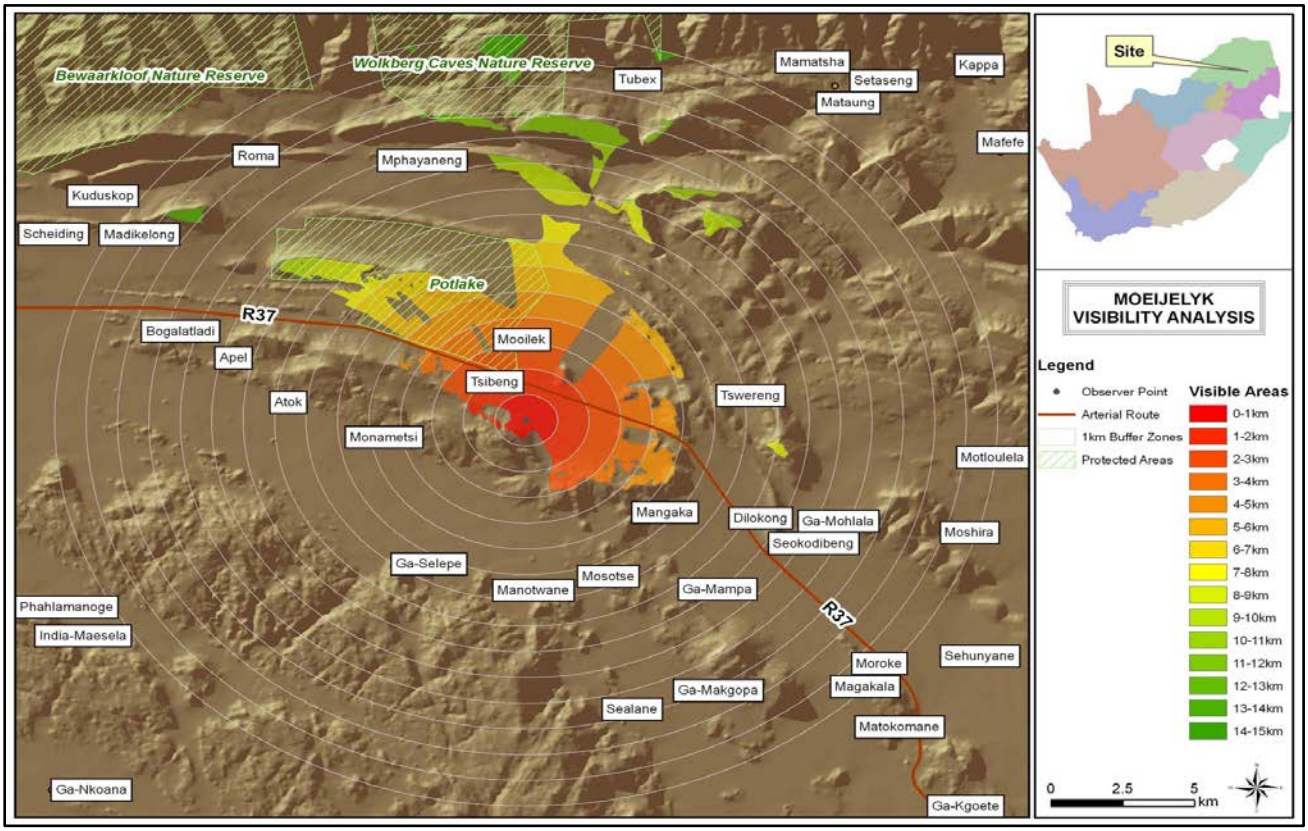


Figure 44: 3D Visibility Analysis

9.13 ARCHAEOLOGY AND HERITAGE

The proposed activities associated with the reuse of the tailings material will be situated on areas already disturbed by the existing mining activities. Thus, no impact to heritage resources are expected.

During the pedestrian survey on the demarcated portion, 7 sites of heritage importance were observed. These are: two sites falling outside of the demarcated area (refer to MX1,and MX2), three sites used as maize platforms (see MX4,MX5, and MX6 for locations of platforms), two sites were recorded to have stone tools, namely MX2, and MX7.

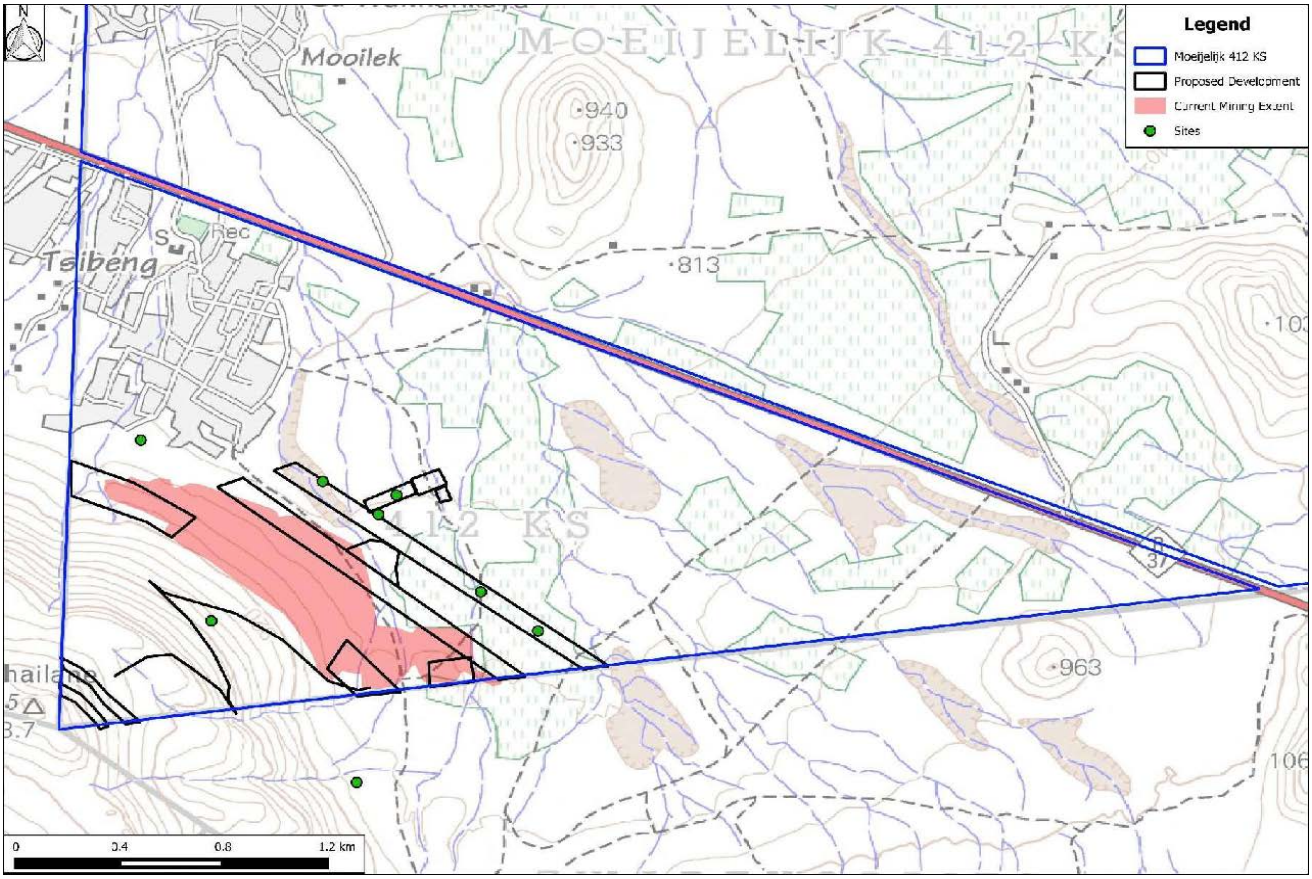


Figure 45:Segment of SA 1:50 000 2429 BD Indicating the Study Area

Two Middle Stone Age Flakes were recorded on the surface of the study area:

- MX2: Was discovered on the existing road leading up the slope towards the south east of the property (refer to Figure 48)
- MX7: Was recorded to be found on the area where the proposed dry tailings will be stored

Several pottery fragments belonging to iron age farmers were recorded within the area demarcated for proposed mining activities. Fragments were recorded within the area where the ROM extension is proposed, also in the area of the newly proposed open cast pits LG2, and LG3. A decorated potshard was recorded within the area of the wet tailings.

Two sites were recorded that might date back to historical times, these sites are MX1, and MX3:

- MX1: Is a stone foundation measuring 7 x 3m and located to the north of the opencast extension area.
- MX3: Appears to be a homestead and consists of partially intact walls. It is located south of the proposed mining activity on another property.

None of these historic sites are at risk due to the proposed mining activities.

As is evident when looking at Figure 48 above there are five sites of archeological, and heritage importance recorded within the proposed mining area, four of which are recent sites, and the other one is associated with the stone age.

No graves were recorded to be within the proposed mining area.

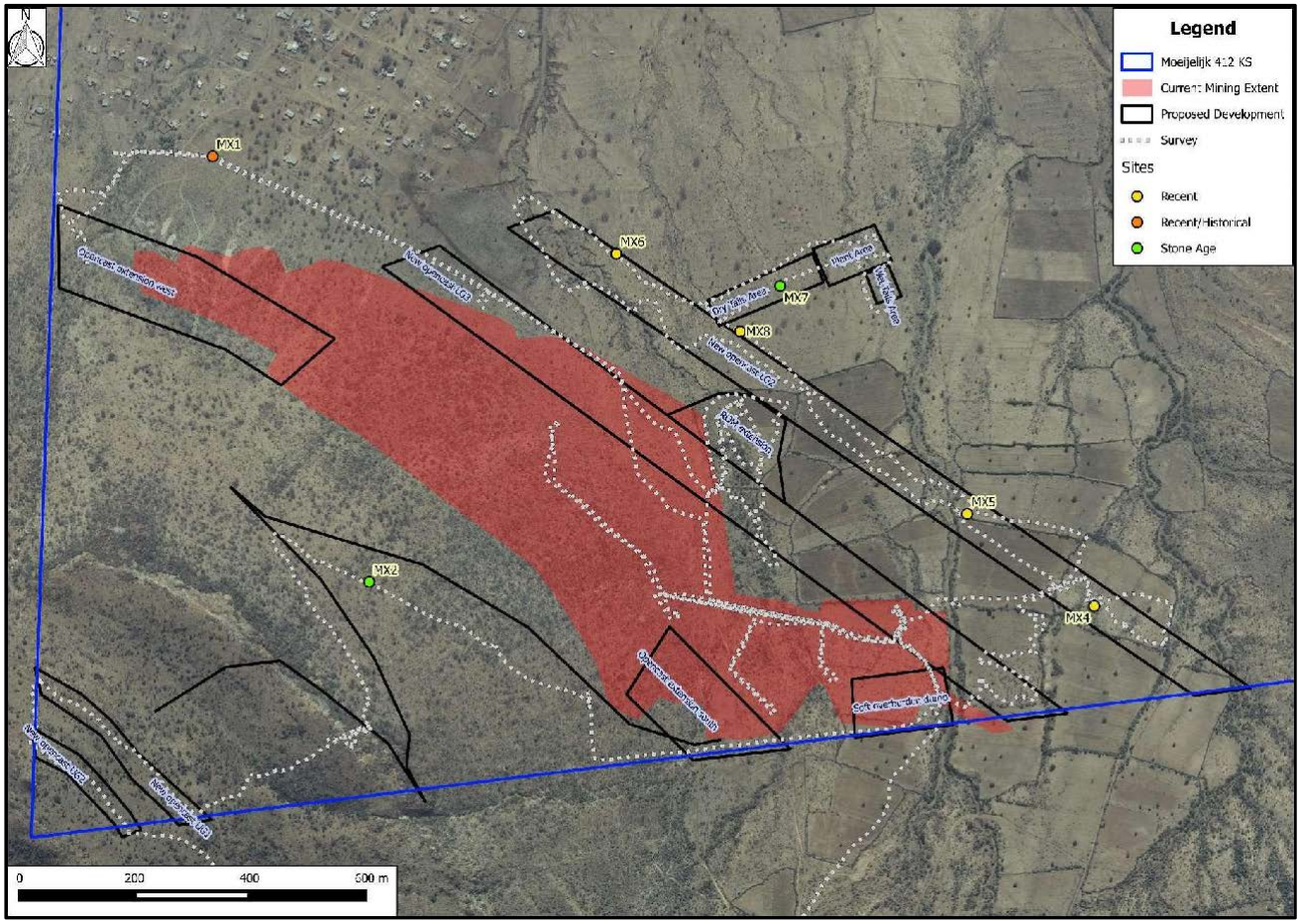


Figure 46:Map of Study Area with Survey Transects

9.14 SOCIO-ECONOMIC ENVIRONMENT

No Socio-economic specialist study was conducted specifically for the tailings backfilling project, but the new Integrated Development Plan for the Fetakgomo-Greater Tubatse Municipality was used to source information for the specific socio-economic profile of the region. The Social Impact Assessment undertaken by EcoElementum in 2015 is included as Appendix 8.

9.14.1 Regional Context

The newest IDP (Fetakgomo Greater Tubatse Municipality, 2016) was obtained from the Governmental website [5] and will give baseline information on the socio-economic structure for the new Fetakgomo Grater Tubatse Municipality. This municipality is formed as an amalgamation between the former Fetakgomo local municipality and the former Greater Tubatse Municipality as both are classified as Category B municipalities in terms of spatial and economic characteristics.

Its municipal boundaries have been determined in the Demarcation Notice published in Gazette no. 2629 dated 11th November 2015. The MDB (Municipal Demarcation Board) Circular 8/2015: Redetermination of Municipal Boundaries in terms of Section 21 of Local Government: Municipal Demarcation Act, 1998 (Act No. 27 of 1998), has amended the municipal boundaries of Lim 476 by amalgamating the former municipal areas of FTM (Lim 474) and GTM (Lim 475) into the boundaries of the new municipal area.

The Fetakgomo Greater Tubatse (Lim 476) Municipality was established and officially proclaimed in the Section 12 Notice Limpopo Provincial Gazette no. 2735, its short title: "Notice in terms of s12 of the Local Government: Municipal Structures

[5] http://www.fgtm.gov.za/sstaff/pages/sites/fgtm/documents/idp/Consolidated%20IDP%20DRAFT%201%20FOR%20FTM% 20NEW.pdf

Act, 1998 (Act 117 of 1998): Disestablishment of Existing Municipalities and Establishment of New Municipalities", dated 22nd July 2016 issued by the Member of the Executive Council (MEC) for Local Government in Limpopo Province.

The political governance of the municipality, Fetakgomo Greater Tubatse, is operated on a collective executive system combined with a ward participatory system. The municipality has a total of 39 wards, making it the third (3rd) largest municipality in the Limpopo Province in terms of wards after Polokwane with 45 wards and Thulamela with 41 wards. The municipality has a total of 77 councillors. Of these, 39 are ward councillors while 38 were proportionally elected.

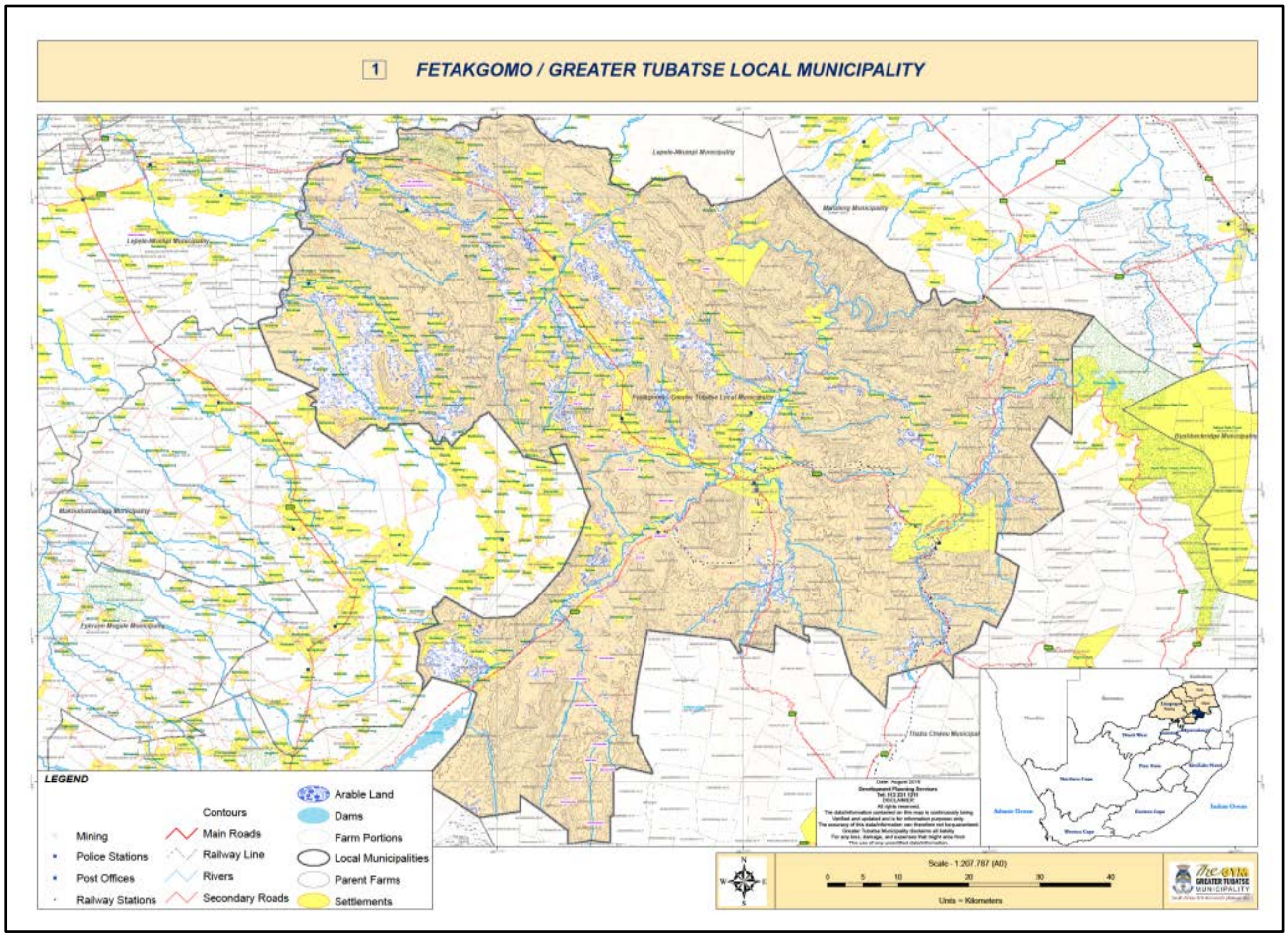


Figure 47: New Fetakgomo Greater Tubatse Local Municipality

The proposed site falls within the Fetakgomo-Greater Tubatse Local Municipality (FGTLM) area which forms part of the Sekhukhune District Municipality.

GTLM has a council that consists of a total of 77 councillors. Of these, 39 are ward councillors while 38 were proportionally elected. The Executive Committee of the municipality is led the Mayor while the municipal Speaker presides over the Council in terms of Section 49 and 37 of the Local Government: Municipal Structures Act 117 of 1998, respectively.

This large municipality comprises of 39 wards and 297 villages. The municipality is largely dominated by rural landscape with only 06 (six) proclaimed townships.

The area of jurisdiction of FGTLM is approximately 4 550 km^2 (Fetakgomo Greater Tubatse Municipality , 2016). According to the FGTLM the northern part has inferior social and engineering infrastructure which impacts on the stability of the economy in this area. This may be attributed to the rural nature of the area. As such, upliftment in the area is of critical importance. There is also virtually no economic base in the northern part of the area and the area is solely dependent on

government handouts and migrant labour income for survival.

9.14.1.1 Population Profile

According to the 2011 STASA information; the total population of the former FGTLM combined is approximately 429 471 with 106 050 households. In 2016 a community survey was undertaken for FGTLM, making it the most highly populated municipality within the Sekhukhune district. It also appears from in the current 2016 Community Survey as compared to the 2011 STASA results that the Fetakgomo Tubatse Local Municipality there has been a population of 490 381 with household increase of 125 454. As per the current community survey 2016 the former Greater Tubatse local Municipality increased with 0.037% and the former Fetakgomo local municipality increase slightly with 0.007. The total percentages of FGTLM as combined increased with 0.043% which put the municipality as the highest in the District.

The population in the district per genders is shown below in Table 33.

Table 32: Sekhukhune District Population group by gender (FGTLM IDP, 2016/17)

2011 STATSA			2016 Community Survey			
Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Growth Rate**
497 648	579 191	1 076 840	548 463	621 299	1 169 762	0.019

The table above indicate the total number of Households for Fetakgomo and Tubatse Municipality in 2011 as combined was 106 050 and 125 454 in 2016; which makes the municipality the biggest municipality in the District. The municipality has shown a growth of 8% growth in 2016; this might be due to the mining activities taking place in the area.

9.14.1.2 Language

The languages that are spoken within the GTLM include Sepedi (94%)and isiZulu (1.2%). Other languages make up the remaining 4.8% (StatsSA, 2011). Table 34 below provides more detail the languages spoken by the people of GTLM.

Table 33: Languages spoken by the people of GTLM

Afrikaans	English	IsiXhosa	IsiZulu	Sepedi	Sesoto	SiSwati	Xitsonga	Tshivenda	Others
0.5%	0.5%	0.3%	1.2%	94%	0.1%	0.4%	0.6%	0.1	0.4

9.14.1.2.1 Gender & Age Distribution

Table 35 shows that the total population is dominated by young people below 18. The age categories below the age of 18 comprise 51% of the population. The ratio for females is almost equal at ages between 0-17 and then this makes a change. Male-female distribution is then dominated by females for example, from ages 19-65.

Table 34: Gender and age distribution within former GTLM (GTLM, 2016/17)

Age	Male	Female	Grand Total
0-4	22 878	21 999	44 877
5-9	20 271	22 517	42 788
10-14	22 440	23 354	45 794
15-19	19 349	19 811	39 160
20-24	15 907	19 112	35 019
25-29	13 245	14 505	27 750
30-34	10 667	11 582	22 249
35-39	7324	8828	16 152
40-44	6076	9519	15 595
45-49	4952	7109	12 061
50-54	4180	6448	10 628
55-59	3241	3993	7234
60-64	2552	4075	6627
65-69	2256	3015	5271

Age	Male	Female	Grand Total
70-74	1484	3086	4570
75-79	1124	2618	3742
80-84	362	1322	1684
85+	335	1911	2266
Grand Total	**158 663**	**184 804**	**335 676**

9.14.1.3 Education Levels

Education levels in the Limpopo province lag behind those of other provinces of South Africa. While average literacy levels for South Africa were 82.2%, literacy levels for Limpopo were 73.6% in 1991. The Greater Tubatse Local Municipality has 163 primary schools, 92 secondary schools and 8 private schools with a total of 114 723 learners and 3 689 educators. Burgersfort, Ohrigstad and Steelpoort each have a primary school and Burgersfort has additional private primary and secondary schools. Two state of the art schools have been developed by the Department of Limpopo, i.e. Nthame primary school at Riba and Batubatse primary school in Prakitiseer. In rural areas, an abundance of primary schools tends to be common as many pupils leave school early in search of employment in order to support their families. Those that can afford to continue to secondary school do so within the area or in more developed towns outside the municipality (GTLM IDP, 2016/17). 22.6% of people above the age of 20 have completed matric (grade 12); while 6.6% have higher education (STATSSA, 2011). Figure 50 shows education levels in Greater Tubatse Local Municipality.

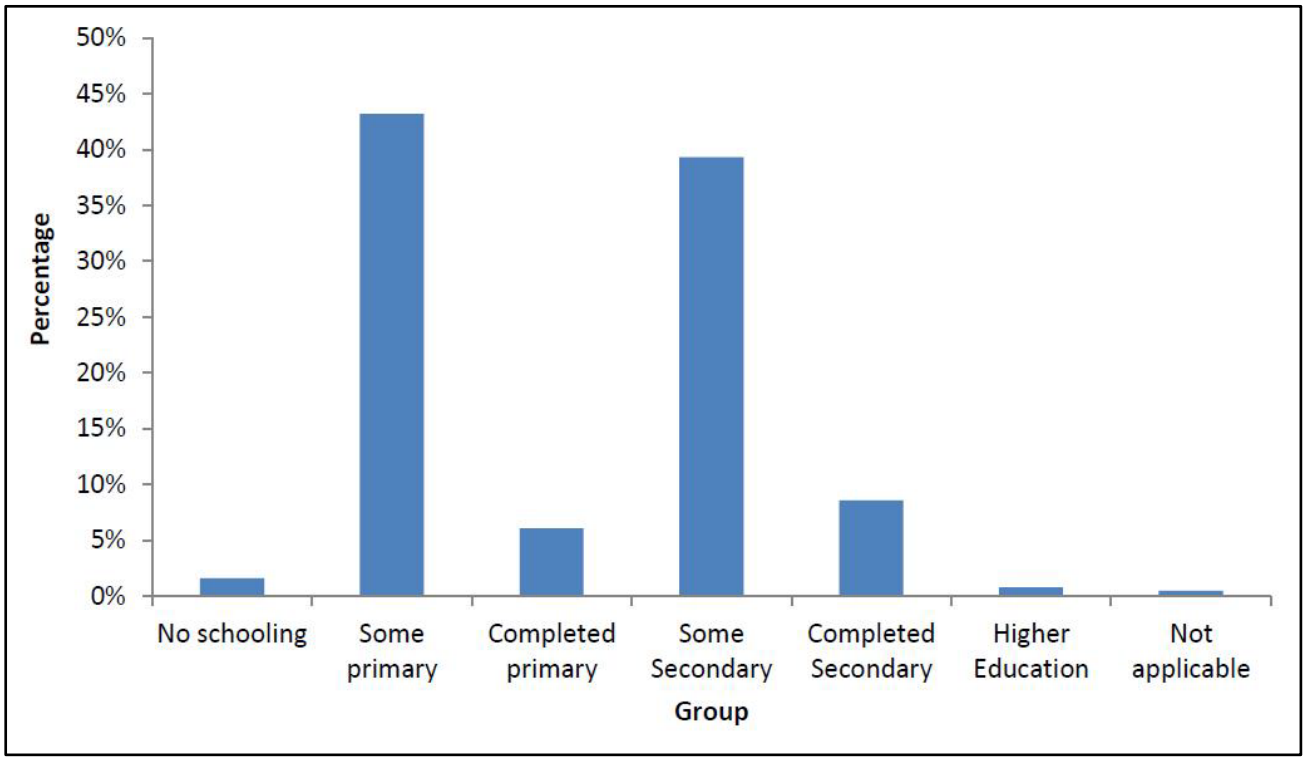


Figure 48: Education levels in Greater Tubatse Local Municipality (StatsSA, 2011)

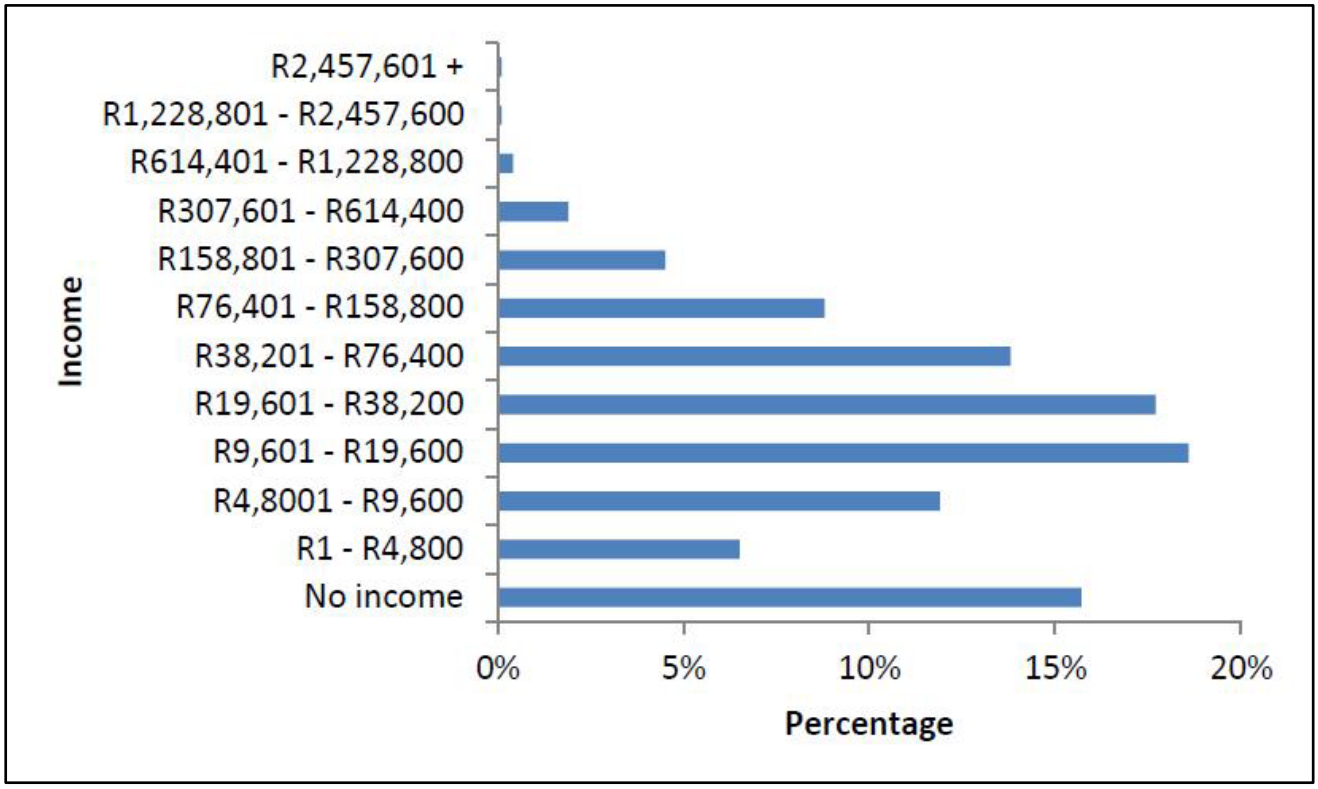


Figure 49: Average household income in GTLM (StatsSA, 2011)

9.14.1.4 Employment Status

The Former Greater Tubatse Local Municipality has a youth unemployment rate of 59.6%. In 2009, The Greater Tubatse Local Municipality had the highest rate of unemployment at 28 022 and in 2015 it still had the highest with 22 264 people unemployed (Local Economic Development Strategy , 2015). Figure 51 and Figure 52 illustrates the employment status of the people of GTLM.

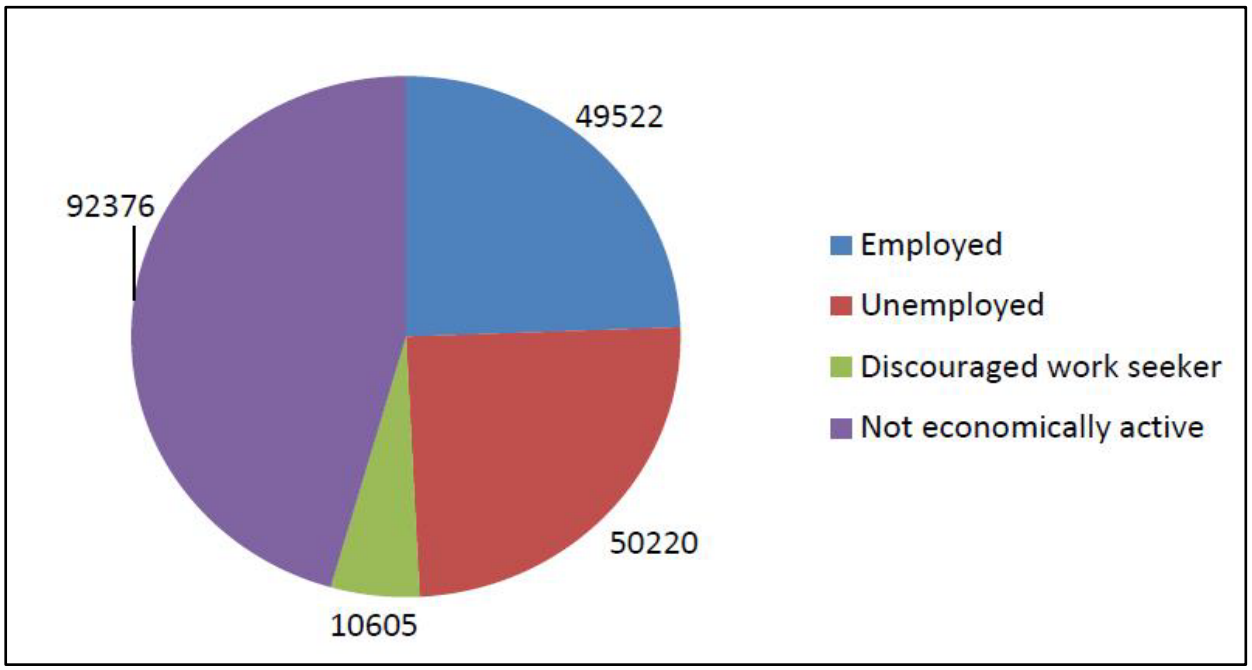


Figure 50: Employment status of people aged 15 - 64 in GTLM (StatsSA, 2011)

9.14.1.4.1 Infrastructure and Services

Owing to FGTLM's rural nature, the municipality is plagued by challenges of poor or backlogged service delivery. The provision and maintenance of services become costly because most of the settlements are situated far apart. Some areas are also not large enough to achieve the economic threshold required to make social facilities available in a manner that is economically viable (FGTLM IDP, 2016/17). Majority of infrastructural projects within FGTLM are Expanded Public Works Programme related projects. Such projects aid in the generation of employment opportunities and the assurance of the improvement of the socio- economic conditions within the area. 800 jobs were created in the 2014/2015 financial year through the construction of the small access bridges and other related projects.

9.15 DESCRIPTION OF THE CURRENT LAND USES

The site has a medium to high agricultural potential, depending on the rainfall. From aerial photography, old dry land crop fields can be observed to the east of the site which indicates that the surrounding land uses include rain fed crop production.

The land surrounding the mining areas is dominantly used for livestock grazing for farm stock, subsistence farming and settlements. The village of Tsibeng is approximately 350 m from the mining area and most homes have small gardens where vegetables and fruit are grown, often with a kraal for livestock.

Grazing areas are regarded as communal and can be used by all members of the community. Over-grazing during dry periods has denuded much of the area and it is hence extremely susceptible to water and wind erosion.

The current land use map is depicted below (Figure 53). Also refer to Figure 54 as well as Appendix 3 and 4 for more descriptive detail on land use in the project area.

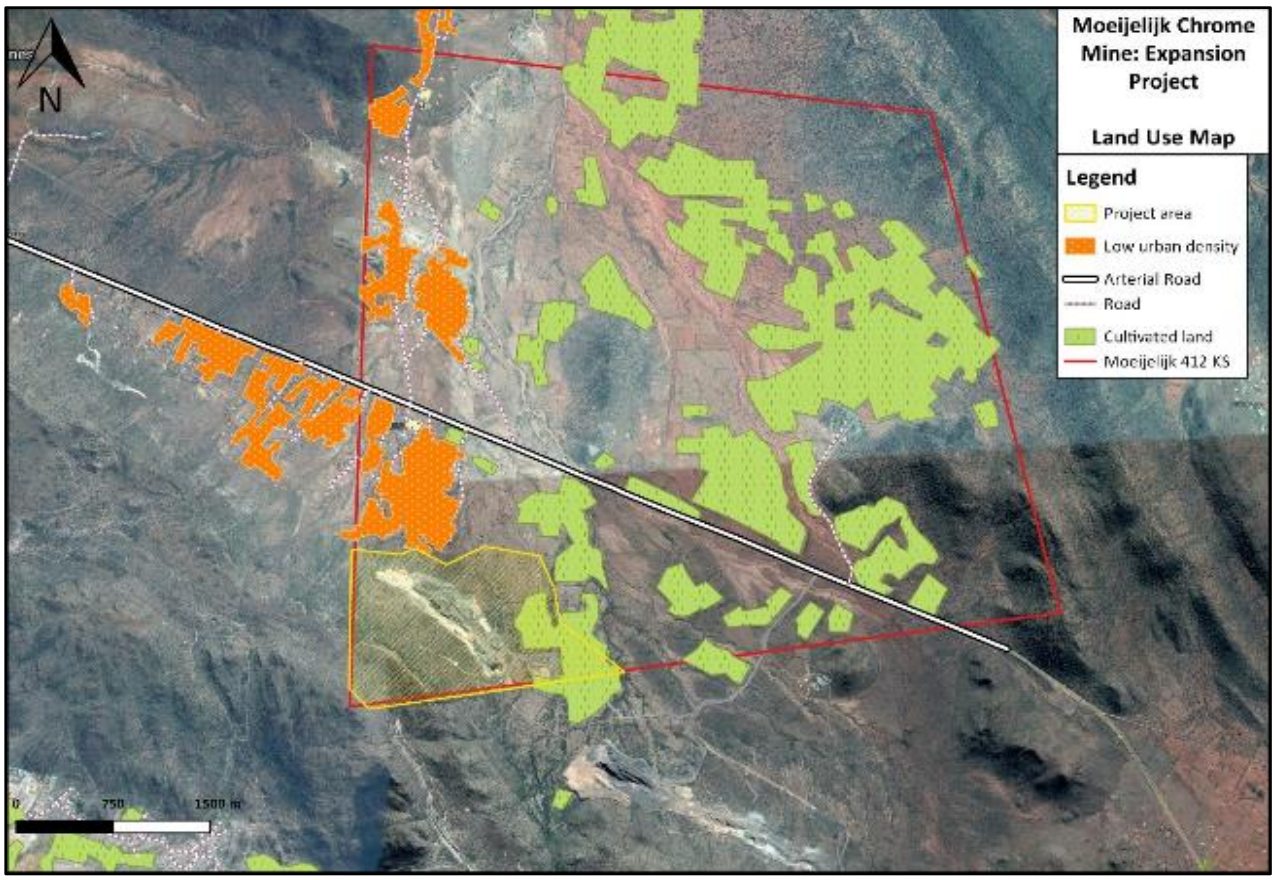


Figure 51: Current land use map of the project area

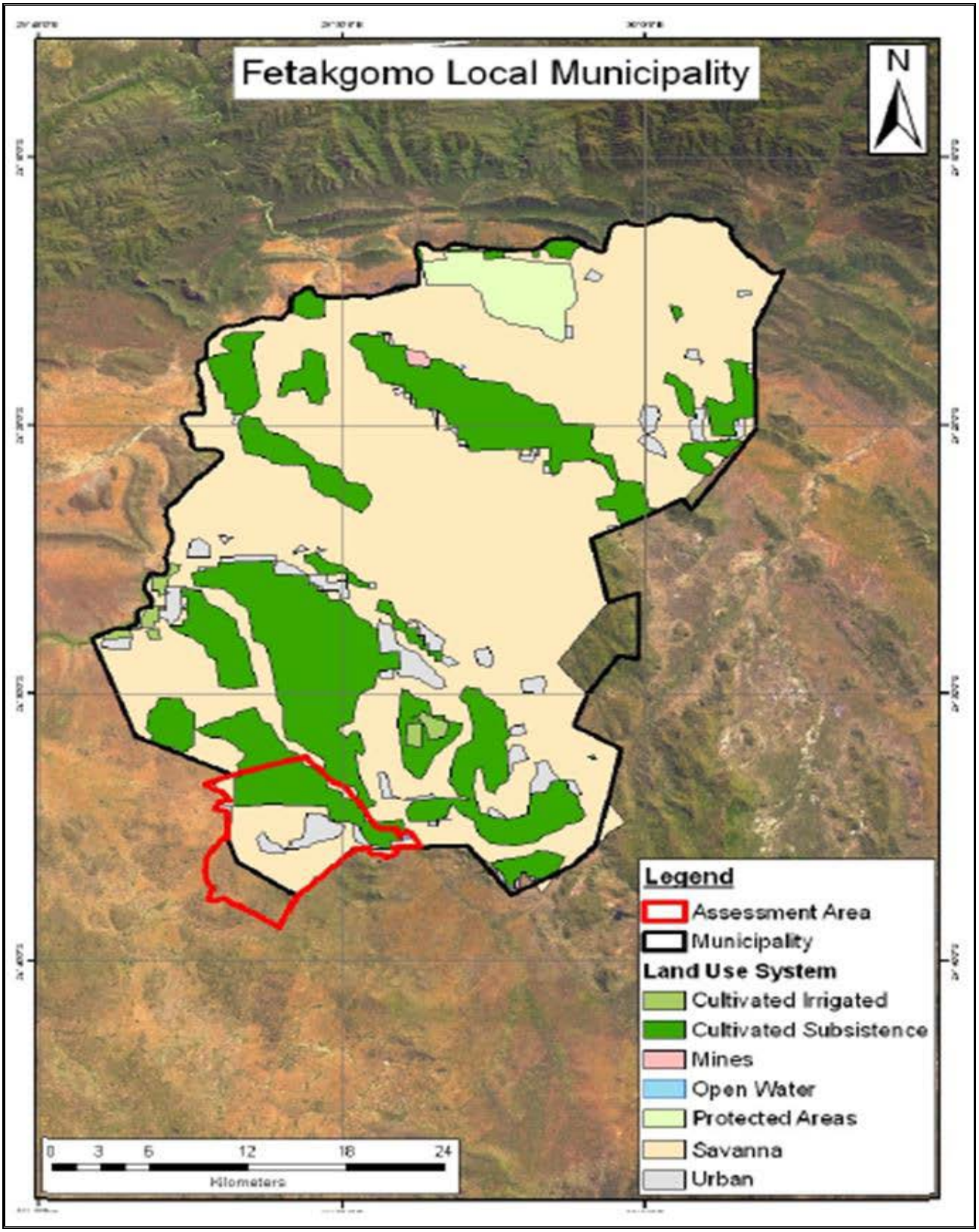


Figure 52: Land Use classification in the Fetakgomo Local Municipality

9.16 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

Please note that the specific environmental features and infrastructure located across the Target Areas of the Proposed Project have been described in the sections above.

9.16.1 Sensitive landscapes

The occurrence of possible sensitive landscapes at the project site is outlined in the table below.

Table 35: Sensitive Landscapes within the Proposed Mining Site

Types of sensitive landscapes	Occurrence at the Proposed Mining Site
Nature conservation or ecologically sensitive areas - indigenous plant communities (particularly rare communities and forests), wetlands, rivers, riverbanks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species.	The proposed activities associated with the reuse of the tailings material will be situated on areas already disturbed by the existing mining activities. Thus, little or no impact to terrestrial biodiversity (fauna and flora) resources are expected. This area forms part of the Sekhukhune Centre of Endemism (specifically the Steelpoort Subcentre) which has a high level of biodiversity with some species that can only be found within certain areas along this Centre. Potlake Nature Reserve is located approximately 5 km from the mining area. The mining area is also located on a ridge which may be regarded as a sensitive area due to the diversity of faunal and floral species often found in this type of habitat.
Sensitive physical environments - such as unstable soils and geo-technically unstable areas.	None
Important natural resources - river systems, groundwater systems, high potential agricultural land.	The site has medium to high agricultural potential. The site is located on a minor aquifer system. The watercourses on site are non-perennial and only contain water during rain events.
Sites of special scientific interest	None
Sites of social significance - including sites of archaeological, historic, cultural, spiritual or religious importance and burial sites.	The proposed activities associated with the reuse of the tailings material will be situated on areas already disturbed by the existing mining activities. Thus, little or no impact to heritage resources are expected.
Sites of outstanding natural beauty, panoramic views and scenic drives	Due to the current mining on site as well as other mining sites within the area, there are no sites of this value.
Green belts or public open space in municipal areas	Not applicable.

9.16.2 Rural Settlements

Rural settlements are settlements that are similar in nature to the tribal settlements with regard to the residential densities and functions, but they are not located on tribal land. Therefore, these settlements do not have the same advantages that settlements located on tribal land and administered by the Tribal Councils have. In contrast, they have a lack of security of tenure and they lack basic municipal services.

The nearest rural settlement to the proposed mining activity is Tsibeng village which is located approximately 300 m to the north-west of the current mining activities on Moeijelijk 412 KS and the village of Ga Wannankaya is located 2 km to

the north of the proposed mine.

9.16.3 Informal Settlements

The other type of settlement within the district and local municipal areas is informal settlements. The locations of these settlements mainly correspond to the mining/semi urban areas and are therefore located along the edges of the mining/urban belts. These settlements largely contain households seeking employment at the mines/urban areas. The informal settlements are characterized by a lack of security of tenure and a lack of basic municipal services. This type of settlement is likely to encroach on the proposed Bauba a Hlabirwa Moeijelijk Chrome Mining project area due to job seekers.

9.16.4 Business

Big businesses are absent from the affected villages. Smaller businesses are normally found scattered through the residential areas and are informal in character – such as shops, public phones, taverns/bars, and day-care centers. Lack of business and employment has caused people to migrate to the bigger towns such as, Polokwane.

9.16.5 Water Supply and Sanitation

The water supply for the current and proposed mining operations is obtained from groundwater abstraction through boreholes located on the current mining site. A Water Use Licence is currently being applied for with DWS to increase the licence groundwater abstraction volume.

Sanitation for mine employees of the current mining operations consists of change houses and portable toilets serviced by septic tanks which are currently pumped out regularly. The mine is currently investigating the feasibility of installing a grey and sewage water treatment works at the underground operations.

9.16.6 Infrastructure, Electricity and Communication

The current layout and infrastructure of the existing mining operation on Moeijelijk 412 KS is depicted in Figure 5.

9.16.7 Access Roads

Existing access and haul roads service the current mining operations. No additional roads will need to be constructed for the activities being applied for.

9.17 ENVIRONMENTAL AND CURRENT LAND USE MAP

Refer to Section 9.14, above.

10 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS CAN BE MANAGED

Only impacts related to new activities being applied for (refer to Table 3 and Section 3.3) will be included in the impact and risk assessment as part of the EIA Report (Section A of this document). However, all impacts of the existing operation and new activities being applied for will be included in the EMPr Report section of this document, as this document is a consolidation and S102 amendment of the existing EMPrs for the operation (refer to section 3.2). The EMPr Report (Section B of this document) will be a consolidation of all mitigation measures included in previously approved EMPrs, whilst taking into account recommendations from auditors regarding the suitability of the mitigation measures included in these approved EMPrs.

Refer to Section 3.2 for extisting activities which have approved EMPrs and Environmental Authorisations, which will be included in the EMPr monitoring and mitigation measures. Refer to Table 3 and Section 3.3 for activites being applied for in this application which will be assessed in the impact and risk assessment section of the EIA Report, and will be included in the monitoring and mitigation measures setout in the EMPr section of this report.

10.1 IMPACTS IDENTIFIED

The Proposed Project may cause impacts to the immediate, surrounding and regional cultural, biophysical and socio-economic environment. Specific cultural, environmental and socio-economic impacts are anticipated to occur at different phases of the project during the life of mine. These phases include:

- Construction
  - No significant impact are expected to be associated with the construction phase, as most of the necessary infrastructure is existing on site. The preconcentrator will be installed in the existing wash plant and the brick-making equipment will be installed on already disturbed areas.
- Operation
  - Including transportation of tailings material to opencast pit, backfilling of the pits with tailings material, brickmaking activities and cement mixing.
- Decommissioning
  - Including scaling down of activities ahead of temporary or permanent closure, implementation of rehabilitation programme, monitoring and maintenance for prescribed period after cessation of operations.
- Closure
  - Including completion of rehabilitation goals, application for closure, transfer of liability to the State and agreed post-closure monitoring and maintenance.

The impacts associated with each of these phases will be specific to the mineral commodity, cultural, environmental and socio-economic context, spatial and temporal aspects of the operation and stated rehabilitation goals. For the purpose of this report, anticipated/ potential impacts have been identified, through specialist studies. Specific cultural, environmental and socio-economic impacts associated with the Proposed Project have been assessed and quantified during the EIA Phase of the project. The methodology that was used is detailed in Section 10 of this report.

The following cultural, environmental and socio-economic impacts associated with the Proposed Project have been assessed in this document. The impacts only relate to the reuse of the tailings for backfilling, brick-making and cement mixing and associated activities during the construction, operation, decommissioning and post-closure phases. Note that many aspects are not relevant in term of potential impacts as the proposed project relating to this application is entirely situated on areas already disturbed by current mining activities.

- Geohydrology;
- Surface water;

- Air quality; and
- Mine closure.

Anticipated impacts associated with the Proposed Project are included in the table below. Additional concerns raised by the public during the public participation process have been considered by the EAP during the EIR Phase (refer to Table 8).

Table 36: Anticipated Impacts associated with the Proposed Project

Environment	Anticipated Impact (excluding mitigation)
Geohydrology (groundwater)	• Impacts on groundwater qualities and plume migration; and • Impacts on surface water qualities due to poor quality groundwater seeping into the surface water in the form of baseflow contribution.
Surface water	• Increased risk of surface water pollution as result of poor water quality within the opencast sections. Overflow could occur during storm events. • Seepage and runoff from stockpile areas are moderately contaminated and could impact on surface water quality. • Contaminated surface water run-off from leachate and final landform created by backfilling with tailings material.
Air quality	Note that impacts related to loading transporting and storage of tailings was assessed as part of the EIA process undertaken for the existing activities: • Fugitive dust (containing TSP, as well as PM10 and PM2.5) occurs as a result of the aforementioned processes. • Tailings stockpiles are prone to dust generation as a result of the erosion forces related to wind velocity.

10.2 SPECIALIST INVESTIGATIONS

The impacts considered of sufficient importance as to warrant mitigation measures and management during the construction and operational phases of the project will be assessed by specialists of the relevant field. The potential impacts and key issues which must be thoroughly investigated during the EIA include the following:

- Groundwater / Geohydrological.

Prior to the initiation of the project it was confirmed with the Competent Authority, DMR, that only a Geohydrological Assessment and Contamination Study needs to be undertaken for the Moeijelijk Mine Tailings Backfilling Project S&EIR process.

The Air Quality Assessment (2015) and Surface Water Assessment (2017) performed for previous applications for the Moeijelijk Mine are still considered relevant to the project and will be used for the EIA report.

Each specialist report as mentioned above has been used for the identification of the impacts and recommended mitigation measures.

10.3 LIMITATIONS AND ASSUMPTIONS

Assumptions and limitations applicable to specific to the assessment process and mitigation measures proposed in specific specialist studies include the following:

10.3.1 Hydrogeological Assessment

Groundwater models have certain limitations and assumptions on which the model parameters are build and based, but no limitations were given for the groundwater assessment report.

10.3.2 Surface water Assessment

While every care is taken to ensure that the data presented is qualitatively adequate, inevitably conditions are never of such a nature that the data is entirely satisfactory. Access to certain points along the section of the Aquatic System relevant to the study site was also limited. It should also be noted that the findings of this study were largely based on a single site visit within which to identify indicators. Visibility of indicators vary throughout seasons and it is therefore noted that, if in future, any further indicators are found on site, the author cannot be held liable for conclusions deducted in good faith based on the available resources and information provided at the time of the study. Furthermore, this study, only outlines the surface water environment directly related to the properties on which development will take place and does not include drainage lines outside of this scope. It is important that this report be viewed and acted upon with these limitations in mind.

No updated Surface Water Assessment was undertaken for this application (Tailings backfilling Project) as the existing study (2017) was considered to be appropriate and sufficient for use in this application.

10.3.3 Air Quality

Dispersion models have certain limitations and assumptions on which the model parameters are build and based, but no modelling were included in the 2015 study and no limitations were given as the report was based on monitoring data for the specific site.

No updated Air Quality Assessment was undertaken for this application (Tailings backfilling Project) as the existing study (2015) was considered to be appropriate and sufficient for use in this application.

10.4 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

Only impacts related to new activities being applied for (refer to Table 3 and Section 3.3) will be included in the impact and risk assessment as part of the EIA Report (Section A of this document). However, all impacts of the existing operation and new activities being applied for will be included in the EMPr Report section of this document, as this document is a consolidation and S102 amendment of the existing EMPrs for the operation (refer to section 3.2). The EMPr Report (Section B of this document) will be a consolidation of all mitigation measures included in previously approved EMPrs, whilst taking into account recommendations from auditors regarding the suitability of the mitigation measures included in these approved EMPrs.

Refer to Section 3.2 for extisting activities which have approved EMPrs and Environmental Authorisations, which will be included in the EMPr monitoring and mitigation measures. Refer to Table 3 and Section 3.3 for activites being applied for in this application which will be assessed in the impact and risk assessment section of the EIA Report, and will be included in the monitoring and mitigation measures setout in the EMPr section of this report.

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation the preferred alternative is located entirely on the current mining footprint, thus reducing the impacts on the biophysical and social environment. No extension of the mining footprint will be required for the proposed activities.

The preferred alternative for the project is the backfilling of the opencast void with tailings material. Benefits of backfilling the pits with tailings, as opposed to other alternative disposal methods, are the following:

- Worked out voids can be filled at a fraction of the costs associated with designing, constructing and operating a conventional, thickened, paste or dry stack facility.
- The tailings do not require retaining walls, thus the risks associated with embankment instability are eliminated. Thereby reducing risks to nearby communities, employees and the biophysical environment.
- No separate final waste deposit for tailings material, as the material will be used for backfilling of the opencast void as part of the rehabilitation activities.
- A smaller footprint at closure since areas already disturbed are used for the deposition of the tailings.
- Maximised reuse and recycling of waste materials through use of the tailings for backfilling.
- Little to no amendments required to existing infrastructure in order to support the proposed activities.
- The farm is currently being mined which ensures that the proposed project falls into the current sense of place and land use.
- No significant surface water bodies (i.e. perennial streams or large dams/ponds) are within close proximity to the existing opencast pits.

10.4.1 Ecological Impacts

A motivation Letter was compiled by Enviridi (2020) for Terrestrial Ecology aspects related to the Moeijelijk Mine Tailings Backfill Project (Appendix 10). Appendix 10 and 11 contain the most recent fauna and flora assessments undertaken for the project as reference.

Since several Ecological Assessments has taken place and has adequately assessed the nature and extent of impacts based on the Moeijelijk Chrome Mine workings. The latest specialist reports for ecology took place in 2017:

- Environment Research Consulting (2017) Vegetation Diversity Assessment - Bauba A Hlabirwa Mining Investments – Moeijelijk Chrome Mine[6];
- Prescali Environmental Consultants (Pty) Ltd (2017) Bauba A Hlabirwa Mining Investments (Pty) Ltd: Moeijelijk Fauna Terrestrial Biodiversity Assessment[7]

Both of these assessments included all footprints (as shown in Figure 4) and no new footprints will be developed and no new habitat will be cleared or altered other than which was originally assessed. The wash plant area, the opencast and the drying pads as described within the latest scope and Figure 4 were included in the available Ecological (2017) assessments.

A formal management plan for both the Flora and Fauna of the Moeijelijk Chrome Mine has been included devised by the specialists and incorporated into the existing EMPR and Audited in terms of compliance on an annual basis.

No additional risk to the ecology based on this information is expected, since the sensitive areas associated with the project falls within the Mountainous areas outside of the developed footprints. All the footprints of the Moeijelijk mine has been assessed in terms of Ecology and no new impacts on vegetation or habitat will be disturbed.

Backfilling should however take cognisance of the natural geological sequences and be covered by suitable layers overburden/subsoil and the top layer of topsoil to allow for vegetation re-establishment once the area has been sloped and rehabilitated.

Therefore, it is the opinion of the specialist that no Offset agreement will be necessary or warranted for the non-substantial changes and backfilling of the tailings since these aspects were already assessed and no new impacts to the ecology have occurred or are proposed that was not already assessed as part of the previous application made (and approved). No new footprints will be impacted.

[6] (Environment Research Consulting , 2017)
[7] (Prescali Environmental Consultants (Pty) Ltd, 2017).

10.4.2 Impacts on Heritage

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation the preferred alternative is located entirely on the current mining footprint, thus no impacts to Archaeological / Heritage Resources are expected.

10.4.3 Impact on Air Quality

In order to transport tailings tonthe opencast pit a number of activities are conducted simultaneously, including the transportation of machinery to opencast, as well as materials and workforce. Drilling is an intermittent exercise that emits fugitive dust. There will be fumes from diesel trucks transporting ore to the conveyor belt. The conveyor belts deposit the minerals into the crusher, the crushing process releases fugitive dust. Activities by machinery underground will lead to exhaust fumes from vehicles and dust from drilling and blasting processes. Fugitive dust (containing TSP, as well as PM10 and PM2.5) may occurs as a result of dumping of tailings during high wind conditions.

Tailings storage facilities are prone to dust generation as a result of the erosion forces related to wind velocity.

10.4.4 Impact on Noise

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation the preferred alternative is located entirely on the current mining footprint. No significant additional impact to noise sensitive receptors is expected from the tailings backfilling activities.

10.4.5 Impact on Surface Water

There is one expected impact on the surface water within the site due to the backfilling of the opencast void with tailings material, which is the possible deterioration of water quality:

- Seepage and runoff from stockpile areas are moderately contaminated and could impact on surface water quality.
- Acidic leachate (AMD) could result in pollution of receiving water environment.

10.4.6 Impact on Groundwater

Geochemical modelling results show that the nitrate concentrations are high (501 mg/L) during the operational phase. Chromium is predicted by geochemical modelling to be present exclusively as Cr6+ at a concentration of 0.3 mg/L.

Plumes can migrate up to 200 m from the surface stockpile footprint areas. Borehole BH1 fall within the plume migrating away from the overburden stockpile. This borehole has been built over and is not in use anymore.

Due to the groundwater level drawdown cone developing around the groundwater dewatering boreholes contamination migrating away from the discard dump will be drawn towards groundwater supply boreholes UGBH1 and UGBH2. Similarly, contamination migrating away from the topsoil stockpile will be drawn towards boreholes WPBH1 and WPBH2.

The migrating plume will reach boreholes UGBH1 and UGBH2 during 2020, or at the latest before the end of 2021. The nitrate concentration at the boreholes will increase over time to a maximum of approximately 250 mg/L.

Groundwater flow patterns around the rehabilitated opencast areas will be directed towards the opencast mine areas due to the fact that the opencast mine areas are interlinked with the underground mine area via the decline shaft. This connection will drain the rehabilitated opencast areas into the underground mine and prevent the water levels within the rehabilitated opencast areas from recovering to near pre-mining levels, thereby containing contamination within the rehabilitated opencast areas. Therefore, there will be no general contaminant plumes migrating away from the opencast areas.

During the decommissioning phase the mine dewatering will stop. This will allow the groundwater level within the underground mine to start rising. However, due to the relatively short time period of the decommissioning phase (less than 1 year) it is not expected that the underground mine will become fully submerged, or that there will be significant contaminant migration away from the mine.

Decant from the mining area will occur. The underground mine and the previous opencast mine areas are interconnected via the decline shaft. Therefore, once the underground mine and the rehabilitated opencast mine areas are submerged decant will start.

The expected decant volume is calculated to be between 10 and 50 m3/day depending on the quality of the rehabilitation of the opencast areas. Proper rehabilitation with re-established vegetation and proper sloping of the surface that prevent ponding of rainwater will reduce recharge into the rehabilitated opencast areas which in turn will reduce the decant volume.

Decant qualities are expected to reflect the results from the geochemical assessment. Nitrate concentrations can be up to 139 mg/L. Hexavalent chromium concentration can be 0.3 mg/L.

Contaminant migration will continue from the overburden and top soil stockpile footprint areas. In addition, contaminant migration away from the opencast and underground mine areas will start once a driving head is established by die rising water levels in the mining areas.

The contaminant plume in the weathered material aquifer will migrate up to 1 500 m from the opencast mine areas. The plume migrates downgradient in a northern direction underneath the village.

There is very little contaminant migration through the fractured rock aquifer away from the underground mine. This is due to the low expected aquifer activity at the depths of the underground mine (up to 655 m below surface).

10.4.7 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 Moeijelijk Mine Tailings Backfilling Project could potentially result in cumulative effects in the following areas:

- Impacts on groundwater qualities due to mine residue storage.
- Impacts on surface water qualities due to poor quality groundwater seeping into the surface water in the form of baseflow contribution.
- Increased risk of surface water pollution as result of poor water quality within the opencast sections. Overflow could occur during storm events.

Regarding surface water environment, the assessment of cumulative impacts from adjacent mines with the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted was recommended as a general management feature to prevent surface water cumulative

impacts.

10.5 ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

An Issues and Response Report has been compiled as part of the Public Participation Process for the Moeijelijk Mine tailings backfilling project. This document records the issues of concern, questions and suggestions contributed by stakeholders during the course of the Scoping and Environmental Impact Process. This report also includes the responses provided by relevant parties. Comments were received at meetings, and by means of written methods (email and text message). The Issues and Response Report is attached as Appendix 13 of the PP Report.

Refer to section 8 for the issues raised by IAPs.

10.6 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

10.6.1 Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines, National Environmental Management Act (Act No. 107 of 1998): EIA Regulations (2014) and as amended from time to time.

The level of detail as depicted in the EIA Guidelines was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

An explanation of the impact assessment criteria is defined below.

Table 37: Impact Assessment Criteria

EXTENT	
Classification of the physical and spatial scale of the impact	
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site	The impact could affect the whole, or a significant portion of the site.
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
National	The impact could have an effect that expands throughout the country (South Africa).
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
DURATION	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
Short to Medium term	The impact will be relevant through to the end of a construction phase (1.5 years).
Medium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long term	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.

Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
INTENSITY	
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
PROBABILITY	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

The status of the impacts and degree of confidence with respect to the assessment of the significance must be stated as follows:

- **Status of the impact:** A description as to whether the impact would be positive (a benefit), negative (a cost), or neutral.
- **Degree of confidence in predictions:** The degree of confidence in the predictions, based on the availability of information and specialist knowledge.

Other aspects to take into consideration in the specialist studies are:

- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the full-lifecycle of the proposed development, including construction, operation and decommissioning.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region.
- The specialist studies must attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

10.6.2 Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

10.6.2.1 Determination of Significance-Without Mitigation

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance is rated on the following scale:

Table 38: Significance-Without Mitigation

NO SIGNIFICANCE	The impact is not substantial and does not require any mitigation action.
LOW	The impact is of little importance, but may require limited mitigation.
MEDIUM	The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
HIGH	The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

10.6.2.2 Determination of Significance- With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

Table 39: Significance- With Mitigation

NO SIGNIFICANCE	The impact will be mitigated to the point where it is regarded as insubstantial.
LOW	The impact will be mitigated to the point where it is of limited importance.
LOW TO MEDIUM	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.
MEDIUM	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
MEDIUM TO HIGH	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
HIGH	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

10.6.3 Assessment Weighting

Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it was necessary to weigh and rank all the criteria.

10.6.3.1 Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer Table 7). The purpose of assigning weights serves to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

Table 40: Description of assessment parameters with its respective weighting

EXTENT		DURATION		INTENSITY		PROBABILITY		WEIGHTING FACTOR (WF)		SIGNIFICANCE RATING WITHOUT MITIGATION (SR WOM)	
Footprint	1	Short term	1	Low	1	Probable	1	Low	1	Low	0-19
Site	2	Short to Medium	2			Possible	2	Low to Medium	2	Low to Medium	20-39
Regional	3	Medium term	3	Medium	3	Likely	3	Medium	3	Medium	40-59
National	4	Long term	4			Highly Likely	4	Medium to High	4	Medium to High	60-79
International	5	Permanent	5	High	5	Definite	5	High	5	High	80-100

MITIGATION EFFICIENCY (ME)		SIGNIFICANCE RATING WITH MITIGATION (SR WM)	
High	0.2	Low	0 – 19
Medium to High	0.4	Low to Medium	20 – 39
Medium	0.6	Medium	40 – 59
Low to Medium	0.8	Medium to High	60 – 79
Low	1.0	High	80 – 100

10.6.3.2 Identifying the Potential Impacts Without Mitigation Measures (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

10.6.3.3 Identifying the Potential Impacts With Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact.

10.6.3.4 Mitigation Efficiency (ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation efficiency (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2:

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency

or WM = WOM x ME

10.6.3.5 Significance Following Mitigation (SFM)

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

10.7 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

Refer to Section 13.11 for discussions on identified impacts as well as to Table 46 and Table 47.

Table 41: Impact Assessment Table (Complete with Ratings used to obtain Significance)

Aspect	Activity	Phase	Impact	Extent	Duration	Intensity	Probability	Weighting Factor	SR WOM	ME	SR WM
Air Quality	Hauling, transportation and backfilling of tailings	Operational	Fugitive dust (containing TSP, as well as PM10 and PM2.5)	2	4	3	4	3	39 LOW	0.6	23.4 LOW
Air Quality	Rehabilitation (spreading of soil, revegetation & profiling/contouring)	Closure and decommissioning	Profiling of backfilled opencast pits and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	1	2	1	4	2	16 LOW to MEDIUM	0.4	6.4 LOW to MEDIUM
Surface Water	Backfilling of opencast pit with tailings	Operational	Impacts on surface quality due to poor quality seepage from the pollution source areas	1	5	1	2	3	27 LOW	0.6	16.2 LOW to MEDIUM
Groundwater	Backfilling of opencast pit with tailings	Operational	Impacts on groundwater quality due to poor quality seepage from the mining area	1	5	1	1	3	24 LOW	1	24 LOW
Groundwater	Backfilling of opencast pit with tailings	Decommissioning	Impacts on groundwater quality due to poor quality seepage from the mining area	2	5	3	5	5	75 MEDIUM to HIGH	1	75 MEDIUM to HIGH
Surface Water	Backfilling of opencast pit with tailings	Decommissioning	Impacts on surface quality due to poor quality seepage from the pollution source areas	1	5	1	2	3	27 LOW	0.4	10.8 LOW to MEDIUM

The supporting impact assessment conducted by the EAP must be attached as an appendix. **(Impact assessment was included in the section above. Refer to the discussion in Section 13.11 as well as the specialist studies attached to this report).**

10.8 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

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

Table 42: Summary of the key environmental impacts SWOM: Significance without mitigation; SWM: Significance with mitigation) [8]

Aspect	Activity	Phase	Impact	SR WOM	Mitigation measures	ME	SR WM
Air Quality	Hauling, transportation and backfilling of tailings	Operational	Fugitive dust (containing TSP, as well as PM10 and PM2.5)	39 LOW to MEDIUM	Low or in-pit dumping of tailings during high wind conditions; Dust suppression to be implemented on haul roads	0.6	23.4 LOW to MEDIUM
Air Quality	Rehabilitation (spreading of soil, revegetation & profiling/contouring)	Closure and decommissioning	Profiling of backfilled opencast pits and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	16 LOW	Revegetation of exposed areas for long-term dust and water erosion control should be implemented. Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion. Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. Spreading of soil must be performed on less windy days. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. Additional mitigation measures include keeping the soil moist using sprays or water tanks, using wind breaks.	0.4	6.4 LOW

[8] Monitoring is listed as part of the mitigation measures; however, it must be noted that monitoring in itself is not a mitigation measure. Monitoring is important to quantify and verify impacts against pre-development baseline and must be used to pro-actively determine when mitigations should be required.

Aspect	Activity	Phase	Impact	SR WOM	Mitigation measures	ME	SR WM
					Dust suppression of roads being used during rehabilitation should be enforced. It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion.		
Surface Water	Backfilling of opencast pit with tailings	Operational	Impacts on surface quality due to poor quality seepage from the pollution source areas	27 LOW to MEDIUM	Storm water runoff generated at the opencast pit should be directed to and contained within the appropriately lined Pollution Control Dams. Appropriate management measures should be implemented to drain any seepage to the PCDs. Dirty water should be re-used wherever practical.	0.6	16.2 LOW
Groundwater	Backfilling of opencast pit with tailings	Operational	Impacts on groundwater quality due to poor quality seepage from the mining area	24 LOW to MEDIUM	Monitor the groundwater quality. Seal off individual high yielding inflow zones intercepted during mining.	1	24 LOW to MEDIUM
Groundwater	Backfilling of opencast pit with tailings	Decommissioning	Impacts on groundwater quality due to poor quality seepage from the mining area	75 MEDIUM to HIGH	Monitor the groundwater quality. Seal off individual high yielding inflow zones intercepted during mining.	1	75 MEDIUM to HIGH
Surface Water	Backfilling of opencast pit with tailings	Decommissioning	Impacts on surface quality due to poor quality seepage from the pollution source areas	27 LOW to MEDIUM	Acidic leachate and decant to be contained in bunded areas and directed to an appropriately lined PCD. Appropriate rehabilitation should be implemented in accordance with the Rehabilitation Plan.	0.4	10.8 LOW

10.9 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 43: Summary of specialist reports

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
Surface water Assessment (Appendix 13)	Considering that adequate hydrologic and geohydrological data had been gathered through specialist investigations coupled with the fact that ongoing data collection could fill the knowledge gaps, the mine would be in a position to implement an integrated water management plan with the main objective of reducing water resource and environmental degradation. An Integrated Water and Waste Management Plan (IWWMP) needs to be compiled as a technical supporting document for the water use authorisation process. The Environmental Management Plan (EMP) for the proposed expansion should address good waste management practices, guidelines for the storage, handling, use and disposal of waste, etc. It is important that the project aim to limit impacts on the aquatic resources as far as possible in order to maintain its current basic ecosystem functions. All mitigation measures that were provided within this report should be implemented and included in the relevant management plans. If all mitigation is adhered to, the combined impact could be rated as low. The Surface Water Assessment was NOT updated for this application, the 2017 assessment information was used for this application and is efficient.	**X**	Sections 9.7, 9.16, 10.1, 10.2, 10.3.2, 10.4.5, 10.7, and 10.8.
Hydrogeology (Appendix 6)	**Remediation of physical activity** The opencast areas will be rehabilitated and backfilled using the overburden and tailings stockpiles. The surface infrastructure areas should be remediated during the decommissioning phase. **Remediation of storage facilities**	**X**	Sections 9.6, 10.1, 10.2, 10.3, 10.4.6, 10.7 and 10.8.

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	Surface storage facilities are being used to backfill the opencast pit areas. The footprint areas should be remediated. Surface stockpiles that cannot be cleared should be sloped, capped and vegetated. This will reduce rainfall recharge and the subsequent leach volumes from the surface storage facilities to the underlying aquifers. **Remediation of environmental impacts** It will be impossible to prevent and rehabilitate the impacts of contaminant migration away from the pollution sources. Therefore, it is recommended that the groundwater monitoring program be continued for a period of at least 5 years after mine closure to monitor the contaminant migration. Based on these results remediation requirements can be identified and a remediation plan put in place. **Remediation of water resources impacts** The contaminant migration simulation results show that it is expected that there will be a limited impact on the surface water courses in the area, should such contaminant migration occur. It is recommended that the streams be monitored and management systems be put in place. This could include cut-off trenches down gradient of the pollution sources and management of the seepage.		
Air Quality (Appendix 7)	Based on the results presented the following recommendations are outlined: • It is recommended that ambient air quality monitoring be undertaken to establish the baseline condition prior to the onset of operations on-site and in order to establish the level at which the proposed operations are noted to impact on the ambient air quality. • Fallout monitoring should be included to assess the level of nuisance dust associated with both mining and process related operations. Sampling of fallout should be undertaken within the neighbouring areas as well as on-site. Dust fallout monitoring should ideally be	**X**	Sections

List Of Studies Undertaken	Recommendations Of Specialist Reports	Specialist Recommendations That Have Been Included In The EIA Report	Reference To Applicable Section Of Report Where Specialist Recommendations Have Been Included.
	located on-site, around the pit and shafts, at the crusher and in the vicinity of major storage stockpiles. • The most significant impacts for the proposed mine includes the storage of ROM stockpile, TSF, waste rock stockpiles, use of the crushing and screening facility, general transportation and hauling and the release of gaseous pollutants from the ventilation shafts. The mitigation and management measures discussed in section 9 of this report should be sufficient to ensure the mining operation can be conducted with minimal impact on the receiving environment and therefore not have a detrimental effect. The study area is situated in a region which already experience affected air quality as a result of current mining activities, agricultural activities and the use of gravel roads in relative close proximity to the proposed site. Through the implementation of the management and mitigation measures and continuous compliance monitoring should the potential impact of the proposed Moeijelyk Chrome Mine be minimal on the receiving environment and can it be mitigated to an extent where the significance will be low and acceptable within the tolerable level. It can therefore be concluded that the proposed project could go forward without a detrimental impact on the environment given the sound implementation of the management, mitigation and monitoring measures as presented throughout this report. The Air Quality assessment was NOT updated for this application, the 2015 assessment information was used for this application and is efficient.		

Attach copies of Specialist Reports as appendices.

Refer to Appendix 7 and 8 for the specialists studies undertaken in 2017 and 2015.

10.10 ENVIRONMENTAL IMPACT STATEMENT

10.10.1 Summary of the Key Findings of the Environmental Impact Assessment

The findings of the specialist studies undertaken for this EIA/EMP process provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed and existing project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that should prevent the proposed project from proceeding.

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/EMP will form part of the contract with the contractors appointed to construct and maintain the proposed mine and associated infrastructure. The EIA/EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA/EMP for key cycle phases (i.e. construction, operation and closure/decommissioning) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

For a detailed impact assessment layout specifying all the ratings used to obtain Significance of impacts with and without mitigation, refer to Table 46 above. For a summary giving only the Significance obtained, refer below.

Table 44: Summary of Key findings in terms of Impact Significance

Aspects Affected	Potential Impact	Significance Without Mitigation	Mitigation Efficiency		Significance With Mitigation
Air Quality	Fugitive dust (containing TSP, as well as PM10 and PM2.5)	39 LOW to MEDIUM	Medium	0.6	23.4 LOW to MEDIUM
Air Quality	Profiling of backfilled opencast pits and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.	16 LOW	Medium to High	0.4	6.4 LOW
Surface Water	Impacts on surface quality due to poor quality seepage from the pollution source areas (operational phase)	27 LOW to MEDIUM	Medium	0.6	16.2 LOW
Groundwater	Impacts on groundwater quality due to poor quality seepage from the mining area (operational phase)	24 LOW to MEDIUM	Low	1	24 LOW to MEDIUM
Groundwater	Impacts on groundwater quality due to poor quality seepage from the mining area (decommissioning and closure phase)	75 MEDIUM to HIGH	Low	1	75 MEDIUM to HIGH
Surface Water	Impacts on surface quality due to poor quality seepage from the pollution source areas (decommissioning and closure phase)	27 LOW to MEDIUM	Medium to High	0.4	10.8 LOW

10.11 FINAL SITE MAP

Please refer to Appendix 4 and Figure 9.

10.11.1 Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

Refer to Section 10.4 and Table 41.

10.12 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

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

Specialist recommendations which could be included as conditions have been discussed in Table 42 and Table 43. Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Table 46 and contained in the respective studies.

Table 45: Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

Aspects Affected	Potential Impact	Management Objectives	Management Outcome
Air Quality	Fugitive dust (containing TSP, as well as PM10 and PM2.5)	To limit public exposure to unacceptable health risks.	Reduction of fugitive dust.
Surface Water	Impacts on surface quality due to poor quality seepage from the pollution source areas	To prevent discharges of contaminated water to the environment and to prevent pollution of water resources in the vicinity of the project	Compliance with legislation. Prevent impacts on surface water quality.
Groundwater	Impacts on groundwater quality due to poor quality seepage from the mining area	To prevent unacceptable negative impacts on surrounding groundwater users. To limit the impact of infiltration of potentially contaminated leachate to the underlying aquifers..	Identification of impacts on groundwater quality.

10.13 FINAL PROPOSED ALTERNATIVES

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

Refer to Section 7.

11 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

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

Refer to Table 45 for conditions which could possibly be included in the Environmental Authorisation. The Mitigation measures as specified within the EMP are to be included in the Environmental Authorisation.

The environmental monitoring programme, as set out in the EMP, should be implemented.

Mining operations in the area must be conducted in accordance with the Mining Work Programme (or any amendments to such MWP) and the approved Environmental Management Plan.

Once mining has ceased the area must be rehabilitated and a closure certificate must be applied for in terms of Section 43 (3) of the MPRDA.

The applicant must take all necessary and reasonable steps to adequately safeguard and protect the environment, the mining area and any person/s using or entitled to use the surface of the mining area from any possible damage or injury associated with the activities of the mining area.

12 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE.

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

Please refer to Section 10.3 giving a description of all the “Limitations and Assumptions” of the study for the Moeijelijk expansion.

13 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

13.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORISED OR NOT

Mining and its associated impacts have already commenced on the proposed project site and the area has been disturbed by adjacent mining activities, the nearby local community, agricultural activities and intensive grazing practices. Taking the aforementioned into account as well as the relatively low nature of the potential impacts, as discussed throughout this document, it is clear that the proposed activities will be the most suitable future land use for the site in terms of environmental and economic cost-benefit.

Please refer to Section 14.7 for the impact statements. The findings of the specialist studies undertaken within this EIA/EMP provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that post the provided mitigation, should prevent the proposed project from proceeding.

13.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

13.2.1 Specific Conditions to Be Included Into the Compilation and Approval of EMPr

Refer to Sections 10.8 and 11.

A description of the rehabilitation objectives to be undertaken throughout the life of the mine, as well as during the closure phase.

A monitoring programme must be established for the following environmental aspects:

- Surface Water Impacts
- Groundwater Impacts
- Air Quality Impacts

13.2.2 Rehabilitation Requirements

For the mining operations, the following closure objectives and goals are proposed:

- To rehabilitate all disturbed land to a state that is suitable for its post closure use;
- To ensure that affected areas are safe and secure for both human and animal activities;
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated;
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required;
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality);
- To limit the impact on personnel whose positions may become redundant on decommissioning of the mine;
- Removal of unneeded surface infrastructures, e.g. roads, offices, plant infrastructure, explosive storage areas etc. as indicated in the construction phase;
- Rehabilitation and reshaping of stockpiles, overburden, waste rock dump
- Rehabilitation of Pollution Control Dams;
- Rehabilitation of opencast area with overburden and tailings material;
- Reshaping of topography to desired closure land use;
- Re-vegetation of rehabilitated areas; and
- Monitoring of rehabilitation objectives.

14 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

In the 2017 EIA/EMP, the statement was made that duration of mining activities will be 20 years, with an additional 5 years for rehabilitation. This is also recommended for the activities proposed for the Tailings backfilling project.

15 UNDERTAKING

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Programme report.

The signed undertaking is included in Section 28 of Part B.

16 FINANCIAL PROVISION

Environmental management infrastructure that is required at the outset will be financed out of the project capital. On-going environmental management and rehabilitation as identified in this document and as set out in the EMP will be funded from working costs during the life of the project.

Table 46: Rehabilitation Quantum for the Moeijelijk Mine Tailings Backfilling Project

No.	Description	Unit	Quantity	Master rate	Amount (Rands)
1	Dismantling of **processing plant and related structures** (including overland conveyors and powerlines)	m^3	Included in annual provision (2019)	16.28	R 0.00
2(A)	Demolition of **steel buildings and structures**	m^2	Included in annual provision (2019)	226.84	R 0.00
2(B)	Demolition of **reinforced concrete buildings and structures**	m^2	Included in annual provision (2019)	334.29	R 0.00
3	Rehabilitation of **access roads**	m^2	Included in annual provision (2019)	40.59	R 0.00
4(A)	Demolition and rehabilitation of **electrified railway lines**	m	N/A	393.99	R 0.00
4(B)	Demolition and rehabilitation of **non-electrified railway lines**	m	N/A	214.90	R 0.00
5	Demolition of **housing and/or administration facilities**	m^2	Included in annual provision (2019)	453.68	R 0.00
6	**Opencast rehabilitation** including final voids and ramps	ha	5.50	230,900.69	R 507,981.51
7	Sealing of **shafts, adits and inclines**	m^3	Included in annual provision (2019)	121.78	R 0.00
8(A)	Rehabilitation of **overburden and spoils**	ha	Included in annual provision (2019)	158,550.21	R 0.00
8(B)	Rehabilitation of processing waste **deposits and evaporation ponds (basic salt-producing waste)**	ha	N/A	197,471.43	R 0.00
8(C)	Rehabilitation of processing waste **deposits and evaporation ponds (acidic, metal-rich waste)**	ha	N/A	573,550.62	R 0.00
9	Rehabilitation of **subsided areas**	ha	Included in annual provision (2019)	132,761.93	R 0.00
10	**General surface rehabilitation**	ha	Included in annual provision (2019)	125,598.51	R 0.00
11	**River diversions**	ha	Included in annual provision (2019)	125,598.51	R 0.00
12	**Fencing**	m	Included in annual provision (2019)	143.27	R 0.00
13	**Water management**	ha	Included in annual provision (2019)	47,756.09	R 0.00
14	2 to 3 years of **maintenance and after care**	ha	11.00	16,714.63	R 183,860.94
15 (A)	**Surface and groundwater monitoring** (2 years)	Sum	3.00	100,000.00	R 300,000.00
15 (B)	**Biodiversity monitoring** (2 years)	Sum	Included in annual provision (2019)	0.00	R 0.00
	Sum of items 1-15				**R 991,842.45**
	Subtotal 1 - Multiply sum of items 1-15 by weighting factor 2 (1.05)			R 1,041,434.57	
1	Preliminary and General	6.0%	if Subtotal 1 > 100 000 000	-	
		12.0%	if Subtotal 1 < 100 000 000	R 124,972.15	
2	Contingency	10%	of Subtotal 1	R 104,143.46	
	Subtotal 2 (Subtotal 1 plus sum of management and contingency)			R 1,270,550.18	
	Subtotal 2 = VAT @ 15%			R 190,582.53	
	GRAND TOTAL (Subtotal 2 plus VAT)			**R 1,461,132.71**	

16.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED

The methodology used is the method prescribed in the guideline document "Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine" (Department of Minerals and Energy, 2005).

The deadline for compliance with the Financial Provisioning Regulations, as set out in GNR 1147, has been extended to 19 June 2021. We submit that it is appropriate to calculate the financial provisioning following the regulations outlined in regulations 53 and 54 of the MPRDA Regulations.

The "Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine" has been used to assess Moeijelijk Mine's closure liability. The DMR Guideline format makes use of a set template for which defined rates and multiplication factors are used. The multiplication and weighting factors which ultimately define the rate to be used are determined by amongst others the topography, the classification of the mine according to mineral mined, the risk class of the mine and its proximity to built-up or urban areas.

The DMR rates were published in 2004 and, due to inflation, are thus no longer accurate. As per the DMR's "Guideline Document for the Evaluation of the Quantum of Closure-related Financial Provision Provided by a Mine", the Master Rates for the DMR spreadsheet have been updated based on annual CPI rates published by StatsSA (http://www.statssa.gov.za/?page_id=1854&PPN=P0141&SCH=7563) for the period 2005 to 2020.

The DMR Guideline Document for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine (DME, 2005), classifies a mine according to a number of factors which allows one to determine the appropriate weighting factors to be used during the quantum calculation. The following factors are considered:

1. The mineral mined;
2. The risk class of the mine;
3. Environmental sensitivity of the mining area;
4. Type of mining operation; and
5. Geographic location.

Once the risk class (Class A, B or C) and the sensitivity of the area where the mine is located (Low, Medium or High) had been determined using the appropriate tables (Table 1, Table 2, Table 3, Table 4 and Table 5) the unit rates for the applicable closure components were identified.

Table 47: Moeijelijk Mine Classification

Risk Class	Sensitivity	Terrain	Proximity to Urban Area
C	Low	Flat	Urban:

16.2 CONFIRM THAT THE FINANCIAL PROVISION WILL BE PROVIDED AS DETERMINED

Moeijelijk Chrome mine will provide the financial provision as specified.

17 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

There are no deviations from the Scoping Report and Plan of Study.

17.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS.

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

No deviations were made to the methodology used and as outlined in Section 12.

17.1.1 Motivation For The Deviation

Not applicable.

18 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No additional request related to additional information has been received from the Competent Authority to date.

18.1 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, 1998 (ACT NO. 107 OF 1998) THE EIA REPORT MUST INCLUDE THE:

18.1.1 Impact on the Socio-Economic Conditions of Any Directly Affected Person

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as Appendix.

The Socio-Economic report is included as an Appendix in this report.

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation the preferred alternative is located entirely on the current mining footprint. No significant additional impact to socio-economic conditions is expected from the tailings backfilling activities.

18.1.2 Impact on Any National Estate Referred To In Section 3(2) of the National Heritage Resources Act

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Bauba A Hlabirwa Mining Investments (Pty) Ltd.'s Moeijelijk Chrome Mine is an existing operation the preferred alternative is located entirely on the current mining footprint, thus no impacts to Archaeological / Heritage Resources are expected.

18.2 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT.

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

Refer to Sections 7.

PART B ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

As part of the application a Section 102 amendment of the EMP will be applied for in terms of the MPRDA. The Section 102 amendment will entail the consolidation of previous EMPs (refer to Part A section 3.2) approved for the project as well as update the current layout of the authorised activities associated with the Moeijelijk Mine project, to reflect the layout of current operations, specifically the current location and dimensions of the overburden stockpiles and Pollution Control Dams.

19 DETAILS OF THE EAP

The information can be found in Section 1.1. Also refer to Appendix 1 and Appendix 2.

20 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

Only impacts related to new activities being applied for (refer to Part A Table 3 and Section 3.3) will be included in the impact and risk assessment as part of the EIA Report (Part A of this document). However, all impacts of the existing operation and new activities being applied for will be included in the EMPr Report section of this document, as this document is a consolidation and S102 amendment of the existing EMPrs for the operation (refer to Part A section 3.2). The EMPr Report (Section B of this document) will be a consolidation of all mitigation measures included in previously approved EMPrs, whilst taking into account recommendations from auditors regarding the suitability of the mitigation measures included in these approved EMPrs.

Refer to Part A Section 3.2 for extisting activities which have approved EMPrs and Environmental Authorisations, which will be included in the EMPr monitoring and mitigation measures.

Key aspects that were assessed by specialist studies as part of the current and previous EIA's include:

- Heritage aspects (2017 assessment);
- Ecological aspect (Fauna, Flora) (2017 assessment);
- Geohydrological aspects (2020 assessment);
- Surface water aspects (2017 assessment);
- Noise impacts (2017 assessment);
- Air Quality (2015 assessment);
- Visual Assessment (2015 assessment);
- Soil and Land Capability (2015 assessment);
- Socio-Economic assessment (2015); and
- Blasting assessment (2015 assessment).

21 COMPOSITE MAP

Refer to Appendix 4, **Figure 3**, Figure 4, Figure 5 and Figure 9 for the layout of the project.

22 DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

22.1 DETERMINATION OF CLOSURE OBJECTIVES

The preliminary objectives have been developed against the background of the mine location in the Sekhukhune region of Limpopo, particularly that the region is disturbed by mining activities and land available for non mining has become more limited. The objectives (see below) are therefore designed largely to manage residual risks and provide land that can be utilised after rehabilitation.

Rehabilitation will be done concurrently, with additional rehabilitation still being required in years 1-6 as provided above. The table provides a breakdown of the annual rehabilitation as well as the total post closure expenditure to be incurred by the operation.

For the mining operations, the following closure objectives and goals are proposed:

- Adhere to all statutory and other legal requirements.
- To develop landforms supporting stable and functioning ecosystems that are aesthetically acceptable on closure and will gradually sustain the desired land-uses post closure.
- Ensure safety & health of all stakeholders during closure and post closure and that communities using the site after closure are not exposed to unacceptable risks.
- Ensure that closure supports productive uses considering pre-mining conditions and are in agreement with commitments to stakeholders.
- Promote bio-diversity and biological sustainability to the maximum extent practicable.
- Utilise closure strategies that promote a self-sustaining condition with little or no need for ongoing care and maintenance.
- To achieve agreed quality targets set by the Catchment Management Authority (CMA) and the Department of Water and Sanitation (DWS) as far as practical relative to impacts and reasonability to achieve.
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated.
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality).
- To limit the impact on personnel whose positions may become redundant on decommissioning of the mine.

22.2 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

Refer to Table 59 for the proposed mitigation measures.

Any activity that results in damage or pollution to the environment will be rated and signed a value to determine the risk. An environmental emergency is defined as an unplanned situation or event resulting in potential pollution of the environment. A pollution incident means an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur.

22.2.1 Roles and Responsibilities

All employees and its contractors working for the mine are responsible for reporting any accident/emergency to their supervisor immediately, and if required notifying the emergency response teams. Personnel must be nominated as response team members and must receive appropriate training to manage emergencies. All other personnel must be

made aware of potential emergencies and trained in emergency response. Management must be aware of their responsibilities in case of emergency.

22.2.2 Response to Environmental Emergencies

22.2.2.1 Emergency Plan

An emergency plan must be developed for each potential environmental emergency situation. The emergency plan must give information on:

- Description of the emergency;
- Reference to relevant material safety data sheets;
- Responsibilities for management of emergencies;
- Contact telephone numbers (on-site & off-site);
- Equipment required (including locations); and
- Site plan where applicable.

22.2.2.2 Classification of Emergencies

The following incidents will be classified as an emergency:

- Natural Disasters;
- Damage to radiological/nuclear sources equipment;
- Strikes, protest or unrest;
- Information Management System Failure (plc systems);
- Health and Disease Outbreaks;
- Serous Incident or Fatality;
- High Potential Risk Incidents (Fatality, serious environmental pollution); and
- Other emergencies.

22.2.2.3 Reporting Emergencies

Moeijelijk mine will establish procedures to identify the potential for, and response to, incidents and emergency situations and for preventing and mitigating the illness, injury or environmental hazard that may be associated with them. Moeijelijk will review its emergency preparedness and response plans and procedures, in particular, after the occurrence of incidents or emergency situations. The mine shall also periodically test such procedures where and when practicable.

In the event of a serious incident or fatality occurring it is of the utmost importance to not only ensure the Health and Safety of every person involved but also to ensure that certain evidence is protected and gathered for use by the Moeijelijk mine, with the aim of the prevention of a similar incident/accident occurring in the future.

A “No Blame Fixing” approach to incident investigation will be implemented and it must be stressed that the gathering of information must be seen as preventative action and not as blame fixing. In light of the above, and in addition to the emergency procedure that is relevant to the specific area where the incident/accident occurred, and in relation to the notifying of person and first aid treatment/safety of any person involved, the following steps must be taken immediately after an incident/accident classified above has occurred.

In the event of a reportable/major environmental incident that could lead to danger to the public or the environment (death or sustaining impact on the environment) the appointee of that specific section, in consultation with SHEQ Manager, is responsible for communicating with and drafting an external report (in terms of Section 30 of National Environmental Management Act, 1998 (Act No. 108 of 1998) and Sections 19 and 20 of the National Water Act, 1998 (Act No. 36 of 1998) to the national and provincial department and the municipality containing the:

- Nature of the incident;
- Substances and quantities and accurate effect on persons and environment;

- Initial measures to minimise impacts;
- Causes of the incident;
- Accordance measures;
- When an environmental incident occurs, the following should be adhered to:
    - Report incident as per Incident Reporting Flow Diagram;
    - Measures to clean up any spillage/pollution must be taken as per Emergency Procedure.
    - It is important to ensure that no secondary pollution is caused by incorrect handling of an environmental incident, e.g. incorrect disposal of absorbent material use to clean up a spill; and
- For high potential risk incident (HPRI) / reportable environmental incidents, the SHEQ Manager will conduct a closeout investigation prior to closure of the incident. This will be done one month after all actions has been completed to verify the effectiveness of the actions.

22.2.2.4 Formalise Policies

Objectives

To formalise and sign off on company policies.

Actions

Compile Health and Safety Policy; and
Compile Environmental Policy.

The notification process has six main steps in managing an emergency, from the identification of the situation to final close off. These are as follows:

- Find and identify;
- Ensure human safety;
- Reporting;
- Containment and clean-up;
- Corrective action; and
- Monitoring.

22.2.2.5 Environmental Emergency Incidents

The SHEQ Manager must, within 14 days of the incident, report information on the incident to enable initial evaluation to the following

- Director-General of DEAT / LEDET;
- Provincial Head of Department (DMR);
- Provincial Head of Department (DWS); and
- Local Municipality.

The report must include:

- Nature of the incident;
- Substance involved and an estimation of quantity released and their possible acute effects on persons and the environment;
- Initial measures taken to minimise impacts;
- Cause of incident, whether direct or indirect; and
- Measures taken to avoid recurrence of such incident.

22.2.2.6 Water Pollution Emergency Incident

Water Pollution Emergency Incident is any accident /incident in which a substance pollutes or has the potential to pollute a water resource or a substance that has or is likely to have a detrimental effect on a water resource.

The responsible person who was in control of the substance involved in the incident at the time or responsible for the section the incident occurred will immediately inform the superior of the area where the incident occurred.

The information with regard to the incident is communicated to the Business Manager, SHEQ Manager and Security Personnel immediately by the superior of the area. The SHEQ Manager and the General Manager must, as soon as reasonably practicable after obtaining the knowledge of the incident, (i.e. within 14 days) report to:

- DWS (Regional Manager); and
- The Catchment Management Agency.
- The SHEQ Manager and crisis management team must:
    - Take all reasonable measures to contain and minimise the effects of the incident;
    - Undertake clean-up procedures;
    - Remedy the effects of the incidents; and
    - Sample the water together with the responsible person of the area.

22.2.2.7 Environmental Impact Register

All non-conformances pertaining to safety, health, environmental, quality of project activities and employees shall be documented as identified by the relevant documented procedures. Moeijelijk will make provision for recording and reviewing the nature and extent of any non-conformance that may be encountered during the Project Execution phase.

The Project Steering Committee in conjunction with the identifier shall decide on the impact of poor performance and the actions that would be necessary to prevent further deterioration or occurrence.

22.2.2.8 Records

Records must be kept of all environmental emergencies and non-conformances.

23 ACID MINE DRAINAGE

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

23.1 POTENTIAL RISK OF ACID MINE DRAINAGE

The silica tails are classified as Type IV i.e. no risk of acid generation, because sulphide sulphur was not detected. The sulphur in the sample takes the form of sulphate, which can potentially be leached from the tailings by rainwater, resulting in sulphate occurring in leachate from the silica tails.

23.2 STEPS TAKEN TO INVESTIGATE, ASSESS, AND EVALUATE THE IMPACT OF ACID MINE DRAINAGE

23.2.1 Geochemical characterisation

Geochemical characterisation was done on two occasions:

- The 2019 GPT hydrogeological study; and
- This current study. The assessment included:
    - Geochemical analysis of the silica tailings sample provided by the client (the sample represents the material that is proposed to be used to backfill the opencast pit areas);
    - Geochemical modelling to determine the short to medium term (up to the end of life of the underground mine) and long term post-closure pollution source concentrations.

During the GPT study overburden material was analysed. This current Future Flow study focused on the tailings material.

During the Future Flow study the interpretation of the geochemical results as well as the geochemical modelling was performed by Dr Meris Mills of Mills Water (Mills, 06 February 2020).

23.2.1.1 Total concentration testing

A number of the elements analysed during the GPT study show a concentration value of 0 mg/kg. The analysis certificate is not included in the report. It is assumed that the 0 values are assigned to elements that fall below detection limit.

None of the parameters from the GPT study exceed the TCT0 guideline values.

Results from the total concentration testing that was done on the silica tailings material as part of the Future Flow study and interpreted by Mills Water (Mills, 06 February 2020) show that the major oxide content of the silica tailings is dominated by silica, magnesium, chrome and iron, with lesser amounts of calcium and manganese.

Apart from fluoride, the reported trace element concentrations are below detection limits. Fluoride was detected at 80 mg/kg. Two things to note are (Mills, 06 February 2020):

- Chromite does not readily dissolve in the acid solution used to determine total trace elemental concentrations. Therefore trace elements associated with chromite would not be detected by this method. This effect can clearly be seen because the XRF-measured Cr is 14.879 wt%, equating to 148 790 mg/kg, and XRD reports 13 wt% chromite, equating to 78 022 mg/kg Cr, yet, <962 mg/kg is reported in the total trace element concentrations. Assuming the chromite in the silica tailings is stable and does not weather on backfilling, this is not a concern. However, low concentrations of total CrT and Cr6+ have been detected in process water, suggesting that chromite may be slightly soluble under the site conditions.
- The laboratory detection limits for some of the trace elements are high e.g. the detection limit for manganese is 962 mg/kg.

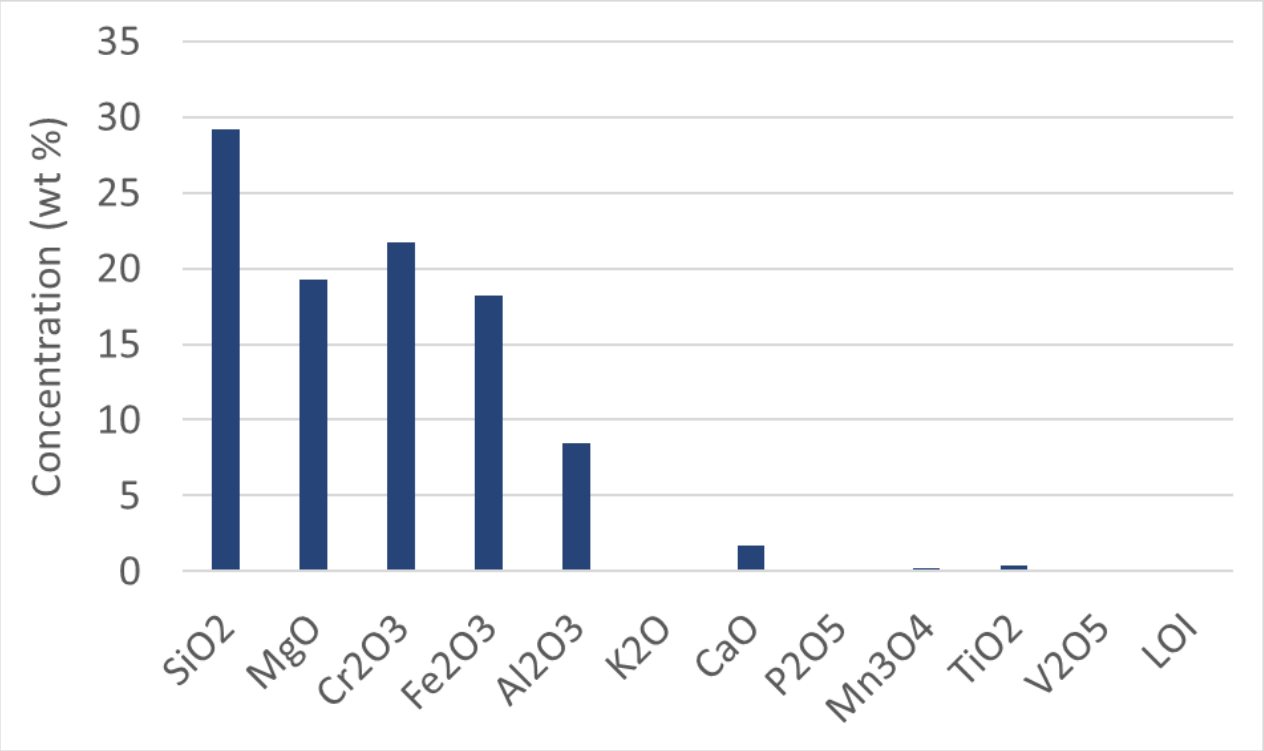


Figure 53: Major elemental content of the silica tails (after Mills, 2020)

23.2.1.2 Leach concentration testing

As with the total concentration results a number of the elements analysed during the GPT study show a concentration value of 0 mg/L. It is assumed that these values fall below the laboratory detection limits.

From the GPT study (GPT, March 2019) it is seen that barium (34.32 mg/L measured vs LCT0 of 0.7 mg/L), cobalt (14.15 mg/L measured vs LCT0 of 0.5 mg/L) and manganese (1.00 mg/L measured vs LCT0 of 0.5 mg/L) concentrations exceed the LCT0 guideline values, while the boron concentration 49.39 mg/L exceed the LCT1 guideline value of 25 mg/L.

Results from the Future Flow study, and as interpreted by Mills Water (Mills, 06 February 2020) show that the measured trace element and anion concentrations for the silica tails are all below detection limits, which are below their respective LCT0s. It should be noted that for many elements the detection limits are unusually high e.g. sulphate detection limit is 50 mg/L, therefore no detection does not mean that there is no sulphate present.

23.2.1.3 Waste classification

The waste classification as defined in Section 7 of GN 635 are summarised as:

- Wastes with any element or chemical substance concentration above LCT3 or TCT2 limits (LC>LCT3 or TC>TCT2) are Type 0 Wastes;
- Wastes with any element or chemical substance concentration above the LCT2 but below or equal to the LCT3 limits, or above the TCT1 but below or equal to the TCT2 limits (LCT2<LC<LCT3 or TCT1<TC<TCT2), are Type 1 Wastes;
- Wastes with any element or chemical substance concentration above the LCT1 but below or equal to the LCT2 limits, and all concentrations below or equal to the TCT1 limits (LCT1<LC<LCT2 or TC<TCT1), are Type 2 Wastes;
- Wastes with any element or chemical substance concentration above the LCT0 but below or equal to the LCT1 limits, and all concentrations below or equal to the TCT1 limits (LCT0<LC<LCT1 or TC<TCT1), are Type 3 Wastes; or
- Wastes with all elements and chemical substance concentration levels for metal ions and inorganic anions below or equal to the LCT0 and TCT0 limits (LC≤LCT0 and TC≤TCT0), and with all chemical substance concentration

levels also below the relevant concentration limits for organics and pesticides, are Type 4 Wastes (no organics or pesticides are included in the waste rock material and therefore that requirement is not applicable);

- If a particular chemical substance in a waste is not listed with corresponding LCT and TCT limits in the norms and standards, and the waste has been classified as hazardous in terms of regulation 4(2) of the Regulations based on the health or environmental hazard characteristics of the particular element or chemical substance, the waste is considered to be Type 1 Waste (not applicable to this study);
- If the TC of an element or chemical substance is above the TCT2 limit, and the concentration cannot be reduced to below TCT2 limit, but the LC for the particular element or chemical substance is below the LCT3 limit, the waste is considered Type 1 Waste;
- Wastes listed in item (2)(b) of Annexure 1 to the regulations are considered to be Type 1 Waste, unless assessed and determined otherwise in terms of the Norms and Standards;
- Wastes with all element or chemical substances leachable concentration levels for metal ions and inorganic anions below or equal to the LCT0 limits are considered to be Type 3 Waste, irrespective of the total concentration of elements or chemical substances in the waste provided that:
    - The concentration levels are below the relevant limits for organics and pesticides;
    - The in1herent waste and chemical character of the waste is stable and will not change over time; and
    - The waste is disposed of to landfill without any other waste.

As the TCs are less than the TCT0s, and the LCs are less than the LCT0s, the waste is assessed as a Type 4 waste (Mills, 06 February 2020). It should be noted that if the XRF chromium, vanadium and manganese values are used in place of the acid digest value, the waste would be classified as a Type 3 waste as the XRF values are between the TCT0 and the TCT1.

Table 48: Total concentration test results

Constituent	Units	TCT Guidelines Values			Overburden (GPT study)	Silica Tailings (Future Flow study)
		TCT0	TCT1	TCT2		
Arsenic (As)	mg/kg	5.8	500	2 000	0	<5.58
Boron (B)	mg/kg	150	15 000	60 000	49.30	<144
Barium (Ba)	mg/kg	62.5	6 250	25 000	34.20	<60.1
Cadmium (Cd)	mg/kg	7.5	260	1 040	0	<7.21
Cobalt (Co)	mg/kg	50	5 000	20 000	14.15	<48.1
Total Chromium (Cr)	mg/kg	46 000	800 000	N/A	238.50	<962
Copper (Cu)	mg/kg	16	19 500	78 000	14.12	<15.4
Mercury (Hg)	mg/kg	0.93	160	640	0	<0.865
Manganese (Mn)	mg/kg	1 000	25 000	100 000	139.40	<962
Molybdenum (Mo)	mg/kg	40	1 000	4 000	0	<9.62
Nickel (Ni)	mg/kg	91	10 600	42 400	59.16	<48.1
Lead (Pb)	mg/kg	20	1 900	7 600	0	<19.2
Antimony(Sb)	mg/kg	10	75	300	7.59	<9.62
Selenium (Se)	mg/kg	10	50	200	0	<9.62
Vanadium (V)	mg/kg	150	2 680	10 720	4.93	<96.2
Zinc (Zn)	mg/kg	240	160 000	640 000	12.71	<212
Total Cyanide (CN)	mg/kg	14	10 500	42 000	0	<9.62
Fluoride (F)	mg/kg	100	10 000	40 000	-	80

Exceed TCT0

Table 49: Leachable concentration test results

Constituent	Units	LCT Guidelines Values				Overburden (GPT study)	Silica Tailings (Future Flow study)
		LCT0	LCT1	LCT2	LCT3		
Total dissolved solids (TDS)	mg/L	1 000	12 500	25 000	100 000	0	<100
Chloride (Cl)	mg/L	300	15 000	30 000	120 000	0	<50.0
Sulphate (SO_4)	mg/L	250	12 500	25 000	100 000	0	<50.0
Nitrate (NO_3)	mg/L	11	550	1 100	4 400	0	<10.0
Fluoride (F)	mg/L	1.5	75	150	600	0	<1.00
Total cyanide (CN)	mg/L	0.07	3.5	7	28	0	<0.05
Arsenic (As)	mg/L	0.01	0.5	1	4	0.01	<0.01
Boron (B)	mg/L	0.5	25	50	200	49.39	<0.500
Barium (Ba)	mg/L	0.7	35	70	280	34.32	<0.700
Cadmium (Cd)	mg/L	0.003	0.15	0.3	1.2	0	<0.003
Cobalt (Co)	mg/L	0.5	25	50	200	14.15	<0.400
Total Chromium (Cr)	mg/L	0.1	5	10	40	0	<0.100
Hexavalent Chromium (Cr^{6+})	mg/L	0.05	2.5	5	20	0	<0.020
Copper (Cu)	mg/L	2.0	100	200	800	0	<1.00
Mercury (Hg)	mg/L	0.006	0.3	0.6	2.4	0	<0.006
Manganese (Mn)	mg/L	0.5	25	50	200	1.00	<0.500
Molybdenum (Mo)	mg/L	0.07	3.5	7	28	0.02	<0.070
Nickel (Ni)	mg/L	0.07	3.5	7	28	0.04	<0.070
Lead (Pb)	mg/L	0.01	0.5	1	4	0	<0.010
Antimony (Sb)	mg//L	0.02	1.0	2	8	0	<0.020
Selenium (Se)	mg/L	0.01	0.5	1	4	0	<0.010
Vanadium (V)	mg/L	0.2	10	20	80	0	<0.200
Zinc (Zn)	mg/L	5.0	250	500	2 000	0.02	<2.00

Exceed LCT0 guideline value
Exceed LCT1 guideline value

23.2.2 Acid-base-accounting testing

ABA involves a combined measurement of sulphur contents (total sulphur, sulphuric acid, sulphur, and organic sulphur), neutralisation capacity (NP), paste pH and the calculation of acid potential (AP), net neutralisation potential (NNP) and NP/AP ratio (NPR).

Guidelines on ABA test analysis set by Robertson and Broughton (Broughton & Robertson, 1992) are summarised in the tables below.

Table 50: Neutralisation Potential Ratio (NPR) guidelines

NPR = NP/AP	Acid generating potential	Comments
<1:1	Likely	Likely AMD generating
1:1 to 2:1	Possible	Possibly AMD generating if NP is insufficiently reactive or is depleted at a faster rate than sulphides
2:1 to 4:1	Low	Not potentially AMD generating unless significant preferential exposure of sulphides along fracture planes, or extremely reactive
>4:1	Unlikely	No further AMD testing required unless materials are to be used as a source of alkalinity

Table 51: Net neutralising potential guideline

Net neutralising potential (NNP) NNP = NP-AP	Acid generating potential
< -20	Likely to be acid generating
>20	Not likely to be acid generating
Between -20 and 20	Uncertain range

Table 52: Rock classification guidelines

Sample ID	Total S%	Sulphide S%	Sulphate S%	Paste pH	AP from sulphide S (kg/t CaCO3)	NP (kg/t CaCO3)	NPR	NNP	Type	Comment
Screening criteria	>0.3	>0.3		<5			<1	<-20	Type I: High	
	0.2 - 0.3	0.2 - 0.3		<7			1 - 2	-20 - 0	Type II: Possible/uncertain	
	0.01 - 0.2	0.01 - 0.2		>7			2 - 4	0 - 20	Type III: Low/uncertain	
	<0.1	<0.1		>7			>4	>20	Type IV: No risk	
Silica tails	0.013	bdl	0.013	8.6	bdl	12.4	39.7	12.4	IV	No sulphide S, no AP

The silica tails are classified as Type IV i.e. no risk of acid generation, because sulphide sulphur was not detected (Table 5.5). The sulphur in the sample takes the form of sulphate, which can potentially be leached from the tailings by rainwater, resulting in sulphate occurring in leachate from the silica tails.

23.2.3 Engineering Or Mine Design Solutions To Be Implemented To Avoid Or Remedy Acid Mine Drainage

The following comments relate to the disposal of the material:

- The Class D liner setup is depicted in the figure below. According to GNR 636: "Type 4 waste may only be disposed of at a Class D landfill designed in accordance with section 3(1) and (2) of these Norms and Standards, or, subject to section 3(4) of these Norms and Standards, may be disposed of at a landfill site designed in

accordance with the requirements for a G:L:B+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998)";

- The Class C liner setup is depicted in Figure 66 below. According to GNR 636: "Type 3 Waste may only be disposed of at a Class C landfill designed in accordance with section 3(1) and (2) of these Norms and Standards, or, subject to section 3(4) of these Norms and Standards, may be disposed of at a landfill site designed in accordance with the requirements for a G:L:B+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (DWAF MR, 1998)".

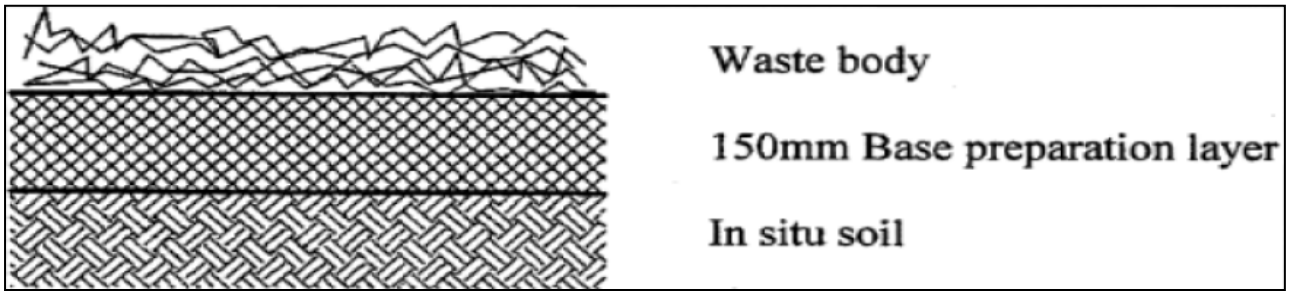


Figure 54: Class D landfill (GNR 636)

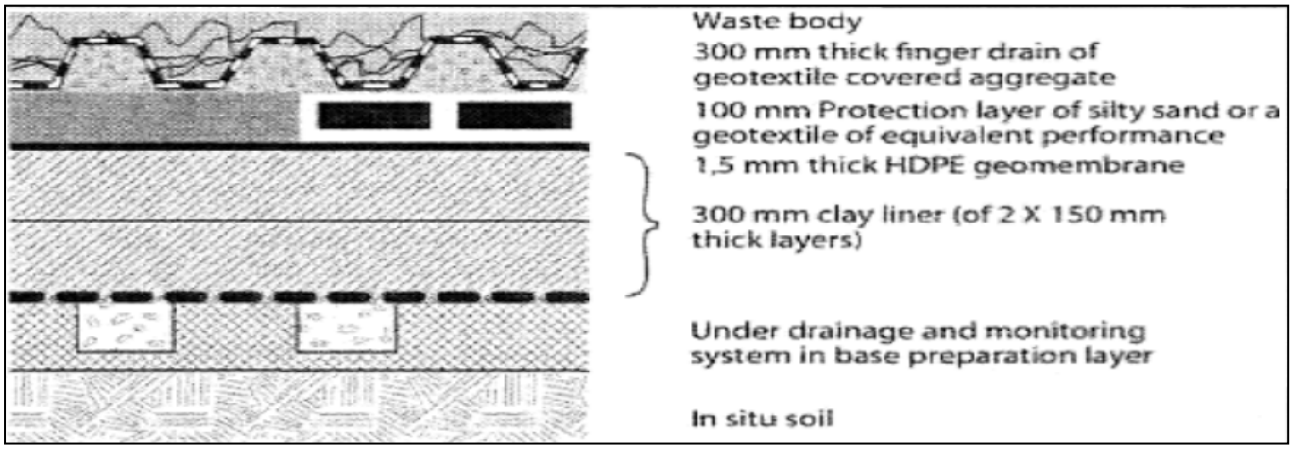


Figure 55: Class C landfill (GNR 636)

23.2.4 Measures That Will Be Put In Place to Remedy Any Residual or Cumulative Impact That May Result From Acid Mine Drainage

Acid mine drainage is not anticipated, however in the unlikely event that AMD occurs in the future, the responsibility will be with Moeijelijk to implement management measures and these will include:

- The construction and operation of a water treatment plant to treat the effected water; and
- Sealing of or resealing of leachate sources.

24 WATER

24.1 VOLUMES AND RATE OF WATER USE REQUIRED FOR THE MINING, TRENCHING OR BULK SAMPLING OPERATION

The volume of groundwater abstraction is based on the below water balance, which takes into account the current needs of the operation as well as the increased needs of the operations expected in future.

Mine Water Balance (m^3/a)

PCD

IN (m^3/a)			OUT (m^3/a)	
Rainfall	44318		0	Seepage
Run-off	2853		47171	Evaporation
TOTAL	47171		TOTAL	47171

WASH PLANT

IN (m^3/a)			OUT (m^3/a)	
Boreholes	149808		149808	Entrained/losses
TOTAL	149808		TOTAL	149808

UNDERGROUND MINE

IN (m^3/a)			OUT (m^3/a)	
Boreholes	87435		9330	Dust supression
			78105	Evaporation
TOTAL	87435		TOTAL	87435

DOMESTIC WATER USAGE

IN (m^3/a)			OUT (m^3/a)	
Borehole	9360		8892	Septic Tank
			468	Losses
TOTAL	9360		TOTAL	9360

Waste Water Treatment Plant

IN (m^3/a)			OUT (m^3/a)	
Septic tank	8892		8892	Irrigation
			0	Losses
TOTAL	8892		TOTAL	8892
Balance	302666	0		302666

Figure 56: Annual water balance (m3)

Increased water consumption is expected for the operations as two new underground portals are currently being developed. It is estimated that the three portals will produce 60 000 tons per month at full production. With the increased production of ROM from the underground operations, the wash plant will be required to have a higher production rate as well. The wash plant production rate is expected to increase from 35 000 tons per month to 100 000 tons per month.

24.2 HAS A WATER USE LICENCE HAS BEEN APPLIED FOR?

A Water Use Licence Application was submitted to the Department of Water and Sanitation in February 2020.

25 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

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

Refer to Table 53 for the impact mitigation measures.

25.1 IMPACT MANAGEMENT ACTIONS

A description of impact management actions, identifying the manner in which the impact management objectives and outcomes will be achieved.

Refer to Table 53 for the impact management actions.

Table 53: Mitigation Measures to rehabilitate the environment

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
Geology	Impact on Geology of area	Opencast mining Underground mining Blasting Backfilling of opencast areas	Construction; Operational; Decommissioning	None possible.	N/A	N/A
Topography	Hazardous excavations	Opencast mining Underground mining Overburden, tailings and waste rock stockpiles	Construction; Operational; Decommissioning	Proposed open pits will be backfilled progressively during mining and until permanent closure, barriers such as fencing or berms will be used to ensure that no humans or animals fall into the pits.	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	Continuous
				Surface monitoring on a regular basis to ensure that no subsidence has occurred or went unnoticed. If required, the use of barriers such as fencing will be used to ensure that no humans or animals fall into the hazardous areas until rehabilitation of the sites can commence.	N/A	Continuous
				No final voids will be left in the post-mining topography.	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				Continuous rehabilitation of topography	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	5 years before closure
				Annual surface inspections to be held over disturbed and rehabilitated areas.	N/A	Annually
				Shape the topography so that it is free draining	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	5 years before closure
Soils	Loss of soil resource	Opencast and underground mining Waste rock stockpiling Temporary topsoil storage/and removal Overburden stockpiles Hauling and transporting Road construction Removal of indigenous vegetation	Construction; Operational; Decommissioning	The soil that has been removed within the area needs to be replaced and rehabilitated to its previous natural state as far as possible.	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	During rehabilitation and decommissioning
				Strip all usable soil ahead of mining and stockpile separately for later use in rehabilitation	N/A	Continuous
				All topsoil stockpiles to be protected from erosion by a development of an earth deflection bund upslope of the stockpile.	N/A	Continuous
				If soil stockpiles are going to be left for more than 12 months, vegetate soil stockpiles to minimise soil loss	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Backfilling of opencast areas		to wind and water erosion. Vegetation to comprise seeding with indigenous grass species suitable to the region.		
				The mine will implement a soil conservation procedure which includes the protection of soil from compaction, protection of topsoil, prevention of erosion and loss, re-vegetation of disturbed areas and monitoring.	N/A	Continuous
	Erosion	Opencast and underground mining Waste rock stockpiling Temporary topsoil storage/and removal Overburden stockpiles Hauling and transporting Road construction Removal of indigenous vegetation Backfilling of opencast areas	Construction; Operational; Decommissioning; Closure	Vegetate disturbed areas during the rainy season.	N/A	As needed
				Where disturbed areas cannot be re-vegetated during the life of the mine appropriate measures will be taken to control erosion. These may include: contours; berms; runoff diversion canals; energy dissipaters; and application of straw mulches or soil binders to exposed soils.	N/A	Continuous
				The mine will ensure that erosion controls are included in the designs of the opencast sections within the koppie areas, which has increased risk for easy mobility downslope.	N/A	Prior to mining of UG1 and UG2 opencast areas
				Energy dissipaters will be constructed at points where there	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.		are concentrated discharges of water to the environment (e.g. culverts and outflows of water from diversion berms or canals).		
				Road should be monitored to ensure that they are draining correctly after rain events and that the culverts along the road are sufficient and functional.	N/A	Monthly
	Soil contamination	Opencast and underground mining; Blasting; Waste rock stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting;	Construction; Operational; Decommissioning	Adequate sanitary facilities will be provided at construction sites and areas that is located away from the mine ablution blocks.	N/A	As needed
				Storage areas and vehicle maintenance areas will be surfaced and will have appropriate runoff containment measures, such as oil traps, bunds and canals, will be in place.	Dangerous goods stored and managed as per SANS 10228:2006 and MSDSs and MPRDA Regulations.	Continuous
				Vehicles will be regularly serviced according to a pre-planned maintenance programme.	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Road construction; Removal of indigenous vegetation; Backfilling of opencast areas; Crushing, screening and washing of ore; Storm water management structures, pipelines, berms and water resources diversions;		Vehicles that break down on the road or in the opencast pit will be repaired with oil drip trays placed underneath them	N/A	Continuous
				All chemical, fuel and lubricant storage areas will be underlain by impermeable substrates; Drums containing chemicals will be stored upright in a secure, bunded area with an impermeable surface.	Dangerous goods stored and managed as per SANS 10228:2006 and MSDSs and MPRDA Regulations.	Continuous
				Spill kits must be available on site and personnel trained to utilise these to clear spills.	N/A	Continuous
				Clean soil affected by hydrocarbon spills immediately and place contaminated soil in hazardous waste container.	N/A	Continuous
				If necessary, the polluted soils will be classified as wastes and will be discarded at an appropriate permitted waste site. After removal of the contaminated soils, the affected areas will be landscaped and rehabilitated.	N/A	As needed
Land Capability	Loss of grazing land within footprint	Opencast mining; Blasting; Waste rock stockpiling; Temporary topsoil	Construction; Operational; Decommissioning; Closure	The new infrastructure will be developed as much as possible on the existing disturbed sites	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas.				
	Loss of post mining land use capability	Opencast mining; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Road construction; Removal of indigenous	Operational; Decommissioning; Closure	ECO to conduct monitoring of rehabilitated areas to assess performance of the rehabilitation approach employed. Rehabilitated areas should be monitored annually to identify occurrence of surface erosion, vegetation die back, and the emergence of alien/exotic vegetation. In the event that non-performance is identified, the ECO will implement a plan for corrective action, and will seek the advice of	N/A	Annually once rehabilitation commences

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		vegetation; Wash plant; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions;		rehabilitation ecologists as required		
				The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated.	Compliance to requirements stipulated by GN R. 598 of NEMBA.	Annually
				Re-vegetate rehabilitated areas	N/A	When suitable areas are available
				Replace topsoil to achieve required pre-mining land capability	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	During rehabilitation
Blasting	Blasting hazard and damage to structures by blasting vibrations	Opencast and underground mining; Blasting;	Construction; Operational	Ground vibration mitigation can be done in two ways: reduce the charge mass per delay – in other words, plan blasting operations considering different initiation and charging options. Secondly increase distance between the blast and the structure of concern. These are the main factors to be considered for mitigation.	Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956).	As needed
	Blasting hazard - Nuisance to people	Opencast and underground mining; Blasting;	Construction; Operational	Air blast and fly rock can be controlled using proper charging methodology. Blasting operations in any area to be conducted further away from possible	Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956).	As needed

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				receptors will yield lower levels of ground vibration. It is advisable that a detail plan of action is put in place to manage ground vibrations in the areas of concern. Problematic POI's with reduced charge are required to facilitate ground vibration levels within limits.		
				Moeijelijk will undertake a thorough crack survey of the potentially affected structures. This will include a photographic record of the structures.	N/A	As needed
				Moeijelijk will inform the surrounding community of its blasting programme. A community liaison forum will be established, if not already existing, and the programme will be made available through the forum as agreed with community representatives.	Blasting Regulations of the Explosives Act, 1956 (Act 26 of 1956).	As needed
Land Use	Road disturbance due to increase in traffic	Opencast and underground mining; Waste rock stockpiling; ROM stockpiling; Temporary topsoil	Construction; Operational; Decommissioning; Closure	As the increase in production and the new infrastructure will increase the amount of trucks and vehicles utilising the road, new roads will need to take cognisance of this and aim to improve congestion and safety on the roads.	N/A	As needed

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Dust suppression; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile;		Travel speeds on the mine roads will be limited to less than 40 km/h. Travel speeds on the access roads will be limited to between 60 m/h and 80 km/h.	N/A	Continuous
	Failure of mine residue deposit	Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Tailings drying facility; Tailings stockpile.	Construction; Operational; Decommissioning	The tailings deposits have been sited and planned and will be designed and operated in terms of the relevant approved management and monitoring plan, under the supervision of suitably qualified professional engineers.	NEMWA: GN R. 632: Regulations regarding the planning and management of residue stockpiles and residue deposits from prospecting, mining, exploration or production operation	As determined by engineers
				Professional engineers will undertake monitoring of the	NEMWA: GN R. 632: Regulations regarding	As determined by engineers

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				residue deposits at the frequency deemed appropriate by these engineers.	the planning and management of residue stockpiles and residue deposits from prospecting, mining, exploration or production operation	
Natural Vegetation	Loss of Biodiversity and Ecological function	Opencast and underground mining; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Placement of fences; Removal of indigenous vegetation; Backfilling of opencast areas;	Construction; Operational; Decommissioning	Surface disturbance will be kept to a minimum. Activities will be concentrated in already disturbed areas as far as is possible. Human and vehicular activity will be restricted to construction and operational sites.	N/A	Continuous
				Avoidance of unnecessary disturbance or destruction of natural habitat	N/A	Continuous
				Rehabilitate affected areas as soon as possible after mining.	N/A	When suitable areas are available
				Strictly monitor and eradicate populations of alien and invasive plants. Do not allow these species to spread uncontrolled into natural vegetation.	Compliance to requirements stipulated by GN R. 598 of NEMBA.	Annually
				Well designed and implemented water and erosion control structures must be constructed during all mining phases – especially after rehabilitation.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions;			protection of water resources	
				Rehabilitation must include revegetation with indigenous local plant species, as soon as feasible.	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	When suitable areas are available
Animal Life	Loss of Biodiversity and Ecological function	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road	Construction; Operational; Decommissioning	Surface disturbance will be kept to a minimum. Activities will be concentrated in disturbed areas as far as is possible. Human and vehicular activity will be restricted to construction and operational sites.	N/A	Continuous
				Relevant Authorisation needed for all Protected species in terms of the Limpopo Environmental Management Act, NEM:BA and the National Forests Act.	N/A	As needed
				Mine staff will be prohibited from collecting plants, cutting firewood and trapping / catching animals.	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		construction; Placement of fences; Removal of indigenous vegetation; Wash plant; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.		No waste will be disposed of in or around the project area, which can attract rodents or other types of fauna; waste will be disposed of at an off-site waste disposal facility.	N/A	Continuous
				Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora that is endemic and serve as habitat for the animals inhabiting the area.	N/A	Continuous
				Allow animals to escape areas of activity freely and do not hinder their movement, especially avoid the natural ecological corridors created by the different drainage lines encountered to the northern sides of Moeijelijk. The mountainous areas also serve as an ecological corridor between different areas and movement along the mountain ranges should not be prevented or fenced in a manner which will endanger the connectivity between larger areas	N/A	Continuous
				All injured animals sighted during the development should be protected and moved to receive	N/A	As needed

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				rehabilitation at the designated centre and should not be handled by the employees under any circumstance.		
				To minimise potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continuous
				Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962). Workers should also be advised on the penalties associated with the needless destruction of wildlife, as set out in this act.	Animal Protection Act, 1962 (Act No. 71 of 1962)	Continuous
				All activities should be restricted to one area within the farm and activity and access into larger intact areas should be avoided. Strict measurements should be implemented. No foraging, food and wood collecting within the veld should be allowed.	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
Surface water	Alteration of drainage patterns due to river diversion or impacts on drainage lines	Opencast and underground mining; Waste rock stockpiling; ROM stockpiling; Overburden stockpiles; Road construction; Backfilling of opencast areas; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and	Construction; Operational; Decommissioning	Define the runoff/flood characteristics of the study site and design storm water management facilities accordingly. This will ensure appropriate separation of clean and dirty storm water and will maximise the return of clean water to the downstream drainage system. Keep the dirty area footprint as small as possible and capture all dirty storm water generated on site for potential re-use. Adherence to the Storm Water Management Plan as compiled by an accredited engineer is crucial.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous
			Decommissioning and Closure	Surface subsidence of rehabilitated areas and differential settlement will be repaired by backfilling and sloping to prevent ponding and promote free draining	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	During rehabilitation
				Re-establish drainage lines at a drainage density equal to or greater than the pre-mining drainage density.	N/A	During decommissioning and prior to closure

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		diversion of watercourses.				
	Exposed surfaces could result in increased erosion and associated runoff which in turn may result in increased siltation of surface streams. Exposed surfaces together with increased traffic on-site could result in increased siltation of surface water streams by excessive dust generation.	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Tailings drying facility; Tailings stockpile; Storm water management	Construction; Operational; Decommissioning	Silt screens/sandbags could be employed on exposed areas. The formation of erosion channels must be monitored and must repair these as required. All erosion channels which develop should be backfilled and consolidated as required.	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.				
	Deterioration in surface water quality	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road	Construction; Operational; Decommissioning	Mobile sanitary facilities must be inspected regularly and adequately maintained by an approved contractor to prevent any spills/leaks from occurring. Mobile sanitary facilities must be located outside the applicable buffer zones. Ensure that an adequate number of mobile toilets are available for workers on site.	N/A	Continuous
				Spills resulting from vehicle maintenance or as result of the storage of hydrocarbon materials must immediately be cleaned and properly disposed of.	N/A	As needed

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		construction; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.		Petroleum (and other hazardous materials) storage areas should be effectively bunded and applicable safety standards must be adhered to. Hazardous materials and chemicals must be stored on solid concrete surfaces. Storage containers must be inspected regularly for leaks and repaired as needed.	Dangerous goods stored and managed as per SANS 10228:2006 and MSDSs and MPRDA Regulations.	Continuous
				Maintain parking areas and roads in good conditions for the duration of operations.	N/A	Continuous
				No unauthorised washing of vehicles should be allowed on the premises.	N/A	Continuous
				Immediate action must be taken to contain spillage from waste water storage facilities. The dams must be inspected regularly for early detection of leaks.	N/A	Daily inspections
				Uncontrolled disposal of waste near any construction site must be communicated to all contractors as unacceptable. All waste should be placed in a central collection point and removed from the site. Encourage and implement the separation and recycling of general	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				waste. Place refuse bins on strategic places to encourage the disposal of litter to these bins. Erect notices to inspire the staff to keep their environment clean and hazardous free.		
				Inspect all on-site disposal sites regularly to ensure adherence to all legal requirements. Inspect all contractors and disposal agents, premises and sites regularly to ensure that all environmental and legal requirements are adhered to.	N/A	Monthly
				Storm water runoff generated at stockpile areas should be directed to and contained within the Pollution Control Dams. Appropriate management measures should be implemented to drain any seepage to the PCDs.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous
				Dirty water should be re-used wherever practical.	N/A	When possible
				An annual report on the project water balance will be submitted to DWS.		Annual
Groundwater	Lowering of groundwater levels due to mine dewatering - effect on	Opencast and underground mining;; Wash plant;	Construction; Operational; Decommissioning; Closure	Clean and dirty water systems should be separated as planned.	NWA: GN 704: Regulations on use of water for mining and related	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
	surrounding groundwater users and base flow	Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.			activities aimed at the protection of water resources	
				Ensure that the appropriate design facilities (berms, storm water channels etc.) are constructed to ensure clean and dirty water is separated at the ore handling facilities.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous
				Groundwater monitoring boreholes should be sited at designated positions based on infrastructure layout, to comply with the design requirements of a groundwater monitoring system.	N/A	Continuous
				Monitor static groundwater levels of monitoring boreholes (including selected community boreholes) on a monthly basis to ensure that any deviation of the groundwater flow from the idealised predictions is detected in time and can be reacted on appropriately.	N/A	Monthly
				If it can be proven that the mine is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be	N/A	As needed

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				done through the installation of additional boreholes for water supply purposes, or an alternative water supply.		
				Groundwater quality must be monitored on a quarterly basis.	N/A	Quarterly
				Optimise water use by means of waste water minimisation, and increasing the reuse and recycling of waste water	N/A	Continuous
				The numerical groundwater model should be updated every 3 years during operation of the mine by using the measured inflows, water levels and drilling and pump test information to re-calibrate and refine the impact prediction	N/A	Every 3 years
				Waste water storage facilities should be lined to prevent ingress of contamination	N/A	Continuous
	Deterioration of water quality as a result of seepage	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Overburden stockpiles;	Operational	Surface hydrology design should include surface drainage and storm water diversion drains, to meet the requirements of the Water Act. This includes the separation of unpolluted from polluted surface water and the containment of polluted water on site in impoundments. Also, where	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Backfilling of opencast areas; Tailings drying facility; Tailings stockpile;		leachate is generated, it must be contained separately from water which is only slightly polluted through contact with the waste.		
				In the case of hazardous waste disposal sites, the design must make provision for containment of hazardous waste. This implies the complete separation of the waste body and any associated leachate from the surrounding soil or rock strata, by means of a liner and a leachate collection system.	Dangerous goods stored and managed as per SANS 10228:2006 and MSDSs and MPRDA Regulations.	Continuous
				Monitoring systems for surface and ground water pollution should be indicated. This will include the positions of both surface water sampling points and monitoring boreholes. Quarterly surface water and groundwater quality and monthly groundwater quantity monitoring should be instituted as planned.	N/A	Quarterly / monthly
				The Progressive Rehabilitation Plan should indicate when areas should reach their final level and how they will be progressively restored, by means of final cover or capping, top soiling and vegetating. The	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	Prior to rehabilitation

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				type of vegetation envisaged should also be described. Rehabilitation, where possible, should run concurrently with the mining programme as planned.		
				Drains must divert or contain the peak design storm of 50-year return period for the particular catchment area. The system must effectively separate unpolluted water, that has not come into contact with waste, from polluted water. Upslope cut -off drains must divert clean storm water around the site and into the natural drainage system.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous
				Polluted water, on the other hand, must be collected in PCDs, retained on the site and managed in accordance with the Department's directives. This may include controlled release, recycling and evaporation or treating with any leachate that has been collected.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous
				All temporarily and permanently disturbed areas must be graded and maintained to promote run-off without excessive erosion and to	N/A	When possible

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				eliminate ponding or standing water.		
				Clean, uncontaminated water, which has not been in contact with the waste, must be allowed to flow off the site into the natural drainage system, under controlled conditions. All drains must be maintained. This involves ensuring that they are not blocked by silt or vegetation.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Continuous
				Domestic waste water should be temporarily stored on-site to be collected and disposed of off-site by a reputable contractor.	N/A	Continuous
				The DWS requires a Water Quality Monitoring Plan as part of the permitting requirements. This involves background analyses, detection monitoring, investigative monitoring and post -closure monitoring. The Water Quality Monitoring Plan ensures that the water quality in the vicinity of a mine is regularly monitored and reported upon throughout its life, so that, where necessary, remedial action can be taken.	N/A	As stipulated in monitoring plan and / or WUL

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				Dewatering and groundwater abstraction for mining purposes should be monitored so as to prevent negative impacts on the underlying aquifer. Sustainable abstraction rates should be determined and adhered to.	N/A	Monthly
	Deterioration of water quality as a result of seepage	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Overburden stockpiles; Backfilling of opencast areas; Tailings drying facility; Tailings stockpile;	Decommissioning, closure	Surface hydrology design should include surface drainage and storm water diversion drains, to meet the requirements of the Water Act. This includes the separation of unpolluted from polluted surface water and the containment of polluted water on site in impoundments. Also, where leachate is generated, it must be contained separately from water which is only slightly polluted through contact with the waste.	NWA: GN 704: Regulations on use of water for mining and related activities aimed at the protection of water resources	Decommissioning
				Quarterly groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends.	N/A	Quarterly during Decommissioning (until closure certificate is issued)
				A pollution control dam could be used to intercept polluted seepage water. An interception trench is an additional option to treat the contaminated discharge.	N/A	Decommissioning

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine.	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	Continuous
				The final backfilled opencast topography should be engineered such that runoff is directed away from the mining areas.	N/A	Decommissioning
Air Quality	Emissions from site clearance and infrastructure development, specifically dust	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Dust suppression;	Construction, Operational	Dust emitted during bulldozing activity can be reduced by increasing soil dampness by watering the material being removed thus increasing the moisture content.	Dust fallout will be monitored and managed as per GNR827	Continuous / as needed
				Blasting should also not take place when poor atmospheric dispersion are expected i.e. early morning and late evening.		
				The hauling of materials should take place on roads which is being watered and/or sprayed with dust suppressant.		
				To reduce the amount of dust being blown from the load bin in the haul roads, the material being		

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions;		transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers. Use of pre-blast environmental checklists, real-time weather monitoring data and stringent controls on blasts carried out in sensitive areas Respiratory protection should only be used to control the dust exposures where other dust collection or suppression systems have not been able to reduce the dust to acceptable levels. When using hand held rock drills efforts should be made to control dust at source e.g. water injection or extraction. If control of dust at source is not practicable then respiratory protection should be used. Low or in-pit dumping of overburden and tailings during high wind conditions Filtration systems can be utilised to remove the pollutants from the underground air prior to their release to the surface via the vent, if necessary.		

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
	General transportation, hauling and vehicle movement on site	Opencast and underground mining; Hauling and transporting; Road construction; Dust suppression; Backfilling of opencast areas; Wash plant;	Construction, Operational	Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.	Dust fallout will be monitored and managed as per GNR827	Continuous / as needed
				To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.		
				In order to mitigate the impacts of the activity, the speed limit should be kept to the low as more dust will be generated at higher wind speeds.		
				Speed limits need to be observed and adhered to.		
				Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion should be considered.		
				The drop heights should be minimised when depositing materials to the ground.		
				Planting plenty of trees or hedges as shelterbelts to eliminate or minimise wind disturbance		

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				Disturbed areas such as those caused by stripping off grass and topsoil should be kept to a minimum		
	Beneficiation by means of crushing, screening and washing	Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile;	Construction, Operational	Conventional water sprays, whose performance can be enhanced with the addition of wetting agents that assist in water to dust particle contact, lessening the amount of water required	Dust fallout will be monitored and managed as per GNR827	As needed
				Dust can be reduced by providing a controlled fine water spray system that directs water onto the input material before it enters the crusher (be careful not to over water as this can cause further problems down the production process)		
				Where practicable, stone boxes on process plants can direct and slow the fall of material onto conveyor belts, and thus the amount of dust generated at transfer points		
	Demolition and removal of all infrastructure (incl. transportation off site), rehabilitation	Opencast and underground mining; Blasting; Waste rock	Decommissioning; Closure	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase.	Dust fallout will be monitored and managed as per GNR827	Continuous / as needed

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water		The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.		
				Speed restrictions should be imposed and enforced.		
				Dust suppression of roads being used during rehabilitation should be enforced.		
				Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option.		
				Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion.		
				Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings.		
				Spreading of soil must be performed on less windy days.		

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.		The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels.		
Noise	Disturbing noise, Day time and Night time	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Overburden stockpiles; Hauling and transporting; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore;	Construction	An Annual Acoustical Measurement & Audit Programme is recommended to be implemented and conducted prior to construction phase (to improve the characterisation of the baseline) and then during all other phases (up till end of closure).	N/A	Annually
Sites of archaeological	Disturbance of heritage sites	Opencast and underground	Construction; Operational	No impact on the identified heritage resource sites is expected,	N/A	Continuous

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
and cultural interests		mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction; Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile; Storm water management		but the requirements apply in the event that the project layout changes in a way that will affect these sites or in the event that additional sites are discovered.		

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.				
Visual aspects	Negative visual impact	Opencast and underground mining; Blasting; Waste rock stockpiling; ROM stockpiling; Temporary topsoil storage/and removal; Overburden stockpiles; Hauling and transporting; Road construction;	Construction; Operational; Decommissioning; Closure	Rehabilitation of the mining area by re-vegetation of the mining site and surrounding area should be undertaken concurrent with mining activities when feasible.	NEMA & MPRDA principals and regulations regarding decommissioning and rehabilitation.	Continuous As needed and when possible
				The area will be rehabilitated after mining is concluded and thus the visual impact will be removed and the area will be restored	N/A	
				Dust from stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust.	Dust fallout will be monitored and managed as per GNR827	

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
		Dust suppression; Removal of indigenous vegetation; Backfilling of opencast areas; Wash plant; Crushing, screening and washing of ore; Tailings drying facility; Tailings stockpile; Storm water management structures, pipelines, berms and water resources diversions; Mining related infrastructure within a watercourse or within 32 m of watercourses and diversion of watercourses.				

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
Socio-Economic	Positive Socio-economic impacts	Opencast and underground mining;	Construction; Operational; Decommissioning; Closure	Non-core activities will be identified and prioritised for local service providers. Local service providers will be identified and requested to tender for the provision of the various services.	As per the requirements of the approved SLP	Continuous / as needed
	Negative impact from closure	Opencast and underground mining;	Decommissioning, Closure	Adequate communication with the surrounding communities during all phases of the development to ensure that an open policy regarding timelines is enforced during all stages of the development	As per the requirements of the approved SLP	
	Negative cumulative impacts	Opencast and underground mining;	Construction; Operational; Decommissioning; Closure	Discussions will be held with the South African Police Force regarding the policing of the area.	As per the requirements of the approved SLP	
				A forum will be established whereby the mine and surrounding land users communicate on a regular basis to ensure that the mine is in a position to attend to any concerns of affected parties promptly.	As per the requirements of the approved SLP	
				Ensure that signs are erected on all boundary fences warning against entering mining area.	As per the requirements of the approved SLP	
				Fencing around the opencast and underground mines area to be	As per the requirements of the approved SLP	

Aspects Affected	Potential Impact	Activity	Phase	Management and Mitigation Measures	Compliance with standards	Time Period For Implementation
				inspected weekly and maintained in competent condition.		
				A clear policy will be developed that is transparent and well-advertised to local communities;	As per the requirements of the approved SLP	
				The policy will be clear on the skills and qualifications necessary for employment;	As per the requirements of the approved SLP	
				The tribal authority will not oversee the recruitment process because this carries risks of job reservation, discrimination and corruption.	As per the requirements of the approved SLP	

26 FINANCIAL PROVISION

26.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

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

The preliminary objectives have been developed against the background of the mine location in the Sekhukhune region of Limpopo, particularly that the region is disturbed by mining activities and land available for non mining has become more limited. The objectives (see below) are therefore designed largely to manage residual risks and provide land that can be utilised after rehabilitation.

For the mining operations, the following closure objectives and goals are proposed:

- Adhere to all statutory and other legal requirements.
- To develop landforms supporting stable and functioning ecosystems that are aesthetically acceptable on closure and will gradually sustain the desired land-uses post closure.
- Ensure safety and health of all stakeholders during closure and post closure and that communities using the site after closure are not exposed to unacceptable risks.
- Ensure that closure supports productive uses considering pre-mining conditions and are in agreement with commitments to stakeholders.
- Promote biodiversity and biological sustainability to the maximum extent practicable.
- Utilise closure strategies that promote a self-sustaining condition with little or no need for ongoing care and maintenance.
- To achieve agreed quality targets set by the Catchment Management Authority (CMA) and the Department of Water and Sanitation (DWS) as far as practical relative to impacts and reasonability to achieve.
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated.
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality).
- To limit the impact on personnel whose positions may become redundant on decommissioning of the mine.

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

The environmental objective in relation to closure which will be made available to all registered I&APs for comment. All comments received and the relevant meeting minutes are appended to this report

26.1.3 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 compilation if the Rehabilitation and Closure Plan, as per the requirements of Government Notice R1147, is currently being undertaken by Elemental Sustainability (Pty) Ltd and will be included in the final EIA and EMPr Report to be submitted for consideration by the Competent Authority (DMR).

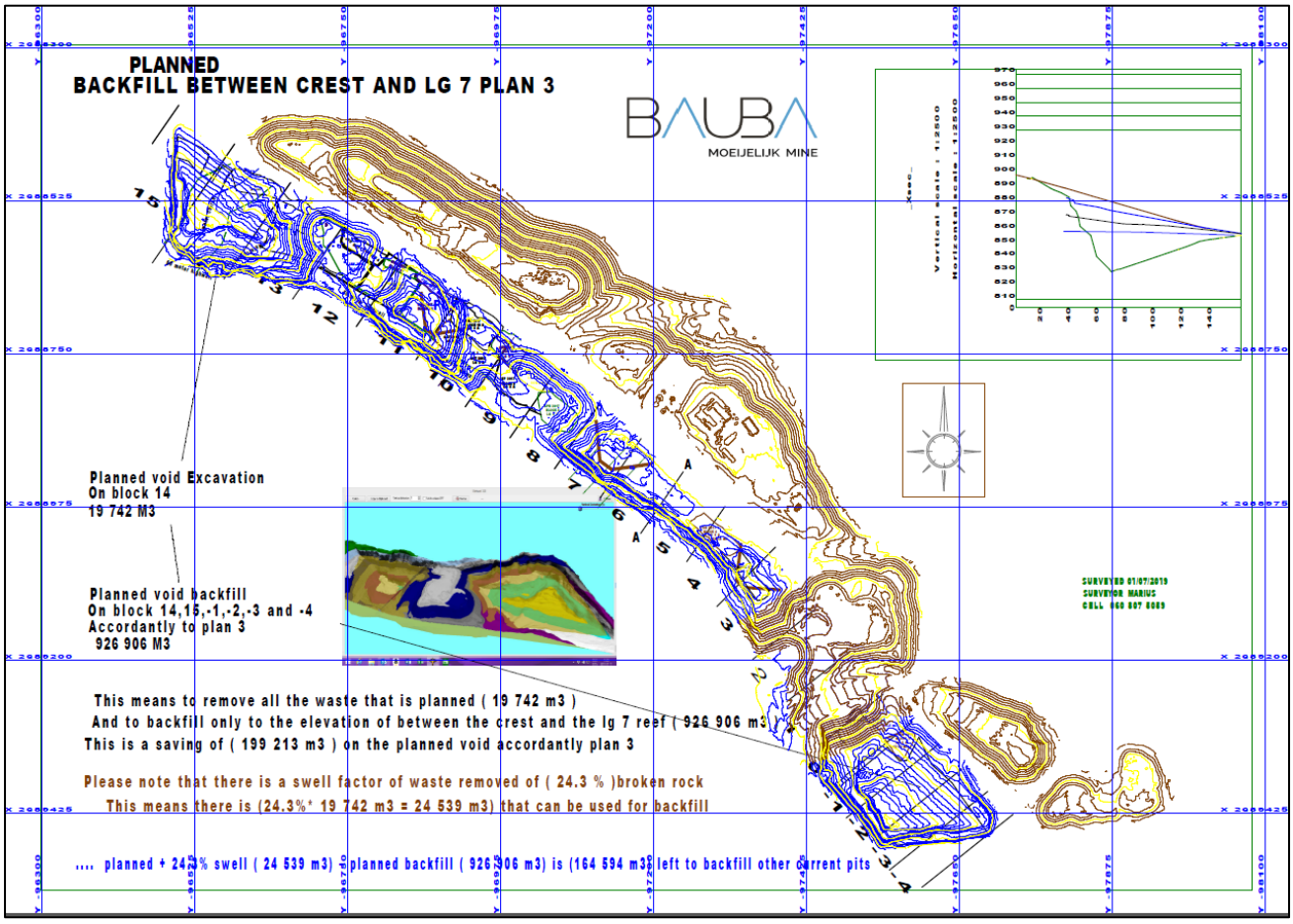


Figure 57: Current available rehabilitation plan for the existing openpits

The final land use for the mining area is recommended to be comparable, as far as practical, to the land use and biodiversity that was present before the mining activities on the property commenced i.e. grazing, agriculture and wilderness. Land forms are to support stable and functioning ecosystems that are aesthetically acceptable on closure and will gradually sustain the desired land-uses post closure.

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

The rehabilitation plan has been compiled in accordance with the objectives and goals 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).

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

Refer to Table 46 for the calculated rehabilitation quantum.

26.1.6 Confirm that the financial provision will be provided as determined

Financial Provision, to the amount of R 1,461,132.71 be made by way of a guarantee acceptable to the DMR, as per the Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations.

27 MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON

Including:
a) Monitoring of Impact Management Actions
b) Monitoring and reporting frequency
c) Responsible persons
d) Time period for implementing impact management action
e) Mechanisms for monitoring compliance

Table 54: Mechanisms for monitoring (Including Time period, Functional requirements, Roles and responsibilities and Frequency)

Aspects Affected	Impacts requiring monitoring	Time Period for Implementation	Functional Requirements for Monitoring	Responsible Persons	Monitoring and Reporting Frequency
Geology	Impact on Geology of area	Continuous throughout operational phase	Tons ore removed and total area mined	Mine Manager	Quarterly throughout operational phase
Topography	Hazardous excavations	Throughout LoM	Mine engineer to survey mining area	Mine engineer	Biannually throughout LoM
		Annually, once rehabilitation commences	Confirm vegetation establishment on revegetated areas	SHEQ	Annually once rehabilitation commences
Soils	Loss of soil resource	From start of rehabilitation phase until closure certificate is issued	Confirm vegetation establishment	SHEQ	Annually once revegetation commences
		From start of operational phase until closure certificate is issued	Confirm that soil is conserved and stockpiled correctly	SHEQ	Annually
	Erosion	From start of rehabilitation phase until closure certificate is issued	Confirm vegetation establishment	SHEQ	Annually once revegetation commences
		Throughout LoM	Road should be monitored to ensure that they are draining correctly after rain events and that the culverts along the road are sufficient and functional.	SHEQ	Monthly
	Soil contamination	Continuous	Set up service plan and record services of vehicles	Workshop manager	As needed / determined
		Throughout LoM	Confirm clean up done correctly, soil disposed of correctly and inspect rehabilitated area.	SHEQ	As needed
		Throughout LoM	Confirm clean up done correctly, soil disposed of correctly and inspect rehabilitated area.	SHEQ	As needed

Aspects Affected	Impacts requiring monitoring	Time Period for Implementation	Functional Requirements for Monitoring	Responsible Persons	Monitoring and Reporting Frequency
Land Capability	Loss of post mining land use capability	Throughout LoM	The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated.	SHEQ	Annually
Land Use	Failure of mine residue deposit	Throughout LoM	The tailings deposits have been sited and planned and will be designed and operated in terms of the relevant approved management and monitoring plan, under the supervision of suitably qualified professional engineers.	Mine engineer	To be determined by engineers
Biodiversity and ecology	Loss of Biodiversity and Ecological function within degraded areas	Throughout LoM	Annual vegetation and fauna (terrestrial ecology) monitoring	SHEQ	Annually
		Throughout LoM	The encroachment of alien and invasive species should be prevented and existing populations of invasive species should be eradicated.	SHEQ	Annually
Surface water	Alteration of drainage patterns due to river diversion or impacts on drainage lines: Quantity	Throughout LoM	As per WUL for Section 21(c) and (i)	SHEQ	As per WUL conditions
	Deterioration in surface water quality	Throughout LoM	WUL monitoring related to surface water and groundwater samples (water quality) Note surface water quality monitoring in drainage lines is not feasible as the area is very dry and water only flows during rain event.	SHEQ	As per WUL
			Report on waste generated and removed from site	SHEQ	Daily / Annually
			Inspect all on-site disposal sites regularly to ensure adherence to all legal requirements. Inspect all contractors and disposal agents, premises and sites regularly to ensure that all	SHEQ	Monthly

Aspects Affected	Impacts requiring monitoring	Time Period for Implementation	Functional Requirements for Monitoring	Responsible Persons	Monitoring and Reporting Frequency
			environmental and legal requirements are adhered to.		
			Measure and record water meter readings for water usage of various on-site processes.	SHEQ	Daily
			Update water balance	SHEQ	Annually
Groundwater	Lowering of groundwater levels	Throughout LoM	Monitor boreholes for water levels	SHEQ	Monthly
			Dewatering and groundwater abstraction for mining purposes should be monitored so as to prevent negative impacts on the underlying aquifer.	SHEQ	Monthly
	Deterioration of groundwater quality	Throughout LoM and 2-3 years post-closure	Monitor boreholes for quality	SHEQ	Quarterly
			The numerical groundwater model should be updated every 3 years during operation of the mine by using the measured inflows, water levels and drilling and pump test information to re-calibrate and refine the impact prediction	SHEQ	Every three years
Air Quality	Emissions from site activities, e.g. clearance, infrastructure development, crushing and screening, demolition and removal of infrastructure.	LoM	Conduct air quality monitoring.	SHEQ, Contractor	Monthly
Noise	Disturbing noise	LoM	Conduct noise monitoring	SHEQ	An annual Acoustical Measurement
Sites of archaeological and cultural interests	Disturbance of heritage sites	Continuous	Record occurrences of sites and artefacts if found	SHEQ	As needed

27.1 DETAILED MONITORING PROGRAMMES AS DESCRIBED FOR NEW ACTIVITIES

27.1.1 Surface Water Monitoring Program

27.1.1.1 Natural Surface Water Features

It is noted that the drainage lines on site are completely dry for the majority of the year and do not contain water significant for sampling. Furthermore, the drainage lines show no form of riparian habitat. It is not anticipated that mining operations will have a significant impact on drainage lines. The drainage lines to be affected will be diverted in accordance with the civil design report. The only direct impact would be the installation of a new river crossing (culvert). Monitoring of the culvert construction should be conducted as per the Rehabilitation Plan.

As no flowing water has been available for sampling on site since issuance of the Mine's first Water Use License in 2015, it is suggested that, if and when a storm event occurs, a grab sample be taken for analyses. Due to the lack of surface water on site, a monthly/quarterly/annual monitoring plan is not feasible. In the event that a grab sample is possible, it should be analysed for the parameters indicated in Table 62 below.

Table 55: Surface water variables to be analysed

Variable	Unit	Frequency
pH		When possible
Electrical Conductivity as EC	mS/m	When possible
Suspended solids as SS	mg/l	When possible
Total Dissolved Solids as TDS	mg/l	When possible
Sulphate as SO_4	mg/l	When possible
Nitrate as NO_3	mg/l	When possible
Sodium as Na	mg/l	When possible
Chloride as Cl	mg/l	When possible
Calcium as Ca	mg/l	When possible
Potassium as K	mg/l	When possible
Magnesium as Mg	mg/l	When possible
Total hardness as $CaCO_3$	mg/l	When possible
Total alkalinity	mg/l	When possible
Fluoride as F	mg/l	When possible
Aluminium as Al	mg/l	When possible
Iron as Fe	mg/l	When possible
Manganese as Mn	mg/l	When possible

There are many surface drainage channels on site, all of which are characterised as non-perennial. It is suggested that, if and when a storm event occurs, surface water quality monitoring take place at the points as indicated in Table 63.

Table 56: Proposed surface water monitoring points

Sampling point	Coordinates
Upstream	S 24º 18' 25.20" E 29º 57' 29.47"
Downstream	S 24º 17' 45.43" E 29º 57' 29.47"

27.1.1.2 Artificial Surface Water Features

In addition, monitoring of the water quality in the pollution control dams is and will continue to be conducted on a quarterly (October, January, April, July) basis and include the variables as specified in Table 62. The water quality is representative of:

- Seepage/run off from the mining areas.
- Seepage from waste rock dump.
- Dewatering of the open pit.
- Potential impacts from upstream mining.

Once the mine moves towards decommissioning and closure, the monitoring programme will have to be updated and upgraded to cover the monitoring needs related to the specific closure objectives. Due to the fact the mining area is located in the upper reaches/head waters of the unnamed tributary no upstream monitoring points are anticipated. It is proposed that the mine monitors the streams directly after a rainy event.

27.1.2 Groundwater Monitoring Programme

27.1.2.1 Groundwater Level Monitoring

Groundwater level fluctuation is determined by means of water level measurements in selected boreholes on site, and in the neighbouring community. It is the responsibility of Bauba A Hlabirwa Mining Investments (Pty) Ltd to record the water levels of these boreholes on a monthly basis, as stipulated by the Water Use License. Water level metering takes place at the boreholes indicated in Table 2 as well Figure 58.

Table 57: Monitoring boreholes used for Moeijelijk Mine

Monitoring point	Coordinates	Description
BH4	24°16'38.86"S 29°55'50.31"E	In community, at Mr. Moloto's residence. Downstream of mine. Domestic use. Borehole well situated for groundwater pollution monitoring.
BH5	24°16'27.84"S 29°57'13.08"E	In community, north of the R37. Domestic use. Borehole well situated for groundwater pollution monitoring.
BH6	24°16'55.18"S 29°56'8.87"E	Borehole for communal use in Tsibeng village. Domestic use. Borehole well situated for groundwater pollution monitoring.
BH7	24°17'26.58"S 29°57'19.74"E	Borehole for communal use in Tsibeng village. Domestic use. Borehole well situated for groundwater pollution monitoring.
BH8	24°17'17.38"S 29°57'14.45"E	Matianyane Primary School. Domestic use.
BH9	24°17'18.09"S 29°56'45.89"E	Morwaswi Secondary School. Domestic use.
MonBH1	24°18'20.38"S 29°57'41.24"E	Upstream of mining activities. Not accessible due to mining activities.
WPBH1	24°17'58.98"S 29°57'50.30"E	Borehole used for groundwater abstraction for top-up in wash plant. Downstream of mining area.
WPBH2	24°17'56.72"S 29°57'48.02"E	Borehole used for groundwater abstraction for top-up in wash plant. Downstream of mining area.
WPBH3	24°17'53.44"S 29°57'51.27"E	Borehole used for groundwater abstraction for top-up in wash plant. Downstream of mining area.
UG BH1	24°17'57.73"S 29°57'37.10"E	Borehole used for groundwater abstraction for top-up in underground mining. Downstream of mining area.
OC BH1	24°17'56.93"S 29°57'48.55"E	Borehole used for groundwater abstraction for dust suppression and potable water at the opencast section

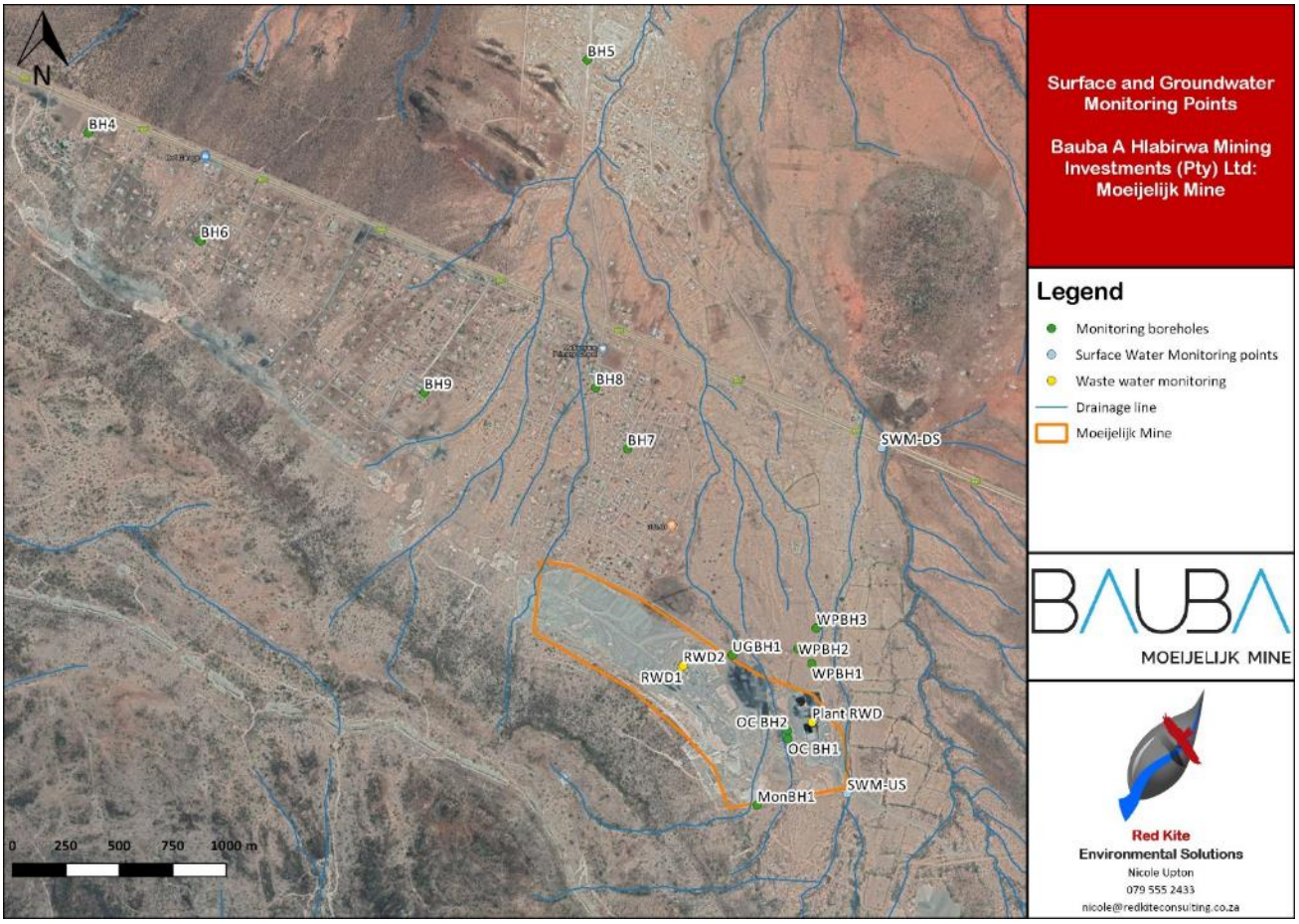


Figure 58: Surface and groundwater monitoring points

27.1.2.2 Ground Water Quality Monitoring

Monitoring the groundwater quality provides an indication of the background water quality for the area and will indicate potential impacts that could result from activities associated with the Moeijelijk Mine. In accordance with the Water Use License, water samples were analysed by a SANAS accredited laboratory for the parameters as indicated in Table 4.

The proposed quarterly sampling schedule with effect from September 2017 is indicated in the table below.

Table 58: Quarterly water monitoring schedule

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Frequency	**X**	-	-	**X**	-	-	**X**	-	-	**X**	-	-

Table 59: Monitoring variables for water quality monitoring

Parameter	Unit	Monitoring frequency
pH	-	Quarterly
Total dissolved solids	mg/l	Quarterly
Sodium	mg/l	Quarterly
Magnesium	mg/l	Quarterly
Sulphate	mg/l	Quarterly
Nitrite	mg/l	Quarterly
Chloride	mg/l	Quarterly
Nitrate	mg/l	Quarterly

Parameter	Unit	Monitoring frequency
Chemical oxygen demand	mg/l	Quarterly
Free and saline Ammonia	mg/l	Quarterly
Potassium	mg/l	Quarterly
Calcium	mg/l	Quarterly
Aluminum	mg/l	Quarterly
Barium	mg/l	Quarterly
Boron	mg/l	Quarterly
Cadmium	mg/l	Quarterly
Total Chromium	mg/l	Quarterly
Hexavalent Chromium	mg/l	Quarterly
Iron	mg/l	Quarterly
Lead	mg/l	Quarterly
Manganese	mg/l	Quarterly
Vanadium	mg/l	Quarterly

27.1.3 Noise Monitoring Program

An annual Acoustical Measurement & Audit Programme report is recommended. The measurement report frequency should be reviewed after the first two or three reports have been conducted. The frequency of the reports can be adjusted according to the level of mitigation options implemented by the developer onsite and based on the recommendations of the acoustical consultant.

It is recommended that the measurements are conducted during all phases with prior baseline measurements conducted a few times (during all season) before the construction phase. This will enable the improvement of the baseline characterisation.

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day- (SANS10103:2008 timeframe of 06:00 – 22:00) and night-time (22:00 – 06:00) period. Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{AIeq,10min}$ (National Noise Control Regulation requirement), L_{AF90} (background noise level as used internationally) and $L_{AFeq,10min}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event. Other variables and measurement recommended settings to be analysed include L_{AMin}, L_{AMax}, L_{Amin} and L_{A10}.

Noise measurements must be continued as long as there are potential receptors living within 1,000 m of the boundaries of the project, or as long as a valid noise complaint is registered.

27.1.4 Ecological Monitoring Programme

Monitoring framework should be instigated and managed by their responsible body and the following system may enforce good practice:

- Implement an “Observe and report” approach which will enable employees to report any disturbance of fauna/flora or degradation that they encounter during the operational phase.
- Activity restrictions of the ecological and aquatic corridors will need to be included to ensure the restriction of human movement within these sensitive zones, except when the required license has been obtained to allow for controlled modifications specifically to the drainage lines within these areas. Access to the mountainous areas should be avoided and there is no reason for entering these areas.

- This biodiversity baseline assessment conducted should be used to compare results with future biodiversity assessments (especially over different stages of the year to gain seasonal variation) and get a more accurate biodiversity standard to be managed accordingly.
- Annual biodiversity monitoring during September to March of areas both affected and unaffected by activities should be initiated to determine annual fluctuation in species numbers and if necessary relate this to activities on site.
- Determine annual fluctuation in species numbers and if necessary relate this to activities on site.
- Establish a monitoring programme for early detection of alien invasive species and establish and alien invasive awareness, eradication and control programme.

27.1.5 Heritage Monitoring Program

No specific heritage monitoring program was described within the specialist report. However, should any heritage remains be discovered during any phase of the development, a specialist should be consulted.

27.1.6 Visual Monitoring Program (2015 Assessment)

No specific Visual monitoring was prescribed for the current operations, mitigation measures should be sufficient to mitigate the need for any visual monitoring as a result of the new proposed activities.

27.1.7 Air Monitoring Program

As part of the ongoing monitoring and risk assessment, vertical dust deposition is gauged to ensure that the dust residues caused by the mining activities are not detrimental to the health of employees, the surrounding community and the environment.

The dust fallout monitoring is done in compliance of the National Dust Control Regulations (GN R827 of 1 November 2013), in terms of the National Environmental Management: Air Quality Act 39 of 2004 [as amended] (NEMAQA). The purpose of the regulations is to prescribe general measures for the control of dust fallout in all areas.

In compliance with the regulations above (GN R827, section 3(2)), SANS 1137:2012 (Edition 1) / American Standard for Testing and Materials (ASTM) method D1739-98 (re-approved in 2004) is used for the collection and measurement of dust fallout. Containers of a standard size and shape are prepared and sealed in a laboratory and then opened and set up at appropriately chosen sites so that particulate matter can settle into them for periods of about 30 days. The containers are then closed and returned to the laboratory. The masses of the water-soluble and -insoluble components of the material collected are determined. The results are reported as grams per square metre per 30 days g/(m^2·30 d).

Table 60: Dust fallout monitoring point information

Monitoring Point	Coordinates	Description
MLK-PN1	24°17'50.37"S, 29°57'46.20"E	Plant Northern Boundary – Close to perimeter fence and tailings dams
MLK-1N	24°17'57.66"S, 29°57'36.73"E	Northern Boundary – North West corner of ROM pad
MLK-2N	24°17'49.95"S, 29°57'24.39"E	Northern Boundary – On perimeter fence on LDV road to Mining Block 17
MLK-2E	24°18'12.15"S, 29°57'55.72"E	Eastern Boundary – On perimeter fence by employees and visitors parking area
MLK-5N	24°17'23.04"S, 29°57'15.76"E	Community Northern Point – Inside domestic property near Tsibeng primary school
MLK-6E	24°17'39.79"S, 29°57'20.32"E	Community Eastern Point – Inside domestic property in centre Tsibeng village

Monitoring Point	Coordinates	Description
MLK-7S	24°17'41.27"S, 29°56'59.69"E	Community Southern Point – Inside Domestic property close to mining Block 17 and overburden dumps
MLK-8W	24°17'25.01"S, 29°56'57.20"E	Community Western Point – Inside domestic property North East of Tsibeng Cemetery

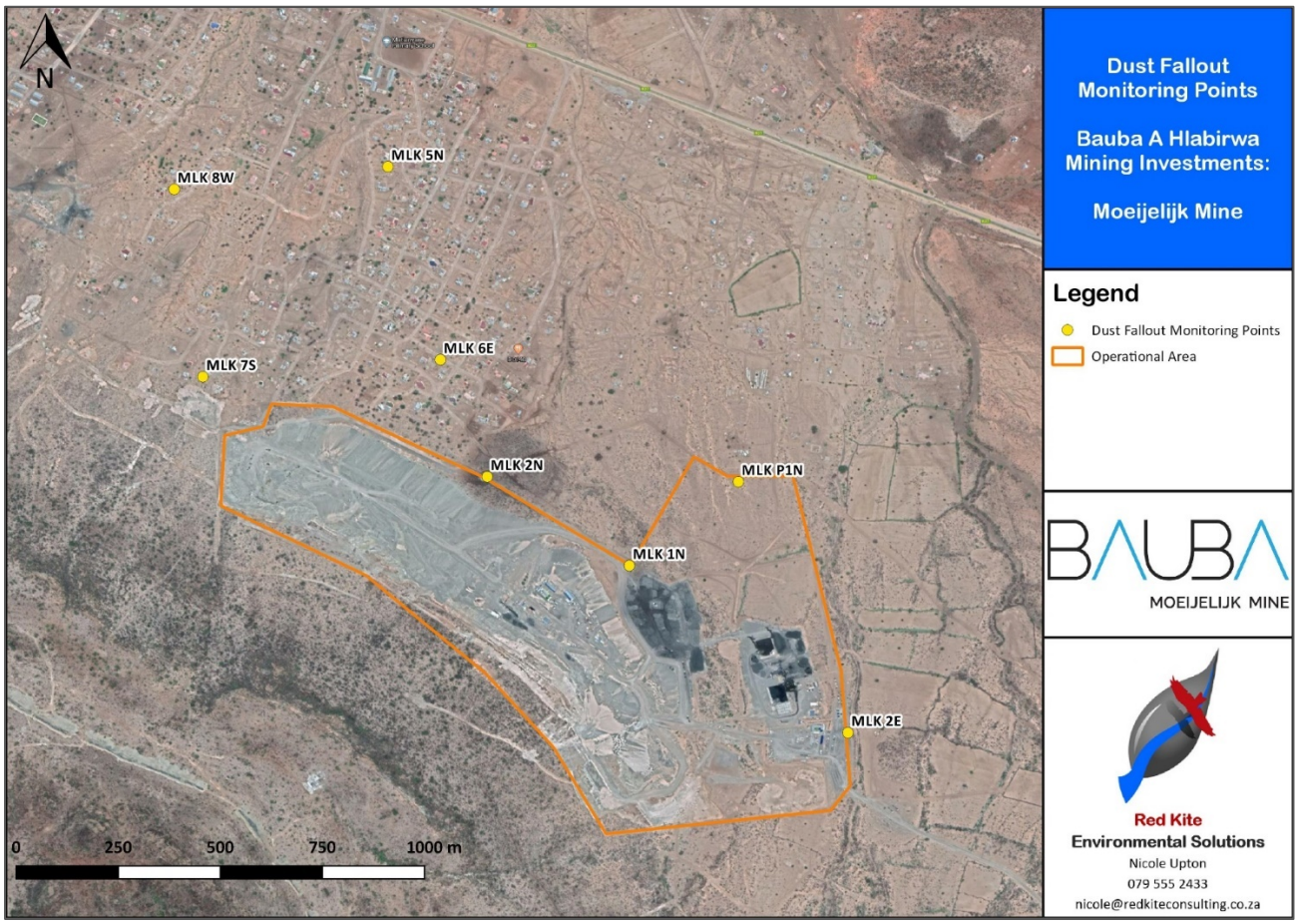


Figure 59: Dust fallout monitoring point locations.

27.1.8 Waste Monitoring

The following waste needs to be monitored for the proposed project:

- The volumes of tailings materials (wet and dry) deposited
- Volumes of Waste rocks and Stockpiles deposited;
- The volume of water pumped from the PCD to the plant; and
- Volumes and type of waste removed from site.

27.2 ENVIRONMENTAL MONITORING AND AUDITING

Department of Environmental Affairs (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 Section 31.2 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.

27.2.1 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 the SHE Representative. 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 DMR and DWS). The Environmental officer will conduct formal monthly site inspections and conduct an internal annual audit during the construction and operational phase.

An independent Environmental Control Officer (ECO) should also be appointed to conduct annual audits for the duration of the construction and operational phase. The Independent ECO should monitor the success and effective implementation of the environmental management measures stipulated by applicable legislation, the EIA/EMP , and any conditions set by the competent authorities. Following each site visit, the ECO should submit a report to the DMR documenting the success/failure of the implementation of the management measures at the operations.

27.2.2 Indicate the Frequency of the Submission of the Performance Assessment Report

All information as required by the various Government Departments should be captured and be readily available for submission when required and also for review by the external consultant conducting the performance assessment and audits.

As per NEMA EIA Regulations, a performance assessment/audit will be conducted by an external consultant throughout the life of mine at intervals stipulated in the EA. It is recommended to complete these audits annually. This is conducted to assess the adequacy and compliance to the EMP and the relevant legislation. As per NEMA, any amendments to the EMPr that may be required due to the performance assessment findings will be completed if necessary.

The Financial Provision must be reviewed on an annual basis, and submitted to the DMR.

In addition to the NEMA requirements, the IWUL will be audited as per conditions. The IWWMP will be updated annually.

27.3 ENVIRONMENTAL AWARENESS PLAN

27.3.1 Manner in Which the Applicant Intends to Inform Employees of Any Environmental Risk Which May Result From Their Work

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 EMP; and
b) The workforce must understand their obligations in terms of the implementation of the EMP and adherence to environmental-legislative requirements.

Bauba A Hlabirwa will develop procedures for environmental awareness. This procedure will define the process for identifying and planning environmental training and awareness. It will pertain to all employees and contractors whose work may create a significant impact upon the environment. Personnel performing the tasks, which can cause significant environmental impacts shall be competent on the basis of appropriate education, training and/or experience.

Training records are maintained to identify the level of instruction needed by personnel whose jobs may create a significant impact on the environment.

Environmental awareness will be part of the induction programme that is compulsory to all new, part-time and transferred employees, as well as onsite contractors.

Three basic categories of training are required. The first is induction training, the second is environmental awareness training and the third is technical training. All people entering the site are required to complete the induction training.

27.4 MANNER IN WHICH RISKS WILL BE DEALT WITH IN ORDER TO AVOID POLLUTION OR THE DEGRADATION OF THE ENVIRONMENT

Refer to Table 59 for the recommended mitigation measures to limit environmental impacts.

27.4.1.1 Objectives

The following requirements are relevant:

- The organisation shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them.
- The organisation shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts.
- The organisation shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.
- The organisation shall also periodically test such procedures where practicable.

27.4.1.2 Identification of Environmental Risks

Environmental risks must be identified and procedures must be set in place by Moeijelijk to deal with potential environmental risks, which could include:

- Environmental emergency situations;
- Potential accidents that can have an impact on the environment; and
- General environmental ignorance that could lead to unnecessary pollution or disturbance to the environment.

Potential environmental risks identified on the Moeijelik Mine include:

- Petrochemical/chemical spillages;
- Hazardous material spillages;
- Uncontrolled emissions to the atmosphere;
- Fires;
- Tailings residue stockpiles (wet or dry) failures;
- Untreated effluent spillages;
- Explosions and natural disasters;
- Disturbance of sensitive ecological environments;
- Disturbance to heritage and cultural resources;
- Uncontrolled erosion; and
- Dissatisfaction of local communities / outrage of communities.

27.4.1.3 Incident response steps

1) Incidents are to be reported to a supervisor and ECO immediately.
2) The responsible person or, where the incident occurred in the course of that person's employment, his or her employer, must, as soon as reasonably practicable after knowledge of the incident –

a) take all reasonable measures to contain and minimise the effects of the incident, including its effects on the environment and any risks posed by the incident to the health, safety and property of persons. Risk classification is determined for the incident.
b) undertake clean-up procedures;
c) remedy the effects of the incident;
d) assess the immediate and long-term effects of the incident on the environment and public health.

3) Incident Register is completed, including actions taken to remediate impacts.
4) Incidents with a risk of medium and above must be reported to the responsible authority within 24 hours and action plan compiled with 14 days.

27.4.1.3.1 INCIDENT REPORTING

The responsible person or, where the incident occurred in the course of that person's employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available –

a. the nature of the incident;
b. the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects;
c. any risks posed by the incident to public health, safety and property;
d. the toxicity of substances or by-products released by the incident; and
e. any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment
f. causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and
g. measures taken and to be taken to avoid a recurrence of such incident.

Should the incident pose a threat to public health, safety and property or have a risk rating of medium or higher the incident report must be submitted to -

a. the Director-General;
b. the South African Police Services and the relevant fire prevention service;
c. the relevant provincial head of department or municipality; and
d. all persons whose health may be affected by the incident.

27.4.1.3.2 RISK CLASSIFICATION

1. *Risk Calculation*

Exposure X Probability X Result (Consequence) = Risk Rating

2. *Risk Reduction*

Exposure X Probability X Result (Consequence after mitigation steps are implemented) = Risk Rating after Mitigation

3. Risk Level

400 <	=	Very High risk, discontinuation considered immediate correction required
200 to 400	=	High risk, immediate correction required
70 to 200	=	Medium / Substantial risk, mitigation required
20 to 70 =	Low / Possible risk, mitigate when required	
>20	=	Tolerable risk, report to Supervisor when complete

Probability Of Event Occurring	**Risk**	**Exposure To Event**	**Risk**
Almost Certain	10	Yearly	0.5
Has happened	6	Quarterly	1
Possible	3	Monthly	2
Heard of	1	Weekly	3
Unlikely	0.5	Daily	6
		Continuous	10

Result (Consequence)	**Risk Rating**
Catastrophic Environmental Impact Irreversible / regional degradation of the biophysical environment, biodiversity compromised on regional scale, formal complaints with clear expectations of corrective actions, impact on immediate and remote neighbours	100
Major Environmental Impact. Irreversible and localised degradation of the biophysical environment, biodiversity compromised on local scale, formal complaints with clear expectations of corrective actions, impact on immediate neighbours (level 3)	40
Very Serious Environmental Impact Irreversible and localised degradation of the biophysical environment, biodiversity compromised on local scale, formal complaints with clear expectations of corrective actions, impact on immediate neighbours (level 2)	15
Serious Environmental Impact Reversible and localised degradation of the biophysical environment, biodiversity not compromised, low-level complaints, no perceived expectations of corrective action(level 1)	7
Self-reversible impact within life of business. No reasonable cause for external complaints	3
Minor environmental incident. Very low impact on biophysical environment, No reasonable cause for external complaints	1

27.4.1.3.3 <u>FOLLOW-UP</u>

Within 24 hours of an incident occurring, regardless of size or impact, the supervisor will conduct a follow-up investigation. The investigation will attempt to determine the cause of the incident and any procedural modifications needed to prevent the spill from recurring. Information gathered during the follow-up investigation will be used in preparing the written report described above.

27.5 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

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

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.

28 UNDERTAKINGS

The EAP, ……..Red Kite Environmental Solutions (Pty) Ltd……., 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;

Signed at Pretoria on this 28th day of June 2020

Signature of EAP 

Designation: Environmental Assessment Proactitioner (Director of Red Kite Environmental Solutions)

COMMITMENT/UNDERTAKING BY THE APPLICANT

I, ……, the undersigned and duly authorised thereto by the Bauba A Hlabirwa: Moeijelijk Expansion undertake to adhere to the requirements and to the conditions as set out in the EMPR submitted to the Director: Mineral Development and approved on .....
.....
Signed at.....on this..... day .....
Signature of applicant .....
Designation .....

-END-

29 REFERENCES

Broughton, L. & Robertson, D. A. M., 1992. *Acid Rock Drainage from mines - Where are we now.* Vancouver, B.C.: s.n.

DEAT, 1998. *Environmental Impact Assessment Guidelines.,* Pretoria: DEAT..

DEAT, 2002. *Impact Significance, Integrated Environmental Management, Information series 5.,* Pretoria: DEAT..

DEAT, 2004. Integrated ENvironmental Management Information Series: Environmental Auditing.

Department of Minerals and Energy, 2005. Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine.

Department of Water Affairs and Forestry, 1996. *South African Water Quality Guidelines for Domestic Use. Volume 1, Second Edition,* s.l.: s.n.

Eco Elementum (Pty) Ltd, 2015. Bauba A Hlabirwa: EIA Phase - Visual Impact Assessment (VIA).

Eco Elementum (Pty) Ltd, 2015. Moeijelijk Project - Baseline Air Quality Assessment.

Environmental Research Consulting (Benah Con cc), 2017. Vegetation Diversity Assessment.

Fetakgomo Greater Tubatse Municipality , 2016. *2016/17 Draft Consolidated IDP for Fetakgomo Greater Tubatse Municipality.,* s.l.: s.n.

Fetakgomo Greater Tubatse Municipality, 2016. *2016/17 Draft Consolidated IDP for Fetakgomo Greater Tubatse Municipality,* s.l.: s.n.

Geo Pollutions Technologies - Gauteng (Pty) Ltd, 2017. Hydrogeological study for Moeijelijk Chrome Mine, Ref: RKMOE-17-2723, dated December 2017.

GPT, January 2018. *Hydrogeological assessment for water supply to Moeijelijk Chrome Mine,* s.l.: s.n.

GPT, March 2019. *Hydrogeological study for Moeijelijk Chrome Mine,* s.l.: s.n.

GTLM, 2016/17. *Final Integrated Development Plan 2016/17-2020/21,* s.l.: s.n.

Local Economic Development Strategy , 2015. s.l.: s.n.

M2 Environmental Connections cc, 2015. Moeijelijk EIA and EMP.

Mills, M., 06 February 2020. *Source terms for backfilled tailings, Moeijelijk Mine,* s.l.: s.n.

Prescali Environmental Consultants (Pty) Ltd, 2017. Terrestrial Fauna evaluation for Moeijelijk expansion activities.

Red Kite Environmental Solutions (Pty) Ltd, 2017. Waste Classification Report.

STATSSA, 2011. *Statistical release (Revised) Census 2011,* s.l.: s.n.

Stuart, C. & Stuart, M., 2013. *A Field Guide to the tracks and Signs of Southern, Central & East African Wildlife" Fourth Revised Edition. Random House Struik (Pty) Ltd.* s.l.:s.n.

Terra Africa Consult, 2015. Soil, Land use and Land Capability for the proposed Bauba A Hlabirwa Moeijelijk Mining Project.

30 APPENDICES

Appendix 1: Qualifications and Resume of EAP
Appendix 2: Experience of the EAP
Appendix 3: Locality Maps
Appendix 4: Site layout plans
Appendix 5: Public Participation Documents
Appendix 6: Groundwater and Contamination Study
Appendix 7: Air Quality Assessment
Appendix 8: Social Impact Assessment
Appendix 9: Soil, Land Use and Land Capability Report
Appendix 10: Vegetation Diversity Report
Appendix 11: Fauna Assessment
Appendix 12: Heritage Assessment
Appendix 13: Surface Water Assessment
Appendix 14: Environmental Noise Impact Assessment