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Application for Amendment of the Approved Environmental Management Programme in Respect of Portion 4 of the Farm Zuurwater 62, Namaqualand, Northern Cape

DMR Ref: NC-00066-MR/102

Basic Assessment Report and Environmental Management Plan

Swartberg Decline

On behalf of: Black Mountain Mining

Black Mountain Mining

ENDEMIC VISION ENVIRONMENTAL SERVICES

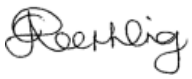
March 2017

Declaration of Consultant Independence

This report has been prepared by EndemicVision Environmental Services (Pty) Limited, with all reasonable skill, care and diligence within the terms of the contract with the client. EndemicVision Environmental Services is a multidisciplinary environmental management and consulting company with more than 25 years of experience in field. The technical appointments for this project are detailed below.

Team Member	Qualifications	Experience	Project Role
Chrizette Neethling	MSc - Rehabilitation BSc Honors BA – EM ND Conservation NC Business Management	Over 20 years of broad based environmental experience with more than 65 projects completed in mining, biodiversity and development industries.	Project Manager and Ecologist
Bonni van Tonder	BSc. Hons.	2 years' experience in conducting environmental impact assessments.	Environmental Technician
Annalien Steenkamp	BA – Environmental Management	1 year experience	Environmental Technician

The author of this report, EndemicVision Environmental Services, does hereby declare that it is an independent consultant and has no business, financial, personal or other interest in the activity, application or appeal in respect of which it was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of the persons performing such work. All opinions expressed in this report are its own.



Confidentiality

Signed: **C.D. Neethling** Dated: **15 February 2017**

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Project Summary

Project Name	Swartberg Decline Development: Amendment of the existing Environmental Management Plan
Environmental Impact Assessor	Chrizette Neethling
Environmental Impact Assessor Details	Chrizette Neethling TEL NO: +27 (0) 53 723 1206 (D); +27 (0) 82 658 6078 (C) FAX NO: +27 (0) 86 590 7261 EMAIL: cdn@endemicvision.co.za POSTAL ADDRESS: P.O. Box 2061, Kathu, 8446 PHYSICAL ADDRESS: 15 Kokkewiet Street, Kathu, 8446
Applicant for authorisation	Black Mountain Mining (Pty) Ltd
Applicant Details	Pieter David Venter TEL NO: +27 (0) 54 983 9316 (D) / +27 (0) 82 851 3091 (C) E-MAIL: PVenter@vedantaresources.co.za POSTAL ADDRESS: Private Bag x01, Aggeneys, 8893 PHYSICAL ADDRESS: 1 Penge Road, Aggeneys
Landowner	Black Mountain Mining (Pty) Ltd
Landowner Details	Black Mountain Mining (Pty) Ltd TEL NO: See above applicant details POSTAL ADDRESS: Private Bag x01, Aggeneys, 8893 PHYSICAL ADDRESS: 1 Penge Road, Aggeneys
Property reference	Zuurwater 62, Portion 4
Surveyor General Property Code	C05300000000006200004
Local Municipality	Khai-Ma Local Municipality
Magisterial district	Namaqualand [C053]
District Municipality	Namakwa District Municipality
Province	Northern Cape

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List of Abbreviations

AIA	Archaeological Impact Assessment
ABP	Area Based Plans
DAFF	Department of Agriculture, Forestry & Fisheries
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IUCN	International Union of Conservation of Nature
LRAD	Land Redistribution for Agricultural Development
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NEM:AQA	National Environmental Management Air Quality Act
NEMPAA	National Environmental Management: Protected Areas Act
NEMBA	The National Environmental Management: Biodiversity Act
PIA	Palaeontological Impact Assessment
PPP	Public Participation Process
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Resource Information System
SANBI	South African National Biodiversity Institute
SANBIS	South African National Biodiversity Information System

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mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

BASIC ASSESSMENT REPORT and ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

NAME OF APPLICANT: Black Mountain Mining (Pty) Ltd

CONTACT PERSON: Pieter David Venter

TEL NO: +27 (0) 54 983 9316 / +27 (0) 82 851 3091

FAX NO:

POSTAL ADDRESS: Private Bag x01, Aggeneys, 8893

PHYSICAL ADDRESS: 1 Penge Road, Aggeneys, 8893

FILE REFERENCE NUMBER SAMRAD: NC-00066-MR/102

1. 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.

2. Objective of the basic assessment process

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

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

(b) identify the alternatives considered, including the activity, location, and technology alternatives;

(c) describe the need and desirability of the proposed alternatives,

(d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage , and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on the these aspects to determine:

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

(e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
  (i) identify and motivate a preferred site, activity and technology alternative;
  (ii) identify suitable measures to manage, avoid or mitigate identified impacts; and
  (iii) identify residual risks that need to be managed and monitored.

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PART A: SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

3. Contact person and correspondence address

a) Details of EAP

i) Details of the EAP

Name of the Practitioner:	EndemicVision Environmental Services (Pty) Ltd Chrizette Neethling
Tel No.:	+27 (0) 53 723 1206
Fax No. :	+27 (86) 590 7261
E-mail address:	cdn@endemicvision.co.za

ii) Expertise of the EAP

(1) The qualifications of the EAP

Please refer to the Appendix A for the Curriculum Vitae of Chrizette Neethling

(2) Summary of the EAP's past experience.

Please refer to the Appendix A for the Curriculum Vitae of Chrizette Neethling

b) Location of the overall Activity

The following table presents the location and associated cadastral details associated with the proposed project area.

Table 1: Project Details

Farm Name:	Farm Zuurwater No 62 - Portion 4
Application area (Ha)	2,7 ha
Magisterial district:	Namaqualand [C053]
Distance and direction from nearest town	The Swartberg decline proposed area of interest is located on BMM property, Portion 4 of Farm Zuurwater 62 within the Khâi-Ma Local Municipality and Namakwa District Municipality, Northern Cape Province. The area is situated approximately 8 km west from the Aggeneys town.
21 digit Surveyor General Code for each farm portion	C05300000000006200004

c) Locality map

Show nearest town; scale not smaller than 1:250 000

The following figure illustrates the farm associated with the proposed decline development, as well as the Regional Setting.

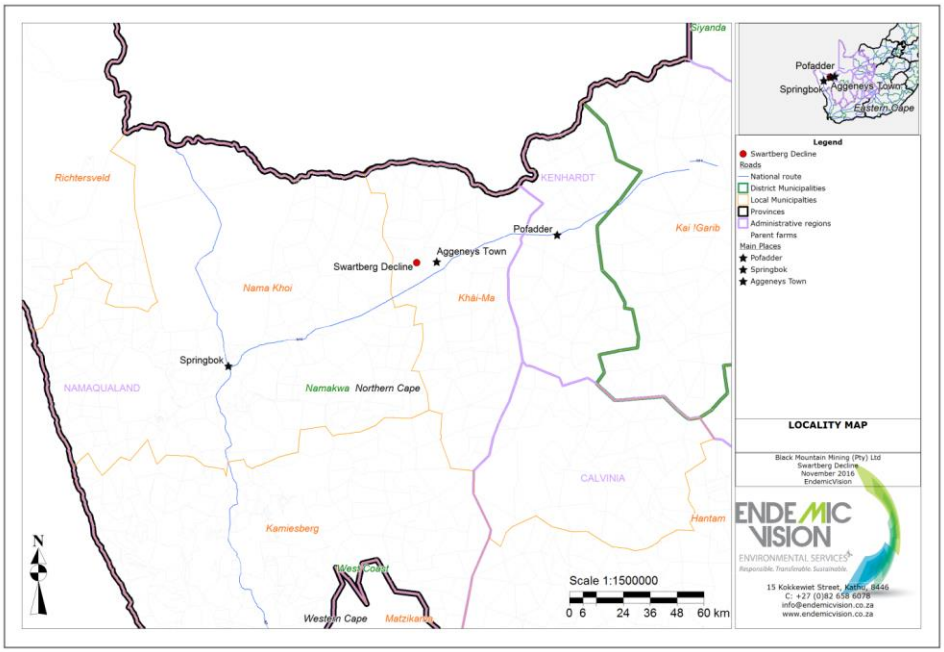


Figure 1: Regional Location of the Swartberg Decline Development

The Swartberg decline proposed area of interest is located on BMM property, Portion 4 of Farm Zuurwater 62 within the Khâi-Ma Local Municipality and Namakwa District Municipality, Northern Cape Province. The area is situated approximately 8 km west from the Aggeneys town.

The following figure illustrates the setting of the Swartberg Decline development within the borders of the Khai-Ma Local Municipality.

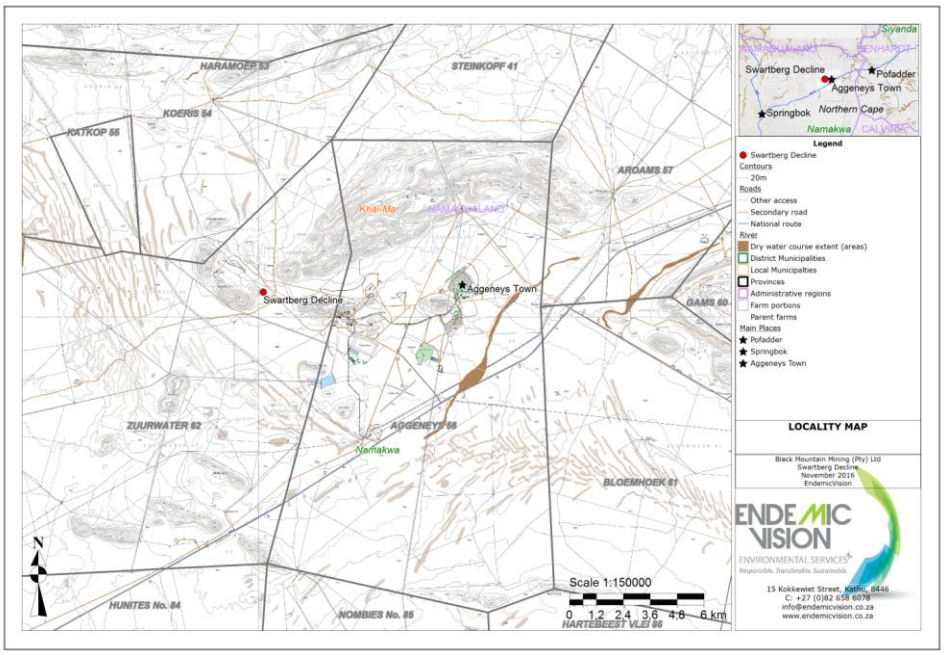


Figure 2: Local Setting within the Namaqualand Administrative Region

The decline and access road are projected with satellite imagery background to indicate aspect and landscape context.

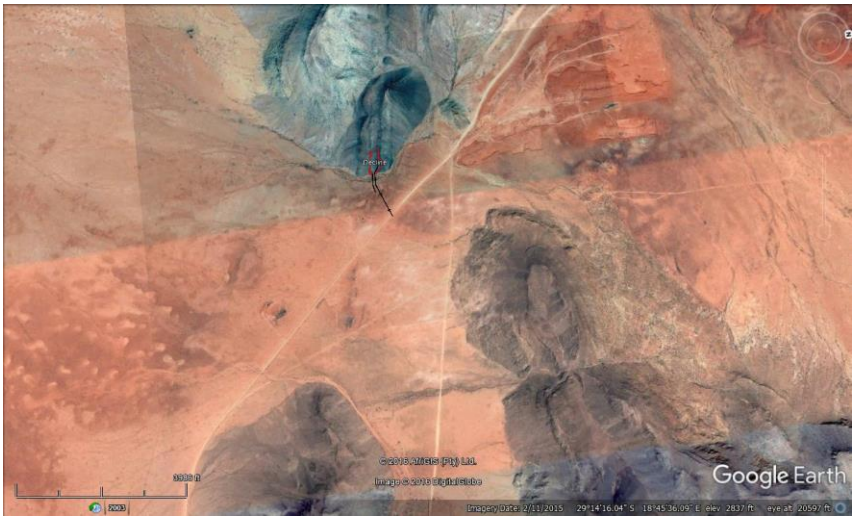


Figure 3: Site layout in topographical landscape

The scope of the proposed Prospecting area is provided in Table 2 below:

Table 2: Property Scope of the Project

Property scope	Swartberg Decline Development
Total landholding size (Ha)	39500
Application area (Ha)	1.4
Project footprint as percentage of total landholding	0.0001%
Project location description	The Swartberg Decline proposed area is situated at the Swartberg deposit which forms part of the Black Mountain Mining complex (BMM). The area is located next to the N14 highway between Pofadder and Springbok, approximately 8 km west of Aggeneys, in the Northern Cape Province, South Africa. Currently, Black Mountain Mining comprises of Broken Hill, Deeps and Swartberg deposits.
Distance from nearest town boundary (km)	8
Distance from nearest residential settlement (km)	8
Distance from nearest neighbor (km)	1.56
Project Central Location Coordinates (Decimal Degrees) South	**Project Central Location Coordinates (Decimal Degrees) East**
-29.240078°	18.752292°
Project Corner Coordinates (Decimal Degrees) South	**Project Corner Coordinates (Decimal Degrees) East**
29.2401336°S	18.7515959°E
29.2400848°S	18.7507763°E
29.2402273°S	18.7507658°E
29.2402434°S	18.7509709°E
29.2406372°S	18.7509366°E
29.2408975°S	18.7526804°E
29.2404623°S	18.7527285°E
29.2398025°S	18.7518674°E

d) Description of the scope of the proposed overall activity

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

The application is in for the amendment of the existing Environmental Management Programme of Black Mountain Mine for the development of the decline in the Swartberg area to access the underground ore at Swartberg.

A summary of the development scope is provided below in Table 3 below:

Table 3: Development Scope of the Project

Development scope	
Development objective	Decline development for accessing underground ore at Swartberg
Type of impact (industry)	Mining Infrastructure Development
Impact Description	Linear development of a decline (ramp), access road and associated infrastructure for accessing underground ore at Swartberg on the property of Black Mountain Mine as part of the existing mining right.
Impact Period	18 months for construction Decline is expected to remain life of mine
Total impact footprint (ha)	1.4
Existing infrastructure	Main Gravel roads: Broken Hill - Swartberg haul road Single track road along powerline Power line in close proximity Water pipeline in close proximity
Planned infrastructure	New road (200 m), laydown and storage area (20 x 50 m), Elevated road (200 m), infrastructure (40 x 10 m), culverts, portal box cut (45 x 17 m)
Affected Vegetation Types	SKr 18 - Bushmanland Inselberg Shrubland NKb 4 - Bushmanland Sandy Grassland
Affected Water Resources	Washes
Affected Sensitive Habitats	Washes
Affected Heritage Resources	Refer to specialist report

The project objective is the construction of a second decline that will be used by a conveyor system to extract ore from the Swartberg ore body in the near future. This is a relatively small scale activity with the following infrastructure required:

- The decline opening
- Water supply from existing water pipeline
- Laydown and storage area for materials and initial removal of overburden material to develop decline
- Access road from the existing haul road with washes crossing
- Power from the existing power line
- Supporting storm water infrastructure for all of the above

Table 4: Existing and planned infrastructure

Existing infrastructure	Main Gravel roads: Broken Hill - Swartberg haul road Single track road along powerline Power line in close proximity Water pipeline in close proximity
Planned infrastructure	New haul road, laydown and storage area,, Elevated road crossing (bridge), decline infrastructure, water supply pipe and tanks, power supply take-off line

Table 5: Project Infrastructure detail specifications

Decline Portal	Water supply tanks	Access roads	Laydown and Storage	Power supply
Width, Entry and exit (ventilation system). Cut and blast area (into mountain) Total footprint: 3200m2	Water supply tanks with water supply pipeline from the existing water supply Total footprint: 2200m2	8-meter-wide, 270 m long road from existing haul road to decline Total footprint: 2200m2	Laydown and parking area Total footprint:9000m2	Power supply from existing power supply line

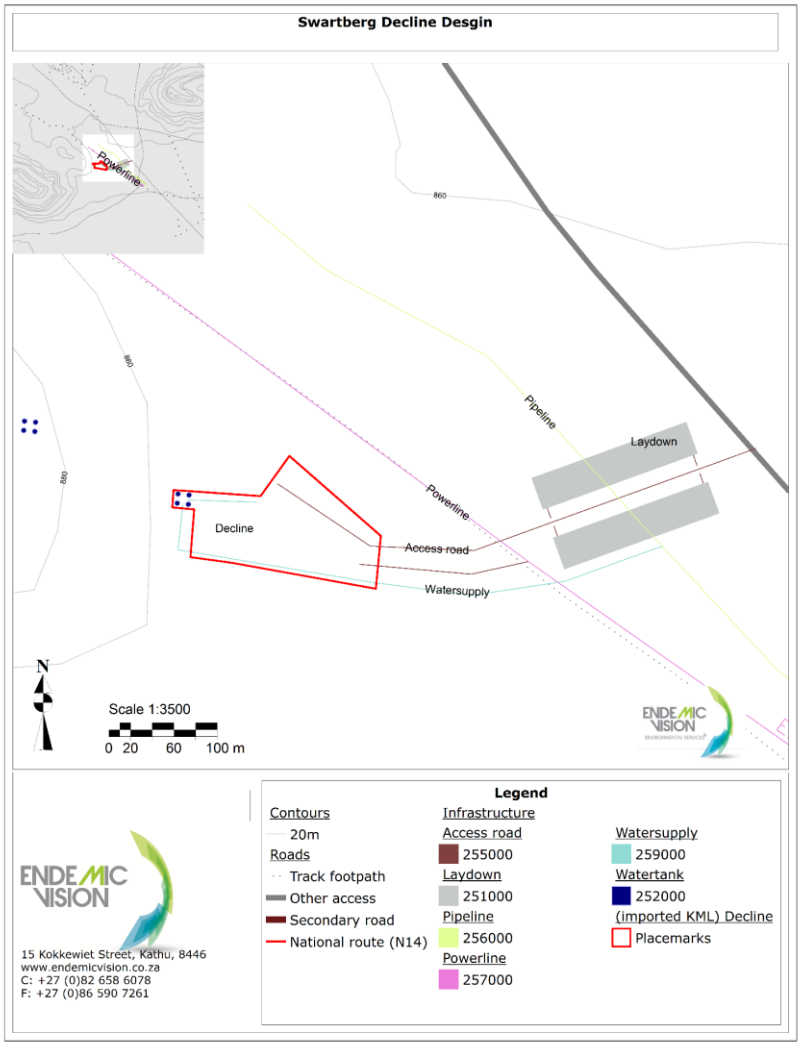


Figure 4: Final Design of the Swartberg Decline Application Area

(i) Listed and specified activities

Section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) requires, upon request by the Minister that an Environmental Management Plan be submitted and that the applicant must notify and consult with Interested and Affected Parties (I&APs). Section 24 of the NEMA requires that activities, which may impact on the environment, must obtain an environmental authorisation from a relevant authority before commencing with the activities. Such activities are listed under Regulations Listing Notice 1 Government Notice (GN) 983, Listing Notice 2 GN 984 and Listing Notice GN 985 (dated 4 December 2014) of NEMA. The proposed activity triggers the following activities from NEMA Government Notice 983 (Listing Notice 1) and 985 (Listing Notice 3):

Table 6: Applicable Listed Activities for the Project

Listed Activities	
Applicable Listing Notice	**Activity referenced in listing notice**
NEMA LISTING NOTICE 01 (GNR983)	12. The development of- (i) canals exceeding 100 square meters in size; (ii) channels exceeding 100 square meters in size; (iii) bridges exceeding 100 square meters in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square meters in size; (xii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 meters of a watercourse, measured from the edge of a watercourse;
NEMA LISTING NOTICE 01 (GNR983)	27. The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
NEMA LISTING NOTICE 01 (GNR983)	56. The widening of a road by more than 6 meters, or the lengthening of a road by more than 1 kilometer- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 meters; excluding where widening or lengthening occur inside urban areas.
NEMA LISTING NOTICE 03 (GNR985)	12. The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

The table below indicates the development activities, extent and applicable listing notice.

Table 7: Prospecting Extent and Activities

NAME OF ACTIVITY	Aerial extent of the Activity m²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)
Plan, design & application for amendment	-	**X**	
Site Clearance	17 000	**X**	
Laydown, storage and parking area	9 000	**X**	
Haul road	2 200		
Water tanks & access road	2 200		
Portal Excavation, infrastructure & Flood Protection Berm	32 000	**X**	
Washes crossing	600	**X**	

(ii) Description of the activities to be undertaken

Describe Methodology or technology to be employed, including the type of commodity to be prospected / mined and for a linear activity, a description of the route of the activity

The activities are presented below according to the project phases. Project period is 18 months for development and life of mine for use.

#	Swartberg Decline development	Project Phases and Activities		
	Construction	**Operational**	**Maintenance**	**Closure**
1	Clearing Indigenous Vegetation	Resource Use: water	Maintenance	Rehabilitation
2	Clearing Soils	Generation of Dust	Generation of Dust	Maintenance
3	Construction of Roads	Disturbance: fauna and flora	Disturbance: fauna and flora	
4	Construction: earth works	Disturbance: Traffic	Disturbance: Traffic	
5	Generation of topsoil stockpiles			
6	Generation and accumulation of mineral waste			
7	Disturbance: Noise			
8	Generation of Dust			
9	Blasting			

The following section presents a detailed description of all the activities associated with the proposed Swartberg decline development.

The application is for the amendment of the existing Environmental Management Programme of Black Mountain Mine for the development of the decline in the Swartberg area to access the underground ore at Swartberg.

- Access Roads

The existing Broken Hill – Swartberg haul road will be used to gain access to close proximity of the area. For access to the portal area of the proposed decline development a new access road will be constructed during the construction phase of the project. The 270m new haul road will be 8m wide and include a section of 60m for the dry water course crossing.

- Power Supply

The existing BMM power supply line is located in close proximity to the proposed decline development area and a new power line will split from this existing line to the portal.

- Water Supply

A water supply line is available in close proximity to the proposed decline development area and a new water supply line will split from this existing line to the proposed water storage tank location.

- Waste Management

BMM subscribe to ISO14001 and own and operate its own waste management facilities. The standard operating procedures for waste and waste related activities will apply for the Swartberg decline area as well.

Figure 5: Existing Water Pipeline

Figure 6: Existing Broken Hill - Swartberg Haul Road

Figure 7: Existing powerline and single track road

Figure 8: Existing turnoff from haul road

e) Policy and Legislative Context

The applicable policy and legislation and context are indicated in the table below.

Table 8: Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
Mineral and Petroleum Resources Development Act, 2002	Application for amendment of existing mining right is submitted.	Amendment application has been submitted to the DMR by the Applicant. Management measures during operation of site will apply MRPDA requirements.
National Environmental Management Act, 1998 and relevant EIA Regulations (2014)	The Basic Assessment Report and Environmental Management Programme for Environmental authorizations in terms of the National Environmental Management Act, 1998 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).	An Application for Environmental Authorisation was submitted to the DMR. The application was accepted by the DMR and requested the submission of the Basic BAR and EMP within 90 days of the letter. The Basic Assessment Report, Environmental Management Programme and the Stakeholder Consultation Process has been conducted with consideration of the EIA regulations.
National Water Act, 1998	General authorisation application according to the 2016 NWA regulations for river crossings are applied.	Water use license is required where general authorisation is not granted. Water use will be limited to between 1000 and 10 000 ℓ per day. The water use must not exceed the general authorisation volume for the area.
National Environmental Management : Biodiversity Act ,2004	Presence of nationally protected trees	The EMP will regulate the applicant to apply for Tree Removal Permit from the DAFF prior to the potential removal of any sensitive and/or protected species. An ecological impact assessment has been conducted and the specialist report submitted as part of this application.
National Heritage Resources Act, 1999	The activity may trigger the requirements under Section 38 of the NHRA. However, the requirements for permits are not known at this stage.	The South African Heritage Resources Agency (SAHRA) is contacted as part of the stakeholder engagement process. A heritage impact assessment has been conducted and the specialist report submitted as part of this application.

f) Need and desirability of the proposed activities

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

The main driver for the second decline to the Swartberg ore body is to have a second safe access to the site as there is only a single access to the underground area at the moment. The future conveying of material instead of load and haul operations that will increase efficiency and reduce human risk exposure in mining the site is also taken into consideration.

The Swartberg ore body has a limited life of mine, without the additional access to this ore body, the life of the BMM operation is significantly affected.

The consideration of an open cast operation, the location of a second access on two other inselbergs were considered and found undesirable in terms of environmental and financial feasibility.

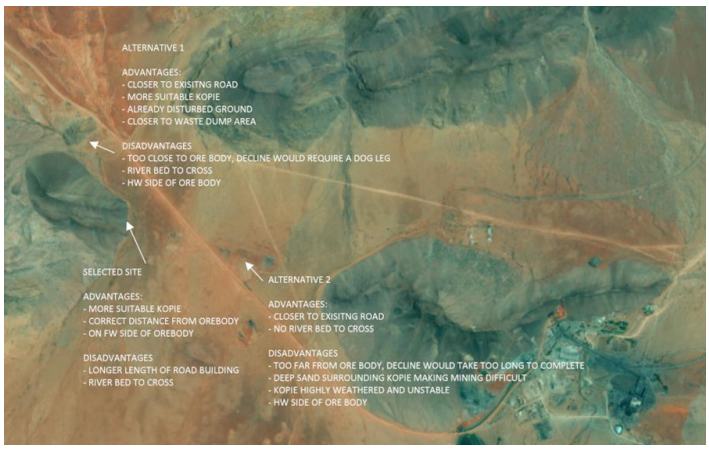


Figure 9: Alternative locations considered

g) Motivation for the overall preferred site, activities and technology alternative

The motivations for the selected site, besides the geological drivers that guide the location where ore should be accessed include the availability of infrastructure in terms of access roads, power and water pipeline. The environmental factors include a reduced footprint because the site can use existing infrastructure.

Alternative 01 would result in the potential development of a third decline as the location is too close to the ore body with dry riverbed that would be directly impacted.

Alternative 02 is considered too far from the ore body that would result in extensive overburden material removal and longer underground (more unsafe) infrastructure. This alternative was also found geotechnical unstable to the point where no safe decline development could be secured.

h) Full description of the process followed to reach the proposed preferred alternatives within the site

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

i) Details of the development footprint alternatives considered

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

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

The evaluation of alternatives is considered extensively for this development to reduce environmental impact while promoting operational efficiency and financial viability. The summary of the evaluation of alternatives are tabled below for the Decline Portal, water supply tanks, access roads, laydown and storage and power supply.

Table 9: Evaluation of alternatives for the development of the Decline

Evaluation Criteria	Decline Portal
Description of infrastructure	Width, Entry and exit (ventilation system). Cut and blast area (into mountain) Total footprint: 12600m2
(a) the property on which, or location where, it is proposed to undertake the activity;	Three alternative locations were considered. The motivations for the selected site, besides the geological drivers that guide the location where ore should be accessed include the availability of infrastructure in terms of access roads, power and water pipeline. The environmental factors include a reduced footprint because the site can use existing infrastructure. Alternative 01 would result in the potential development of a third decline as the location is too close to the ore body with dry riverbed that would be directly impacted. Alternative 02 is considered too far from the ore body that would result in extensive overburden material removal and longer underground (more unsafe) infrastructure. This alternative was also found geotechnical unstable to the point where no safe decline development could be secured.
(b) the type of activity to be undertaken;	Above ground mining vs underground was considered. Development of the second decline is the best alternative.
(c) the design or layout of the activity;	'Exact location of the portal had to be front facing on the ore body and accessible from existing infrastructure. The portal was moved slightly west to reduce sphere of impact on the dry rivulet directly across from the decline.
(d) the technology to be used in the activity;	Standard acceptable technology is use to ensure safe development of the decline. No new technology is investigated.
(e) the operational aspects of the activity; and	The portal will be developed while the Swartberg ore body is being mined and operation can continue. The timeframe to ensure the completion of the portal before limited ore can be accessed from the existing decline is critical.
(f) The option of not implementing the activity	The no-go option for this development will result in a reduced life of mine or operating feasibility of the existing mine.

Table 10: Evaluation of Alternatives: Supporting infrastructure

Evaluation Criteria	Water supply tanks	Access roads	Laydown and Storage	Power supply
(a) the property on which, or location where, it is proposed to undertake the activity;	A new road to the tank and using decline footprint was considered. Access roads for tanks are avoided by placing the tanks at the decline. Access to the tanks will now be from the decline footprint instead of an additional road at the back of the koppie	The access road is located on existing tracks as far as possible with the widening of the existing single track road.	Laydown areas are situated 100 meters from the dry rivulet, in the road reserve.	Existing powerline infrastructure will be used. The transformer will be accommodated in the decline footprint.
(b) the type of activity to be undertaken;	Access road vs no access road was considered. Small access from decline platform will be developed, no additional road.	The haul road is the only type of development that will fulfil the requirements of the project. No other alternative is considered.	No other alternative is considered.	Existing supply will be used. Solar is not seen as viable option for the specific power supply needed.
(c) the design or layout of the activity;	Layout of tanks adapted as stated above.	The access road is located on existing tracks as far as possible with the widening of the existing single track road.	The design of the laydown area considers storm water management for materials, temporary stockpile of overburden or ore that is taken to the plant or existing waste rock dumps.	Existing powerline infrastructure will be used. The transformer will be accommodated in the decline footprint.
(d) the technology to be used in the activity;	UV protected tanks with minimal visual impact will be used.	Standard acceptable technology will be used.	Standard acceptable technology will be used.	Standard acceptable technology will be used.
(e) the operational aspects of the activity; and	Standard acceptable operating procedures will be applied.	Standard acceptable operating procedures will be applied.	Standard acceptable operating procedures will be applied.	Standard acceptable operating procedures will be applied.
(f) The option of not implementing the activity	The no-go option for this development will result in a reduced life of mine or operating feasibility of the existing mine.			

ii) Details of the Public Participation Process Followed

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

The diagram below sets out the approach for the engagement process for the proposed project. The detailed stakeholder engagement report is attached as Appendix E of this report.

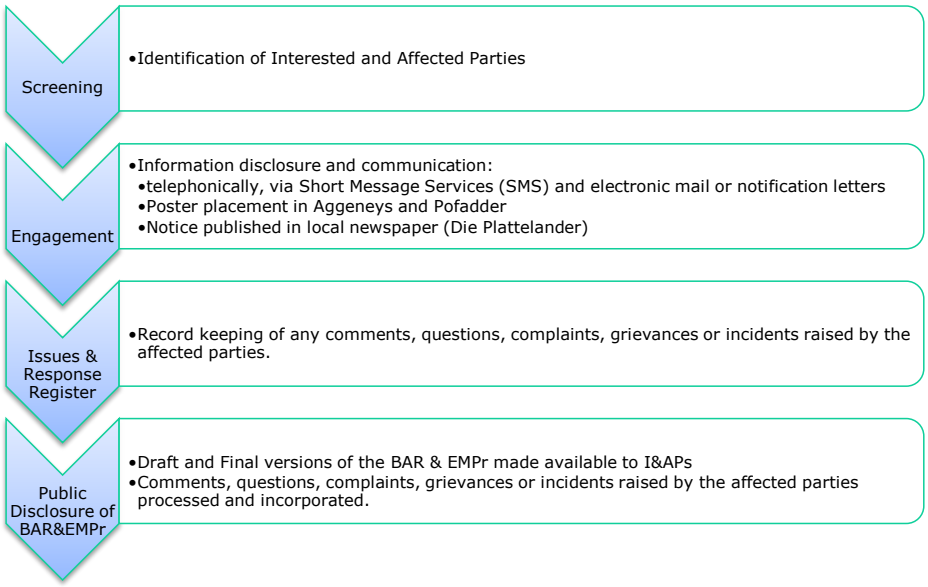


Figure 10: Public Participation Process applied.

iii) Summary of issues raised by I & Aps

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

Comments and issues received from Interested and Affected Parties are provided in the table below.

Table 11: Issues Raised by Stakeholders

Interested and Affected Parties	Consulted	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status
Deon Maasdorp	x	11-Dec-16	Farmers in surrounding areas must be considered in such projects. Underground water is drained due to mining activities. Dust on grazing land - this will cause no harm to animals eating dusted grass.	Commitment to conduct ecological study and conduct prospecting in consultation with ecologist and land owner.	Continuous as project develop.
Deon Maasdorp	x	28-Feb-17 (Meeting)	Concerned that groundwater levels would be reduced and would be insufficient for his farm Zuurwater with only one borehole. Asked about the use of the mines borehole. Freshwater is being used for drinking water, to feed his cattle and for domestic water which leads to high costs. Concerned about dust control.	The following was communicated to Mr. Maasdorp during the meeting. The mine can only take responsibility for water shortage if it can be determined that it is the mine causing this. A flow meter should be installed at the solar pump on Zuurwater farm from the mining side to determine water usage. No further impacts could be applied on the mines boreholes. Boreholes will be monitored. The farms pipeline should be monitored for leakages. The dams and water tanks on the farm should be covered with shade netting to minimise evaporation. The main pipeline supply should be upgraded. Water supply rates must be changed to agricultural rates and not domestic rates. Sedibeng must be contacted by the farmer. Communication of measures put in to place to control the dust. No new waste dump would be established. A dust control product is also used on the gravel roads.	Continuous as project develop
Heritage authority: SAHRA	x	23-Feb-17	Request for recommendations, location map, ground level photographs and track log of field survey regarding heritage study.	All requested items have been provided to SAHRA	Awaiting final comment

(1) Baseline Environment

(a) Type of environment affected by the proposed activity

Its current geographical, physical, biological, socio-economic, and cultural character

Climatic Context

The Black Mountain study area falls within the D82C quaternary catchment in the Lower Orange Water Management Area. The area is semi-desert and according to climatic data of the Pella weather station the mean annual rainfall is 106.5 mm/a. Table 12 shows the precipitation vs. evaporation water balance computed from the monthly values obtained from the Pella weather station and Figure 11 presents the rainfall events from 1993 to 2013. The rainy season occurs from October to April with the highest levels of rainfall occurring during February, March and April.

Table 12: Water Balance for the Pella Meteorological Station

Month	Precipitation (mm)	Evaporation (mm)	Difference (mm)
January	6.2	550.5	-544.3
February	18.1	452.4	-434.3
March	21.6	418.6	-397
April	18.6	300.0	-281.4
May	4.5	206.4	-201.9
June	2.9	148.0	-145.1
July	3.7	166.8	-163.1
August	2.8	224.7	-221.9
September	4.2	302.3	-298.1
October	5.7	408.9	-403.2
November	7.9	467.1	-459.2
December	10.1	534.0	-523.9
Mean annual	106.5	4271.0	-4164.5

The data showed in Table 12 clearly displays the evaporation exceeding the precipitation values for every month of the year.

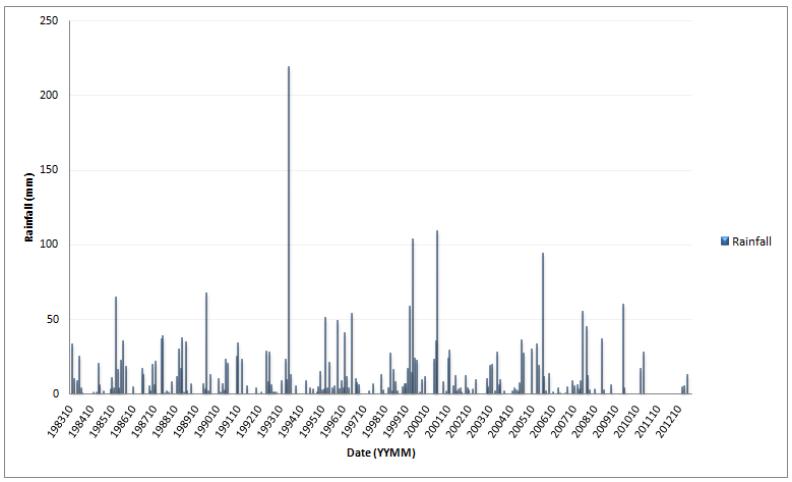


Figure 11: Time Series Rainfall

The elevation of the study area range between 830 and 870 meters above mean sea level (mamsl) from west to east and 890 to 807 mamsl from north to south with some higher mountain peaks. Surface run-off water in the region drains towards the low lying areas on the south western and eastern part of the area. At the Swartberg Mine area the run-off drains towards the north east locally.

Flora & Vegetation Context

The project falls within the Succulent Karoo Biome in the Bushmanland area of the Northern Cape.

The Succulent Karoo Biome is characterized by unparalleled species diversity, endemism and limited formally conserved areas. The Succulent Karoo is predominated by low, succulent-leaved shrubs, few grasses and a scarcity of tall shrubs and trees.

The Bushmanland lies between the Orange River in the north, Namaqualand in the west, Loeriesfontein in the south and Van Wyksvlei, Verneukpan and the Hartbees River in the east. The elevation is between 900 and 1200 meters above sea level, sloping down towards the Kalahari-basin in the northwest.

Black Mountain mine is situated in the North-West region of Bushmanland, an area which is marginal to the winter and summer rainfall zones. Namaqualand to the west is considered a winter rainfall area while Gordonia to the east is a summer rainfall area. Protracted droughts are a common feature, and in the recent past. The annual rainfall varies between 50 mm and 190 mm, averaging just over 90 mm.

Bushmanland is characterized by a particularly high biodiversity. It lies east of Springbok and is dominated by a sea of sandy plains out of which rise steep, quartzite-capped hills. These ancient, rocky outcrops are known as inselbergs. On the gravel plains and within the grasslands there are gravel patches with unique micro flora, including species such as Lithops, Conophytum, Titanopsis, Lapidaria, Dinteranthus and Avonia. But it is the flat-topped inselbergs that are covered by a particularly rich variety of succulents and geophytes. The isolation of populations has led to species diversification within the dwarf succulent shrub lands. The inselbergs are thus important refugia for plants and animals and act as stepping-stones for rock loving species migrating east - west across the sand covered plains of Bushmanland.

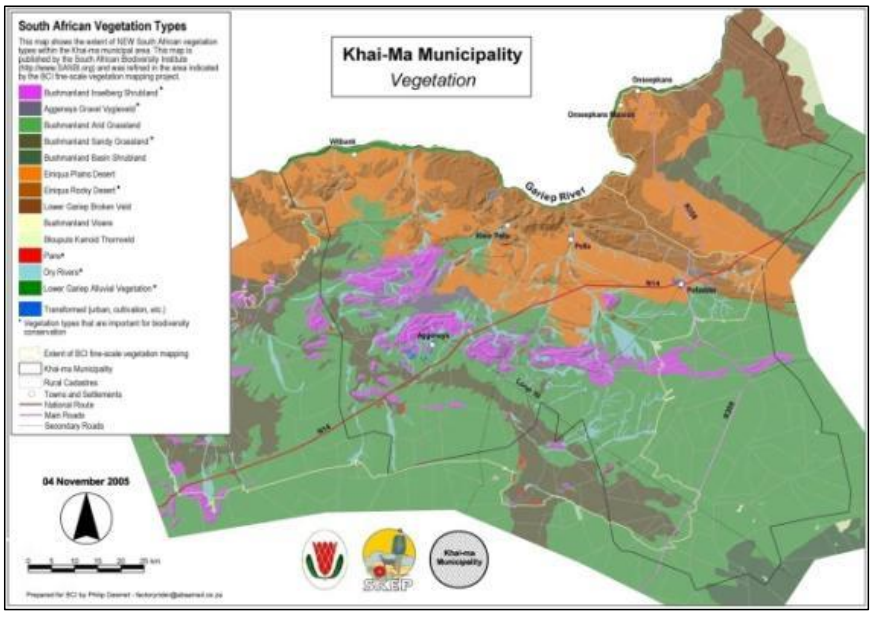


Figure 12: Vegetation Topographical Map in municipal context

The study area is in a unique position as a considerable amount of botanical work has previously been done in the study area and regionally. The previous EIA and the Bushmanland Conservation Initiative (BCI) generated amongst other products that are available to this project:

- A regional context study quantifying the floristic relationships in the region (Desmet, 2000);
- Regions of Floristic Endemism in Southern Africa (van Wyk, A. and Smith, G. 2001);
- The succulents of Northern Bushmanland: their distribution and implications for conservation(Desmet 2000);
- A fine-scale vegetation map of the whole Bushmanland Inselberg Region(BIR) mapping habitat features found on the Gamsberg at a regional scale (Desmet*et al.*, 2005)
- Floral specialist study (Desmet, 2010).

Biodiversity management of the area must also be considered with this assessment. According to the fine scale biodiversity areas map generated from the fine scale vegetation map the project area does not have any critical plant populations, two important plant populations are however in close proximity towards the west of the project area.

The area is outside the mountain plateau aquifer areas. The majority of the project is planned on east facing inselberg slopes with the road crossing the dry rivers stream. The material holding area will be marginally affecting the Bushmanland Flat Arid Grassland areas.

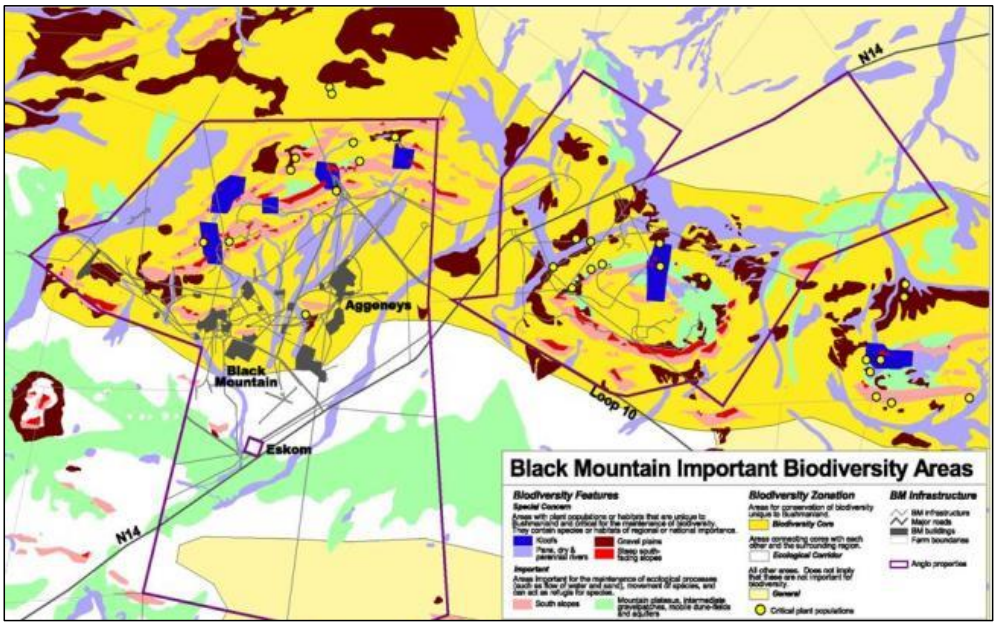


Figure 13: Fine Scale Biodiversity Areas Map for Black Mountain (BCI)

Site specific context

According to Mucina and Rutherford (2006), the project falls primarily within vegetation units SKr 18 Bushmanland Inselberg Shrubland; NKb 4 the Bushmanland Flat Arid Grassland and transverse by the washes.

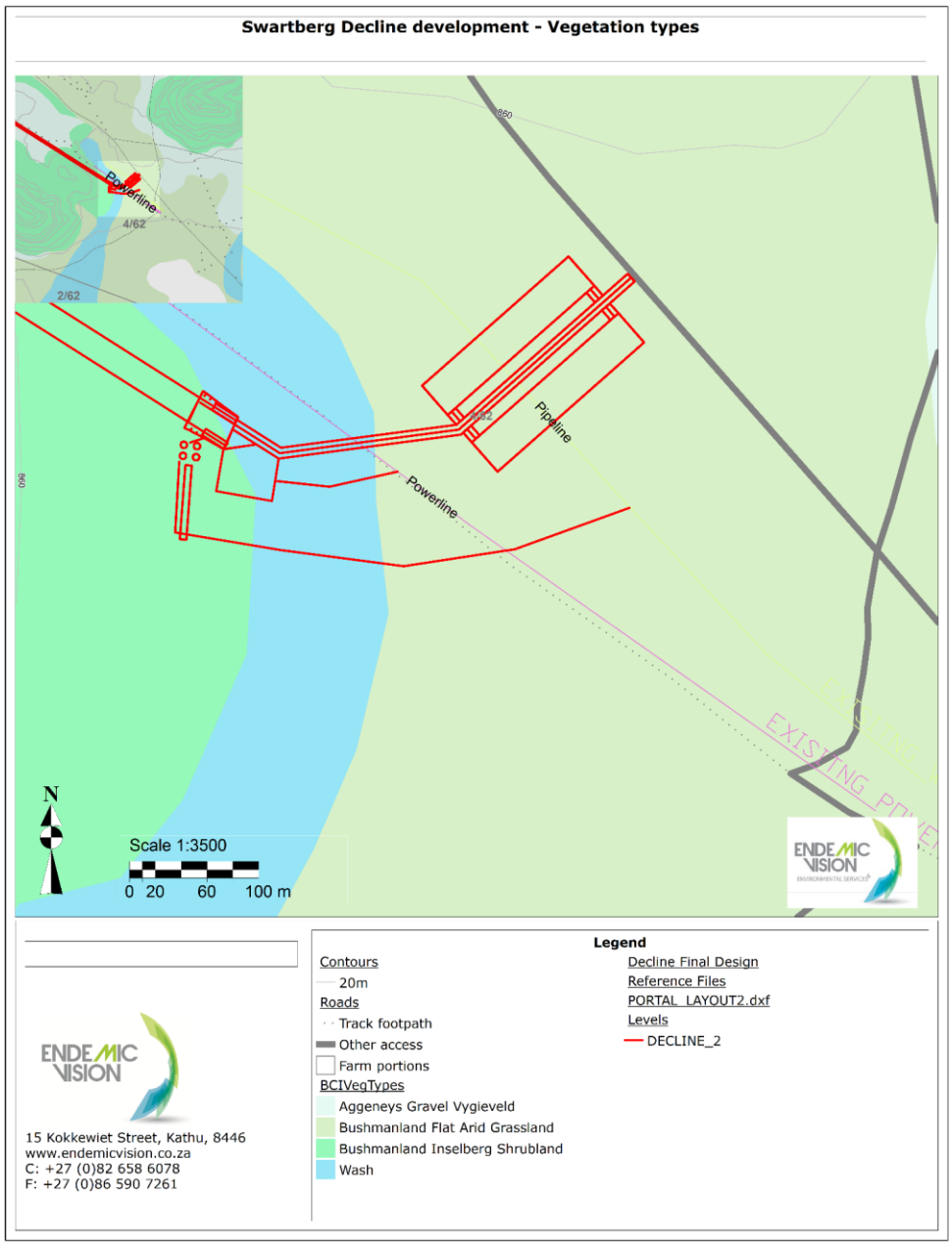


Figure 14: Vegetation types associated with the Swartberg decline development

The decline itself will be constructed along the foot of Bushmanland Inselberg Shrubland, the road crossing over the washes area and the laydown area and access road will be constructed through the Bushmanland Flat Arid Grassland.

In terms of sensitivity, the washes are considered most sensitive, where Bushmanland Inselberg Shrubland, Bushmanland Flat Arid Grassland and the dry riverine habitats all come together at an east facing upland-lowland intersection.

Thereafter the Bushmanland Inselberg shrub land on mountain habitats and finally the Bushmanland flat arid grasslands on sandy plains habitats.

Mountain Slope Habitats

The mountain slope area under investigation is along the east facing slope habitat characterized by winter-shaded inselberg slopes. The vegetation is considered sparse in comparison with similar aspects and inselbergs of the surrounding area. This may be associated with the minerology of the inselberg and the contrasting dark soils that reach high soil temperatures in summer.

Eastward view of inselberg slope

Northward view of inselberg slope

Westward view of inselberg slope

Southward view of inselberg slope

Figure 15: Photo catalogue of inselberg slope

Washes

The washes consist of a shallow depression in sandy substrate along the foot of the inselberg. Larger plant specimens of isolated trees and numerous shrubs are encountered here. Spoor and droppings in the river area indicate that this is a high activity zone for small mammals. The washes habitat is artificially enhanced by the water supply pipeline that has been leaking for extended period (more than a single year).

Washes area towards the South East

Washes area upstream, North West

Washes area towards the West

Washes area towards North, Aardvark burrow in front

Washes area with artificial long term water supply

Centre of washes area with spoor indicating mammal activity

Figure 16: Washes area photo catalogue

Plains

The Bushmanland flat arid grasslands vegetation type are the most prominent and characteristic feature of the Bushmanland. This area has sand dominated substrate with a greater proportion of grass elements and shrub elements with very little succulent species present. This vegetation type is homogenous and structurally uniform, except where Propopis ingresses on the site. This habitat type is well represented in the area. Along the plains greater grass elements dominate with Stipagrostis cilliaris; Stipagrostis obtuse and Schmidtia Kalahariensis occurring along with memsembryanthemum species and small shrubs. The continuous covering of shallow sand is sometimes exposed by underlying calcrete hardpan, not supported by Avonia as anticipated, but rather a continuation of sparse to dense, loose sandy grassland.

Plains in North western direction

Plains in North eastern direction

Plains in eastern direction with existing single track road

Plains with existing impacts in direction of decline

Figure 17: Plains area photo catalogue

The plant species list inserted at the end of this report indicates species found on site as well as what can be expected to occur on site because of suitable habitat. Genus, species and protected status is presented. This is not an all-inclusive list.

Fauna

The project area is zoned mining with no farming activities taking place and limited free roaming wildlife utilizing the area. Considering the aridity of the area, fauna populations are relatively low, but with heterogeneity and diversity adapted to the harsh environments.

Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases. This information was augmented by literature review where appropriate using Branch (1988) and Alexander and Marais (2007) for reptiles and Skinner and Chimimba (2005) for mammals.

Bird data for the site was extracted from the SABAP databases and Birdlife South Africa. The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

Table 13: List of Fauna Species expected to occur in the areas

Scientific Name	Common Name
Macroscledidea (Elephant Shrews):	
Macroscelidesproboscideus	Round-eared Elephant Shrew
Elephantulusrupestris	Western Rock Elephant Shrew
Mellivora	
Mellivora capensis	Ratel
Tubulidentata	
Orycteropusafer	Aardvark
Hyracoidea (Hyraxes)	
Procaviacapensis	Rock Hyrax
Lagomorpha (Hares and Rabbits):	
Pronolagusrupestris	Smith's Red Rock Rabbit
Lepuscapensis	Cape Hare
Rodentia (Rodents):	
Hystrixafricaeaustralis	Cape Porcupine
Petromustypicus	Dassie Rat
Xerusinauris	South African Ground Squirrel
Graphiurusplatyops	Rock Dormouse
Rhabdomyspumilio	Four-striped Grass Mouse
Thallomyspaedulcus	Acacia Tree Rat
Thallomysnigricauda	Black-tailed Tree Rat
Aethomysnamaquensis	Namaqua Rock Mouse
Parotomysbrantsii	Brants' Whistling Rat
Parotomyslittledalei	Littledale's Whistling Rat
Desmodillusauricularis	Cape Short-tailed Gerbil
Gerbilluruspaeba	Hairy-footed Gerbil
Gerbillurustytonis	Dune Hairy-footed Gerbil
Gerbilliscusleucogaster	Bushveld Gerbil
Gerbilliscusbrantsii	Higheld Gerbil
Saccostomuscampestris	Pouched Mouse
Malacothrixtypica	Gerbil Mouse
Petromyscuscollinus	Pygmy Rock Mouse
Primates:	

Papioursinus	Chacma Baboon
Cercopithecusmitis	Vervet Monkey
Eulipotyphla (Shrews):	
Crociduracyanea	Reddish-Grey Musk Shrew
Carnivora:	
Protelescristata	Aardwolf
Caracal	Caracal
Felissilvestris	African Wild Cat
Pantherapardus	Leopard
Felisnigripes	Black-footed cat
Genettagenetta	Small-spotted genet
Suricatasuricatta	Meerkat
Cynictispenicillata	Yellow Mongoose
Herpestespulverulentus	Cape Grey Mongoose
Atilaxpaludinosus	Marsh Mongoose
Vulpeschama	Cape Fox
Canismesomelas	Black-backed Jackal
Otocyonmegalotis	Bat-eared Fox
Aonyxcapensis	African Clawless Otter
Ictonyxstriatus	Striped Polecat
Rumanantia (Antelope):	
Tragelaphusstrepsiceros	Greater Kudu
Oryx gazella	Gemsbok
Sylvicapragrimmia	Common Duiker
Antidorcasmarsupialis	Springbok
Raphiceruscampestris	Steenbok
Oreotragusoreotragus	Klipspringer
Chiroptera (Bats)	
Sauromyspetrophilus	Flat-headed free-tailed bat
Tadaridaaegyptiaca	Egyptian Free-tailed Bat
Nycteristhebaica	Egyptian Slit-faced Bat
Cistugoseabrae	Angolan hairy bat
Eptesicushottentotus	Long-taliedserotine bat
Rhinolophusclivosus	Geoffroy'shorsehoe bat
Rhinolophuscapensis	Cape horseshoe bat
Rhinolophusdarlingi	Darling's Horsehoe Bat

Fauna activity was evident by spoor (Klipspringer, Duiker, Kudu); middens (Dassie, Gerbil, Cape Hare); sightings (numerous avi-fauna with Marshall Eagle nests in close vicinity).

Ecological Sensitive Area Context

The ecological status, considering the biotic and abiotic elements and the way they interact is considered for this assessment.

Specific habitats that affect flora and fauna interactions with the environment are found on the site including the steep southern slopes; the upland-lowland gradient along the mountain slope, the a-zonal habitats and catchment area headwaters, the washes in the plains at the foot of the mountain slope.

Ecological sensitive areas are investigated and presented spatially to assist in the evaluation of the baseline area and possible impacts. Information is integrated by focusing on the following aspects:

- Southern Slope habitat areas as mapped in the Black Mountain Fine Scale conservation plan
- Catchment areas and catchment streams supplying important ecological functions
- Location of important species and populations (unique populations of species of conservation concern)
- Protected species that will affect legal compliance (*Boscia albitrunca* species location)

The map depicts areas according to categories Low (for low biodiversity impact), Medium or High (for high biodiversity impact)

- Low Sensitivity Rating
  - Low ecological sensitivity
  - Previously disturbed areas
  - Negligible impact on ecological processes and terrestrial biodiversity
  - Extent of impact is little, temporal and insignificant in context of the extend of biodiversity
- Medium Sensitivity Rating
  - Moderate ecological sensitivity
  - Relatively undisturbed sites showing signs of extensive indirect disturbance (over grazing, excessive fires, trampling)
  - Little ecological impact provided that all mitigation measures are fully complied with
  - Secondary impacts of development will be low (like erosion, ground water plumes)
- High Sensitivity Rating
  - High ecological sensitivity and high biodiversity value
  - Undisturbed, intact areas
  - Development is undesirable here and should only proceed with caution where all other alternatives have been investigated and failed
  - Ecological impact will be high with little possibility of recovering the area to its original state
- Critical Sensitivity Rating
  - Conservation priority or species priority area with unique habitat types or critical ecological services provided
  - Undisturbed, intact areas of high biodiversity importance beyond the local scale
  - Development should be avoided and area is essentially a no-go area

The following areas or habitats can be demarcated for the project site and directly adjacent to the site that affects the sensitivity mapping results for the area:

Table 14: Sensitivity rating for affected habitats

Area	Sensitivity Rating
The plains	Low
The east-facing slope	Moderate
The washes	Moderate

Figure 18: Ecological Sensitivity zones

The majority of the project is presented in the low ecological impact zone primarily because of the extent of the footprint, project impact and duration in relation to the represented vegetation type in the area.

The washes and east facing inselberg slopes are seen as moderately sensitive. Moderate ecologically zoned areas are highlighted with important mitigation measures that must be followed, amongst others, specifically pollution control, erosion control, storm water management and avoiding the destruction of nationally protected species.

Geology and Soils

Hydrology

The rainfall patterns, driving the hydrological cycles, indicate a relatively low rainfall of between 100mm and 200mm per year. The rainfall events are erratic and annual rainfall seldom results in river systems flowing. Extreme rain events or a good rainfall year with sufficient follow-up rain could result in the Aggeneys berge catchment flowing out towards the lower lying plains.

Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).

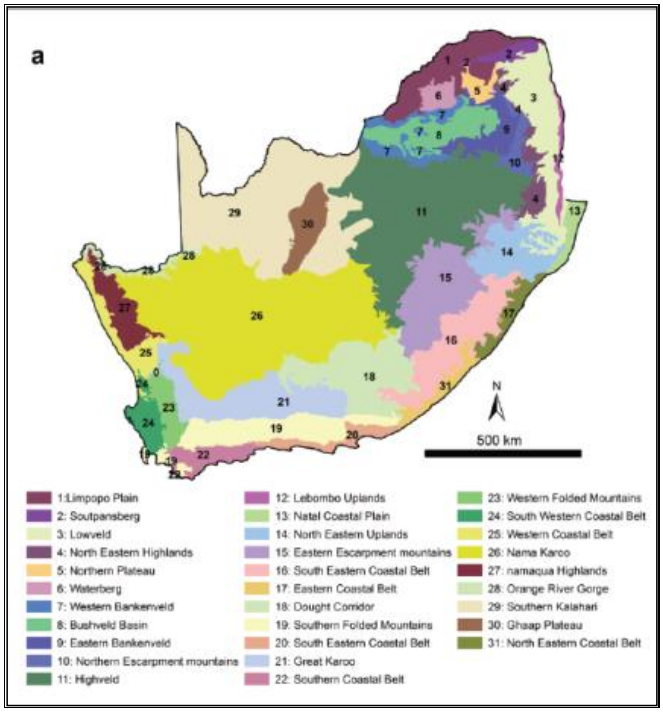


Figure 19: National Freshwater Priority Areas

Black Mountain mine falls within the Orange River Gorge (28) freshwater priority area.

In terms of surface hydrology categories by the Department of Water Affairs South Africa is divided into a number of drainage regions. The Aggeneys farm 56 within the Lower Orange water management area and the Big Syncline Valley sub-catchment.

The surface area is further investigated in terms of national data bases to look for the presence of any listed hydrological features that may be directly or indirectly affected by the project. According to the latest NFEPA categorization, there is no river or hydrological feature in direct conflict with the project.

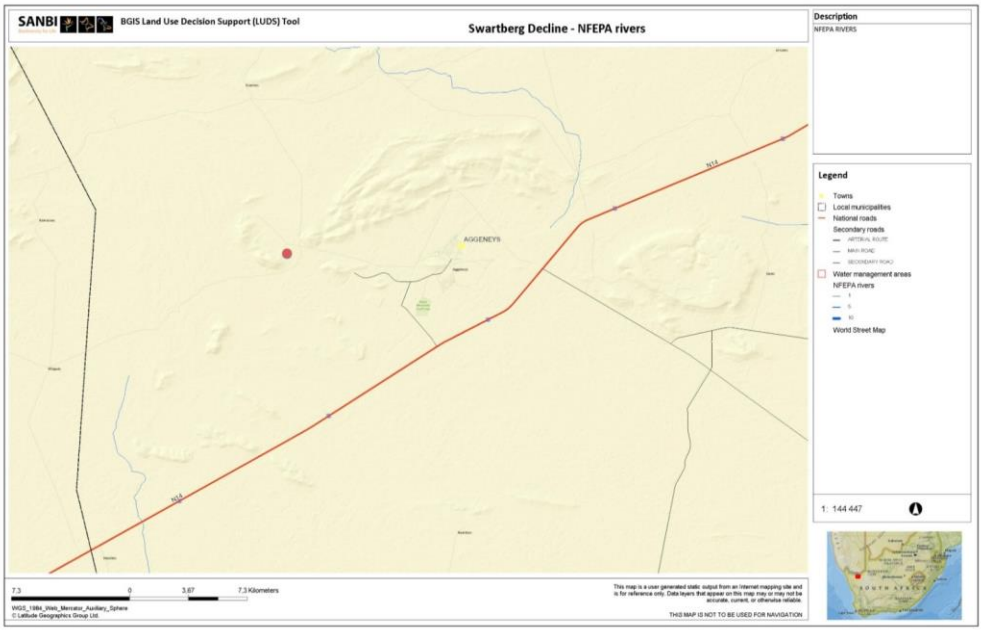


Figure 20: NFEPA river desktop review

In terms of hydrological habitats, washes as defined by the Bushmanland Conservation Initiative are found and directly impacted.

The vegetation of washes tends to be fairly heterogeneous due to a spatially and temporally dynamic and heterogenous environment. For the most part the vegetation of washes is most similar to that of the surrounding vegetation. Many species found growing on the surrounding plains or mountain slopes can be found growing in the washes, usually larger specimens. Specialist species, those adapted to high disturbance regimes and those dependent on the water associated with washes, can be found in these areas, as well as deep rooted species adapted to sub-surface flow or ground water. The unstable nature of washes also give way to pioneers, indigenous and alien species.

The characteristic species of the plains drainage lines are *Sisyndite spartea, Indigofera heterotricha, Salsola aphylla, Aptosimum indivisum, Aptosimum spinescens, Sesamum capense, Tribulus cf. zeyheri, Zygophyllum retrofractum* and *Zygophyllum simplex*. Common species include *Boscia foetida subsp. foetida, Euclea undulata, Lycium cinereum and L. prunus-spinosa, Zygophyllum retrofractum, Rhigozum trichotomum, Monechma incanum, Aptosimum spinescens, Geigeria plumosa, Gazania lichtensteinii, Hermbstaedtia glauca* and *Didelta carnosa* (Desmet, 2010).

Washes are mapped according to peripheral ecological functioning anticipated for the drainage lines. Surface washes are seen as important habitats, functioning as conduits for water movement in the landscape and keystone ecological resource.

According to the washes delineation, the Swartberg decline will intersect a narrow portion of the washes as it meanders around the Swartberg secondary inselberg. The washes quickly expand into a floor plains wash crossing into

neighbouring properties. The main drainage area is the Swartberg primary and secondary inselbergs with extensive artificial surface flow entering from across the decline – the dune system quarried for backfill sand.

In regional context, the Swartberg wash is an isolated wash, not developing from a non-perennial river or catchment rivulet, but from inselberg and quarry surface flow. The plains wash footprint is however extensive and its ecological functioning would be the same as other wash areas, albeit at lower frequencies.

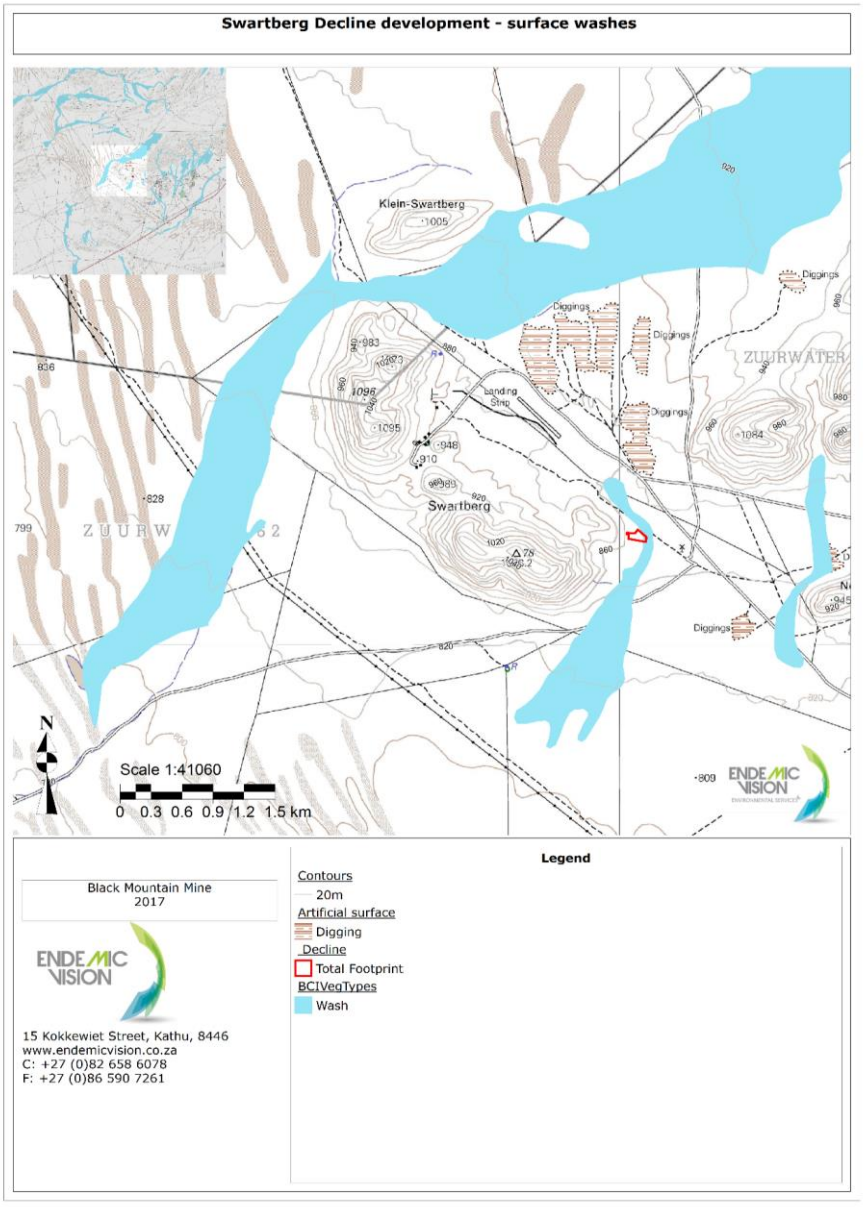


Figure 21: Surface washes of surrounding landscape

The washes ecological zone is approximately three (3) kilometers long and at the point of crossing 90 meters wide.

The wash is extremely shallow, situated between contours 860 and 820 meters above sea level, having a 40 meter drop over the three kilometers.

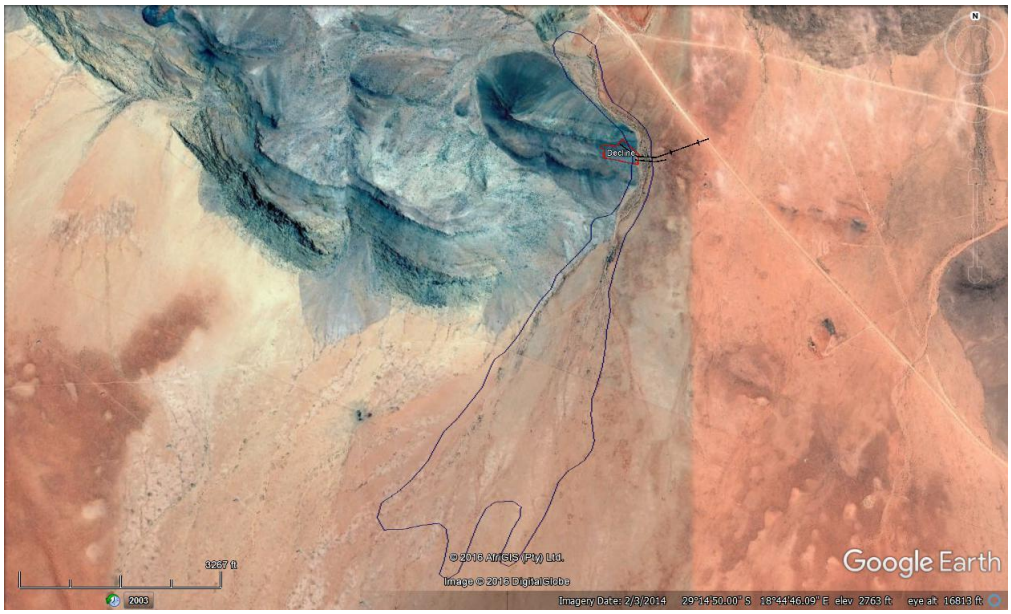


Figure 22: Vertical satellite view of Washes

Upon closer investigation, the main water source for the washes are artificially supplied by the haul road and adjacent sand quarry entering the wash at similar low gradients as well as the storm water berm from the existing Swartberg mine and the leaking artificial pipeline.

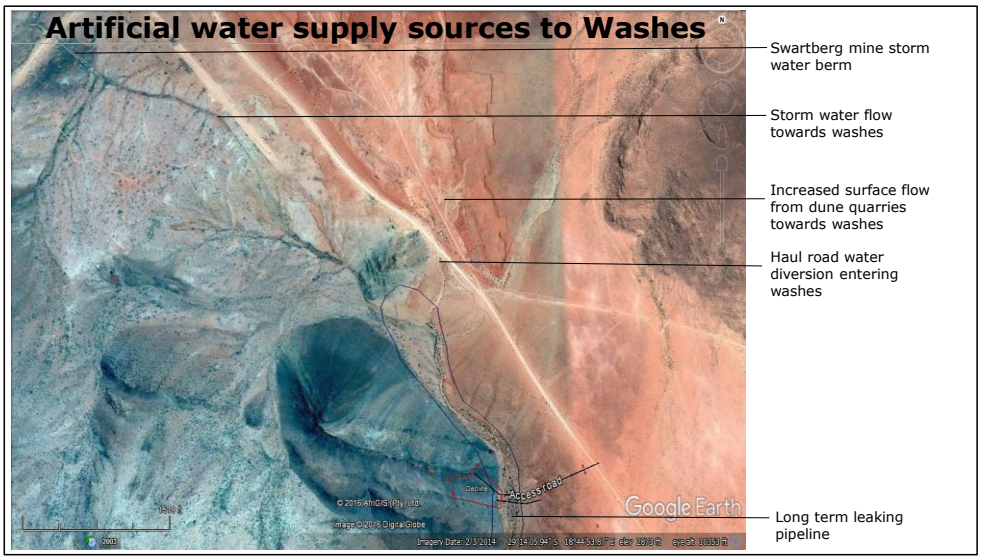


Figure 23: Washes with supply areas highlighted

The substrate, predominantly sandy result in relatively high infiltration potential. It should be noted, however that this area is characterized by extreme flood events when it does rain and surface flow, or washes form along inselbergs in the region as a norm.

Geohydrological

The past mining at Swartberg did have an impact on the groundwater levels around the mine.
The groundwater quality around the Swartberg Mine has been impacted by mining related contaminants.

Regional Geology

The study area is situated in the Northern Cape's tectonically bound terrains namely the Bushmanland Terrane which forms part of the Namaqua Orogeny and is composed of basement granitic and gneissic rocks from the Proterozoic Eon (1200 – 1000 Ma). The rocks have been subjected to various phases of metamorphic deformation. The area also consists of metasedimentary, metavolcanic and intrusive rock units.

Rozendaal (1982) and Praekelt et al. (1994) reported that due to the rapid facies changes and sedimentological characteristics a relatively shallow water environment for the deposition of the Aggeneys and Gams Ore Formations were favoured with the depositional conditions varying between oxidising and reducing.

The ore assemblages and host rocks were intensely affected by medium to high-grade metamorphism and poly-phase deformation. Four phases of deformation were recognised in the Bushmanland area and the main episode of deformation was during a period of the highest degree metamorphism resulting in large open synformal features, fractures and shear zones. Joubert (1986) suggested that these structures represent the final phase of uplift for the area exposing the high-grade rock of the Bushmanland and Namaqualand.

The lower lying plains consist of various depths of surficial cover of wind-blown sand, dunes, scree rubble, sandy soil, calcrete and alluvium of Quaternary and Tertiary age. There are also a number of pale channels filled with this material. Gneiss, quartzite and schist underlie these surficial deposits.

Local Geology

The stratigraphy of the Swartberg deposit is contained within a major recumbent isoclinal synformal fold which extends into the basal gneisses. This fold plunges towards the north east. As a result of this folding event the succession of the stratigraphy is overturned or reversed. The general stratigraphy of the site is summarised in Table 15 below. Figure 24 shows the regional and local geology of the site area.

Table 15: Summary of Strati graphical Succession

Stratigraphic Unit			Thickness (m)
Aggeneys Ore Formation: (Stratigraphic Top)			
7	Baritic-sulphidic schist, sulphidic quartzite, massive sulphide, garnet-quartzite, magnetite-amphibolite	Lower Orebody	(0-17)
6	Baritic quartz schist	Upper Orebody	(5-25)
5	Magnetite-barite rock		(10-25)
4	Magnetite amphibolite		(0-45)
3	Magnetite quartzite		(0-20)
2	Mixed zone consisting of gradations between garnet quartzite and quartz schist	Copper Lenses	(30-65)
1	Banded quartz schist		(10-25)
White Quartzite Formation			
Aluminium Schist Formation			
Pink Gneiss Formation (Stratigraphic Bottom)			

A series of quartzite, schist, gneisses and pegmatites is found in the areas as seen in Figure 24. The strike and dip of these rocks were reported to be east-west orientated and steeply dipping to the north. The quartzite is the most resistant to erosion from the east-west trending range of hills surrounding the site area namely, Swartberg, Broken Hill, Maanhaarkop and Froneman-se-Kop. The hard rock geology is covered by sands, calcareous sands, gravels and calcrete of various thicknesses over a large area of the site.

Structural Geology

In addition to the larger scale faulting, the multiple phases of deformation have resulted in an extremely folded and fractured environment. Late structures have been identified as N-S trending monoclonal folds, fractures and shear zones that represented the final phase of uplift and present-day exposure of the these high-grade rocks.

Due to the local open synformal features, it caused local steepening of lineations, fracturing of the competent rock and downward displacement of the various lithostratigraphic units to the east. The geological structures associated with the site are also presented in Figure 24.

GCS (2000) reported that jointing and fracturing extend to depths of less than 200 meters below ground level (mbgl). Fracturing at these depths are significant due to their occurrence mainly associated with the quartzite-gneiss contacts where late stage folding and fracturing has occurred. The fractured contact zones may act as preferential flow pathways for groundwater.

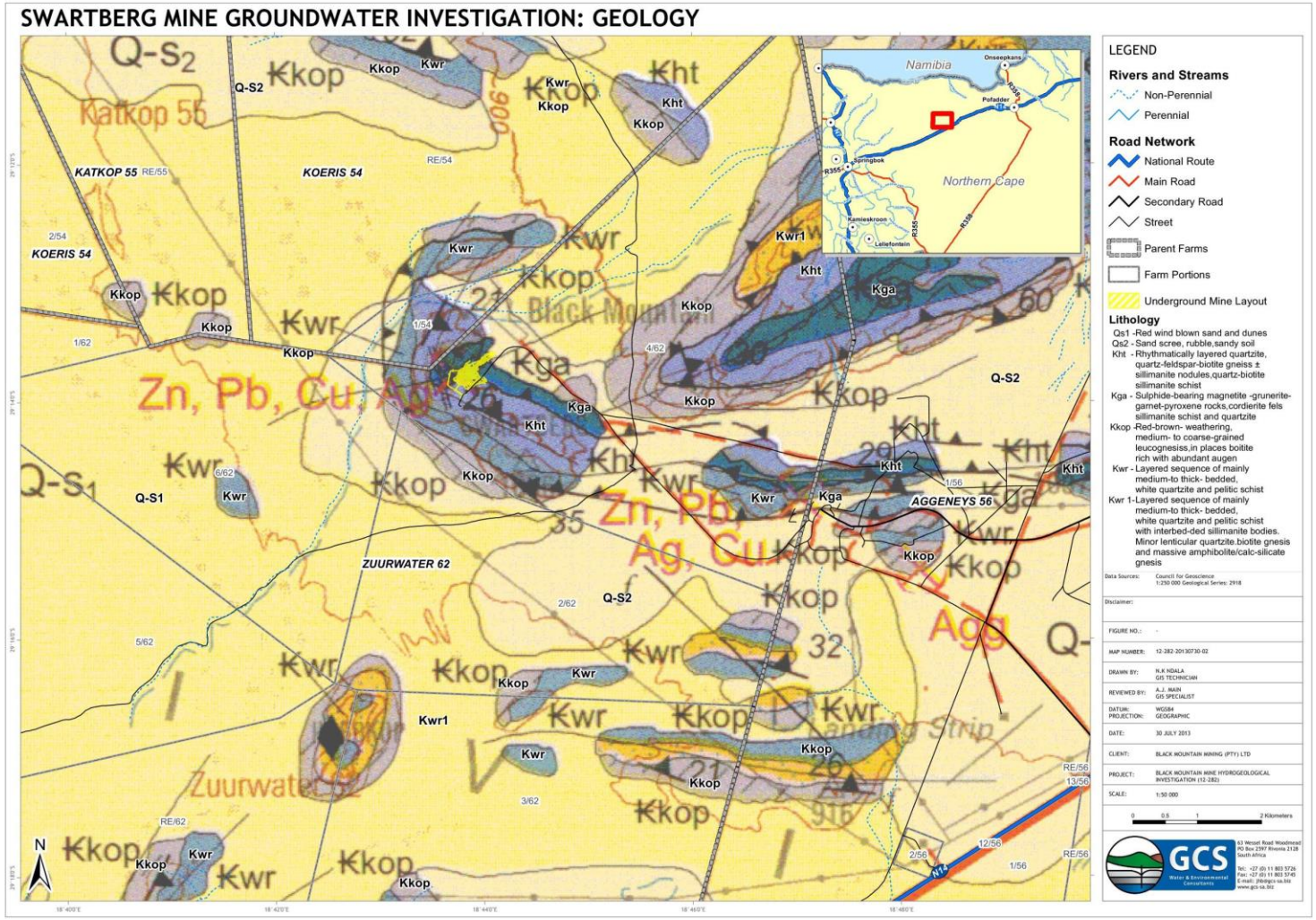


Figure 24: Geology Map

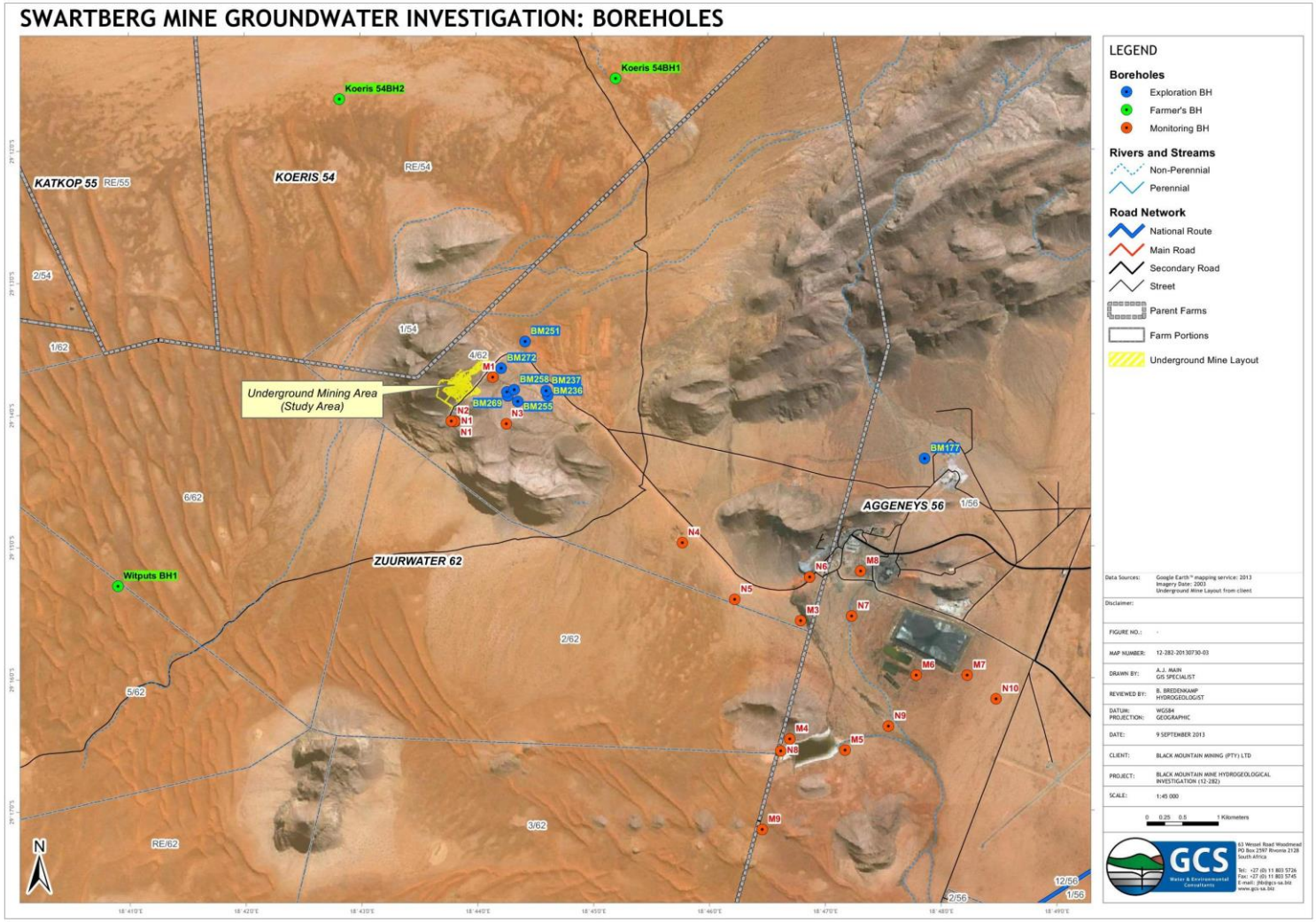


Figure 25: Boreholes in the Swartberg area (excluding NGA boreholes)

Groundwater Quality

Water quality monitoring data for the Swartberg Mine was made available by Black Mountain Mine, see Table 16 below. The data of five boreholes in the vicinity of Swartberg was used to determine the current groundwater quality.

Table 16: Mine Monitoring Boreholes

Borehole	Coordinates		Available data
	Longitude	Latitude	
M1	18.73631	-29.22597	May 1999 to December 2007
N1	18.73028	-29.2342	December 1999 to June 2012
N3	18.7375	-29.2344	May 2000 to September 2007
AD14	18.72725	-29.2378	June 2007 to June 2012
AD17	18.73414	-29.2295	September 2007 to June 2011

The latest complete data sets of the five listed boreholes were compared to the Department of Water Affairs' (DWA) South African Water Quality Guidelines (SAWQG) target range, Volume 5, Agricultural Use (Livestock Watering) (1996) and the South African National Standards for Drinking Water (SANS 241-1:2011) in Table 17 below.

The water quality is characterized by elevated calcium, magnesium, sodium, chloride, fluoride, manganese, iron and lead concentrations. Sodium (254 – 480 mg/l) and chloride (1168 – 12645 mg/l) were high in boreholes N1, AD14 and AD17. Chloride concentrations are naturally elevated in the area. Borehole AD17 had a pH of 3.11 which is probably the reason for high metal concentrations such as manganese (39.62 mg/l), iron (41.16 mg/l), zinc (61.92 mg/l) and lead (5.21 mg/l).

Sulphate was elevated in boreholes AD17 (731 mg/l) and M1 (360 mg/l). Chromium was elevated in boreholes N3 (0.39 mg/l) and M1 (0.32 mg/l). The elevated metal concentrations are associated with the ore mined at Black Mountain Mine and vicinity.

The most significant health risk associated with the groundwater quality is chronic effects associated with dental fluorosis in young livestock and skeletal fluorosis in mature livestock, such as mottling of teeth and enamel hypoplasia, a decrease infeed and water intake and a decline in productivity may occur due to fluoride (>2 mg/l). Elevated concentrations of metals (especially Pb and Zn) will be toxic on long term exposure.

Table 17: Water Quality Comparison of the Mine Monitoring Boreholes

Parameter	SAWQG TV Livestock Water	SANS 241-1: 2011	N1	N3	AD14	AD17	M1
Date			Jun-12	Sep-07	Jun-12	Dec-09	Dec-07
pH Value	NS	5-9.7	6.87	7.17	7.14	3.11	7.54
Conductivity mS/m @ 25°C	NS	<170	96	147	72	396	151
Total Dissolved Solids	<1000	<1200	672	1032	504	2772	1053.5
Calcium as Ca	<1000	NS	52	133	99	191	103
Magnesium as Mg	<500	NS	25	92	51	141	50
Total Hardness as $CaCO_3$	NS	NS	237	890	196	910	1190
Sodium as Na	<2000	<200	254	114	396	480	174
Potassium as K	NS	NS	10	58	11	37	10
Total Alkalinity as $CaCO_3$	NS	NS	148	272	158	0	295
Bicarbonate as HCO_3	NS	NS	180	272	193	0	359
Chloride as Cl	<1500	<300	5457	161	12645	1168	154
Sulphate as SO_4	<1000	<500	91	84	97	731	360
Fluoride as F	<2	<1.5	2.65	2.4	3.35	5.24	3
Chemical Oxygen Demand, COD	NS	NS	16	10.99	35	116	15.75
Manganese as Mn	<500	<0.50	0.82	0.31	BDL	39.62	0.19
Iron as Fe	<10	<2	5.68	0.17	0.43	41.16	0.44
Zinc as Zn	<20	<5	0.03	0.07	0.04	61.92	0.15
Lead as Pb	<0.1	<0.01	0.02	0.04	0.05	5.21	0.01
Cobalt as Co	<1	<0.5	0.015	0.01	0.017	0.43	0.02
Copper as Cu	<0.05	2.0	BDL	BDL	BDL	0.15	BDL
Bismuth as Bi	NS	NS	0.03	BDL	0.02	0.02	BDL
Total Chromium as Cr	<1	<0.05	0.007	0.39	0.007	0.05	0.32
Sum of Cations meq/ℓ	NS	NS	115.39	20.70	265.18	48.58	17.13
Sum of Anions meq/ℓ	NS	NS	158.93	10.75	358.91	48.46	16.82
% Error	NS	NS	-15.87	31.63	-15.02	0.13	0.92

Below SANS 241-1: 2011 standard & SAWQG TV Livestock target

Above SAWQG Livestock Watering Target Value

Above SANS 241-1: 2011 Drinking Water Standard

Groundwater Quality Spatial Characterization

The average water quality for each groundwater sampling point was plotted on the Piper diagrams. The Piper diagram (Figure 26) is a tri-linear plot that groups the water chemistry of the samples according to their environment. The cation and anion percentages are illustrated in two triangular fields and extrapolated onto a central diamond-shaped field as a combination of both anions and cations. Piper plots are a useful way of revealing differences and similarities among waters.

The water type for the mine monitoring boreholes can be deduced as Na-Mg /Cl-SO4 with sodium and chloride as dominant cation and anion which is characteristic of the relatively stagnant aquifer conditions of the area.

A pie diagram is a circular graph where each cation and anion is plotted as a percentage of the total cations and anions. The pie diagrams can be seen in Figure 27 below. From the pie diagrams the major cations and anions can be identified as Na, Mg, Ca, Cl, SO4 and HCO3. When comparing these diagrams it is clear that they are similar, but N3 and AD17 have larger portions of sodium while boreholes N1 and AD14 have larger portions of chloride.

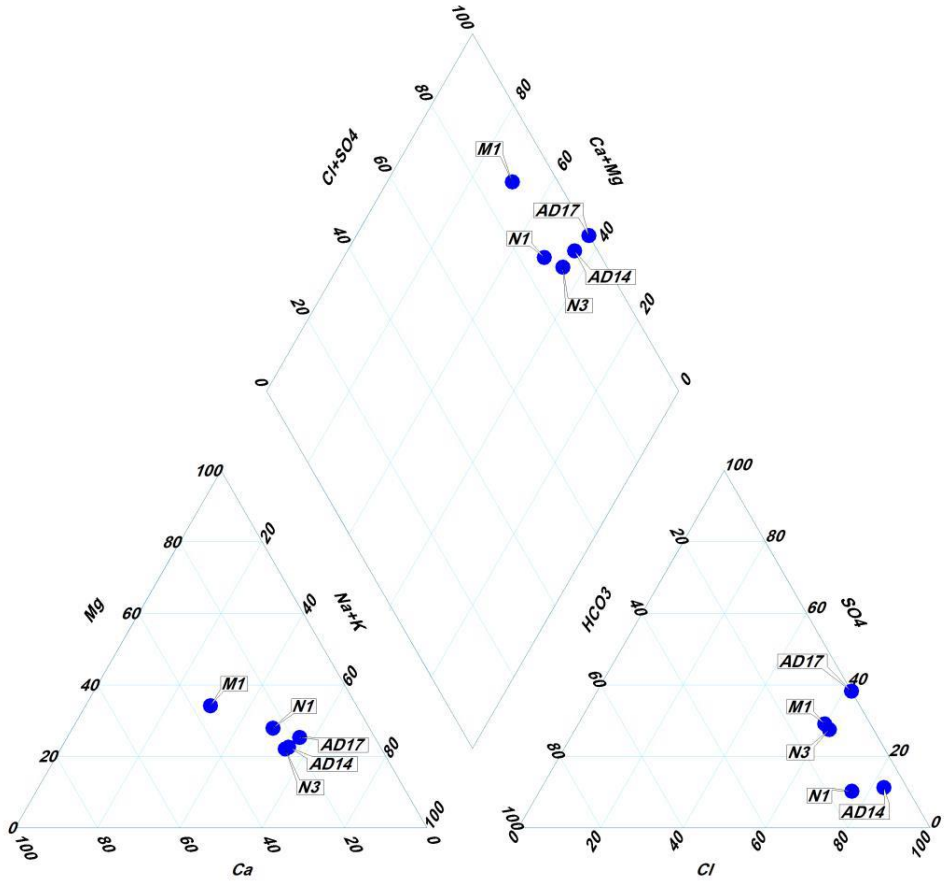


Figure 26: Piper diagram

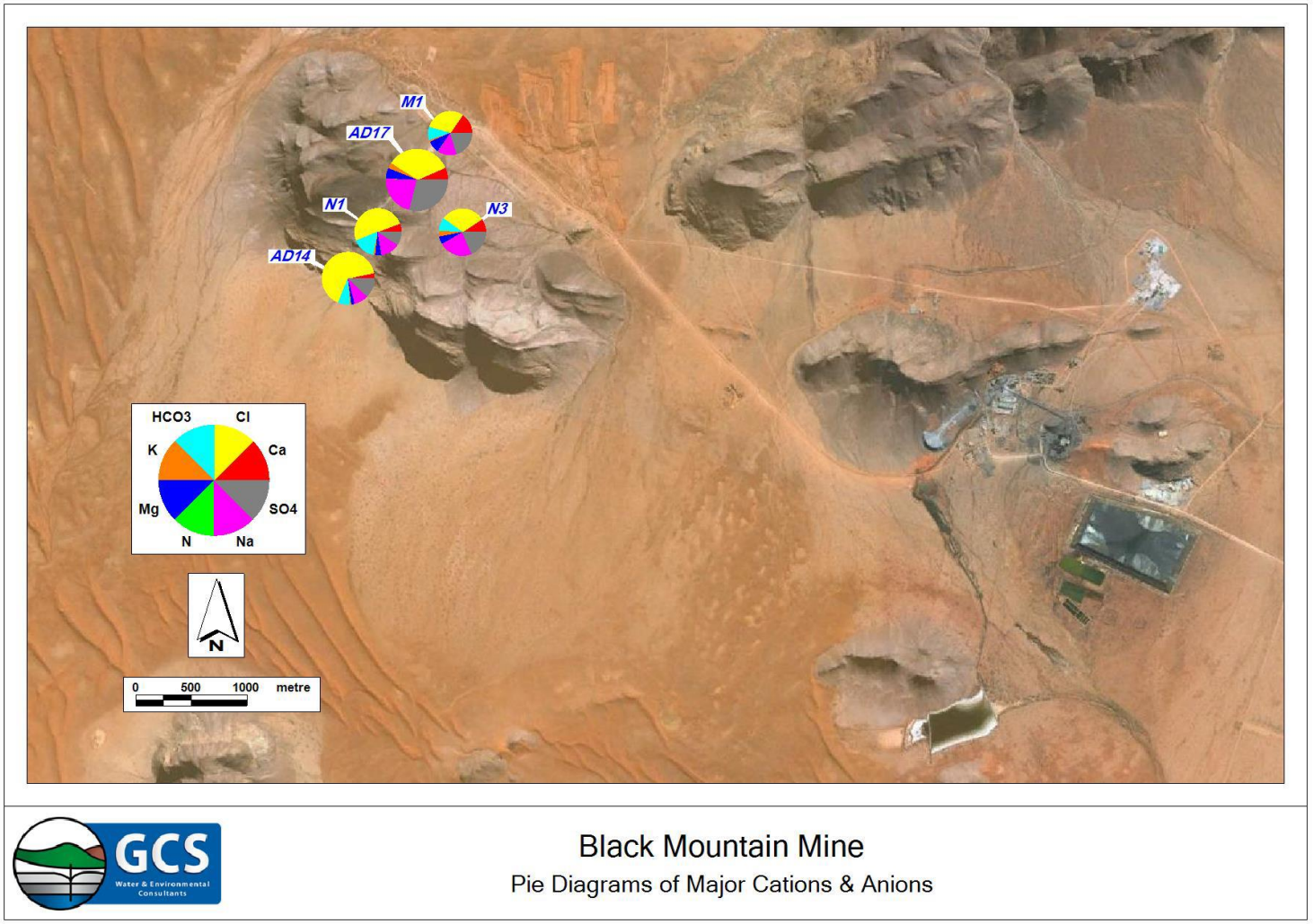


Figure 27: Pie diagram

Groundwater Levels

The Swartberg Mine is likely to be situated in relatively stagnant hydrogeological setting. This can be substantiated by Vegter (2006) which found that groundwater level changes as large as 40 meters have been observed in boreholes on a major drainage divide. The regional water levels indicative that groundwater flow does takes place, while the aquifer storage is limited and recharge events are occasional.

Regional Groundwater Levels

The groundwater level data obtained for the regional area around the mining site included data from the National Groundwater Archive (NGA), exploration boreholes and monitoring boreholes. The regional water levels a fair distance away from the mining ranged between 3.5 and 108 mbgl with an average groundwater level of 33.7 mbgl. These water levels were measured over a large period of time (1981 to 2002) and were therefore only used as an indication of water levels on a regional scale. The average groundwater elevation for the regional study area was calculated to be 781 meters above mean sea level (mamsl) and ranged between 671 and 945 mamsl. The shallow water levels are however often the influence of the upper Quaternary (primary) aquifer system (water level a combination of the upper and lower aquifer) or artificial recharge from surface water bodies.

Local Groundwater Levels

The boreholes located within a 5 km radius of the mining site were isolated from the regional borehole data set. The groundwater levels were obtained from, monitoring- and exploration boreholes which are concentrated to the east of the Swartberg decline shaft. The groundwater levels ranged from 66 to 185 mbgl with an average groundwater level of 131 mbgl. The groundwater levels in the exploration boreholes to the north east of the decline have an average groundwater level of ~147 mbgl (729 mamsl) ranging from 121 mbgl (727 mamsl) to 158 mbgl (729 mamsl). These boreholes are likely to intersect the quartzite-schist aquifer, which is also associated with the ore body being mined. These boreholes have thus been impacted by dewatering from the Swartberg Mine. Exploration borehole BM236 has a water level of ~70 mbgl while the adjacent borehole has a water level of ~145 mbgl, it is therefore likely that BM236 is blocked at depth.

The monitoring borehole N1 located to the west of the incline near the waste rock stockpile has a water level of 66 mbgl, this borehole is unlikely to be affected by the Swartberg dewatering.

Groundwater Correlation

Figure 28 shows the groundwater levels and boreholes elevations. The water levels in the NGA boreholes on a regional scale showed a fair Bayesian2 correlation of 84 % between surface elevation and groundwater levels. It is likely that the NGA boreholes are found in the upper Quaternary (primary) aquifer system (water level a combination of the upper and lower aquifer) which is likely to emulate the topography.

The correlations for the exploration boreholes as well as the monitoring boreholes on a local scale were poor as expected mainly due the effects of dewatering at Swartberg, Broken Hill and Deeps sections. Furthermore as many of these boreholes (especially the exploration boreholes) have been drilled into the fractured quartzite schist aquifer, it can be expected that a poor Bayesian correlation is found in this type of aquifer in the arid environment.

The boreholes from which water levels were obtained are summarized in Table 18 and presented in Figure 25 above.

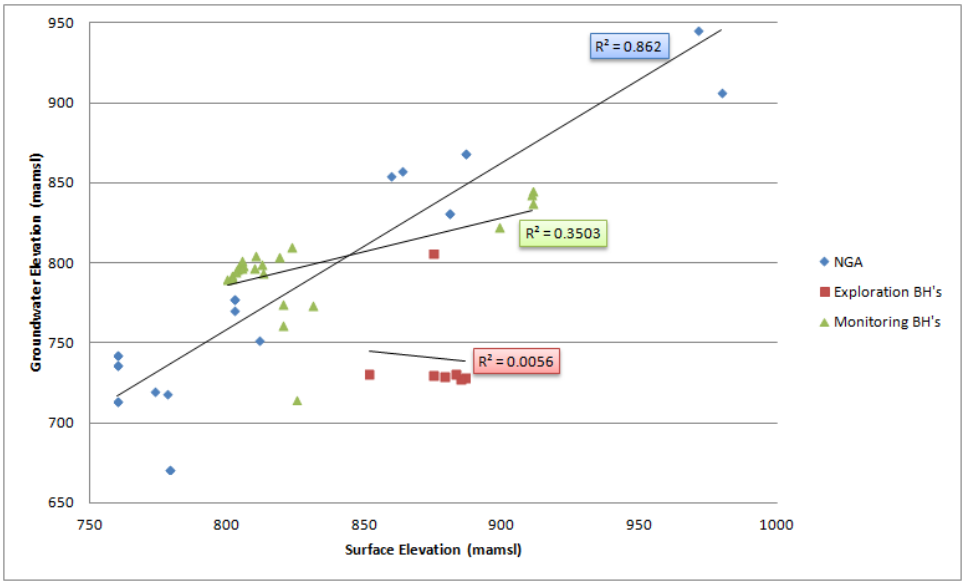


Figure 28: Overall Bayesian Correlation

Table 18: Water Levels Summary

BH ID	Coordinates (Cape, LO19)		Elevation	SWL*	SWL*	Classification	Scale
	X	Y	(mamsl)	(mbgl)	(mamsl)		
2918BA00080	-25706.4	-3234450.1	886	18.3	868	NGA	Local
2918BA00080	-25706.4	-3234450.1	886	18.3	868	NGA	Local
BM236	-24868.2	-3234601.7	875	69.2	806	Exploration BH	Local
BM237	-24892.0	-3234537.7	875	145.1	730	Exploration BH	Local
M1	-25637.8	-3234344.2	825	110.2	715	Monitoring BH	Local
N1	-26164.3	-3234961.8	911	66.1	845	Monitoring BH	Local
BM268	-25428.9	-3234610.2	887	158.3	728	Exploration BH	Local
BM272	-25518.3	-3234221.3	879	149.7	729	Exploration BH	Local
BM269	-25440.7	-3234552.6	885	157.3	727	Exploration BH	Local
BM258	-25337.7	-3234521.3	883	152.3	731	Exploration BH	Local
N1	-26171.0	-3234963.1	910	67.3	843	Monitoring BH	Local
N2	-26217.0	-3234959.3	911	73.6	838	Monitoring BH	Local
N3	-25448.0	-3234998.3	899	75.8	823	Monitoring BH	Local
N4	-22987.0	-3236657.2	831	57.6	773	Monitoring BH	Local
N5	-22254.8	-3237452.1	820	45.9	774	Monitoring BH	Local
2918AB00005	-55179.3	-3221222.4	779	108.0	671	NGA	Regional
2918AB00005	-55179.3	-3221222.4	779	108.0	671	NGA	Regional
2918BA00028	-40538.0	-3233107.7	760	47.0	713	NGA	Regional
2918BA00028	-40538.0	-3233107.7	760	47.0	713	NGA	Regional
2918BA00030	-40538.0	-3233108.8	760	18.0	742	NGA	Regional
2918BA00030	-40538.0	-3233108.8	760	18.0	742	NGA	Regional
2918BA00031	-40536.1	-3233107.7	760	24.0	736	NGA	Regional
2918BA00031	-40536.1	-3233107.7	760	24.0	736	NGA	Regional
2918BA00056	-27585.9	-3227526.9	881	50.0	831	NGA	Regional
2918BA00056	-27585.9	-3227526.9	881	50.0	831	NGA	Regional
2918BA00065	-33800.1	-3227974.8	778	60.0	718	NGA	Regional
2918BA00069	-42659.5	-3214641.5	811	60.0	751	NGA	Regional
2918BA00071	-43038.4	-3214644.0	802	25.0	777	NGA	Regional
2918BA00071	-43038.4	-3214644.0	802	25.0	777	NGA	Regional
2918BA00072	-43037.4	-3214644.0	802	32.0	770	NGA	Regional
2918BA00086	-33991.5	-3228057.4	773	54.0	719	NGA	Regional
2918BB00016	-23089.8	-3225968.5	980	73.6	906	NGA	Regional
2918BB00018	-11489.9	-3226205.9	971	26.2	945	NGA	Regional
2918BD00009	-20139.6	-3251803.4	863	6.0	857	NGA	Regional
2918BD00041	-20248.1	-3251374.6	859	5.0	854	NGA	Regional
BM177	-19595.7	-3235481.1	851	121.2	730	Exploration BH	Regional
BH1	-19796.0	-3238686.0	804	5.4	799	Monitoring BH	Regional
BH2	-19747.0	-3238801.0	804	6.5	797	Monitoring BH	Regional
BH3	-19747.0	-3238848.0	803	6.9	796	Monitoring BH	Regional

BH ID	Coordinates (Cape, LO19)		Elevation	SWL*	SWL*	Classification	Scale
	X	Y	(mamsl)	(mbgl)	(mamsl)		
BH4	-19773.0	-3238945.0	803	7.9	795	Monitoring BH	Regional
BH5	-19862.0	-3239112.0	802	9.3	792	Monitoring BH	Regional
M3	-21332.2	-3237749.4	813	18.8	794	Monitoring BH	Regional
M4	-21483.6	-3239402.1	806	6.7	799	Monitoring BH	Regional
M5	-20711.7	-3239557.4	805	7.8	797	Monitoring BH	Regional
M6	-19715.2	-3238509.7	805	3.5	802	Monitoring BH	Regional
M7	-19001.7	-3238512.3	810	5.4	805	Monitoring BH	Regional
M8	-20494.7	-3237056.1	823	13.0	810	Monitoring BH	Regional
M9	-21867.5	-3240668.8	820	58.7	761	Monitoring BH	Regional
N6	-21206.0	-3237139.3	819	14.9	804	Monitoring BH	Regional
N7	-20619.2	-3237684.4	812	12.7	800	Monitoring BH	Regional
N8	-21609.0	-3239570.8	800	10.2	790	Monitoring BH	Regional
N9	-20104.0	-3239224.9	802	11.1	791	Monitoring BH	Regional
N10	-18601.0	-3238843.9	810	12.6	797	Monitoring BH	Regional

* - Static Water Level

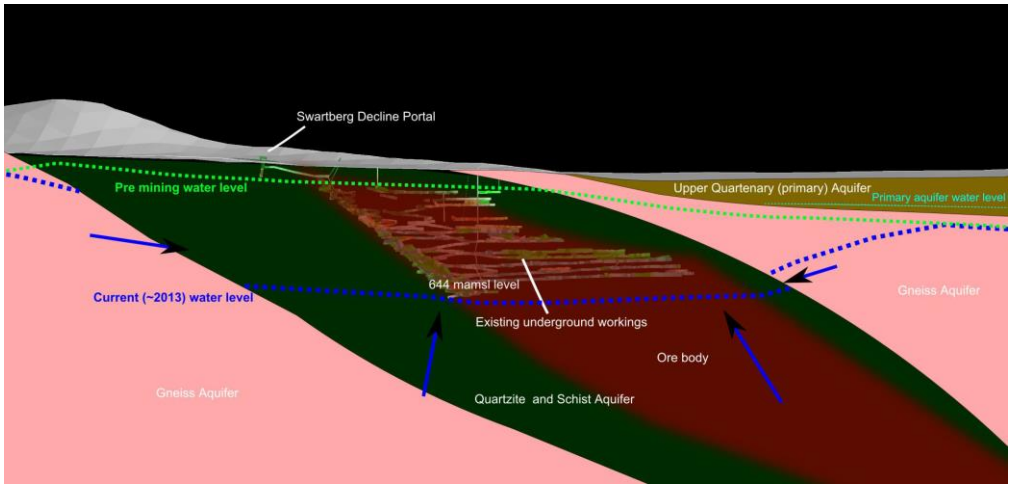


Figure 29: Schematic Site Conceptual Model

Archaeological, Heritage and Palaeontological

On-site investigation was completed by EndemicVision with supporting desktop specialist report by Paleo xxxx. The following areas were investigated:

Decline portal;

Washes crossing

Down-stream from washes to approximately 1 kilometre

Up-stream from washes to approximately 3 kilometres

Access road across plains from existing haul road to decline portal.

The below photo record is evidence of the area investigated.

Comment [CDN1]: photos

The proposed footprint is primarily located on flat, open terrain covered by red-brown residual soils, calcretes and wind-blown sands.

Geologically recent superficial deposits along the valley floors are largely made up of Quaternary calcretes and sands.

Cenozoic river terrace deposits between Upington and Pella consists of thin remnants preserved as bedrock lags and small sediment accumulations concentrated at local bedrock knick points (De Wit 2006).

There are currently no records of vertebrate fossil remains from alluvial contexts associated with the Orange River in the region. Paleogene fossil assemblages are known from a crater-lake deposit within a volcanic pipe at Stompoor, located about 160 km due south of Upington, and include a diversity of fish, frogs, reptiles, insects, and palynological remains (Smith 1988). Fluvial deposits from the ancient Koa Valley have yielded fossil vertebrate bone as well as fossil wood (Maglio 1978; De Wit 1996; De Wit and Bamford 1993) while a rich, Middle Miocene vertebrate site is located further downstream in proto-Orange River gravel deposits on the Namibian side of the Orange River at Arrisdrift, about 40 km northeast of Oranjemund.

Archaeological and historical evidence show that the Middle Orange River and Bushmanland regions have been populated more or less continuously during prehistoric times and that the region was extensively occupied by Khoi herders and San hunter-gatherers during the last 2000 years (Morris & Beaumont 1991; Beaumont et al. 1995; Smith 1995). According to Beaumont (1986) archaeological visibility in the region was high during the Last Glacial Maximum, a viewpoint that is in contrast to that indicated for southern Africa as a whole (Deacon and Thackeray 1984).

Beaumont et al. 1995 also noted that MSA artefact occurrences are widespread in the Bushmanland area, but are mainly preserved as low density surface scatters on the landscape. Morris (2010, 2013a, 2013b) noted very sparse localized scatters of MSA stone tools at the top of Gamsberg, including a MSA knapping site, and ESA material, including a Victoria West core on quartzite within the Gamsberg basin. The importance of Gamsberg as an archaeological/historical focal point is further alluded to in early 19th century records (Penn 2005) as a place of refuge and conflict during the colonial frontier period and by the meaning of its name, which is derived from the Khoikhoi word Gaams, meaning 'grassy spring'.

The principal Khoikhoi inhabitants of the Middle Orange River were the Einiqua who belonged to the same language group as the Namaqua and Korana, namely the Orange River Khoikhoi (Penn 2005). The Einiqua occupied the area around and east of the Augrabies Falls while the Korana occupied the Middle-Upper Orange River further to the east.

A large number of burial cairns were excavated near the Orange River in the Kakamas area and appear to be related to Korana herders (Morris 1995).

It is pointed out that while Bushmanland sites in the surrounding area appear to be ephemeral occupations by small hunter-gatherer groups, substantial herder encampments found along the Orange River itself indicate that the banks and floodplains of the river were more intensely exploited (Morris & Beaumont 1991; Beaumont 1995).

Hinterland sites are mainly restricted rock shelters near mountainous terrain sand dune deposits, or around seasonal pans and springs (Beaumont 1995). Herder sites with ample pottery have been recorded near Aggeneys and, east of Pofadder, at Schuitdrift South (Morris 1999) and historical records show that herder groups settled at the stronger springs such as Pella (Thompson 1827).

Pella originated as Roman Catholic mission station, about 28 km northwest of Pofadder. It was established as a station of the London Missionary Society about 1806, was taken over by the Rhenish Missionary Society until 1869, and then by the Roman Catholics in 1874.

The town of Pofadder developed from a station of the Inland Mission founded in 1875, and named after Klaas Pofadder, a Korana chief. The town was laid out in 1917 and a village management board was instituted in 1937. Originally named Theronsville, the name Pofadder was restored in 1936.

Grinding grooves have been found on rock outcrops in the Gamsberg area (Morris 2011) and rock paintings, grinding surfaces and cupules sites are known from the Black Mountain Mining property at Aggeneys and at the foot of the mountain on Zuurwater 62 (Morris 2013a). No Iron Age sites are expected to be found in this area as it falls outside the southwestern periphery of distribution of Iron Age settlement in the region (Humphreys 1976).

Regional socio-economic environment

(b) Description of the current land uses.

The land use for the property in question is zoned and applied for mining. The land use in the application and surrounding area is grazing (sheep, cattle and goats). There is evidence of historic bulk sampling and prospecting activities on some of the neighbouring farms.

(c) Description of specific environmental features and infrastructure on the site.

The key environmental features of the site are the dry rivulet that the access road will transect and the koppie itself. Significant infrastructure includes the existing haul road, single track, water pipeline and powerline.

Figure 30 : View from the decline location looking towards existing haul road and environmetnal features

Figure 31: Site location indicating pipeline, powerline and dry rivulet

(d) Environmental and current land use map

Show all environmental and current land use features

Please refer to the sensitive habitats map for the site; the Vegetation Types map and the site map (Topo cadastral map) indicating services infrastructure indicating the environmental and land use features associated with the proposed project.

iv) 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 reversed

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

This section identifies and evaluates the actual and potential environmental consequences associated with the proposed prospecting activity. The potential for mitigation of negative impacts and enhancement of positive impacts (DEAT, 2003) to enable sustainable development principles are adhered to.

Table 19: Summary of impacts according to aspect as applicable to the project lifecycle

Summary of Impacts Applicable for Assessment	
The following aspects were identified as potentially significant	
Resource Use	- Topsoil - soil disturbance and compaction for road construction. - Topsoil stockpiling resulting in soil erosion - Potential destruction of heritage resources (if applicable) - Surface water - where affected as dirty water runoff, sedimentation of dry watercourse
Waste Management	Temporary waste and ore stockpiles - potential surface water and soil pollution resulting from improper waste storage and management
Biodiversity Disturbance	- Site clearance for possible new access roads to the drill sites, drill site clearance for drilling during the invasive prospecting phases of the programmer. - Destruction and/or disturbance of on-site fauna, flora and sensitive areas - Blasting activities resulting in fauna disturbance - Activities within the watercourse could result in disturbance to the natural geomorphology and safety hazards during rainy periods
Air Emission	Dust emission resulting from site clearing, soil stripping and construction activities such as blasting (including dust generated by vehicle movement during operation)
Water Pollution	Temporary waste and ore stockpiles as a main source of groundwater pollution. Surface water - storm water run-off from exposed areas and development on decline
Noise / Vibration	Noise as a result of construction (including blasting), operation and vehicle movement resulting in disturbance of fauna

Table 20: Summary of activities according to aspect as applicable to the project lifecycle

The following activities according to the project cycle is applicable to this application	
Clearing Indigenous Vegetation	Indigenous vegetation will be cleared for road construction, material lay-down areas, temporary stockpile areas
Clearing Soils	Topsoil will be cleared and stock piled
Construction of Roads	Haul road: 8 meter wide, 270 m long
Construction: earth works	Construction of portal (32000m2) for decline and associated infrastructure
Blasting	Cut and blast of decline construction
Construction: earth works	Cut and blast of decline construction
Generation and accumulation of mineral waste	Temporary waste and ore stockpiles

Generation of topsoil stockpiles	Topsoil stockpiles
Resource Use: water	Source Tanks: 10 000 Supply line
Maintenance	Maintenance of infrastructure and storm water system
Rehabilitation	Backfill - Rehabilitation of overburden material: 200 000m2 of overburden material
Generation of Dust	The main source of air pollution in the area is dust generated on access roads.
Disturbance: Noise	Blasting during construction

v) Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks

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

Standard evaluation methods are applied as defined below.

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environmental system that can be attributed to human activities related to alternatives under study for meeting a project need. Assessment of impacts will be based on DEAT's (2014) Guideline Document: EIA Regulations. The various environmental impacts and benefits of this project are discussed in terms of impact status, probability, duration, scale/extent and magnitude/severity.

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the potential impacts will be determined through a synthesis of the criteria below:

- **Impact Status**

The nature or status of the impact is determined by the conditions of the environment prior to construction and operation. A discussion on the nature of the impact will include a description of the cause of the effect, the aspect that will be affected and how it will be affected. The nature of the impact can be described as negative or positive.

Table 21: Impact Nature Rating

RATING	DESCRIPTION	RATING
Positive	A benefit to the receiving environment	(+ve)
Negative	A cost to the receiving environment	(-ve)

Probability This describes the likelihood of the impact actually occurring.	
Improbable:	The possibility of the impact occurring is very low, due to the circumstances, design or experience.
Probable:	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly Probable:	It is most likely that the impact will occur at some stage of the development.
Definite:	The impact will take place regardless of any prevention plans, and there can only be relied on mediatory actions or contingency plans to contain the effect.

Duration:	**The lifetime of the impact.**
Short term:	The impact will either disappear with mitigation or will be mitigated through natural processes in a time span shorter than any of the phases.
Medium term:	The impact will last up to the end of the phases, where after it will be negated.
Long term:	The impact will last for the entire operational phase of the project but will be mitigated by direct human action or by natural processes thereafter.
Permanent:	Impact that will be non-transitory. Mitigation either by man or natural processes will not occur in such a way or in such a time span that the impact can be considered transient.

Scale:	**The physical and spatial size of the impact**
Site:	The impacted area extends only as far as the activity, e.g. footprint
Local:	The impact could affect the whole, or a measurable portion of the above mentioned properties and adjacent properties.
Regional:	The impact could affect the area including the neighbouring residential areas.

Magnitude/ Severity:	**Does the impact destroy the environment, or alter its function.**
Low:	The impact alters the affected environment in such a way that natural processes are not affected.
Medium:	The affected environment is altered, but functions and processes continue in a modified way.
High:	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

Significance This is an indication of the **importance of the impact** in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.	
Negligible:	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.
Low:	The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.
Moderate:	The impact is of importance to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.
High:	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The ratings of the identified impacts were undertaken in a quantitative manner as provided from section (vi) above. A risk matrix will be used to determine the significance of the impacts. The magnitude of the impact, the extent of the impact, the reversibility of the impact, the duration of the impact and the probability of the impact occurring were taken into consideration. The assessment has been conducted without implementing any mitigation or management measures and then with the implementation of management and mitigation measures. During the process a score was determined to divide the significance of the impacts into negligible, low, moderate and high.

The following scale is used to determine the significance score of the impact.

Table 22: Impact Significance Rating

Aspect	Description	Weight	Significance Rating	Weight	Score Color
Duration	Short term	1	(Duration, Scale, Magnitude) x Probability		
	Medium term	3			
	Long term	4			
	Permanent	5	Negligible	<20	
Scale/Extent	Site	1			
	Local	2			
	Regional	3	Low	<40	
Magnitude/Severity	Low	2			
	Medium	6			
	High	8	Moderate	<60	
Probability	Improbable	1			
	Probable	2			
	Highly probable	4	High	>60	
	Definite	5			

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

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

Potential positive and negative impacts of the proposed activity include the following:

Potential impact on heritage resources

A Heritage Impact Assessment of the area has been conducted to identify any cultural, heritage and/or archaeological and palaeontological features which may be impacted on. The field assessment provided no above-ground evidence of prehistoric structures, buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the proposed development footprint. It is also considered unlikely that significant artefact occurrences will be found below the surface within the boundaries of the proposed development footprint. No further palaeontological or archaeological mitigation is required, as long as all the planned activities are restricted to within the boundaries of proposed development footprint.

Impacts on communities, individuals or land uses in close proximity

The following impacts are regarded as community impacts:

- Potential water and soil pollution resulting from hydrocarbon spills and soil erosion;
- Potential water resource impacts resulting from groundwater extraction for safe operating of activities if this should become applicable;
- Noise due to traffic activities;
- Poor access control resulting in impacts on wildlife movement, breeding and grazing practices;

- Influx of persons (job seekers) to site as a result of increased activity and the possible resultant increase in opportunistic crime; and

The above community concerns are addressed where the project will be developed on mine property, in an area zoned for mining approximately 2.5 kilometres from the nearest neighbour and 7.1km from residential areas (mining town Aggeneys).

The development of the project will be undertaken by existing staff, contractors, the BMM Mining crew and specialists. It is not anticipated that employment opportunities for local and/or regional communities will result from the project activities.

Destruction and/or disturbance of on-site fauna, flora and sensitive areas

The top five impacts that the project team should manage include ground water contamination, storm water management, rehabilitation (positive impact), vegetation loss and sensitive habitat destruction.

Water quality and availability

Possible pollution sources include stockpiled soil and all areas cleared of vegetation. The eroded soil particles may be carried by storm water to watercourses which will result in an increase in the Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) of the watercourses. The storage of hazardous goods, temporary ablution facilities and discharge of drill fluids may also lead to surface- and groundwater pollution if not managed properly.

Groundwater Impacts

The mining can have a potential impact on both groundwater quality and quantity (lower of groundwater level). Post closure scenarios can only be simulated once the LOM schedule and surface infrastructure has been finalized. Therefore contaminant transport simulations was not incorporated in the model, as potential contaminants are likely to flow towards the mining area during the operational phase and recovery of water levels post closure.

- **Groundwater levels**
  The past mining at Swartberg did have an impact on the groundwater levels around the mine. No private groundwater users are thus likely to be impacted. This should however be verified by a comprehensive hydro census.
  The drawdown cone is likely to develop further as the Swartberg mine is mined at deeper levels. It is therefore important that the hydro census is conducted prior to mining the deeper sections in order to obtain baseline water levels. This data is also important for future model calibration.
- **Groundwater quality**
  The groundwater quality around the Swartberg Mine has been impacted by mining related contaminants. Furthermore geochemical characterization of the Swartberg material indicates the potential for acid rock drainage to occur. Contaminant plumes are unlikely to develop extensively during the operational phase of mining due to the groundwater flow gradient towards the mine. Post closure when dewatering has ceased some contaminant plume movement may occur, provided the groundwater levels recovery to pre mining levels. The recovery of groundwater levels post closure should further be investigated together the potential for contaminant plume migration.

Waste stockpiles

The samples tested for ABA analysis (acid base account) indicate a generally low risk of ARD due to low sulphur content. This is supported by the alkaline paste pH measured in these samples.

The paste pH of all samples was reported to be >8.8, indicating that weathering products on the surface of the rocks will tend to produce an alkaline, rather than an acidic, pH in leachate. This suggests a low potential for

ARD. The total sulphur content of the samples is also low, resulting in a low AP. Although the NP for the samples is low, it exceeds the AP, which means that the rocks contain sufficient neutralising potential to neutralise any acid produced by oxidation of sulphide minerals. The NNP values are within a range which could be classified as indeterminate, however this is because of the low total NP values, and in the context of the paste pH and total sulphur concentrations, and the low risk NPR values, the NNP values are not believed to be of concern for ARD generation.

- **Influx/presence of persons resulting in increased crime rates**

  The potential impacts of an increase in crime associated with an influx of unemployed persons travelling to mine sites seeking employment may occur, but is unlikely given the extend of the existing operation and the small scale of this development.

- **Visual impact**

  The decline development activities may result in localised visual impacts due to the general characteristics of the koppie and surrounding area that can be regarded as otherwise natural.

- **Positive impacts**
  - While no significant short term positive impacts are associated with the project activities, a positive socio-economic benefit is realised where the mine continue to operate profitably and where life of mine is expanded.
  - Rehabilitation of impacted areas.

vii) The possible mitigation measures that could be applied and the level of risk

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

This section provides a summary of the key management measures associated with the impacts identified in the previous section. The detailed rating and management plan is presented below.

- **Measures to manage the potential impact on heritage resources**

  The field assessment provided no above-ground evidence of prehistoric structures, buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the proposed development footprint. It is also considered unlikely that significant artefact occurrences will be found below the surface within the boundaries of the proposed development footprint. No further palaeontological or archaeological mitigation is required, as long as all the planned activities are restricted to within the boundaries of proposed development footprint.

  Should any unknown heritage sites be identified during the project, all activities will cease immediately and the HIA Specialist will be contacted. After assessment, and if appropriate, a permit will be obtained from SAHRA to remove such remains/artefacts. Care will be taken to avoid all visible structures, monuments and graveyards which may occur on site. Prospecting activities will be moved to avoid them.

- **Measures to manage the potential impact on water quality and availability**
  - The volume of water currently being abstracted from the mine should be measured daily. Water circulation and leakage should also be accounted for.

- The mine water level should also be measured daily.
- Some of the exploration borehole should be equipped as piezometers to assess the extent of dewatering. Should this not be possible then additional monitoring boreholes should be drilled. Aquifer tests should conduction the monitoring boreholes should they be drilled. It is envisaged that this will be conducted as part of the Swartberg Mine Feasibility Study.
- Visual inspection should be conducted underground to identify the zones of seepage and related back to the geology.
- As part of the monitoring program, the area should be visually assessed for any seepage emanating from the shafts or areas in proximity to the shafts.
- A hydro census should be conducted in at least a 7 kilometre radius around the Swartberg Mine. This data should also be used to update the groundwater model.
- The boreholes in the farm Koeris 54 should be closely monitored; additionally their depth and associated aquifer should also be identified.
- Groundwater levels and quality should be monitored to establish groundwater level and quality trends. The monitoring information must be used to update, verify and recalibrate the predictive tools used during the study to increase the confidence of the predictive scenarios and management plans;
- A monitoring protocol and action plan should be drafted. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required.
- The monitoring results must be interpreted annually by a qualified hydrogeologist and network audited annually as well to ensure compliance with regulations
- The numerical model should be updated annually by using the measured water ingress and water levels to re-calibrate and refine the impact predictive scenario;
- During the operational phase the mine water must be used or pumped to dirty water dams or pollution control facilities in order to avoid deterioration of the mine water;
- It is recommended that the geochemical assessment is updated during the life of the mine in order to construct an effective closure plan;
- If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply; and
- Audit the monitoring network annually.

Measures to manage potential destruction and/or disturbance of on-site fauna, flora and sensitive areas

- All indigenous species is retained as far as possible and where alien species are encountered they are removed.
- The selection of laydown areas will consider already disturbed areas first.
- Any nationally protected trees within close proximity of the development footprint to be identified as no-go areas.
- Given the hyper-arid nature of the area active re-vegetation of disturbed areas is not recommended on account of the very low success that is likely to result. It is rather recommended that adequate and appropriate surface preparation which will encourage natural regeneration of the vegetation and ensure long-term vegetation recovery is performed.
- Along areas with deep sandy soils the topsoil should be put aside and replaced after disturbance.
- All construction staff should undergo an environmental induction from a suitably qualified person regarding the importance of footprint management.
- General waste accumulating on site should be sorted, stored and deposed of at a registered waste facility

- Sanitary waste must be contained in mobile toilets and removed from site by a competent contractor.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. The material and its waste must be placed on a PVC liner, in a bunded area with a lid to contain the material.
- Mineral waste in the form of overburden material, residue from blasting and drill sludge should be contained and removed from site to allow for site recovery.
- Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- Any rubble, waste materials and litter removed from the site.
- Any fauna directly threatened by the construction activities should be removed to a safe location by the responsible person from the Environmental team.
- The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander away from the construction area into the natural veldt.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises, as well as to minimize dust generation.
- All vehicles and machines to remain on demarcated roads and access routes.
- Avoidance and reduced activity (in terms of activities, extent and duration) should be applied to highly sensitive ecological areas as mapped on the sensitivity mapping.
- Habitat fragmentation (by cross cutting any one habitat type) should be avoided as far as possible.
- No fires should be allowed on-site.
- No fuelwood collection should be allowed on-site.
- In order to minimize the disturbed area and disturbance impact the project should be completed as soon as possible and return to a state of recovery before the next rain season. It should be endeavoured that the construction site and loose material will not be exposed to rain resulting in excessive erosion, siltation and general disturbance down slope.

viii) Motivation where no alternative sites were considered

Alternatives for the entire infrastructure are considered in the application section above.

ix) Statement motivating the alternative development location within the overall site

Provide a statement motivating the final site layout that is proposed

Project Location alternatives

Three alternative locations were considered. The motivations for the selected site, besides the geological drivers that guide the location where ore should be accessed include the availability of infrastructure in terms of access roads, power and water pipeline. The environmental factors include a reduced footprint because the site can use existing infrastructure.

Alternative 01 would result in the potential development of a third decline as the location is too close to the ore body with dry riverbed that would be directly impacted. Alternative 02 is considered too far from the ore body that would result in extensive overburden material removal and longer underground (more unsafe) infrastructure. This alternative was also found geotechnical unstable to the point where no safe decline development could be secured.

Bridge construction alternatives

Three alternative bridge designs were considered to evaluate the risk to the washes functionality.

The three designs considered are the drift, low water bridge and bridge options. The competency of the crossing is determined by the large vehicles that must cross the washes and proper design and construction is required while adequate account of the impacts on the washes and required storm water management is taken into consideration.

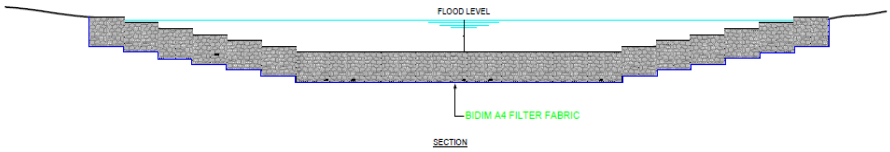


Figure 32: Drift crossing design for access road over washes

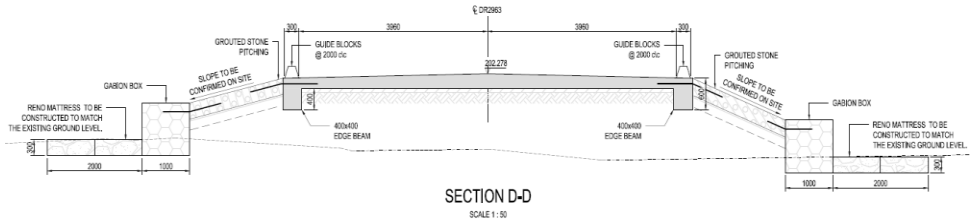


Figure 33: Bridge crossing design for access road over washes

The final selection does not divert the washes where "diverting" means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently.

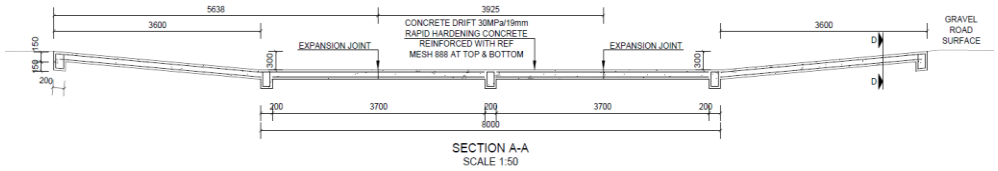


Figure 34: Low water bridge crossing for access road over washes

After numerous reiterations and review of the risk assessment the most environmentally friendly and engineering stable design combination is the low water bridge crossing for the access road over the washes.

The final selection that directly impact on the washes does not divert the flow of the washes where "diverting" means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently.

The impacts on the washes is "flow- altering" in the sense that when surface water reach the crossing, the water flow is anticipated to have a slight reduction in speed at the crossing. The impacts on the washes can also be considered marginally impeding, where the low water bridge surface area could hinder or obstruct the instream flow of water temporarily, but no damming of water as defined by the regulations will take place.

In terms of the requirements of the new regulations, the risk assessment is conducted by a competent team according to the DWS format.

i) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity

Including (i) a description of all environmental issues and risks that where identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures

In order to identify the potential impacts associated with the proposed project activities the following steps were undertaken:

For the environmental issues and risks identified, specialists conducted a high level desktop assessment to determine the environmental setting in which the Swartberg decline development project is located. The various resources used to determine the significance and sensitivity of the environmental considerations include:

- Geographic Information System maps
- South African National Biodiversity Institute (SANBI)
- Biodiversity Geographic Database LUDS system;
- Department of Water Affairs information documents; standards and guidelines.

The site visits were undertaken on 11-12 November 2016 to ensure that the information gathered as part of the desktop investigation reflects the current status of the land.

For ecological impact assessments, site investigation and sensitivity classification was done according to the regulations and guidelines set out for specialists.

For Heritage, Archaeological and Palaeontological impacts assessments, the specialist conducted an assessment to determine the environmental setting in which the Swartberg decline development project is located. The various resources used to determine the significance and sensitivity of the environmental considerations include the site significance classification standards prescribed by SAHRA (2005) were used to indicate overall significance and mitigation procedures where relevant. Please refer to Appendix D4, the Specialist Phase 1 Heritage Impact Assessment Report.

For geohydrological and waste investigations detailed site evaluation, testing and modelling is presented in line with both standard and best practice requirements for the specific discipline.

The baseline studies and impact findings, with strong focus on the views of the stakeholders were incorporated into the assessment of impacts and ranking of these.

The ratings of the identified impacts were undertaken in a quantitative manner as provided from section (vi) above. A risk matrix will be used to determine the significance of the impacts. The magnitude of the impact, the extent of the impact, the reversibility of the impact, the duration of the impact and the probability of the impact occurring were taken into consideration. The assessment has been conducted without implementing any mitigation or management measures and then with the implementation of management and mitigation measures. During the process a score was determined to divide the significance of the impacts into negligible, low, moderate and high.

The identification of management measures and impact management objectives were developed to ensure that adverse socio-economic impacts and minimised and socio-economic benefits are maximised. Measures were further defined to avoid, prevent, limit or manage any impacts. Closure objectives were further measured against Section 28 of the National Environmental Management Act (Act 107 of 1998) and Regulation 52(2) (f) of the MPRDA regulations.

j) Assessment of each identified potentially significant impact and risk

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

This section identifies and evaluates the actual and potential environmental consequences associated with the proposed drilling activity. The potential for mitigation of negative impacts and enhancement of positive impacts (DEAT, 2003) to enable sustainable development principles are adhered to.

Table 23: Impact Assessment of activities BEFORE mitigation

Element	Project Phase	Activity	Impact Description	Impact Type Degree of loss	Duration	Scale	Severity	Initial Probability	Initial Score Before mitigation
Heritage	Site Clearance	Clearing Soils	Loss of heritage artefacts or archaeological resources	Direct Negative Low	Permanent	Local	Low	Probable	18
Heritage	Site Clearance	Clearing Soils	Loss of paleontological resources	Direct Negative Moderate	Permanent	Local	Low	Probable	18
Water - Surface	Site Clearance	Clearing Indigenous Vegetation	Changes in surface hydrological patterns and processes	Indirect Negative Moderate	Short term	Site	Medium	Highly Probable	32
Water - Groundwater	Site Clearance	Clearing Indigenous Vegetation	Changes in ground water levels	Indirect Negative Low	Long term	Site	Low	Definite	35
Water - Groundwater	Site Clearance	Clearing Indigenous Vegetation	Changes in ground water quality	Indirect Negative Low	Long term	Site	Low	Definite	35
Water - Surface	Site Clearance	Clearing Soils	Changes in surface hydrological patterns and processes	Indirect Negative Moderate	Short term	Site	Medium	Highly Probable	32

Ecology	Operational	Maintenance	Loss of sensitive habitats	Direct Negative Moderate	Medium term	Site	Medium	Highly Probable	40
Soil	Operational	Generation and accumulation of mineral waste	Changes in soil functionality: compaction	Indirect Negative Low	Long term	Site	Low	Definite	35
Soil	Operational	Maintenance	Changes in soil fertility	Indirect Negative High	Long term	Site	Medium	Highly Probable	44
Flora	Operational	Maintenance	Changes in vegetation composition: Alien species encroachment	Direct Negative Moderate	Medium term	Site	Low	Highly Probable	24
Landscape	Operational	Generation and accumulation of mineral waste	Changes to landscape: transformation	Direct Negative Moderate	Long term	Site	Medium	Definite	55
Water - Surface	Operational	Generation and accumulation of mineral waste	Changes in surface hydrological patterns and processes	Indirect Negative High	Long term	Site	Medium	Definite	55
Fauna	Operational	Disturbance: Traffic	Persecution of fauna - road kills	Direct Negative Low	Short term	Site	Low	Highly Probable	16
Fauna	Operational	Disturbance: Noise	Disturbance of fauna engagement patterns	Indirect Negative Low	Short term	Site	Low	Probable	8
Fauna	Operational	Generation of Dust	Changes in air quality - dust	Indirect Negative Low	Short term	Site	Low	Probable	8
Fauna	Operational	Generation and accumulation of general waste	Contamination of Water - loss of water function	Direct Negative Low	Short term	Site	Low	Highly Probable	16
Fauna	Operational	Generation and accumulation of hazardous waste	Contamination of Soil - loss of soil function	Indirect Negative Low	Short term	Site	Low	Highly Probable	16
Fauna	Operational	Human interaction with environment: trespassing to undisturbed areas	Persecution of fauna - illegal hunting	Direct Negative Low	Short term	Site	Low	Highly Probable	16
Ecology	Construction	Clearing Indigenous Vegetation	Loss of sensitive habitats	Direct Negative Moderate	Long term	Site	Medium	Definite	55
Water - Groundwater	Construction	Clearing Soils	Changes in ground water quality	Indirect Negative Low	Long term	Site	Low	Definite	35

Water - Groundwater	Construction	Clearing Soils	Changes in ground water levels	Indirect Negative Low	Long term	Site	Low	Definite	35
Ecology	Construction	Clearing Indigenous Vegetation	Ecological system impacts: Ecological process & function deterioration/ breakdown	Indirect Negative Low	Medium term	Site	Medium	Highly Probable	40
Ecology	Construction	Clearing Indigenous Vegetation	Ecological system impacts: habitat fragmentation	Direct Negative Moderate	Medium term	Site	Medium	Highly Probable	40
Fauna	Construction	Construction: earth works	Loss of habitats	Direct Negative Moderate	Short term	Site	Low	Definite	20
Fauna	Construction	Construction of Roads	Disturbance: noise	Indirect Negative Low	Short term	Site	Low	Definite	20
Fauna	Construction	Construction: earth works	Disturbance of fauna engagement patterns	Indirect Negative Low	Short term	Site	Low	Definite	20
Fauna	Construction	Human interaction with environment: trespassing to undisturbed areas	Persecution of fauna - illegal hunting	Direct Negative Low	Short term	Site	Low	Highly Probable	16
Fauna	Construction	Human interaction with environment: vehicle accidents	Persecution of fauna - road kills	Direct Negative Low	Short term	Site	Low	Definite	20
Flora	Construction	Clearing Indigenous Vegetation	Loss of vegetation cover	Direct Negative Moderate	Medium term	Site	Medium	Highly Probable	40
Flora	Construction	Clearing Soils	Changes in soil functionality: loss of topsoil	Indirect Positive High	Medium term	Site	Medium	Highly Probable	40
Heritage	Construction	Construction of Roads	Loss of heritage artefacts or archaeological resources	Direct Negative Low	Permanent	Local	Low	Probable	18
Heritage	Construction	Construction of Roads	Loss of paleontological resources	Direct Negative Low	Permanent	Local	Low	Probable	18
Heritage	Construction	Construction: earth works	Loss of heritage artefacts or archaeological resources	Direct Negative Low	Permanent	Local	Low	Probable	18

Heritage	Construction	Construction: earth works	Loss of paleontological resources	Direct Negative Low	Permanent	Local	Low	Probable	18
Soil	Construction	Generation and accumulation of mineral waste	Changes in surface water quality runoff	Indirect Negative High	Long term	Site	Low	Definite	35
Dust	Construction	Generation and accumulation of mineral waste	Changes in air quality - dust	Indirect Negative Low	Short term	Site	Low	Probable	8
Water - Surface	Construction	Construction of Roads	Changes in surface hydrological patterns and processes	Indirect Negative High	Long term	Site	Low	Definite	35
Water - Surface	Construction	Construction of Roads	Changes in soil functionality: compaction	Indirect Negative Low	Long term	Site	Low	Definite	35
Socio-Economic	Operational	Construction: earth works	Socio-economic: employment opportunities	Direct Positive Low	Medium term	Local	Low	Probable	14
Socio-Economic	Operational	Disturbance: Traffic	Social: Health and Safety of individuals on site	Direct Negative Low	Short term	Site	Low	Probable	8
Socio-Economic	Operational	Generation of dust	Social: Health and Safety of individuals on site	Indirect Negative Low	Short term	Site	Medium	Probable	16
Socio-Economic	Rehabilitation	Rehabilitation	Costs: shift in rehabilitation costs	Direct Negative High	Medium term	Site	High	Highly probable	0
Socio-Economic	Rehabilitation	Rehabilitation	Costs: change in land use value	Direct Positive High	Long term	Site	High	Probable	26
Socio-Economic	Maintenance	Maintenance	Costs: shift in management costs	Direct Negative Low	Short term	Site	Medium	Probable	16
Socio-Economic	Monitoring	Maintenance	Costs: shift in management costs	Direct Negative Low	Short term	Site	Low	Probable	8
Socio-Economic	Monitoring	Monitoring	Costs: shift in management costs	Direct Negative Moderate	Short term	Site	Medium	Probable	16
Socio-Economic	Closure	Monitoring	Costs: shift in management costs	Direct Negative Low	Short term	Site	Low	Probable	8

Social	Operational	Construction: earth works	Access Control: Job seekers, unauthorized persons and children	Indirect Negative High	Short term	Site	Medium	Definite	40
Social	Operational	Construction of open cast pit	Social: Health and Safety of individuals on site	Direct Negative Low	Medium term	Site	High	Definite	60
Social	Rehabilitation	Generation of dust	Social: Health and Safety of individuals on site	Indirect Negative Low	Short term	Site	Medium	Probable	16
Social	Rehabilitation	Rehabilitation	Change in management decisions	Direct Positive Moderate	Long term	Site	Medium	Probable	22
Social	Rehabilitation	Rehabilitation	Social: Health and Safety of individuals on site	Direct Positive Low	Short term	Site	Medium	Probable	16
Social	Maintenance	Maintenance	Change in management decisions	Direct Positive Moderate	Long term	Site	Medium	Probable	22
Social	Monitoring	Monitoring	Access Control: Job seekers, unauthorized persons and children	Indirect Positive High	Short term	Site	Medium	Probable	16
Social	Closure	Monitoring	Access Control: Job seekers, unauthorized persons and children	Indirect Positive High	Short term	Site	Low	Probable	8
Social	Site Clearance	Clearing Indigenous Vegetation	Changes in sense of place	Indirect Negative Moderate	Medium term	Site	Low	Definite	30
Social	Site Clearance	Clearing Soils	Changes to landscape: transformation	Direct Negative Moderate	Long term	Site	Medium	Definite	55
Social	Operational	Construction: earth works	Changes in sense of place	Indirect Negative Moderate	Medium term	Site	Medium	Definite	50
Social	Rehabilitation	Rehabilitation	Changes in sense of place	Indirect Positive Moderate	Long term	Site	Medium	Improbable	11
Social	Closure	Monitoring	Changes in sense of place	Indirect Positive Low	Short term	Site	Low	Probable	8

Social	Operational	Disturbance: Traffic	Impact on traffic and transport networks	Direct Negative Low	Short term	Local	Medium	Highly Probable	0

k) Summary of specialist reports

The specialist studies and recommendations incorporated in the report are indicated in the table below.

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 24: Summary of Specialist Reports

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
Ecological Study	The impact assessments indicate only flora and ecologically sensitive areas as having moderate significance during construction phase with the greatest significance rating during operational phase as Low impact significance. The mitigations are stipulated for each area assessed and if applied, should result in little cumulative and residual impacts after the project has been completed. Provided that the mitigation measures as suggested can be implemented, the overall impact of the development would be of a low significance if all mitigation measures are applied.	X	Baseline Environment: Type of environment affected by the proposed activity Description of specific environmental features and infrastructure on the site 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 The possible mitigation measures that could be applied and the level of risk Assessment of each identified potentially significant impact and risk Summary of the key findings of the environmental impact assessment;
Geohydrological Study	• The volume of water currently being abstracted from the mine should be measured daily • The mine water level should also be measured daily • Some of the exploration borehole should be equipped as piezometers to assess the extent of dewatering. Should this not be possible then additional monitoring boreholes should be drilled. • A hydro census should be conducted in at least a 7 kilometre radius around the Swartberg Mine. This data should also be used to update the groundwater model. • Groundwater levels and quality should be monitored	X	Baseline Environment: Type of environment affected by the proposed activity Description of specific environmental features and infrastructure on the site 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 The possible mitigation measures that could be applied and the level of risk Assessment of each identified potentially significant impact and risk

	• A monitoring protocol and action plan should be drafted • The monitoring results must be interpreted annually by a qualified hydrogeologist and network audited annually • It is recommended that the geochemical assessment is updated during the life of the mine in order to construct an effective closure plan • If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply; and • Audit the monitoring network annually.		Summary of the key findings of the environmental impact assessment;
Waste Study	The samples tested for ABA analysis indicate a generally low risk of ARD due to low sulphur content. The rock waste samples retrieved from the site were classified in accordance with current waste management legislation (i.e. NEMWA, 2008 and NEMWA Regulations, 2013). Based on the waste classification results, the rock waste samples are classified as Type 3 waste and can be disposed of at a Class C landfill. In the absence of a suitable designed Class C landfill, the waste can be disposed of at a GLB+ landfill. The regulations provide no limit to the volume of waste that can be accepted by the landfill.	X	Baseline Environment: Type of environment affected by the proposed activity Description of specific environmental features and infrastructure on the site 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 The possible mitigation measures that could be applied and the level of risk Assessment of each identified potentially significant impact and risk Summary of the key findings of the environmental impact assessment;
Heritage Study	The field assessment provided no above-ground evidence of prehistoric structures, buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the proposed development footprint. It is also considered unlikely that significant artefact occurrences will be found below the surface within the boundaries of the proposed development footprint. No further palaeontological or archaeological mitigation is required, as long as all the planned activities are restricted to within the boundaries of proposed development footprint	X	Baseline Environment: Type of environment affected by the proposed activity Description of specific environmental features and infrastructure on the site 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 The possible mitigation measures that could be applied and the level of risk Assessment of each identified potentially significant impact and risk Summary of the key findings of the environmental impact assessment;

I) Environmental impact statement

(i) Summary of the key findings of the environmental impact assessment;

Table 25: Summary of Impact Assessment WITH mitigation

Element	Project Phase	Activity	Impact Description	Final Probability	Final Score Residual
Heritage	Site Clearance	Clearing Soils	Loss of heritage artefacts or archaeological resources	Improbable	**9**
Heritage	Site Clearance	Clearing Soils	Loss of paleontological resources	Improbable	**9**
Water - Surface	Site Clearance	Clearing Indigenous Vegetation	Changes in surface hydrological patterns and processes	Probable	**16**
Water - Groundwater	Site Clearance	Clearing Indigenous Vegetation	Changes in ground water levels	Probable	**14**
Water - Groundwater	Site Clearance	Clearing Indigenous Vegetation	Changes in ground water quality	Improbable	**7**
Water - Surface	Site Clearance	Clearing Soils	Changes in surface hydrological patterns and processes	Improbable	**8**
Ecology	Operational	Maintenance	Loss of sensitive habitats	Probable	**20**
Soil	Operational	Generation and accumulation of mineral waste	Changes in soil functionality: compaction	Highly Probable	**28**
Soil	Operational	Maintenance	Changes in soil fertility	Improbable	**11**
Flora	Operational	Maintenance	Changes in vegetation composition: Alien species encroachment	Probable	**12**
Landscape	Operational	Generation and accumulation of mineral waste	Changes to landscape: transformation	Highly Probable	**44**
Water - Surface	Operational	Generation and accumulation of mineral waste	Changes in surface hydrological patterns and processes	Highly Probable	**44**
Fauna	Operational	Disturbance: Traffic	Persecution of fauna - road kills	Probable	**8**

Fauna	Operational	Disturbance: Noise	Disturbance of fauna engagement patterns	Probable	**8**
Fauna	Operational	Generation of Dust	Changes in air quality - dust	Probable	**8**
Fauna	Operational	Generation and accumulation of general waste	Contamination of Water - loss of water function	Probable	**8**
Fauna	Operational	Generation and accumulation of hazardous waste	Contamination of Soil - loss of soil function	Probable	**8**
Fauna	Operational	Human interaction with environment: trespassing to undisturbed areas	Persecution of fauna - illegal hunting	Improbable	**4**
Ecology	Construction	Clearing Indigenous Vegetation	Loss of sensitive habitats	Probable	**22**
Water - Groundwater	Construction	Clearing Soils	Changes in ground water quality	Highly Probable	**28**
Water - Groundwater	Construction	Clearing Soils	Changes in ground water levels	Improbable	**7**
Ecology	Construction	Clearing Indigenous Vegetation	Ecological system impacts: Ecological process & function deterioration/ breakdown	Probable	**20**
Ecology	Construction	Clearing Indigenous Vegetation	Ecological system impacts: habitat fragmentation	Probable	**20**
Fauna	Construction	Construction: earth works	Loss of habitats	Highly Probable	**16**
Fauna	Construction	Construction of Roads	Disturbance: noise	Probable	**8**
Fauna	Construction	Construction: earth works	Disturbance of fauna engagement patterns	Highly Probable	**16**
Fauna	Construction	Human interaction with environment: trespassing to undisturbed areas	Persecution of fauna - illegal hunting	Probable	**8**
Fauna	Construction	Human interaction with environment: vehicle accidents	Persecution of fauna - road kills	Definite	**20**
Flora	Construction	Clearing Indigenous Vegetation	Loss of vegetation cover	Probable	**20**
Flora	Construction	Clearing Soils	Changes in soil functionality: loss of topsoil	Probable	**20**
Heritage	Construction	Construction of Roads	Loss of heritage artefacts or archaeological resources	Improbable	**9**
Heritage	Construction	Construction of Roads	Loss of paleontological resources	Improbable	**9**

Heritage	Construction	Construction: earth works	Loss of heritage artefacts or archaeological resources	Improbable	**9**
Heritage	Construction	Construction: earth works	Loss of paleontological resources	Improbable	**9**
Soil	Construction	Generation and accumulation of mineral waste	Changes in surface water quality runoff	Improbable	**7**
Dust	Construction	Generation and accumulation of mineral waste	Changes in air quality - dust	Improbable	**4**
Water - Surface	Construction	Construction of Roads	Changes in surface hydrological patterns and processes	Improbable	**7**
Water - Surface	Construction	Construction of Roads	Changes in soil functionality: compaction	Highly Probable	**28**
Socio-Economic	Operational	Construction: earth works	Socio-economic: employment opportunities	Highly probable	**0**
Socio-Economic	Operational	Disturbance: Traffic	Social: Health and Safety of individuals on site	Improbable	**4**
Socio-Economic	Operational	Generation of dust	Social: Health and Safety of individuals on site	Improbable	**8**
Socio-Economic	Rehabilitation	Rehabilitation	Costs: shift in rehabilitation costs	Probable	**24**
Socio-Economic	Rehabilitation	Rehabilitation	Costs: change in land use value	Highly probable	**0**
Socio-Economic	Maintenance	Maintenance	Costs: shift in management costs	Probable	**16**
Socio-Economic	Monitoring	Maintenance	Costs: shift in management costs	Probable	**8**
Socio-Economic	Monitoring	Monitoring	Costs: shift in management costs	Probable	**16**
Socio-Economic	Closure	Monitoring	Costs: shift in management costs	Probable	**8**
Social	Operational	Construction: earth works	Access Control: Job seekers, unauthorized persons and children	Probable	**16**
Social	Operational	Construction of open cast pit	Social: Health and Safety of individuals on site	Probable	**24**
Social	Rehabilitation	Generation of dust	Social: Health and Safety of individuals on site	Improbable	**8**
Social	Rehabilitation	Rehabilitation	Change in management decisions	Highly probable	**0**
Social	Rehabilitation	Rehabilitation	Social: Health and Safety of individuals on site	Highly probable	**0**

Social	Maintenance	Maintenance	Change in management decisions	Highly probable	**0**
Social	Monitoring	Monitoring	Access Control: Job seekers, unauthorized persons and children	Highly probable	**0**
Social	Closure	Monitoring	Access Control: Job seekers, unauthorized persons and children	Highly probable	**0**
Social	Site Clearance	Clearing Indigenous Vegetation	Changes in sense of place	Highly probable	**0**
Social	Site Clearance	Clearing Soils	Changes to landscape: transformation	Highly probable	**0**
Social	Operational	Construction: earth works	Changes in sense of place	Highly probable	**0**
Social	Rehabilitation	Rehabilitation	Changes in sense of place	Probable	**22**
Social	Closure	Monitoring	Changes in sense of place	Highly probable	**0**
Social	Operational	Disturbance: Traffic	Impact on traffic and transport networks	Probable	**18**

(ii) Final Site Map

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

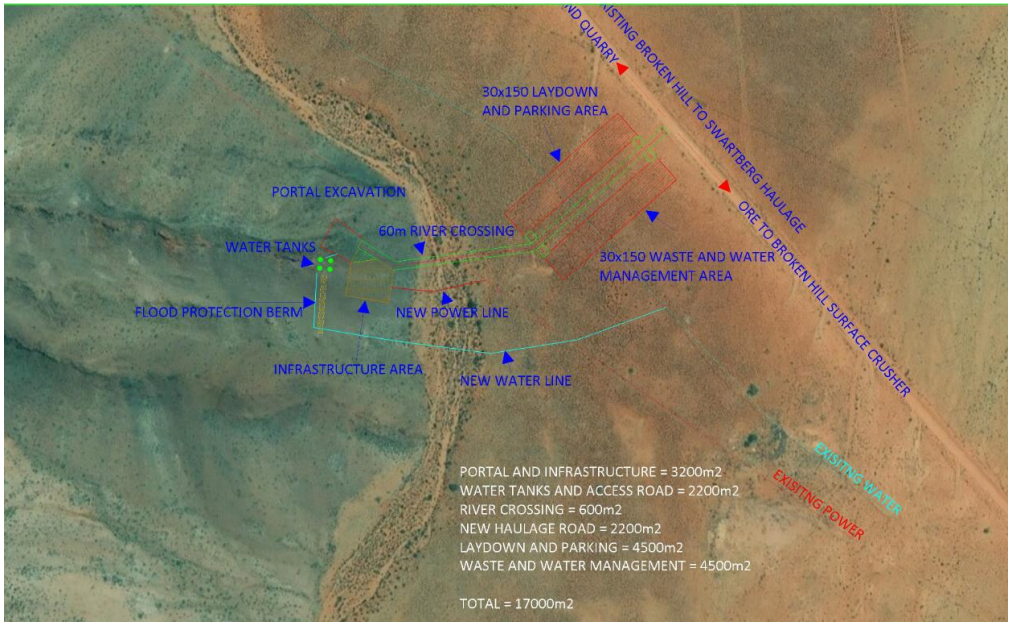


Figure 35: Final design map in geographical context

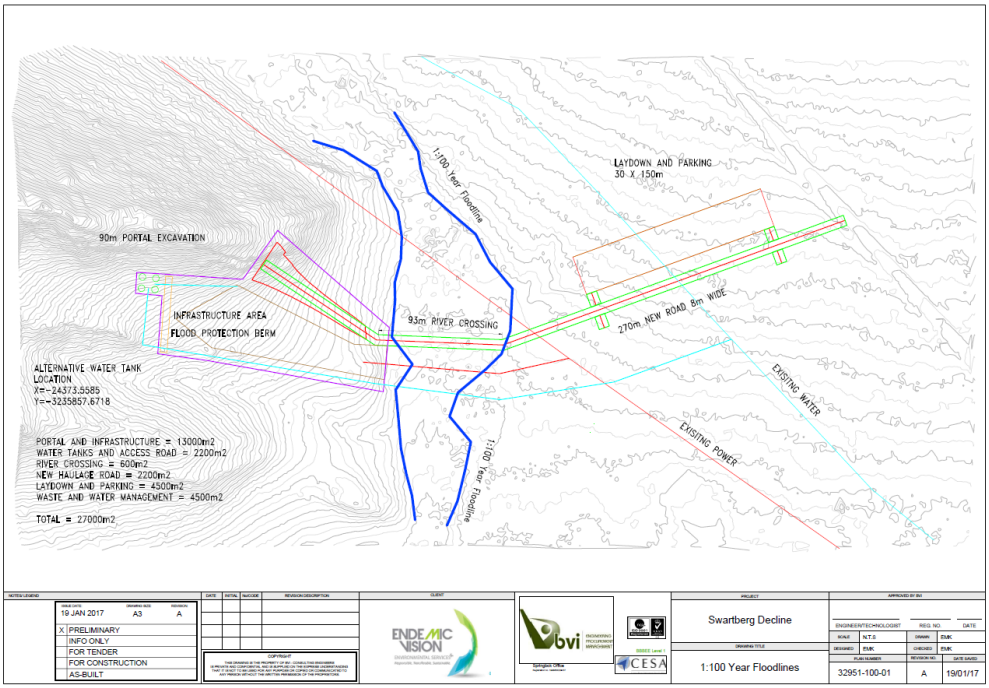


Figure 36: Design map with flood line incorporated

(iii) Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

Not replacing the impacts identified in *Table 23*, the summary of highlighted potential impacts includes:

- Increased ambient noise levels resulting from increased traffic movement activities during all phases.
- Influx of persons (job seekers) to site as a result of increased activity and the possible resultant increase in opportunistic crime.
- Potential storm water impacts, specifically erosion and affecting natural flow regime.
- Potential water and soil pollution impacts resulting from hydrocarbon spills and soil erosion which may impact on environmental resources utilized by landowners and stakeholders.
- Potential water availability impacts resulting from groundwater extraction which may impact on environmental resources utilized by landowners and stakeholders.
- Potential water and soil pollution impacts resulting from hydrocarbon spills and soil erosion may impact on ecosystem functioning.
- Potential visual impacts from other mining areas
- Increased vehicle activity and vegetation clearance within the area resulting in the possible destruction and disturbance of fauna and flora.
- Dust emissions caused by increased vehicle movement on site.
- Potential sensitive habitat loss
- Rehabilitation of impacted areas (positive)
- Loss of vegetation cover
- Rehabilitation of impacted areas

m) 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 authorization

Impact management objectives are developed to ensure that adverse socio-economic impacts and minimised and socio-economic benefits are maximised. Measures are further be defined to avoid, prevent, limit or manage any impacts.

The objectives of the EMPr will be to:

- Provide sufficient information and guidance to plan prospecting activities in a manner that would reduce both social and environmental impacts as far as possible.
- Provide sufficient information to strategically plan the prospecting activities to avoid unnecessary social and environmental impacts.
- Provide a management plan that is effective and practical for implementation.
- Ensure an approach that will provide the necessary confidence in terms of environmental compliance.

Through the implementation of the mitigation and management measures it is expected that:

- Noise impacts can be managed through consultation and restriction of operating hours.
- Concerns regarding access control to farms can be managed through the development of an appropriate access control procedure and the compliance to the procedure.

- Risks associated with crime can be mitigated through the avoidance of recruitment activities on site and also monitoring and reporting.
- The water and soil resource pollution can be effectively managed through containment.
- Water resource availability can be managed through groundwater monitoring strategies.
- Ecological impact can be managed through the implementation of pollution prevention measures, land clearance minimisation, faunal disturbance by restricting working hours and rehabilitation.
- Visual impact can be minimised through the consideration of the material used for temporary infrastructure and drill site infrastructure used.
- Early consultation with the landowners and maintaining an open channel of communication must be ensured.

n) Aspects for inclusion as conditions of Authorisation

Any aspects which must be made conditions of the Environmental Authorisation

The following conditions should be considered for inclusion in the Authorisation:

- The loss of 1ha of indigenous vegetation may be insignificant, but if affecting protected trees a NFA License must be obtained prior to disturbance.
- The developer may also need a Flora Permit from the provincial Department of Environment and Nature Conservation (DENC) for destruction of natural indigenous, protected or specially protected plant species under the Northern Cape Nature Conservation Act, Act 9 of 2009 (NCNCA). The same applies to TOPS of CITES listed plant species under the NEMBA.

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

Which relate to the assessment and mitigation measures proposed?

The following assumptions, uncertainties and gaps are applicable to this project:

- Final comment from SAHRA is not yet available
- Final approval from DWS is not yet available.

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

i) Reasons why the activity should be authorized or not

The proposed decline area is between two existing mines (Swartberg and Deeps) and none of the activities proposed in this project is novel or occur in novel areas. With the implementation of the recommended management measures the potential impacts can be managed.

The option of not authorizing the activities will result in a significant loss to operate viably and source mineral resources already approved for mining.

ii) Conditions that must be included in the authorisation

The following conditions should be considered for inclusion in the Authorisation:

q) The loss of 1ha of indigenous vegetation may be insignificant, but if affecting protected trees a NFA License must be obtained prior to disturbance.

r) The developer may also need a Flora Permit from the provincial Department of Environment and Nature Conservation (DENC) for destruction of natural indigenous, protected or specially protected plant species under the Northern Cape Nature Conservation Act, Act 9 of 2009 (NCNCA). The same applies to TOPS of CITES listed plant species under the NEMBA.

s) Period for which the Environmental Authorisation is required

The amendment should be authorised in terms of the existing mining right life of mine.

t) Undertaking

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

An undertaking by the EAP is provided for in Section 2 of the EMP (Part B) and is applicable to both the Basic Assessment Report and the Environmental Management Programme report.

u) Financial Provision

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

i) Explain how the aforesaid amount was derived.

The following section details the methodologies adopted to calculate the quantities, associated rehabilitation (clean closure) rates and eventually the final (clean) closure cost estimate

Please refer to the Swartberg Financial Provision Cost Report, Appendix H, of this submission that details methodologies and approach.

The summary of costs is a first order reiteration and categorised as a class 0 estimate according to the guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine, DMR (2005).

The financial provision provided at this initial stage must be periodically reviewed and adjusted to conform to the relevant project activities and actual costs to ensure proper rehabilitation is undertaken at all times.

Table 26: Summary of Closure Provision

Amended Quantum Assessment 2017

Total Qua Total Quantum Amendment Estimate:	**R 567,182.94**

FARM:
Black Mountain Swartberg Decline Development Dated: 175-02-2017

Farm: Zuurwater No 62 - Portion 4

Life of Project Footprint	17000	Previous Impacted Footprint	2450
Planned Footprint	14550	Split costs according to rehab schedule	14550

AMENDED COST SUMMARY	
Pollution Mitigation and Remediation	R 46,018.69
Demolition	R 192,129.00
Rehabilitation	R 134,148.75
Monitoring and Maintenance	R 59,358.50
Management and Contingencies	R 135,528.00
TOTAL COSTS	**R 567,182.94**

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

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

The closure and rehabilitation costs of this development will be incorporated into the next annual review of financial quantum provision for Black Mountain Mine and become part of the overall BMM closure plan and BMM financial provisioning.

v) Specific Information required by the competent Authority

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

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

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

We made reference to the Black Mountain Mine Social and Labour Plan.

Therefor no specific report was generated for the purposes of the socio-economic conditions.

The assessment of the anticipated social-economic impacts was done by the EAP and is presented in *Table 23.*

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

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

The field assessment provided no above-ground evidence of prehistoric structures, buildings older than 60 years, or material of cultural significance or in situ archaeological sites within the proposed development footprint. It is also considered unlikely that significant artefact occurrences will be found below the surface within the boundaries of the proposed development footprint.

No further palaeontological or archaeological mitigation is required, as long as all the planned activities are restricted to within the boundaries of proposed development footprint

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

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

Not applicable.

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. Draft environmental management programme

a) Details of the EAP,

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

The requirement for the provision of the details and expertise of the EAP are included in Part A, Section (1) (a).

b) Description of the Aspects of the Activity

Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required.

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in Part A, Section (1) (h).

c) Composite Map

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

Please refer to **Appendix F** for the composite map.

d) Description of Impact management objectives including management statements

i) Determination of closure objectives

Ensure that the closure objectives are informed by the type of environment described.

The Swartberg decline makes out part of the Black Mountain Mining operation and in that instance, will not deviate from the closure objectives already committed by the mine.

Black Mountain Mine has a main integrated closure management plan (2010); a concept closure plan to integrate the Gamsberg project (2013) and a closure quantum external review and amendment (2016).

The aim of the Black Mountain Closure Plan is to ensure that the area transformed by mining, processing and other operational activities is either returned to as natural a state as possible or facilities remaining at the end of the life of BMM are utilised for other economically viable and sustainable activities.

The closure objectives should be achieved in as cost effective a manner as possible, and the closure solution should be sustainable in the long term.

Four Key Objectives are identified through environmental, social and physical assessment and public workshops held from 2008 to 2010.

The Black Mountain Closure Objectives are:

- To secure the effective and sustainable transfer of the municipal services of the town, Aggeneys, and the Pella-drift Water Board to the Khai Ma municipality.

- To ensure that the biodiversity and environment on the site is protected.
- To make sure that the following commitments will be achieved as a minimum:
  - The site will be made safe for both humans and animals,
  - The site will be rehabilitated to be physically, chemically and biologically stable
  - The residual impacts will be managed to acceptable levels and will not deteriorate over time, and
  - Closure will be achieved with minimal socio-economic upheaval.

Cross-cutting to the above, Black Mountain commit to provide sufficient funds at the end of life of mine, to properly implement the closure plan, and also to make provision for possible premature closure, and post closure monitoring requirements.

ii) Volumes and rate of water use required for the operation.

During the operational phase of the prospecting activities an estimate of 1000 to 10 000 ℓ water will be used per day. It is currently not anticipated that water use will exceed the general authorisation volume for the area. The site has a water use license and is authorised to use water beyond the generally authorised amounts.

iii) Has a water use licence been applied for?

A water use license has not been applied for, BMM has an existing water use license for its operation that includes the greater Swartberg.

The application for general authorisation as gazetted in the general authorisation in terms of section 39 of the national water act, 1998 (act no. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i), is applied for in order to allow access to the decline.

The access road from the existing haul road to the decline cross a dry rivulet and water use activities 21 c and i is applicable.

iv) Impacts to be mitigated in their respective phases

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

The impacts and action plans listed below will be implemented during the different phases of the project. Rehabilitation and closure will however be addressed separately and concurrently according to the phases set out below:

The rehabilitation strategies will be three phased to ensure best and most practical results. Rehabilitation will be undertaken:

1. during construction and operational phase,
2. during closure phase and
3. post closure phase.

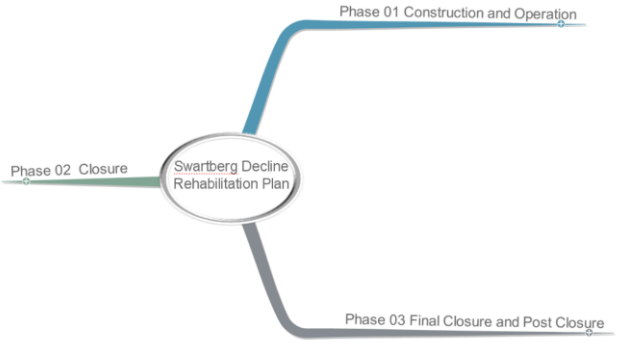


Figure 37 : Phase layout of Swartberg Rehabilitation Plan

Construction and Operational Phase Rehabilitation

The proposed rehabilitation strategy is to conduct rehabilitation concurrently while construction of the decline will take place.

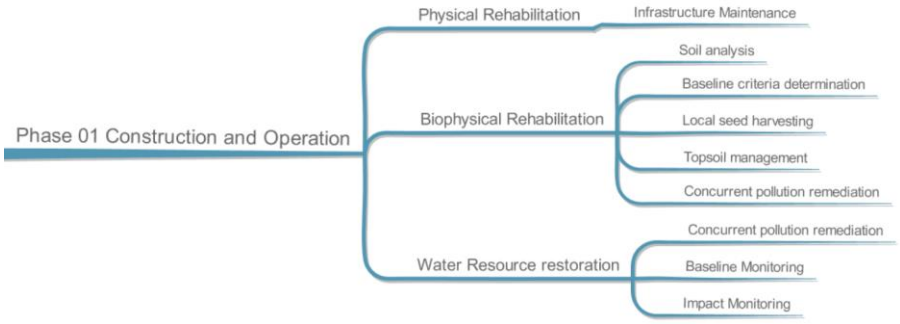


Figure 38: Phase 01 Rehabilitation activities

Closure phase rehabilitation

Decline use and related activities will be temporarily terminated and the associated infrastructure 'moth-balled' pending a final decision as to the future mining potential for this area.

The drainage system constructed to isolate the decline and drain the shaft area has to be evaluated upon closure in terms of metal and salinity composition. The results of this analysis will guide final disposal of the drainage material. Where the material remain inert, as proposed by the waste characterization study for Swartberg (ERM, November 2016), the material can be retained or used for final closure backfilling. Where the material indicate high metal content (specifically risk for Cd, Co, As metals), this material should be removed to a depth of one meter and dumped on the tailings dam. The excavated drainage system should then be filled with a top soil mix consisting of sand dune material and gravel from the plains (50:50 ratio). Biophysical rehabilitation should then commence where soil amelioration and vegetation establishment takes place. Thereafter vegetation, ecological and soil monitoring to indicate degree of restoration and ecological sustainability.

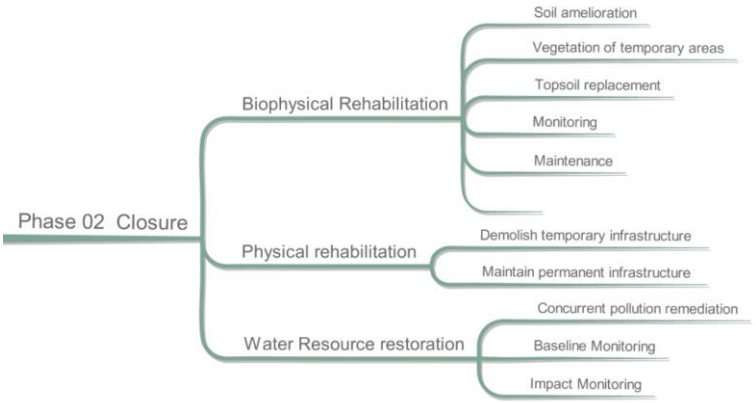


Figure 39:Phase 02 Rehabilitation Activities

Final Closure and Post closure phase rehabilitation

Upon final closure, the mineral resource is deemed exploited and any future use for the area disregarded.

At this stage, final and complete decline closure according to DMR standards are required, specifically:

- The installation of shaft plug ±10 meters from shaft entrance.
- The demolition of shaft entrance and associated infrastructure – all concrete materials
- The evaluation of ground water levels and quality as well as recharge rates
- The establishment of permanent post closure monitoring infrastructure and equipment
- The backfilling of the shaft with material from adjacent Swartberg waste rock dump, where the waste rock material are characterized as having a positive acid balance.
- Final demolition of the access road and washes crossing if this will not be used for long term monitoring.

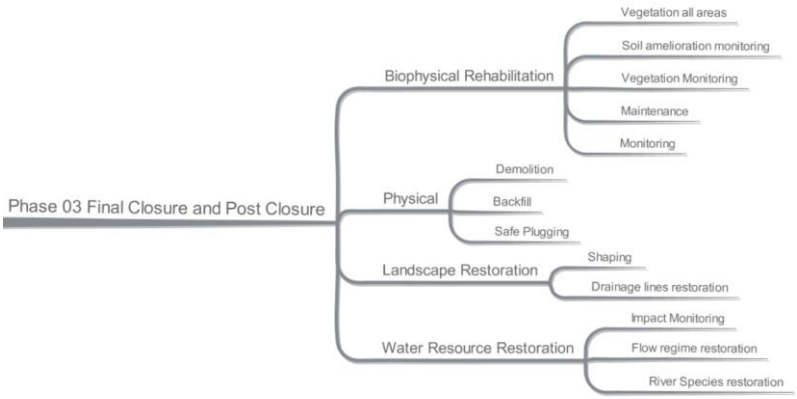


Figure 40: Final Closure phase activities

The project schedule for implementation is presented below with the following assumptions and premises:

- The project will be approved and commence middle 2017
- The project construction will take approximately 18 months
- The project feasibility will take 12 months, while maintenance and monitoring will take place and initial closure (moth ball)
- Where feasibility assessment results are negative, final closure and post closure will take place.

Table 27: Concurrent Rehabilitation Schedule

Swartberg Decline Rehabilitation Plan	Start		Finish		Duration	Tracking		
Project Phase and Activities	*Month*	*Year*	*Month*	*Year*	*Months*	*Priority*	*% Completed*	*Resources*
Phase 01 Construction and Operation	**Apr**	**2017**	**Mar**	**2019**	**24**	**0**	**0**	**0**
Physical Rehabilitation	Jan	2018	Mar	**2019**	15	0	0	0
Infrastructure Maintenance	Jan	2018	Mar	**2019**	15	0	0	0
Biophysical Rehabilitation	May	2017	Aug	**2018**	16	0	0	0
Soil analysis	May	2017	May	**2017**	1	0	0	0
Baseline criteria determination	May	2017	Dec	**2017**	7	0	0	0
Local seed harvesting	Jun	2017	Aug	**2018**	15	0	0	0
Topsoil management	Jun	2017	Aug	**2017**	3	0	0	0
Concurrent pollution remediation	Jun	2017	Aug	**2018**	15	0	0	0
Water Resource restoration	Apr	2017	Oct	**2018**	19	0	0	0
Concurrent pollution remediation	Jun	2017	Aug	**2018**	15	0	0	0
Baseline Monitoring	Apr	2017	Aug	**2018**	17	0	0	0
Impact Monitoring	Jun	2017	Oct	**2018**	17	0	0	0
Phase 02 Closure	**Aug**	**2018**	**Dec**	**2026**	**102**	**0**	**0**	**0**
Biophysical Rehabilitation	Aug	2018	Dec	**2026**	102	0	0	0
Soil amelioration	Oct	2018	Sep	**2020**	24	0	0	0
Vegetation of temporary areas	Oct	2018	Mar	**2021**	30	0	0	0
Topsoil replacement	Sep	2018	Oct	**2018**	2	0	0	0
Monitoring	Aug	2018	Jan	**2021**	30	0	0	0
Maintenance	Oct	2018	Mar	**2021**	30	0	0	0
Physical rehabilitation	Oct	2018	Oct	**2019**	12	0	0	0
Demolish temporary infrastructure	Oct	2018	Dec	**2018**	3	0	0	0
Maintain permanent infrastructure	Oct	2018	Oct	**2019**	12	0	0	0
Water Resource restoration	Sep	2018	Sep	**2019**	12	0	0	0
Concurrent pollution remediation	Sep	2018	Sep	**2019**	12	0	0	0
Baseline Monitoring	Sep	2018	Sep	**2019**	12	0	0	0
Impact Monitoring	Sep	2018	Sep	**2019**	12	0	0	0
Phase 03 Final Closure and Post Closur	**Sep**	**2019**	**Dec**	**2026**	**89**	**0**	**0**	**0**
Biophysical Rehabilitation	Jul	2023	Dec	**2026**	42	0	0	0
Vegetation all areas	Jul	2023	Jul	**2024**	12	0	0	0
Soil amelioration monitoring	Jul	2023	Dec	**2025**	30	0	0	0
Vegetation Monitoring	Jul	2024	Dec	**2026**	30	0	0	0
Maintenance	Jul	2024	Dec	**2026**	30	0	0	0
Monitoring	Jul	2024	Dec	**2026**	30	0	0	0
Physical	Oct	2019	Aug	**2020**	11	0	0	0
Demolition	Oct	2019	Dec	**2019**	3	0	0	0
Backfill	Dec	2019	Apr	**2020**	4	0	0	0
Safe Plugging	Apr	2020	Aug	**2020**	4	0	0	0
Landscape Restoration	Aug	2020	Jun	**2021**	10	0	0	0
Shaping	Aug	2020	Dec	**2020**	4	0	0	0
Drainage lines restoration	Dec	2020	Jun	**2021**	6	0	0	0
Water Resource Restoration	Sep	2019	Jul	**2023**	47	0	0	0
Impact Monitoring	Sep	2019	Sep	**2019**	0	0	0	0
Flow regime restoration	Jun	2021	Jun	**2022**	12	0	0	0
River Species restoration	Jul	2022	Jul	**2023**	12	0	0	0

e) Impact Management Outcomes

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

Table 28: Impact Management Outcomes

ASPECTS								OUTCOMES
Resource Use	Waste Management	Air Emission	Water Pollution	Noise / Vibration	Land Contamination	Biodiversity Disturbance	Socio Economic Changes	Environmental Management Objective
x								Limit loss of heritage artefacts or archaeological resources during site clearance, rood construction and earth works
x	x							Manage and limit the impact of mineral waste generation and accumulation on groundwater levels and quality
x								Manage and limit impact on groundwater levels and quality
					x		x	Limit loss of community amenity and the effect on property values and tourism
							x	Optimize opportunities for employment and procurement of local labor and services
							x	Limit injuries to individuals on site
		x					1	Limit dust impacts from traffic
		x					x	Limit dust impacts from blasting
					x	x	1	Manage rehabilitation sustainability through proper planning
						x	x	Maintenance and monitoring management
x						x	x	Ensure vegetation establishment as soon as possible after clearing.
x					x		x	Restore land use value to sustainable land use or natural pre-determined state
					x		x	Minimize the visual impact on the topography
x								Water resource protection

						×		**To minimize destruction or degradation of flora and ensure legal compliance in this regard**
						×		**To minimize biodiversity impact, soil erosion in the proposed development area.**
						×		**To minimize destruction or degradation of biodiversity**
						×		**To minimize destruction or degradation of sensitive habitats and ecological processes**
						×		**To minimize ecological sensitive area impacted the proposed development area.**

f) Impact Management Actions

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

Table 29: Impact Management Actions

Environmental Management Objective	Avoidance Measures	Reduction Measures	Remedial Measures	Monitoring Measures
Limit loss of heritage artefacts or archaeological resources during site clearance, rood construction and earth works	No heritage artefacts or archaeological resources should be damaged or destroyed by site clearance, road construction or earth works.	Reduce the number and width of roads required by proper planning and agreement to a single traffic management plan. Where this is inevitable, on-site environmental risk assessment by suitably competent person should be conducted to reduce impacts before construction.	Road verges should be restored to natural state as soon as possible after road construction. This would include storm water diversions and landscaping, replacement of topsoil, brush packing, seeding and/or planting.	
Manage and limit the impact of mineral waste generation and accumulation on groundwater levels and quality	'Engineering study done for all mineral waste stockpile laydown areas and proper storm water infrastructure and maintenance of infrastructure put in place.	Construct surface water runoff catchment channels around mineral waste stockpiles and slope stockpiles to channels. Line all mineral waste stockpile laydown areas.		

Manage and limit impact on groundwater levels and quality	Some of the exploration borehole should be equipped as piezometers to assess the extent of dewatering. Should this not be possible then additional monitoring boreholes should be drilled. Aquifer tests should conduction the monitoring boreholes should they be drilled. It is envisaged that this will be conducted as part of the Swartberg Mine Feasibility Study. During the operational phase the mine water must be used or pumped to dirty water dams or pollution control facilities in order to avoid deterioration of the mine water A hydro census should be conducted in at least a 7 kilometer radius around the Swartberg Mine. This data should also be used to update the groundwater model. A monitoring protocol and action plan should be drafted. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required.	Visual inspection should be conducted underground to identify the zones of seepage and related back to the geology. As part of the monitoring program, the area should be visually assessed for any seepage emanating from the shafts or areas in proximity to the shafts The monitoring results must be interpreted annually by a qualified hydrogeologist and network audited annually as well to ensure compliance with regulations It is recommended that the geochemical assessment is updated during the life of the mine in order to construct an effective closure plan	The drawdown cone is likely to develop further as the Swartberg mine is mined at deeper levels It is therefore important that the hydro census is conducted prior to mining the deeper sections in order to obtain baseline water levels. This data is also important for future model calibration. If it can be proven that the mining operation is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. This may be done through the installation of additional boreholes for water supply purposes, or an alternative water supply.	The volume of water currently being abstracted from the mine should be measured daily. The mine water level should also be measured daily. The boreholes in the farm Koeris 54 should be closely monitored, additionally their depth and associated aquifer should also be identified. Groundwater levels and quality should be monitored as mentioned in Section 12.1 to establish groundwater level and quality trends. Two additional boreholes should be installed, upstream and downstream from the decline to monitor direct impacts of the decline.

Limit loss of community amenity and the effect on property values and tourism	Avoid excavations in un-demarcated areas. Only pre-planned areas demarcated and in line with concurrent rehabilitation planning may be excavated.	Establish vegetation cover with the assistance of a professional environmentalist or landscape planner	Implement mitigation measures that would reduce the effects on the sense of place (i.e. visual, noise, etc.). Communicate with the directly and indirectly neighbors to adequately inform them of the potential impacts as well as mitigations that are planned to be implemented to address them	Restore excavations by infilling and levelling as soon as practically possible.
Optimize opportunities for employment and procurement of local labor and services	All contractors will be required to recruit and procure in terms of standard recruitment and procurement processes according to the Public Finance Management Act (No 1 of 1999) (PFMA).	Where possible, local labor and sub-contracting to local companies should be considered for employment to increase the positive impact on the local economy	Expectations about job creation should be responsibly managed to stem the influx of hopeful job-seekers	
Limit injuries to individuals on site	Site access should be controlled and no unauthorized persons should be allowed onto the site	Ensure excavations are safe by preventing access to site from persons or animals or by ensuring all side slope is at safe angles of 1:3.	No open excavations, holes or pits should be left without rehabilitation at the site as persons can fall in and get injured	
Limit dust impacts from traffic	Travel on demarcated roads only and apply dust suppressant or wetting agent to seal road surfaces	Maintain speed limits to reduce dust on site and in area.	Dust impacts cannot be remediated.	Dust monitoring is applicable where this is a significant risk or impact on third parties must be monitored. Ensure compliance according to NEMAQA and dust regulations where applicable.
Limit dust impacts from blasting	Consider excavation and drilling before blasting.	Where blasting must take place, drill blast holes beforehand and wet overburden material to reduce soil lift and dust.	Dust impacts cannot be remediated.	Dust monitoring is applicable where this is a significant risk or impact on third parties must be monitored. Ensure compliance according to NEMAQA and dust regulations where applicable.

Manage rehabilitation sustainability through proper planning	Ensure a rehabilitation plan is in place that incorporate physical and biophysical (biotic and abiotic remediation) designs specific to the site conditions.	Reduce rehabilitation costs by implementing rehabilitation according to the rehabilitation plan and review plan and monitoring results annually to adjust for continual improvement.	Fire, flood, wind and trampling impacts on rehabilitation works should be mapped and prioritized for follow-up as frequently as these impacts on rehabilitation occur.	Monitor the rehabilitation plan and rehabilitation success annually.
Maintenance and monitoring management	Sufficient resources and funds must be available to maintain the required monitoring and maintenance, data analysis and management of elements monitored throughout the project.	Local municipal authorities must partner with other prominent users of the local roads to upgrade them to meet the required capacity and intensity of the vehicles related to the quarry activities	Maintenance plans should be in place for the site	Alien vegetation monitoring and maintenance plans adhered for the site during operation and for the rehabilitated areas after operation has ceased
Ensure vegetation establishment as soon as possible after clearing.	Demarcate all areas that require vegetation clearance to reduce footprint and peripheral damage	Where vegetation clearance takes place for fire breaks, consider brush cutting. Limit vegetation clearing to areas that will be mined immediately.	Ensure all vegetation is stockpiled for re-use in rehabilitation. Ensure concurrent vegetation establishment on cleared areas before next rain season.	Monitor vegetation crown cover to ensure cleared areas are sufficiently restored to baseline values. Monitor vegetation stockpiles from being used as wood collecting areas.
Restore land use value to sustainable land use or natural pre-determined state	No area should be left unsafe, or as waste land after the project. All areas (small or great) must be rehabilitated to reduce cumulative effect of land use reduction as a result of the project.	Land use should be acceptable to the community and sustainable on the long term.	Where areas are cannot be restored to sustainable land use or natural pre-determined state and alternative land use can be selected through specialist and community consultation process.	Monitor final land use quality before project closure and or handover.

Minimize the visual impact on the topography		Reduce above surface volumes of waste material by promoting backfilling as far as possible. Reduce visual impact in terms of extent of visual impact by re-using the material for rehabilitation as far as possible. Reduce edge effect of waste rock dumps by shaping the heaps to represent shallow undulating topography instead of sharp edged lines. Reduce coloration and hue contrasts by applying an ecological approach to landscaping. Revegetation should replicate the natural environment in vegetation structure. (including grass and shrub elements)	Increase visual screening along all the national, regional and divisional roads by planting indigenous tree and shrub lines.	

Water resource protection	The water user must ensure that the water use; 1) does not have a detrimental impact on the lawful water use or land of any person, and 2) is not detrimental to the health and safety of the public. Prior to the commencement of the water use, the water user must obtain; 1) lawful authority to enter upon land owned or controlled by the state, and 2) access to enter to enter upon private owned or controlled land on which the proposed water use is to be undertaken. The water use must not result in potential, measurable, or cumulative detrimental; 1) changes in the stability of a watercourse, 2)change in physical structure of a watercourse, 3) scouring, erosion or sedimentation of a watercourse, or 4) decline in the diversity of communities and composition of the natural, endemic vegetation. The water use must not result in a potential, measurable or cumulative detrimental change in the quantity, velocity, pattern, timing, water level and assurance flow in a watercourse. The water use must not result in a potential, measurable, detrimental change in the water quality characteristics of the watercourse. The water use must not result in a potential, measurable or cumulative detrimental changes in the; 1)breeding, feeding and movement patterns of aquatic, including migration species; 2) level of composition and diversity of biotopes and communities of animals and microorganisms, or 3) condition of the aquatic biota. The water user must ensure that there is sufficient budget to complete and maintain the water use as set out in this	Structures and hardened surfaces associated with the water use must not; 1) be erosive, 2) be structurally unstable, 3) include any flooding, or 4) be a health and safety hazard.	Upon completion of the water use; 1) a systematic rehabilitation programme must be undertaken to restore the water course to its condition prior to the commencement of the water use, 2) all disturbed areas must be re-vegetated with indigenous vegetation suitable to the area, and 3) an active campaign for controlling new exotic and alien vegetation must be implemented within a disturbed area. Upon completion of the water use, the water user must undertake a habitat assessment study annually for three years to ensure that the rehabilitation is stable, failing which; remedial action must be taken to rectify any impacts.	Copies of all designs, risk assessments, rehabilitation plans and any other reports must be made available upon written request to the responsible authority.

	notice. The Department may at any stage of the process request proof of budgetary provisions.			

To minimize destruction or degradation of flora and ensure legal compliance in this regard	All indigenous species is retained as far as possible and where alien species are encountered they are removed. The selection of laydown areas will consider already disturbed areas first. Any nationally protected trees within close proximity of the development footprint to be identified as no-go areas. All construction staff should undergo an environmental induction from a suitably qualified person regarding the importance of footprint management.	Along areas with deep sandy soils the topsoil should be put aside and replaced after disturbance.	Given the hyper-arid nature of the area active re-vegetation of disturbed areas is not recommended on account of the very low success that is likely to result. It is rather recommended that adequate and appropriate surface preparation which will encourage natural regeneration of the vegetation and ensure long-term vegetation recovery is performed.	

To minimize biodiversity impact, soil erosion in the proposed development area.	All indigenous species is retained as far as possible and where alien species are encountered they are removed. The selection of laydown areas will consider already disturbed areas first. Any nationally protected trees within close proximity of the development footprint to be identified as no-go areas. All construction staff should undergo an environmental induction from a suitably qualified person regarding the importance of footprint management. 'General waste accumulating on site should be sorted, stored and deposed of at a registered waste facility Sanitary waste must be contained in mobile toilets and removed from site by a competent contractor. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. The material and its waste must be placed on a PVC liner, in a bunded area with a lid to contain the material.		Mineral waste in the form of overburden material, residue from blasting and drill sludge should be contained and removed from site to allow for site recovery. ◇ Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	

To minimize destruction or degradation of biodiversity	Any rubble, waste materials and litter removed from the site. The collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander away from the construction area into the natural veldt. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises, as well as to minimize dust generation. ◇ All vehicles and machines to remain on demarcated roads and access routes.	Any fauna directly threatened by the construction activities should be removed to a safe location by the responsible person from the Environmental team. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.		

To minimize destruction or degradation of sensitive habitats and ecological processes	Avoidance and reduced activity (in terms of activities, extent and duration) should be applied to highly sensitive ecological areas as mapped on the sensitivity mapping. Habitat fragmentation (by cross cutting any one habitat type) should be avoided as far as possible. No fires should be allowed on-site. No fuelwood collection should be allowed on-site. It should be endeavored that the construction site and loose material will not be exposed to rain resulting in excessive erosion, siltation and general disturbance down slope.	In order to minimize the disturbed area and disturbance impact the project should be completed as soon as possible and return to a state of recovery before the next rain season.		

To minimize ecological sensitive area impacted the proposed development area.	Avoidance and reduced activity (in terms of activities, extent and duration) should be applied to highly sensitive ecological areas as mapped on the sensitivity mapping. Habitat fragmentation (by cross cutting any one habitat type) should be avoided as far as possible. No fires should be allowed on-site. No fuelwood collection should be allowed on-site. It should be endeavored that the construction site and loose material will not be exposed to rain resulting in excessive erosion, siltation and general disturbance down slope.	In order to minimize the disturbed area and disturbance impact the project should be completed as soon as possible and return to a state of recovery before the next rain season.		

i) Financial Provision

(1) Determination of the amount of Financial Provision.

(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.

The Black Mountain Closure Objectives are:

- To secure the effective and sustainable transfer of the municipal services of the town, Aggeneys, and the Pella-drift Water Board to the Khai Ma municipality.
- To ensure that the biodiversity and environment on the site is protected.
- To make sure that the following commitments will be achieved as a minimum:
  - The site will be made safe for both humans and animals,
  - The site will be rehabilitated to be physically, chemically and biologically stable
  - The residual impacts will be managed to acceptable levels and will not deteriorate over time, and
  - Closure will be achieved with minimal socio-economic upheaval.

Cross-cutting to the above, Black Mountain commit to provide sufficient funds at the end of life of mine, to properly implement the closure plan, and also to make provision for possible premature closure, and post closure monitoring requirements.

The site-specific rehabilitation goals for the Swartberg decline is set out as:

- Restore the washes interface ecological and hydrological functionality post closure
- Monitor and manage ground water impacts
- Ensure decline and surrounding area is safe and stable for humans and animals after closure

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

The Basic Assessment Report and Environmental Management Plan are now made available to each registered stakeholder for review and comment. All comments are recorded in the issues and response section and will be included into the final report.

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

The final land-use for the Swartberg Decline is to return the site to function ecologically as the washes conduit is was before the project. The area is zoned mining and it is foreseen that post mining land-use will be either wildlife use or extensive livestock grazing. In both these instances, the functioning washes remain an important goal to ensure sustainable alternative land-use after mining.

Upon final rehabilitation, the only infrastructure that will remain include the monitoring boreholes for long term ground water monitoring. To ensure restoration of the washes, the road and crossing will have to be removed.

The decline plug may also be evident, even after rehabilitation because of the naturally sparse vegetation cover of the area.

Figure 41: Swartberg Decline Final Land use

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

The rehabilitation plan has been developed on the basis that the rehabilitated areas are safe, stable, non-polluting and are able to support an ecosystem similar to the surrounding natural environment. The management plan is provided in

such a manner as to ensure concurrent rehabilitation towards the same land-use as that of the original state and surrounding area.

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

Table 30: Estimated Total Rehabilitation Cost and Annual Provision

Amended Quantum Assessment 2017

		Total Qua Total Quantum Amendment Estimate:	**R 567,182.94**

FARM:
Black Mountain Swartberg Decline Development Dated: 175-02-2017

Farm: Zuurwater No 62 - Portion 4

Life of Project Footprint	17000	Previous Impacted Footprint	2450
Planned Footprint	14550	Split costs according to rehab schedule	14550

AMENDED COST SUMMARY	
Pollution Mitigation and Remediation	R 46,018.69
Demolition	R 192,129.00
Rehabilitation	R 134,148.75
Monitoring and Maintenance	R 59,358.50
Management and Contingencies	R 135,528.00
TOTAL COSTS	**R 567,182.94**

(f) Confirm that the financial provision will be provided as determined.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

g) Monitoring of Impact Management Actions

h) Monitoring and reporting frequency

i) Responsible persons

j) Time period for implementing impact management actions

k) Mechanism for monitoring compliance

It is the primary responsibility of Black Mountain Mining (Pty) Ltd to ensure that the execution of the monitoring and management programme is done in accordance with this environmental management programme (EMP).

In instances where contractors will be appointed, it remains the responsibility of the BMM Manager to communicate the requirements of this EMP to the said contractors. An environmental officer or other appointed representative will at least conduct EMP audits monthly during prospecting to ensure compliance with the EMP.

All existing ISO14001 procedures and standards will be applied to this site as for the rest of the BMM operation. Where new requirements are detailed in this report, that is not in the existing standards, the standards will be reviewed and updated. Roles and responsibilities need to be defined clearly in such a procedure. The Manager must ensure that all reporting to specific government department is done as per this EMP.

The table below provides details of how environmental impacts must be managed and monitored and also provides the monitoring frequency as well as the reporting frequency.

Table 31: Mechanisms for Monitoring Compliance

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Site clearance and development Site access/roads	Land disturbed by operation Destruction of protected species	Measure concurrent rehabilitation in terms of : - Areas cleared - Volumes of topsoil stored - Areas rehabilitated	BMM Environmental Manager	Monitoring: Annually Reporting: Annually
		Remove all foreign matter, waste and historic littering from site and disposed at designated site	BMM Environmental Manager	Monitoring: Before and after construction
		Search and rescue for protected fauna and flora before clearance	BMM Environmental Manager	Monitoring: Every drill site, daily Reporting: Monthly
		Take photographs prior, during and after construction as records	BMM Environmental Manager	Monitoring: Daily Reporting: According to DWS requirements
Operations	Surface water and ground water	Ground water monitoring (quantity and quality)	BMM Environmental Manager	According to monitoring management program
		Prevent hydro carbons spills by using drip pans or PVC linings. Remove content of drip pan and dispose at a designated disposal site.	BMM Environmental Manager	Monitoring: Daily where required Reporting: Monthly
		Surface water – storm water runoff (water quality, river functionality, blockages and erosion)	BMM Environmental Manager	Monitoring: Directly after rain events Reporting: According to DWS requirements

l) Indicate the frequency of the submission of the performance assessment/ environmental audit report

Internal and external inspections will be conducted on a regular basis to confirm the compliance to this EMP.

EMP performance results and quantum update from these inspections will be reported to the relevant regulator according to the prescribed manner annually.

m) Environmental Awareness Plan

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

All employees and subcontractor staff involved with the project will undergo Safety-Health-Environmental Induction that is updated on a regular basis to adhere to changes in compliance requirements.

A Safety-Health-Environmental (SHE) representative is appointed for the working teams to assist in highlighting operational SHE issues while construction and operations takes place.

The reporting hierarchy for operational performance is also used to ensure environmental communication and awareness. Competent contractors are appointed with supervisors that can translate SHE risks to foremen and operating staff. This takes place through morning meetings before work commence (toolbox meetings) and SHE meetings held specifically for this purpose.

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

Black Mountain Mining Pty (Ltd) will aim to apply a risk management system where risks are identified and rated.
Site inspections in terms of EMP compliance take place and will serve as a training opportunity.

Emergency procedures of risks are practiced at least annually and improvements made to ensure emergency preparedness and response is adequate to address environmental incidents.

Recommendations and Incident reporting of events takes place during site inspections and are addressed to ensure continual improvement of the environmental management on site.
Vedanta plc apply international IFC best practice standards on site and BMM is an ISO14001 certified operation.

n) Specific information required by the Competent Authority

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

No specific information has been required by the Competent Authority.

2. UNDERTAKING

The EAP herewith confirms

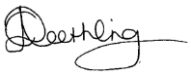
(a) the correctness of the information provided in the reports

(b) the inclusion of comments and inputs from stakeholders and I&APs ;

(c) the inclusion of inputs and recommendations from the specialist reports where relevant; and

(d) that the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected. parties are correctly reflected herein

Signature of the environmental assessment practitioner:



Name of company:
EndemicVision Environmental Services

Date:
17 February 2016

Responsible. Transferable. Sustainable.

Appendix A

QUALIFICATIONS OF EAP - CV

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix B

LOCALITY MAP

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix C

SITE PLAN

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix D1

WASTE – GEOCHEMISTRY REPORT

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix D2

ECOLOGICAL ASSESSMENT REPORT

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix D3

WATER - HYDROLOGY REPORT

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix D4

HERITAGE ASSESSMENT REPORT

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix E

STAKEHOLDER ENGAGEMENT

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix F

BMM Social and Labour Plan

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix G1

BMM MINE WORKS PROGRAM (1)

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix G2

BMM MINE WORKS PROGRAM (2)

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix H

FINANCIAL QUANTUM

For the Swartberg Decline Development BAR & EMPr

March 2017

Responsible. Transferable. Sustainable.

Appendix I

SWARTBERG DECLINE METHOD STATEMENT

For the Swartberg Decline Development BAR & EMPr

March 2017