DIGBY WELLS
ENVIRONMENTAL

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File Reference Number SAMRAD:	LP 10656 MP

De Groote Boom Mining Permit Application: Prescribed Environmental Management Programme

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).

May 2015

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

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This document has been prepared by Digby Wells Environmental.

Report Type:	**EMP Report**
Project Name:	**De Groote Boom Mining Permit Application: Prescribed Environmental Management Programme**
Project Code:	**UAR2967**

Name	Responsibility	Signature	Date
Vumile Dlamini	Report Writer		May 2015
Natasha Taylor-Meyer	Co-author		May 2015
Michael Hennessy	Reviewer		May 2015
Danie Otto	2nd Reviewer		May 2015

IMPORTANT NOTICE

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

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

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

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

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

OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

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

- 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;
- identify the alternatives considered, including the activity, location, and technology alternatives;
- describe the need and desirability of the proposed alternatives;
- 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:
  - the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  - the degree to which these impacts—
    - can be reversed;
    - may cause irreplaceable loss of resources; and
    - can be managed, avoided or mitigated;
  - 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—
    - identify and motivate a preferred site, activity and technology alternative;
    - identify suitable measures to manage, avoid or mitigate identified impacts; and
    - identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Digby Wells Environmental (hereafter Digby Wells) has been requested by De Groote Boom Minerals (Pty) Ltd (hereafter De Groote Boom), to compile and submit an Environmental Management Plan (EMP), pursuant to an application for a mining permit, in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) to the Limpopo Department of Mineral Resources (DMR).

The Project is situated on the farm De Grooteboom 373 KT, near the town of Steelpoort situated in the Limpopo Province (Plan 1 - Local Setting, Appendix A).

The Mining Permit Application (MPA) has been accepted by the Regional Manager, Limpopo Region, of the DMR under Reference LP 10656 MP and De Groote Boom has been instructed to prepare an EMP, which will include various specialist investigations, and a Public Participation Process (PPP) will be undertaken. One part of the PPP relates to consultation with the Land Claims Commissioner and the Department of Rural Development and Land Reform.

Project applicant

Details of the Project applicant are indicated in the table below:

Company name:	De Groote Boom Minerals (Pty) Ltd
Contact person:	Hendrik Cornelis Moen
Postal address:	Postnet Suite 320, Private Bag X06, Waterkloof, 0145
Telephone:	012 362 8689
Cell phone:	082 906 3299
Email:	henk@bouldergroup.eu

Project overview

De Groote Boom currently holds an approved Prospecting Right valid for three years (with the right to take a bulk sample (that is, the removal of an initial quantity of the ore for metallurgical test purposes and economic viability) and it now proposes to mine primarily chromitite (chrome ore, platinum group metals and all associated minerals) covering an extent of not more than 5 ha on the farm De Grooteboom 373 KT (Plan 1 - Local Setting, Appendix A). It is possible that after competing work under the mining permit, De Groote Boom may commence with full scale mining of Chrome and all associated minerals in terms of a mining right that may be applied for at that stage. Mining will be undertaken by open cut methods and the ore may be transported to a portable plant for crushing and screening. The ore will be stockpiled until transported off site by truck. The mining permit area is adjacent to an area where a bulk sample extraction is planned and the operational and related

infrastructure areas are depicted on the infrastructure plan (Plan 4 - Environmental Features, Appendix A).

Purpose of this Report

The scope of work requires investigating all potential environmental and social impacts, for various activities, in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA); and compiling an Environmental Management Programme Report (EMPR) in support of the Mining Permit, in terms of the Mineral and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA). This includes all specialist studies required to identify the potential environmental impacts of the Project and its related activities. This document will be submitted to the Limpopo DMR in support of De Groote Boom's Mining Permit Application (MPA).

The objectives of the Final EMP for the De Groote Boom Project are to:

- Comply with the legal requirements of the MPRDA and NEMA (Section 31, Regulation R543)[1];
- Describe the proposed Project environmental and socio-economic context;
- Develop a detailed understanding of the baseline environment at the sites proposed for development;
- Determine and assess the impacts to receptors and resources as a result of Project activities;
- Introduce stakeholders to the additional activities of the Project and provide information about the proposed Project in a transparent way;
- Identify and engage with stakeholders to ensure that feedback on the results of the study is provided and that the assessment and management of impacts is identified and concerns considered;
- Develop environmental and social management measures to mitigate negative impacts and enhance positive impacts;
- Consider and assess Project alternatives in terms of environmental impacts; and
- Provide sufficient information to the authorities to inform the mining authorisation decision

[1] Since the application for the mining permit was made before the commencement of the Environmental Impact Assessment Regulations, 2014 (GN 982) (the EIA Regulations, 2014), the NEMA Regulations of 2010 apply. However, this EMPR has been structured substantially in accordance with the EIA Regulations, 2014 and where relevant, activities identified in Listing Notice 1 (GN R983) and Listing Notice 2 (GN R984) have been referred to.

Environmental consultants

Digby Wells was appointed by De Groote Boom as the independent environmental consultant to facilitate the environmental authorisation application process for the proposed De Groote Boom Project.

Particulars of the EAP undertaking the EIA process are supplied in the table below.

EAP Name:	Digby Wells Environmental
Contact Person:	Natasha Taylor-Meyer
Telephone No:	011 789 9495
Fax No:	011 789 9498
Email Address:	natasha@digbywells.com
Physical Address:	Fern Isle, 359 Pretoria Avenue, Randburg
Postal Address:	Private Bag X10046, Randburg, 2125

Approach and methodology for the Public Participation Process

The Public Participation Process (PPP) undertaken for this process included the requirements of the MPRDA and was designed to provide sufficient and accessible information regarding the proposed Project to stakeholders in an objective manner. The process also provided opportunities to stakeholders to contribute actively to the environmental assessment. Refer to Sections 9.2 and 9.3 for details regarding the PPP.

A phased approach to the PPP was undertaken and relevant objectives to each of the phases are set out below.

During the Announcement Phase:

- Provide information about the proposed Project;
- Raise issues of concern and suggestions for enhanced benefits; and
- Contribute relevant local and traditional knowledge to the environmental assessment.

During the EMP Phase:

- Verify that their issues have been considered in the environmental assessment; and
- Comment on the findings of the environmental assessment

Project alternatives

No alternatives have been considered for this Project.

Conclusions and recommendations

Mitigation and management measures have been recommended to prevent, avoid and reduce the significance of the potential impacts of the Project. Conversely, enhancement measures will be implemented to increase the significance of the potential positive impacts for the De Groote Boom Project. Should the mitigation and management measures be correctly implemented, the potential impacts will reduce in their significance. The proposed activities requiring Environmental Authorisation are critical for the mining activities and the prevention of pollution of the environment, as well as to ensure the efficient and successful operation of the Project. With the implementation of the recommended mitigation measures to manage potential impacts, it is recommended that the proposed Project be granted an Environmental Authorisation.

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1 Introduction

De Groote Boom Minerals (Pty) Limited (De Groote Boom) currently holds an approved Prospecting Right valid for three years (with the right to take a bulk sample) and it now proposes to mine primarily chromitite (chrome ore, platinum group metals and all associated minerals) covering an extent of not more than 5 ha on the farm De Grooteboom 373 KT (Plan 1 - Local Setting, Appendix A). It is possible that after competing work under the mining permit, De Groote Boom will commence with full scale mining of Chrome and all associated minerals in terms of a mining right that would be applied for at that stage. Mining will be undertaken by open cut methods and the ore may be transported to a portable plant for crushing and screening. The ore will be stockpiled until transported off site by truck. The mining permit area is adjacent to an area where a bulk sample extraction is planned and the operational and related infrastructure areas are depicted on the infrastructure plan.

Digby Wells Environmental (hereafter Digby Wells) has been requested by De Groote Boom Minerals (Pty) Ltd (hereafter De Groote Boom), to compile and submit an Environmental Management Plan (EMP), pursuant to an application for a Mining Permit, in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) to the Limpopo Department of Mineral Resources (DMR) (The Regulation 2(2) Plan is attached as Plan 2, Appendix A).

The Project is situated on the farm De Grooteboom 373 KT, near the town Steelpoort situated in the Limpopo Province (Plan 1 - Local Setting, Appendix A).

The Mining Permit Application (MPA) has been accepted by the Regional Manager, Limpopo Region, of the DMR under Reference LP 10656 MP and De Groote Boom has been instructed to prepare an EMP, which will include various specialist investigations, and a Public Participation Process (PPP) will be undertaken. One part of the PPP relates to consultation with the Land Claims Commissioner and the Department of Rural Development and Land Reform.

2 Project applicant

This section of the report provides an overview of the applicant, details the Environmental Assessment Practitioner (EAP): who will oversee and facilitate the environmental process and details of the competent authorities.

This section also provides details on the property on which the mining permit area is located as well as adjacent properties, including surface right holders and land claims.

2.1 Details of EAP

Digby Wells was appointed by De Groote Boom as the independent environmental consultant to facilitate the environmental authorisation application process for the proposed De Groote Boom Project.

Digby Wells Environmental (Digby Wells) is a South African company with international expertise in providing Environmental and Social services to South African and International clients, with the focus predominantly on the Mineral Resources and Energy sectors in Africa.

Particulars of the EAP are supplied in Table 2-1.

Table 2-1: Particulars of the Environmental Assessment Practitioner Responsible for the Environmental Impact Assessment

EAP Name:	Digby Wells Environmental
Contact Person:	Natasha Taylor-Meyer
Telephone No:	011 789 9495
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Email Address:	natashay.taylor@digbywells.com
Physical Address:	Fern Isle, 359 Pretoria Avenue, Randburg
Postal Address:	Private Bag X10046, Randburg, 2125

2.2 Expertise of the EAP

For this specific Project, Digby Wells conducted a number of the specialist investigations, as discussed below.

- Michael Hennessy - Project Management;
- Natasha Taylor-Meyer - Co-author;
- Vumile Dlamini - EMP document compilation;
- Andre van Coller - Geohydrology;
- Andrew Pirie - Surface Water;
- Crystal Rowe - Biodiversity;
- Wayne Jackson - Soil Assessment ;
- Stephanie Mulder - Map work, Topography and Visual Assessment;
- Johan Nel - Archaeology and Heritage Assessment;
- Darren Dunne - Social Impact Assessment; and
- Nestus Bredenhann - Public Participation Process.

The curricula vitae of the specialists are attached in Appendix B.

2.2.1 The qualifications of the EAP

Natasha Taylor-Meyer holds a holds a Masters degree in Medicine (Virology): MSc. (Medicine Virology) WITS University (2004) (awarded with distinction).

2.2.2 Summary of the EAP's past experience

Mrs Taylor-Meyer has worked in the HIV/AIDS research environment for eight years, where she gained extensive knowledge in this field. Responsibilities included managing vaccine trials, data analysis, conducting laboratory audits, report writing and presentations. She has spent time in the United Kingdom working as an environmental scientist where she was actively involved in the remediation of the old gas works to what is today known as the Millennium Dome. She has also spent time at Mintek, working as an assistant to an environmental specialist, conducting environmental impact assessments and studying, implementing and auditing ISO14001. Mrs Taylor-Meyer has worked with Digby Wells for over seven years. She is unit manager for the Health Department and is responsible for conducting and managing Community Health Impact Assessments and Environmental Impact Assessments, including the compilation of Health and Environmental Management Plans, in accordance with both local South African standards and International standards.

3 Location of the overall Activity

The Project is situated on the farm De Grooteboom 373 KT, near the town Steelpoort situated in the Limpopo Province. Please refer to Table 3-1 (Plan 3 - Land Ownership, Appendix A).

Table 3-1: Property description

Farm Name:	De Grooteboom 373 KT
Application Area (Ha):	5 ha
Magisterial District:	Lydenburg Magisterial District
Distance and direction from nearest town:	Lydenburg, located 38km SE to Project Area
21 digit Surveyor General Code for each farm portion:	T0KT00000000037300000

4 Locality map

Please refer to the Local Setting map (1:40 000) attached as Plan 1 - Local Setting, Appendix A. The land tenure of De Grooteboom 373 KT is shown in Plan 3 - Land Ownership, Appendix A.

5 Description of the scope of the proposed overall activity

Please refer to the mining permit and infrastructure map (1: 22 000) attached as Plan 4 - Environmental Features, Appendix A.

5.1 Extraction Method

The current proposed mining method will be a two bench cut/pit into the western section of the koppie between the elevations of 1260 mamsl and 1180 mamsl. This will result in two high walls of approximately 40 m each.

5.2 Mineral Deposit

De Groote Boom may produce up to five products namely; Run of Mine, lumpy ore, metallurgical grade chrome ore, foundry grade chrome ore and chemical grade chrome ore.

- Run of Mine / Lumpy (metallurgical) ore with typically 38 – 41% Cr_2O_3 and a specified size distribution is sold to the ferrochrome industry where it is processed together with coal in an electric furnace to form ferrochrome. Ferrochrome is the master alloy used in the production of a wide range of corrosion and heat resistant stainless steel.
- Metallurgical grade chrome ore with 44% chrome is sold to the local ferrochrome industry where it is processed together with coal in an electric furnace to form ferrochrome.
- Foundry grade chrome ore with a Cr_2O_3 content of typically 46.5% and a strictly specified grain size distribution is used for the manufacture of casting moulds in foundries. The same material is also used in the production of refractory materials.
- Chemical grade chrome ore with a typical Cr_2O_3 content of 46.0% is the raw material for the production of sodium dichromate processed by De Groote Boom in their other operations (chemical plants), which is the main constituent of all chrome chemicals. Chrome chemicals are used for example as leather tanning agents.

5.3 Processing

There is no current plan to produce anythihg other than Run of Mine material, Lumpy or and Fines.

All products will be sold to external clients.

5.4 Chromitite

Chromium is one of the most important industrial metals. Pure chromium metal is used for making several nonferrous alloys. Chromium is also used to harden and toughens steel and increases its resistance to corrosion, especially at high temperatures. Most stainless steel contains about 18 % chromium; some cutting tools and wear-resisting alloys contain as much as 33 %.

5.5 Listed and specified activities

Table 5-1: Provisional list of activities identified for the De Groote Boom mining operation

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per Project description:
R. 544, 18 June 2010[2]	9	Construction of stormwater management infrastructure
		Construction of sewage management facilities
	11	Construction of stormwater management canals, pipes and dams
		Construction of dirty water containment facilities and infrastructure
	22	Construction of internal haul roads
	26	Any process or activity identified, during scoping phase, in terms of section 53(1) of the National Environmental Management: Biodiversity Act
R. 545, 18 June 2010[3]	3	Storage and handling of fuel, lubricants, various process input chemicals, raw material stockpiles/bunkers, gas, burning oils and explosives
	5	Certain Project related activities may require water use licensing
	19	Stormwater management and pollution control dams

5.6 Description of the activities to be undertaken

De Groote Boom currently holds an approved Prospecting Right, which is valid for three years (with the right to take a bulk sample). This Prospecting Right is covers the farm De Grooteboom 373 KT, located in the Greater Tubatse Local Municipality, Limpopo Province. The prospecting rights include exploration of minerals Chrome ore and all associated minerals. The prospecting activities already conducted included non-invasive activities such as desktop studies, mapping, geochemical survey and geophysical survey and invasive activities such as diamond drilling. The process of taking the bulk sample is underway. The prospecting drill holes have already been rehabilitated.

De Groote Boom now proposes to mine primarily chromitite (chrome ore, platinum group metals and all associated minerals) covering an extent of not more than 5 ha on the farm De

[2] The relevant activities under Listing Notice 1 (GN R983) are Activities 21, 27, 28, 30

[3] The relevant activity under Listing Notice 2 (GN R984) is Activity 4

Grooteboom 373 KT (refer to Plan 3 - Land Ownership, Appendix A). It is possible that after competing work under the mining permit, De Groote Boom will commence with full scale mining of Chrome and all associated minerals in terms of a mining right that would be applied for at that stage.

The Project entails a construction phase, operational phase and possibly a decommissioning phase, depending on whether the Project continues with a full Mining Right (Plan 4 - Environmental Features, Appendix A). The listed activities for the Project are detailed within Table 5-2.

Table 5-2: List of activities for the proposed Project

Activity	Description
Construction phase	
1	Augmenting existing roads
2	Construction of pollution control dam (PCD)
3	Transport of construction material, mobile plant and equipment to the site; and movement of haul trucks and excavator on haul roads
4	Storage of material / diesel at site in temporary facilities
5	Site clearing and topsoil removal for mining operation area; and construction of mining cut
6	Preparing an area of approximately 2-3 ha for portable plant and infrastructure (crushing, screening, workshops, ablution and offices etc.) and stock piling
7	Use of existing drilled boreholes (4,000l per day for ablution and additional quantities for dust control)
Operational Phase	
8	Storage of fuel and lubricants in temporary facilities
9	Topsoil removal and stockpiling; and extraction and transportation of ore;
10	Vehicular activity on haul roads; and operation of mining equipment
11	Crushing and screening of ore in mobile plant
12	Stockpiling material
13	Water management
14	Waste generation and disposal (including sewage)
Decommissioning phase	
15	Demolition / removal of portable and related infrastructure (if applicable)
16	Vehicular activity: removal of mobile plant / equipment and vehicles
17	Rehabilitation of site (As per surface use agreement roads, buildings etc. need not be rehabilitated)

The shaping of the mining permit area slopes will be undertaken during the operational phase of the mine to reduce closure costs. After the activities are completed, 150mm thick of soil will be spread on the disturbed areas. Once placed, the soil will be ripped, fertilised, and re-vegetated. De Groote Boom will be using a mobile plant for its processing activities and therefore no infrastructure associated with the plant will need to be stripped and broken down at closure. General surface rehabilitation will entail establishing topography that emulates the surrounding areas and aligned to the general landscape character, without unnecessary remnants of structures and surface infrastructure to give the rehabilitated area a neat appearance. The PCD close to the plant will be removed at closure. The plastic lining must be removed and can be recycled. The earth walls will be flattened and the area profiled.

Waste handling of scrap metal and used oil as a result of the Decommissioning Phase will be undertaken.

Post-closure monitoring and rehabilitation will determine the level of success of the rehabilitation, as well as to identify any additional measures that have to be undertaken to ensure that the mining permit area is restored to an adequate state. Monitoring will include surface water, groundwater, soil fertility and erosion, natural vegetation and alien invasive species and dust generation from the discard dumps.

5.6.1 Ore processing

The only processing or ore will be crushing and screening.

5.6.2 Site facilities during construction

While the existing infrastructure relating to the bulk sampling will be used as far as possible, the following facilities are expected to be established on site during the construction phase (Plan 4 - Environmental Features, Appendix A):

- Contractor’s laydown area;
- Workshops, stores, wash-bays, lay down areas, office(s), ablution facilities (chemical toilets);
- Handling and storage area for construction materials (paints, solvents, oils, grease);
- Stockpiles;
- Water management facilities;
- Run of mine (ROM) pads;
- Haul roads (up to 10m wide);
- Temporary access roads; and
- Temporary services (water, electricity).

These facilities would either be removed at the end of the construction phase or incorporated into the layout of the operational mine.

5.6.3 Site facilities during operation

The following facilities will be established on site during the operational phase:

- Open cuts against the side of the koppie;
- Ore stockpiles (within the plant area);
- Soil stockpiles;
- Waste rock dump;
- Crushing and screening plant;
- Conveyors;
- Haul roads;
- Mining camp;
- Office and ablutions;
- Chemical, fuel, and material storage facilities;
- Parking areas;
- Lighting infrastructure;
- Water storage facilities and surface water control measures (in compliance with Regulation R704 under the National Water Act, 1998); and
- Portable ablution facilities.

6 Policy and legislative context

Please refer to Table 6-1 for a summary of the applicable policies and legislation pertaining to this application.

Table 6-1: Relevant policies and legislation

Applicable legislation and guidelines used to compile the Report	Reference where applied	How does this development comply with and respond to the policy and legislative context
(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning	***(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)***	***(E.g. In terms of the National Water Act:- Water Use Licence has/has not been applied for)***

Applicable legislation and guidelines used to compile the Report	Reference where applied	How does this development comply with and respond to the policy and legislative context
frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)		
The Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	Part A: Sections 1 through 22 and Part B: Sections 1 through 12	This EMP document has been compiled in accordance with the Act.
The National Environmental Management Act, 1998 (Act No. 107 of 1998)	Part A: Section 5.1, 7, 8 and 11	Listed activities as per the NEMA Regulations have been considered; Authorisation is required in the terms of the NEMA Regulations.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).	Not applicable	Listed activities as per the NEM:WA Regulations have been assessed and it is considered that no waste licence is required.
The National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Part A: Section 9.4 and 22.2	This EMP document complies with section 38(8) of the NHRA that stipulates that a Heritage Resources Management (HRM) process must be implemented if an evaluation of the impact of a development on heritage resources is required in terms of the NEMA, the integrated environmental management guidelines issued by the Department of Environment Affairs (DEA), the MPRDA, or any other legislation. The consenting authority (in this instance the DMR) must ensure that the evaluation fulfils the requirements of the South African Heritage Resources Agency (SAHRA) and / or the Provincial Heritage Resources Authority of Gauteng (PHRA-G) in terms of section 38(3) of the NHRA. The NID, HSR and HIA reports completed for the project complies with the aforementioned section. Any comments and recommendations of

Applicable legislation and guidelines used to compile the Report	Reference where applied	How does this development comply with and respond to the policy and legislative context
		SAHRA and / or PRHAG must be taken into account prior to the granting of the consent.
National Environment Management: Air Quality Act (Act No. 39 of 2004)	Part A: Section 9.4 and 22.2	The Air Quality Assessment was conducted in accordance with the NEM: AQA.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)	Part A: Section 9.4 and 22.2	The Fauna & Flora study considered CARA in terms of alien invasive species found on site.

7 Need and desirability of the proposed activities

A large percentage of the world's economically mineable chromitite ore reserves are located in the Bushveld Complex, a saucer-shaped deposit in the northern part of South Africa. The complex is the largest known layered intrusion in the world. It stretches some 480km east-west and 240km north-south over the North West and Limpopo Provinces. Chromite ore is mined along the eastern and western rims of the complex, which has a surface area of about 66,000 km^2. Chromite ore and concentrates are used primarily in metallurgical applications such as the production of ferrochrome, which is a major input in the production of stainless steel. Other applications include refractories, foundry sands and chromium chemicals.

Although it is expected that all production form the mine will be sold into the local market, this is dependent on international demand. In this regard, despite the current economic crisis in the eurozone and a slowdown in the growth rate of the Chinese economy, the long term outlook for chrome remains good as it is closely linked to stainless steel production, which is expected to experience renewed growth in demand in the medium to long term.

In addition to the local and national economic benefits of the proposed mining operation, there will also be socio-economic benefits. The following positive impacts are anticipated:

- Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the increased spending power of employees;
- Local and regional employment opportunities. Although smaller in number than employment creation during the construction phase, these will have a significantly longer duration;
- Increased business opportunities for local entrepreneurs through the supply of goods and services to the mine;
- A positive macro-economic impact at a local, regional and provincial level due to operational expenditure, taxes and royalties; and

- Economic and social benefits associated with Corporate Social Responsibility (CSR) and Local Economic Development (LED) initiatives by the mine.

Unemployment is a major problem within the Bojanala District. The proposed De Groote Boom Mine will have a significant positive impact on the baseline socio-economic conditions of the local communities involved. The mine will create several employment opportunities and preference will be given to the locally unemployed wherever possible. The mine will contribute towards the socio-economic development of the region as a whole through social upliftment and job creation as primary agents.

Clear policy guidelines and careful management of Project implementation will be required to ensure that benefits for the local population and economy are maximised.

8 Motivation for the overall preferred site, activities and technology alternative

De Groote Boom has undertaken considerable exploratory drilling on the property and has investigated the economic viability, including environmental sustainability and technical feasibility of a new chromitite mine, using open cut mining methods, on the farm De Grooteboom 373 KT. The applicant is in the process of taking a bulk sample adjacent to the Mining Permit area.

Chromitite ore and concentrates are used primarily in metallurgical applications such as the production of ferrochrome, which is a major input in the production of stainless steel. Other applications include refractories, foundry sands and chromium chemicals. De Groote Boom intends exporting the chromite products from its proposed mining operations to the local market for the production of ferrochrome.

The proposed mining operation will have a life of no more than two years, after which it is possible that an application for a Mining Right may be made.

8.1 Strategic importance of the Project

As described in the GTLM Final 2013/2014 IDP, the eastern limb Bushveld Igneous Complex (mining belt) is emerging as an important structuring element of the municipality's spatial development. As a result, retail and service businesses respond to the opening of mines and the development of housing, locating close to these areas. This will eventually alter the current fragmented spatial pattern by creating few large urban settlements.

Although there are several existing mines in the area, resources still remain unexploited and investment in this sector is important. The expansion of the mining activities in the GTLM area presents an opportunity to improve infrastructure, increase job opportunities, address unemployment and generate many other economic spin-offs. The lack of economic growth in other sectors in the region warrants special attention and support to optimize the available opportunities in the mining sector.

GTLM has developed its Local Economic Development (LED) Strategy in June 2007 and is aligned with the Limpopo Growth and Development Strategy, Provincial Spatial Framework, National Spatial Development Perspectives and ASGISA. The strategy identifies the mining activities taking place in the area as the primary economic activity in GTLM. It also outlines key issues that have to be taped into to unlock the economic potential in GTLM. To date, the growing mining sector in the GTLM has resulted in GTLM being the 7th largest regional economy in South Africa.

The De Groote Boom Project would contribute towards economic development through employment opportunities, improvement of procurement of services and increase in social development Projects for the communities in the local area.

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

The proposed Project is located within the De Groote Boom prospecting right area and the surrounding area is currently used for mining related activities. The Mining Permit area can only be located within the Prospecting Right area and the mineralised zone is located to the Western side of the koppie in the North-East part of the farm.

9.1 Details of the development footprint alternatives considered

With reference to the site plan provided in Plan 4 - Environmental Features, Appendix A and the location of the individual activities on site, the alternatives were considered with respect to:

- **the property on which or location where it is proposed to undertake the activity;**

No property alternatives have been considered as the envisaged mining operations will occur on properties already utilised for the mining operations and where De Groote Boom has negotiated surface rights.

- **the type of activity to be undertaken;**

No alternatives to the mining of chromitite have been considered.

- **the design or layout of the activity;**

The site layout in terms of the position of the haul road, waste rock dump and topsoil stockpile was determined by considering both spatial and practical mining operation aspects. These options would have been considered during the planning phase for the bulk sample to derive an optimal layout.

- **the technology to be used in the activity;**

No alternative in terms of the technology to be used have been considered.

- **the operational aspects of the activity; and**

The site layout in terms of the position of the haul road, waste rock dump and topsoil stockpile was determined by considering both spatial and practical mining operation aspects already established for the bulk sample extraction. The optimal layout was determined during that stage.

- **the option of not implementing the activity.**

The “no-go” option for implementing the activity has been considered, but due to the fact that operations are about to commence for the bulk sample and that the mining of the resources will lead to job creation, the contribution to the GDP of not only the municipality, but also the Province as a whole, will continue. Thus the option of not implementing the activity will not be pursued.

9.2 Details of the public participation process followed

The Public Participation Process (PPP) undertaken was designed to allow for provisioning of information about the proposed Project in a manner that will enable stakeholders to provide comments or to request further details. Full details of the PPP are set out in the Consultation Report included hereto as Appendix C. Below is a summary of the key PPP activities.

9.2.1 Stakeholder identification

Stakeholders for the proposed Project were identified by means of Windeed searches, utilisation of an existing database used for the Bulk Sample Test concluded in September 2014 and informal stakeholder networking. Relevant sectors of society were identified who would be affected by or interested in the proposed Project.

9.2.2 Project announcement

The proposed Project was announced to the entire stakeholder database by means of a Background Information Document (BID), formal letter with registration and comment sheet, and placement of an advertisement (Steelburger / Lydenburg News, 17 April 2015) and site notices. The content of the announcement material predominantly included a Project description, the applicable environmental legislation, details of the environmental regulatory and public participation process and information of the independent Environmental Assessment Practitioner (EAP).

9.2.3 Stakeholder comments

Comments from stakeholders were received by means of written submissions and telephonic consultation during April 2015. Written comments were predominantly centralised around the following themes:

- Attention needs to be given to management of water resources;
- Importance of closure and rehabilitation to be done;
- Positive impact and possibilities for local development and employment;

- Impact of road traffic on wildlife populations; and
- Existing land claims needs to be considered.

Some of the stakeholders indicated that no comment would be provided and/or that submission would be made in due course.

9.3 Summary of issues raised by I&APs

Limited comments were received from stakeholders. Table 9.1 is populated with the most prominent comments received from stakeholders.

Table 9-1: Interested and Affected Parties

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this Report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
Landowners					
Kennedy Owour, JH Spangler	Yes	17, 29 April 2015	Importance that water resources be managed effectively in terms of availability and pollution.	Surface and groundwater impact assessment specialist studies are to be completed and will provide details of the impacts together with proposed mitigation measures.	Refer to Section 9.4.1.1.8 and 9.4.1.1.9 Refer to Appendix I and J
Organisations of state (Responsible for Infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc.					
Transnet	Yes	29 April 2015	Concern that the railway might be affected by the proposed Project.	There are no railway lines near the Project area. Data shows that the closest railway is approximately 20km north east of the prospecting area.	Refer to Plan 1 of Appendix A
Communities					
Buffelshoek Community, Kalkfontein Community,	Yes	29 April 2015	No comments or specific comments will be provided in due time.	Thank you for the comment.	Comment and Response Report as part of the Consultation Report (Appendix C)
Traditional Leaders					
Masha Makopole Traditional Council	Yes	29 April 2015	Cognisance must to taken of the fact that existing land claims reside over the directly affected properties.	Thank you for the comment.	Comment and Response Report as part of the Consultation Report (Appendix C)
Department of Land Affairs					
Commission on Restitution of Land Rights	Yes	23 March 2015	Feedback provided on a land claims query and indicating that research is ongoing.	Thank you for the feedback.	Preliminary Consultation Report as part of the Consultation Report (Appendix C)

Table 9-2: Interested Parties

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this Report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
Sotac Transport and Express, David and Sons	Yes	17, 26 April 2015	Would like to partner with the mine and investigate opportunities once operations are underway.	Thank you for the comment.	Comment and Response Report as part of the Consultation Report (Appendix C)

9.4 The environmental attributes associated with the alternatives

9.4.1 Baseline environment

9.4.1.1 Type of environment affected by the proposed activity

9.4.1.1.1 Air Quality

Major atmospheric pollutants in the proposed De Groote Boom Project area will be influenced by local and regional pollutants signature, which include:

- Operational opencast and underground mines in the immediate vicinity, with numerous area and point sources;
- Agricultural activities, which is not dominant in the area.

In terms of air quality, the main pollutants of concern will be associated with dust generated from mining operations i.e. erosion of stockpiles, vehicular movement on unpaved, dry and dusty roads and material handling process.

A detailed air quality report can be found in Appendix D.

9.4.1.1.1.1 Dust Fallout Baseline

Dust deposition data is crucial as it shows monthly, seasonal, and inter-annual variability in dust fallout rates – pre and during mining scenarios. The amount of dust collected at any given time is a function of the rate of deposition, which may vary widely depending on meteorological factors such as wind speed and direction, variations in the number of sources and mitigation measures adopted, and the background level of pollutants. The dust monitoring network will be commissioned towards the end of May 2015. Sampling will be conducted for an initial period of six months. The dust fallout sampling, analyses, comparison and interpretation will be conducted according to the recommended SANS 1929:2011 (adapted from ASTM1739-98).

The deposition results will be illustrated by means of tables and graphs expressed in the units of mg/m^2/day averaged over a 30-day period. South African Bureau of Standards (SANS 1929:2011) has published an important standard in terms of air quality underlying limits for dust fallout rates. In terms of dust deposition standards, a four-band scale use to apply – with target, action and alert thresholds clearly spelt out, with three permissible frequencies of excesses.

Since November of 2013, the National Dust Control Regulation (NDCR) dust fallout rates in residential and non-residential areas now apply. Pre mining dust deposition rates measured in the in and around the proposed site will be compared to the NDCR 2013.

9.4.1.1.1.2 Particulate and Gaseous Pollutants Baseline

Particulate matter - PM_{10} (particulate matter with an aerodynamic diameter of less than 10 µm) and fine particles $PM_{2.5}$ (particulate matter with an aerodynamic diameter of less than

2.5 µm) are of health significance (Harrison and van Grieken, 1998). Data for both sets of pollutants were not available for assessment. This is considered a data gap, since mining operation often impacts on the ambient particulate loading of these pollutants in any airshed.

As a result of the latter, acquisition of site specific information for these criteria pollutants is imperative. These pollutants are regulated, as such measurement should be prioritised before the project commences to establish baseline conditions prior to mining by De Groote Boom.

9.4.1.1.2 Climate

The project area falls within the escarpment. The climate of the area is described as temperate interior according to SANS 204. There is no weather station on site and the closest SAWS Automated Weather Stations are in Mashishing (Lydenburg), about 45 km to the southeast, and in Graskop (about 75km east-southeast). Although a series of parallel ridges are observed between Lydenburg and the proposed De Groote Boom Mining permit area, which could have an effect on the airflow and dispersal of pollutants.

Site specific MM5 modelled meteorological data set for full three calendar years (2012 – 2014) was obtained from the Lakes Environmental Consultants in Canada to determine local prevailing weather conditions. This dataset consists of surface data, as well as upper air meteorological data that is required to run the dispersion model. It is required if site specific surface and upper air meteorological data is not available. The Pennsylvania State University / National Center for Atmospheric Research (PSU/NCAR) meso-scale model (known as MM5) is a limited-area, non-hydrostatic, terrain-following sigma-coordinate model designed to simulate or predict meso-scale atmospheric circulation. This data has been tested extensively and has been found to be extremely accurate.

Modelled meteorological data for the period January 20112 to December 2014 was obtained for a point in the proposed De Groote Boom open pit site (24.941561 S, 30.150786 E). Data availability was 100%.

Dispersion of atmospheric pollutants is a function of the prevailing wind characteristics at any site. The vertical dispersion of pollution is largely a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of the wind speed, in combination with the surface roughness.

The amount of particulate matter generated by wind is highly dependent upon the wind speed. Below the wind speed threshold for a specific particle type, no particulate matter is liberated, while above the threshold, particulate matter liberation tends to increase with the wind speed. The amount of particulate matter generated by wind is also dependent on the material's surface properties. This includes whether the material is crusted, the amount of non-erodible particles and the particle size distribution of the material.

Wind roses comprise 16 spokes which represent the directions from which winds blew during the period. The colours reflect the different categories of wind speeds. The dotted

circles provide information regarding the frequency of occurrence of wind speed and direction categories. The figure given at the bottom of the legend described the frequency with which calms occurred, i.e. periods during which the wind speed was below 0.5 m/s.

The spatial and annual variability in the wind field for the De Groote Boom area modelled data is clearly evident in Figure 9-1. The predominant wind direction is from the east southeast accounting for about 15.5% of the time, and wind speed greater than 5.4 m/s occurring for 11% throughout the period. Secondary wind speeds were also observed from the southeast (14%) and east (~10%). Over the three year period, winds capable of generating dust occurred for some 93 days. Calm conditions (wind speeds < 0.5 m/s) occurred for 0.25% of the time. Wind class frequency distribution per sector is given in Figure 9-4 and Table 9-3. During the last three years, strong winds greater than 8.8 m/s occurred for approximately 1% of the time. This equates to 11 days throughout the entire three year period.

The diurnal patterns during the night, showed winds coming from the ESE (30%) and SE (28%) dominating, while the morning, afternoon and evening experienced predominant winds from the ESE (14%), N (16%) and E (16%) sectors respectively (Figure 9-2).

Calm conditions in the morning, afternoon, evening and night time were: 0.76%, 0.17%, 0.03% and 0.05%. Average wind speeds were 3.16 m/s (morning), 3.37 m/s (afternoon), 3.78 m/s (evening) and 4.20 m/s (night time).

The seasonal patterns show spring has been dominated by winds from the ESE (17%) and E (13%) respectively. Wind speed greater than 5.4 m/s was observed 14% of the time. Average wind speed was 3.97 m/s and calm 0.15%. Summer was dominated by winds from the ESE (19%) and E (16%), and winds greater than 5.4 m/s was observed 7.6% of the time in summer. In autumn, winds from the SE (20%), and ESE (15%) dominated. Wind greater than 5.4 m/s capable of generating dust occurred some ~10% of the time. Winter was dominated by winds from SE (19%) and ESE (12%) with winds greater than 5.4 m/s occurring some 11% of the time.

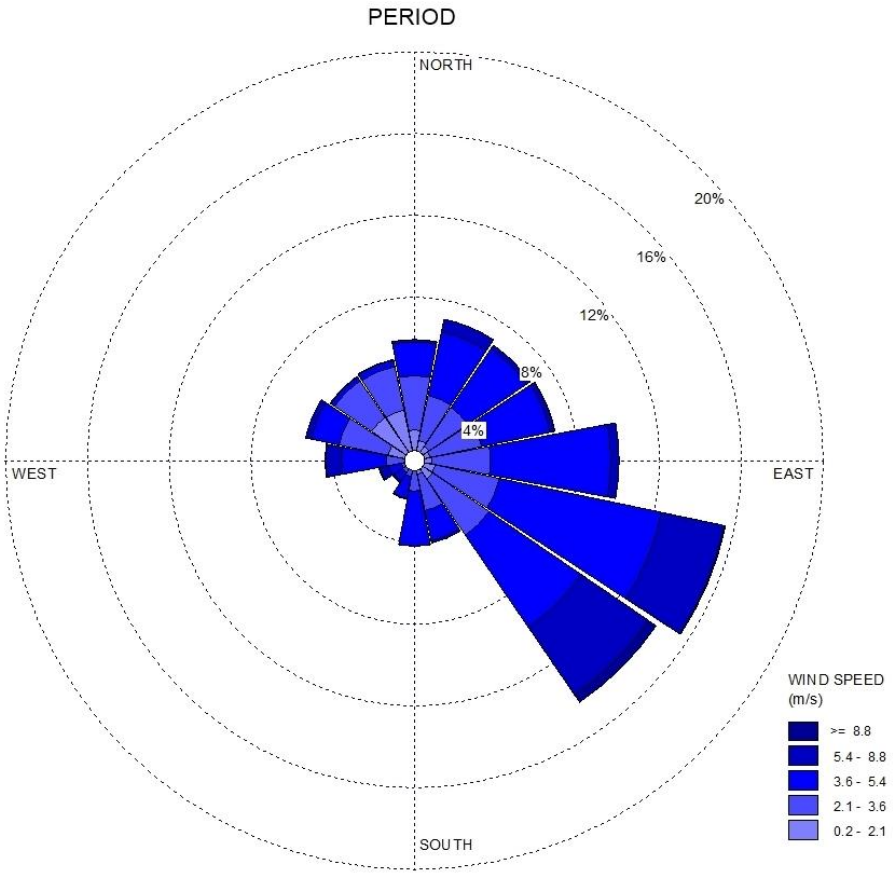


Figure 9-1: Surface wind rose for De Groote Boom modelled data, 01 January 2012 – 31 December 2014

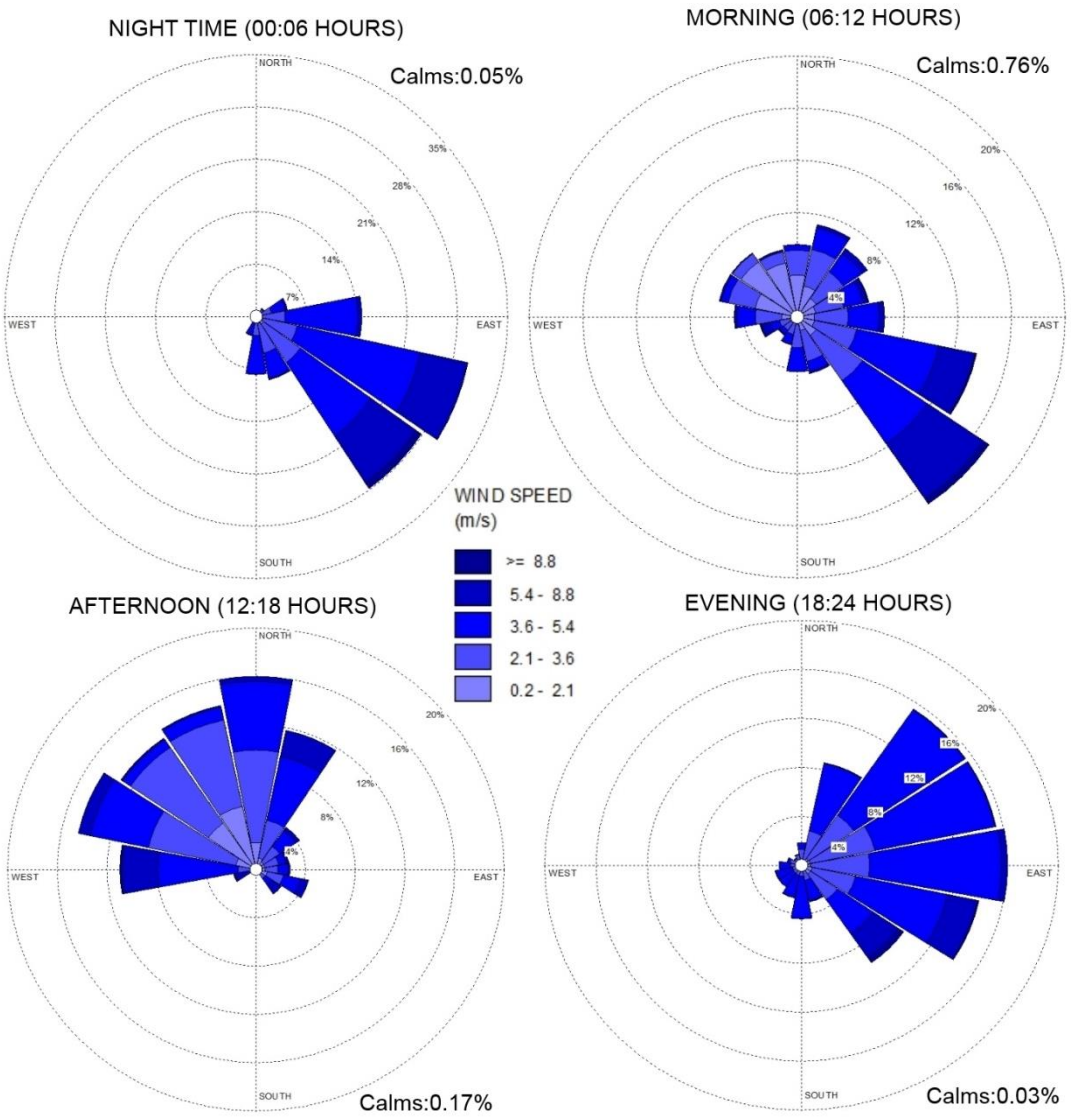


Figure 9-2: Diurnal variation of winds between Morning 06:00 – 12:00 (top right), Afternoon 12:00 – 18:00 (bottom right), Evening 18:00 – 24:00 (bottom right) and Night time 00:00 – 06:00 (top left) (01 January 2012 – 31 December 2014)

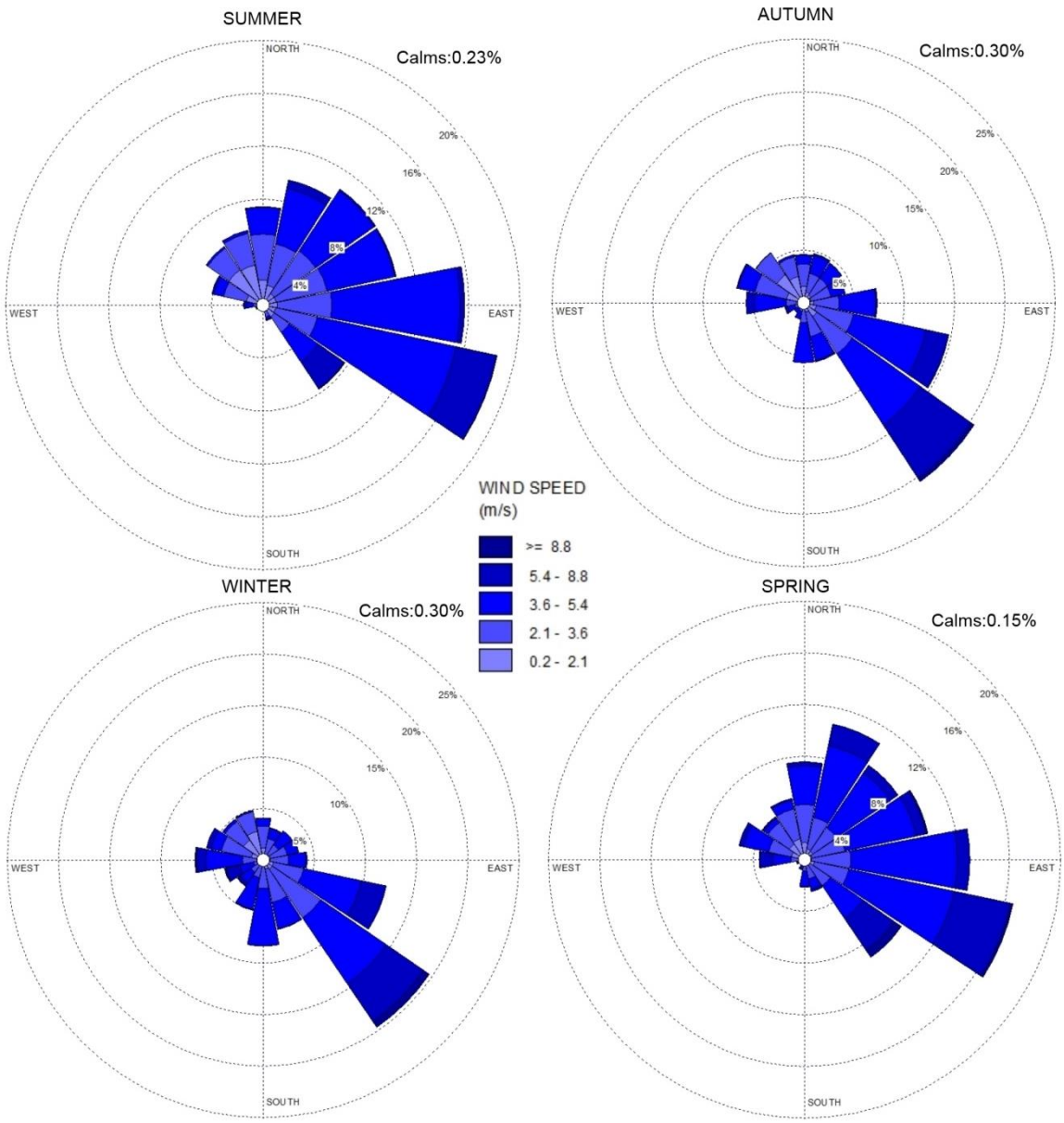


Figure 9-3: Seasonal variation of winds in spring season (September – November) (bottom right), summer season (December - February) (top left), autumn season (March – May) (top right) and winter season (June – August) (bottom left) (01 January 2012 – 31 December 2014)

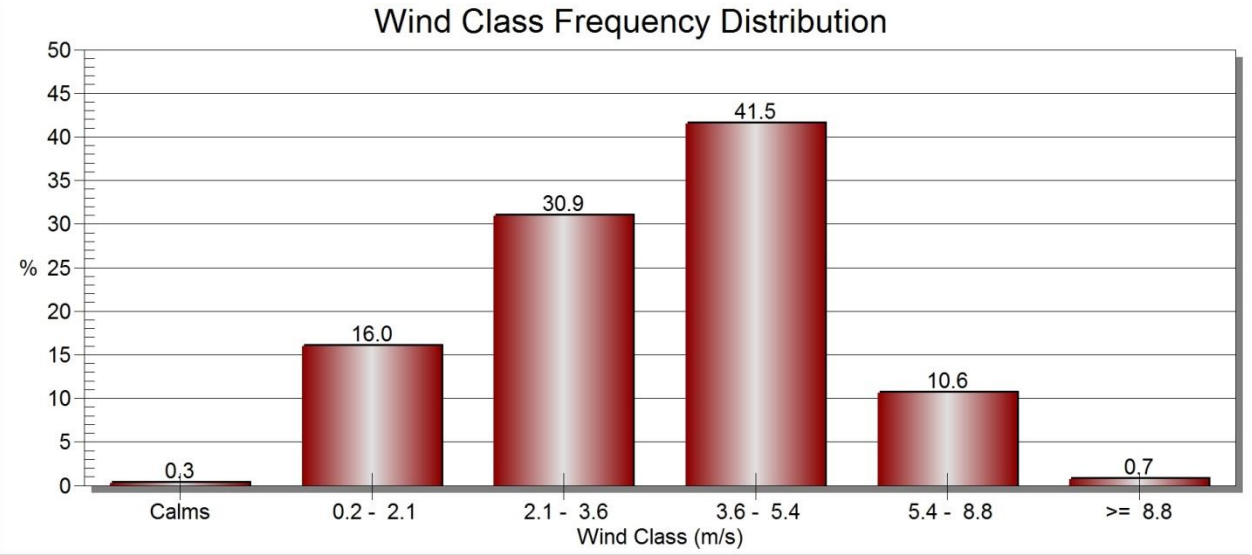


Figure 9-4: Wind Class Frequency Distribution for De Groote Boom opencast pit modelled data, 01 January 2012 – 31 December 2014

Table 9-3: Wind Class Frequency Distribution per Direction for De Groote Boom modelled data, 01 January 2012 – 31 December 2014

Directions		Wind Classes (m/s)					
		0.2 - 2.1	2.1 - 3.6	3.6 - 5.4	5.4 - 8.8	>= 8.8	Total (%)
1	N	0.36	0.94	0.53	0.00	0.00	1.84
2	NNE	0.40	2.46	5.60	0.09	0.00	8.55
3	NE	0.65	4.29	10.40	0.09	0.00	15.43
4	ENE	0.71	5.11	9.53	0.08	0.00	15.43
5	E	0.71	4.58	10.22	0.50	0.00	16.01
6	ESE	0.87	3.42	7.28	2.42	0.09	14.08
7	SE	0.87	2.52	3.35	2.37	0.50	9.61
8	SSE	0.52	0.75	1.69	0.09	0.02	3.06
9	S	0.36	0.53	3.47	0.02	0.00	4.38
10	SSW	0.20	0.62	1.86	0.05	0.00	2.72
11	SW	0.26	0.52	1.34	0.02	0.00	2.13
12	WSW	0.23	0.49	1.37	0.03	0.00	2.11
13	W	0.29	0.58	0.87	0.02	0.00	1.75
14	WNW	0.38	0.55	0.23	0.02	0.00	1.17
15	NW	0.36	0.30	0.05	0.03	0.00	0.75
16	NNW	0.43	0.46	0.06	0.00	0.00	0.94
	Sub-Total	7.60	28.12	57.83	5.81	0.61	99.97
	Calms						0.03
	Missing/Incomplete						0
	Total						100

9.4.1.1.2.1 Temperature

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers.

Three-year average maximum, mean and minimum temperatures for De Groote Boom area are given in Table 9-4. The average monthly maximum temperatures range from 18°C in July to 30°C in January, with monthly minima ranging from 0°C in July to 13°C in February and December respectively (Figure 9-5). Annual mean temperature for De Groote Boom area is given as 25°C. It is worth mentioning that the highest temperature recorded was 30°C and a lowest of 0 C in the area.

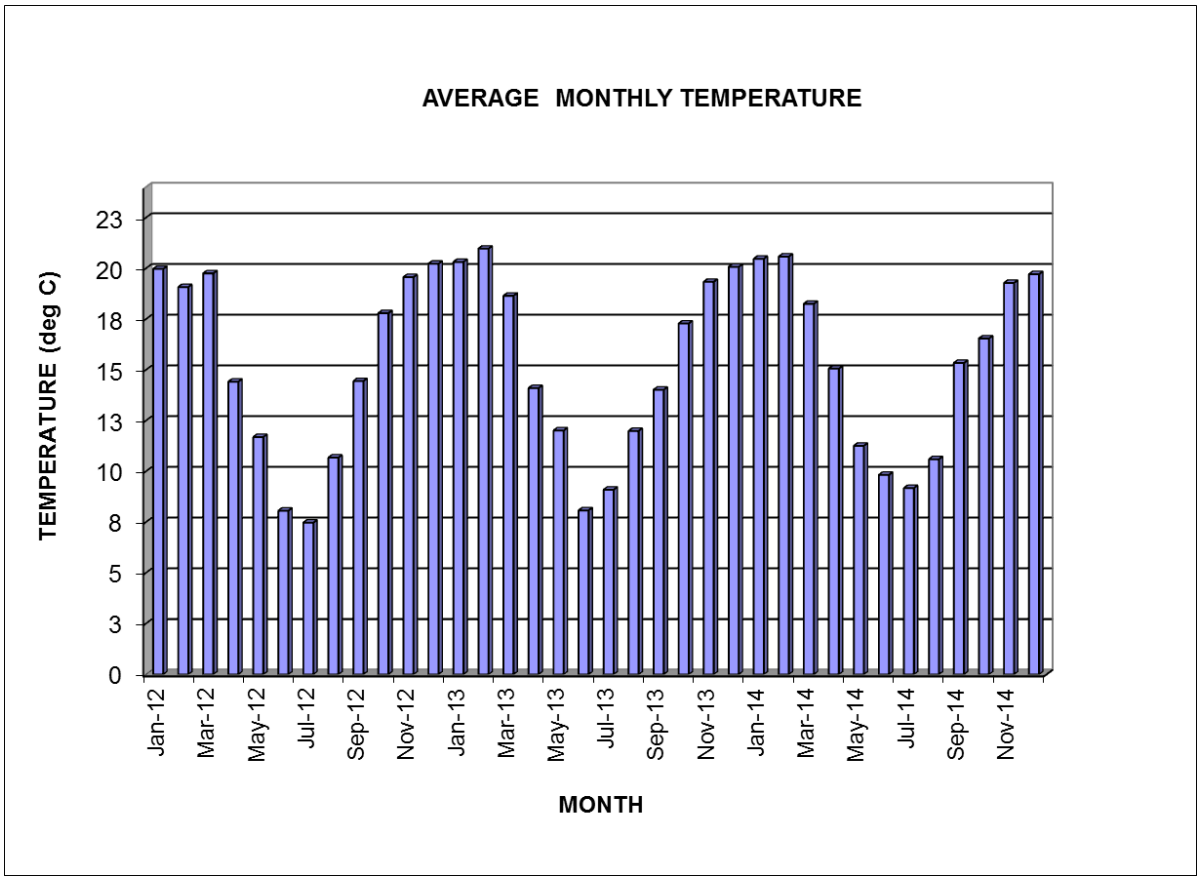


Figure 9-5: Average monthly temperature derived from the De Groote Boom modelled data (2012-2014)

Table 9-4: Average monthly minimum, maximum and mean temperature values derived from the De Groote Boom modelled data (2012-2014)

Temp(°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	30	29	27	25	19	19	18	20	25	27	28	29	25
Monthly Min.	11	13	10	7	2	1	0	2	2	7	10	13	6
Monthly Mean	20	21	18	15	11	10	9	11	15	17	19	20	16

Temperature data from the Lydenburg Weather Stations covering a 29 years monitoring period was used in the baseline report (Table 9-5). Data provided shows that summers are warm, temperatures rarely exceed 30°C, and winters are mild.

Table 9-5: Temperatures recorded in the region of the Project - Lydenburg SAWS weather station (1961 to 1990)

Month	Mean daily (°C)			Extremes (°C)	
	Maximum	Minimum	Average	Highest	Lowest
January	25.9	14.7	20.3	33.5 (1983/11)	15.8 (1972/23)
February	25.5	14.2	19.8	34.5 (1983/27)	14.9 (1967/19)
March	24.8	12.9	18.8	34.0 (1984/02)	13.6 (1975/18)
April	22.6	10.0	16.3	31.3 (1987/04)	12.8 (1974/03)
May	20.8	6.0	13.4	28.0 (1979/08)	9.0 (1972/13)
June	18.3	2.8	10.6	25.3 (1962/28)	5.9 (1968/03)
July	18.8	2.7	10.7	26.4 (1983/15)	8.0 (1967/15)
August	20.9	4.8	12.8	28.5 (1979/08)	6.2 (1977/24)
September	23.6	8.1	15.9	33.5 (1983/29)	6.4 (1974/04)
October	24.0	10.8	17.4	33.5 (1961/24)	9.3 (1965/19)
November	24.2	12.7	18.4	33.3 (1981/06)	9.0 (1968/11)
December	25.2	14.1	19.6	31.8 (1972/30)	15.2 (1966/17)
Annual	**22.9**	**9.5**	**16.2**	**34.5 (1983/27)**	**5.9 (1968/03)**

The long term data of temperature recorded at the Lydenburg Weather Station is in agreement with the modelled Lakes Software data used in the baseline.

9.4.1.1.2.2 Wind Speed

The data in Table 9-7 is representative of the wind speed for the De Groote Boom mining permit area. The monthly maximum and minimum wind speed is reported. For the period under survey, 2012– 2014 the highest wind speed observed in the area was 12.3 m/s. Wind speed greater than 5.4 m/s occurred some 11% throughout the period, accounting for 93 day (~31 days each year). The potential is there for wind erosion in the proposed De Groote Boom mining permit area.

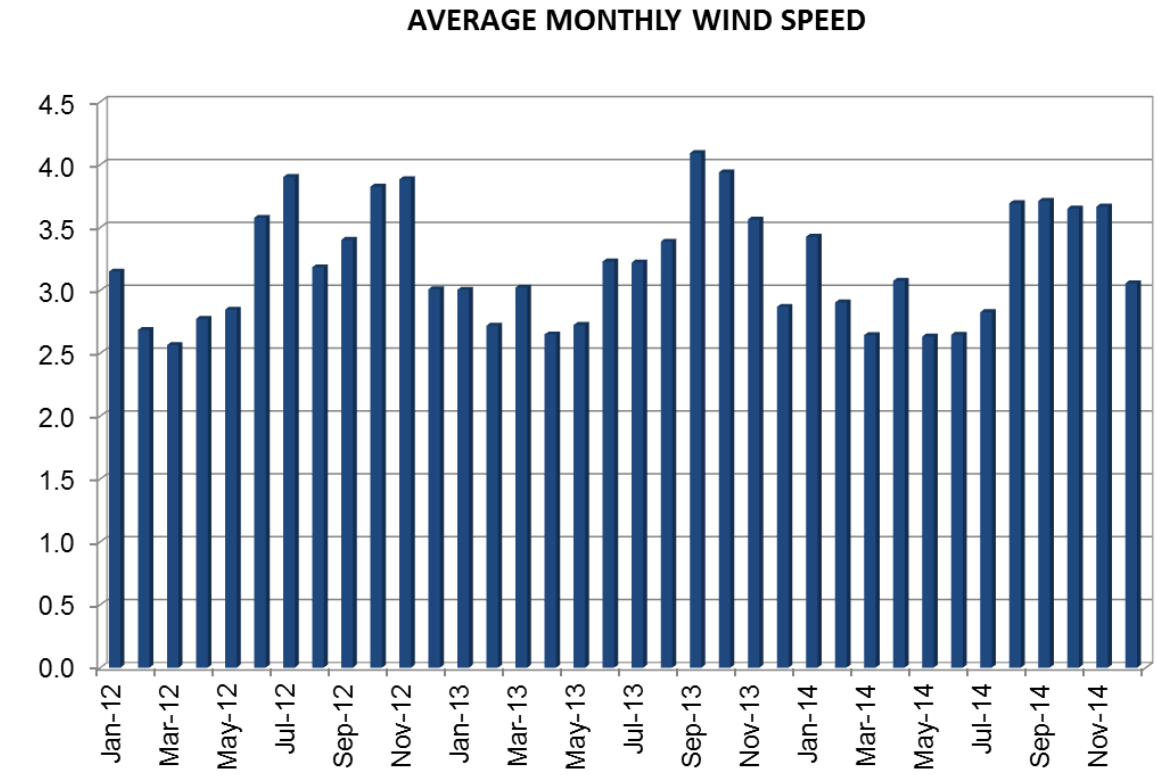


Figure 9-6: Average Monthly Wind Speed derived from the De Groote Boom modelled data (2012-2014)

Table 9-6: Average Monthly Wind Speed derived from the De Groote Boom modelled data (2012-2014)

Wind Speed (m/s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	9.1	8.9	8.2	8.3	8.8	10.5	9.3	11.2	12.3	11.4	9.2	9.9	9.76
Monthly Min.	3.2	2.8	2.8	2.8	2.7	3.1	3.3	3.4	3.7	3.8	3.7	3.0	3.20

9.4.1.1.2.3 Relative Humidity

The data in Table 9-7 is representative of the relative humidity for the De Groote Boom mining permit area. The monthly maximum, minimum and mean relative humidity reported on. The monthly maximum relative humidity remains above 99.9 % for the year. The monthly minimum relative humidity recorded range between 18 % (March) and 36 % in June.

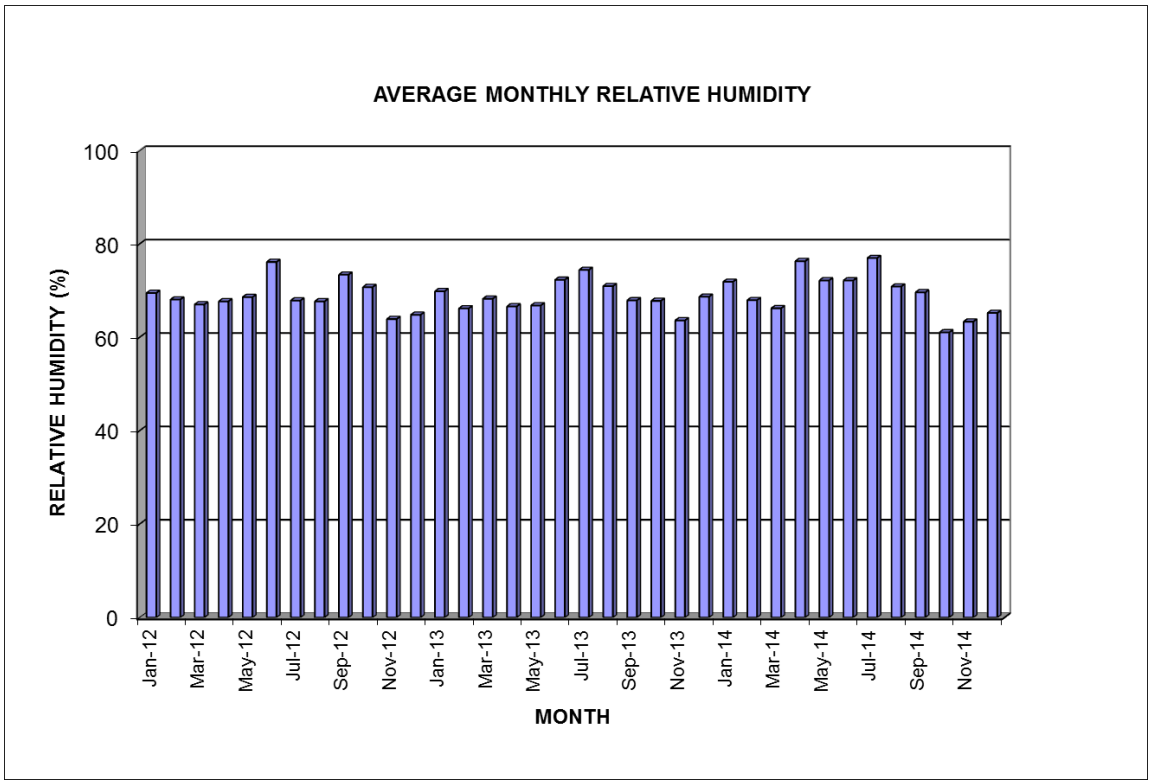


Figure 9-7: Average Monthly Relative Humidity derived from the De Groote Boom modelled data (2012-2014)

Table 9-7: Average Monthly Relative Humidity derived from the De Groote Boom modelled data (2012-2014)

Relative Humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
Monthly Min.	20.0	22.0	18.0	23.0	28.0	36.0	27.0	22.0	27.0	24.0	18.0	23.0	24.0
Monthly Mean	70.1	65.7	68.3	66.1	66.8	72.7	74.4	71.0	67.9	68.0	63.6	68.5	68.6

9.4.1.1.2.4 Precipitation

As shown in Table 9-9 below, the three year (2012-2014) annual total rainfall maximum and average for the De Groote Boom site are 1,249 mm and 788mm respectively. The highest total monthly precipitation (488 mm) was observed in January. The rate decreases down to1 mm in May. The maximum total rainfall and averages observed for each month over the three year period under survey are depicted in Figure 9-8 below.

Historical monthly rainfall statistics in the vicinity of proposed mining development were obtained from Lydenburg weather stations that had records 40 years rainfall data. The Lydenburg Weather Station (WD 0554816), located 45 km east of the project area at 25˚00' South and 30˚28' East. A summary of the mean monthly and mean annual rainfall at the Lydenburg stations is given in Table 9-8.

Table 9-8: Average monthly rainfall in the region of the Project at the nearest SAWS stations

STATIONS	
Station name	**Lydenburg**
SAWS Station No.	0554816 W
Latitude	25°06’ S
Longitude	30°28’ E
Altitude (m)	1412
Length of record	1960 – 2000
RAINFALL (mm)	
January	137.8
February	78.1
March	75.0
April	47.5
May	16.0
June	5.9
July	5.5
August	10.1
September	24.6
October	66.1
November	126.3
December	118.4
Annual	**711.3**

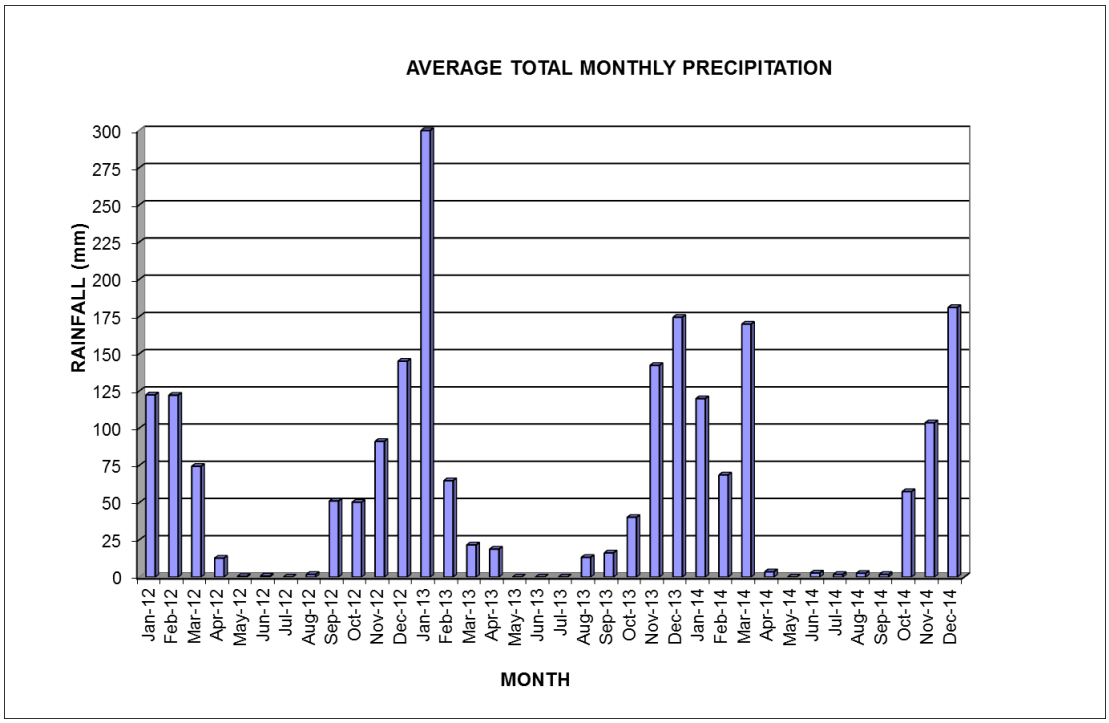


Figure 9-8: Average Monthly Precipitation derived from the De Groote Boom modelled data (2012-2014)

Table 9-9: Average Monthly Precipitation derived from the De Groote Boom modelled data (2012-2014)

Precipitation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Total Monthly Rainfall (Max).	488	122	170	19	1	3	2	13	51	57	142	181	1249
Average Total Monthly Rainfall	244	85	89	12	0	1	1	6	23	49	112	167	788

9.4.1.1.2.5 Evaporation

The South African Weather Station in Lydenburg is the only station with evaporation data in the surrounding area. Mean monthly S-pan evaporation data shows that the evaporation exceeds precipitation. It was assumed that the evaporation statistics for the SAWS Lydenburg Weather Station is similar to that at the proposed mining development. The 25 years of evaporation data generated for the SAWS Lydenburg Weather Station is displayed below (Table 9-8).

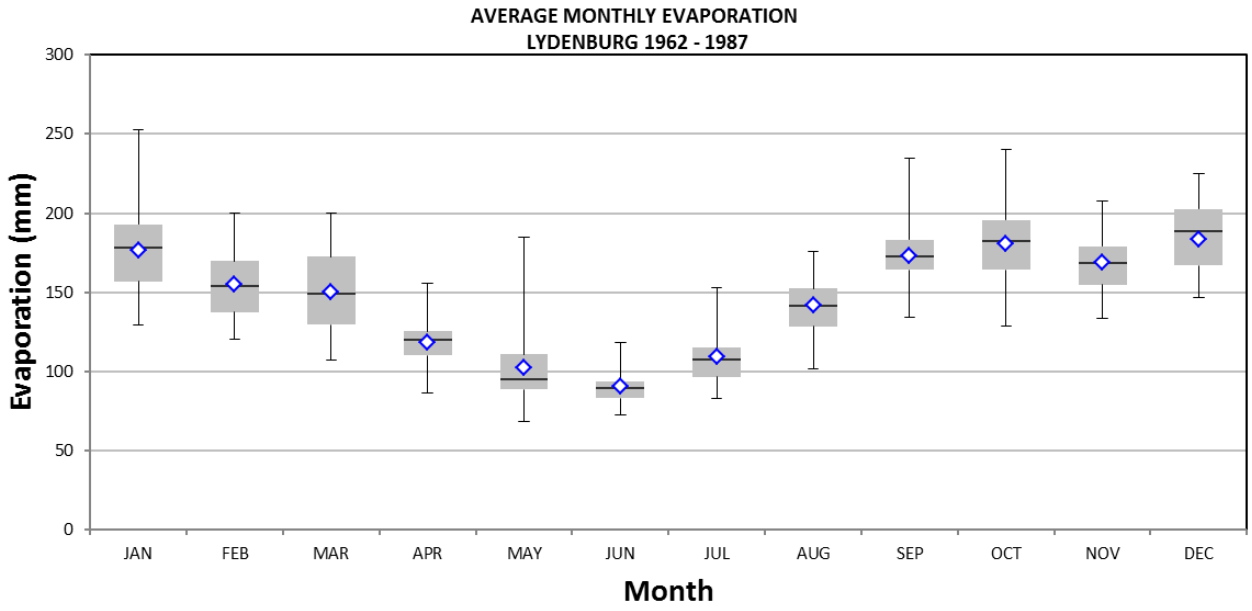


Figure 9-9: Average Monthly Evaporation for Bethal S-Pan Evaporation Station (1963 – 1987) (Source: South African Weather Service)

Table 9-10: Maximum, minimum and mean monthly evaporation rates for the Bethal (Symon's Pan) S-Pan evaporation station for 1963-1987 period (South African Weather Service)

Evaporation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	253	200	200	155	185	118	153	176	235	240	208	225	196
Monthly Min.	129	121	107	87	69	73	83	102	134	129	134	146	109
Monthly Mean	177	155	150	118	102	90	109	142	173	180	169	183	146

9.4.1.1.3 Geology

The mafic layered Bushveld Complex is dated 2.06 Ga and has an aerial extent of approximately 66,000 km^2 and is situated in the north eastern extremities of South Africa, on the Kaapvaal Craton (Mfayela, 2013). It comprises four major zones: the mafic-ultramafic Lower and Lower Critical Zones, the Upper Critical Zone, the Main Zone, and the Upper Zone (Mfayela, 2013) (Plan 5 - Local Geology, Appendix A).

De Grooteboom 373 KT is situated on the Eastern Lobe of the Bushveld Complex in the Mpumalanga Province of South Africa. The farm is on Lower Zone and Lower Critical Zone rocks and thus has chromitite potential. The licence area is situated near three operating chromitite mines namely, Dwarsrivier Chrome Mine, Thorncliffe Chrome Mine and Tweefontein Chrome Mine (Mfayela, 2013). The farm Dwarsrivier 372 KT on which Two Rivers Platinum Mine is located is underlain by rocks of the Winnaarshoek and Winterveld Norite-Anorthosite formations of the Rustenburg Layered Suite. These formations comprise alternating layers of chromatite, pyroxenite, norite and anorthosite (GCS, 2013). The outcrop

of the Winterveld Norite-Anorthosite formation, which hosts the platiniferrous UG-2 chromatite layer and Merensky Reef, is orientated north/south.

The Merensky unit is the thinnest cyclic unit and defines a transition to the main zone and is mainly overlain by a feldspathic pyroxenite that may be pegmatitic and typically consist of chromitite, pyroxenite, thin norite and anorthosite. The UG2 chromitite reef, which may be up to 1.2 m thick, contains minimal sulphide, but still carries a similar PGE grade to the Merensky reef (GCS, 2013). Within the TRP UG2 seam there may also be internal pyroxenite partings, which in cases may result in split reef facies whereby the UG2 is separated into two or three seams especially in the southern-most portion of the property (GCS, 2013). From a site specific and chromite economic perspective, the Lower Critical Zone hosts the LG6 and MG1 & 2 chromitite layers, the Upper Critical Zone the MG3 & 4 and UG1 & 2. The Main Zone and Upper Zone host no chrome potential (Mfayela, 2013).

The mapping and preliminary resource estimation of the proposed mining permit area was done by GeoActiv in 2013 with the following summary from their Report (Kruger, 2013).

The stratigraphic data and the mapping indicate that there is about 6 m of chromitite on De Groote Boom. The MG1 to MG3 are grouped together in 14 m of rock of which 4 m comprises chromitite. Above the MG3 there is 23 m of noritic rocks and then a 2 m thick combined MG4 A & B. The chromitite dips quite gently towards the northwest at 8° (Kruger, 2013). The gentle dip towards the west will aid mining if access is from the west. Assuming that the maximum high-wall will be 40 m, given the favourable inclination of the rocks, it is possible to calculate the area and hence the tonnage available for mining.

The total potential mineable tonnages indicates that the bottom layers (MG1-MG3) will be mined as a group and that MG4 will be mined on a second bench higher up. The areas that will be mined is therefore the maximum height of the first bench (40 m) and then a second bench of 40 m allows a significant tonnage of chromitite to be accessed as gravity aids the mining process (Kruger, 2013).

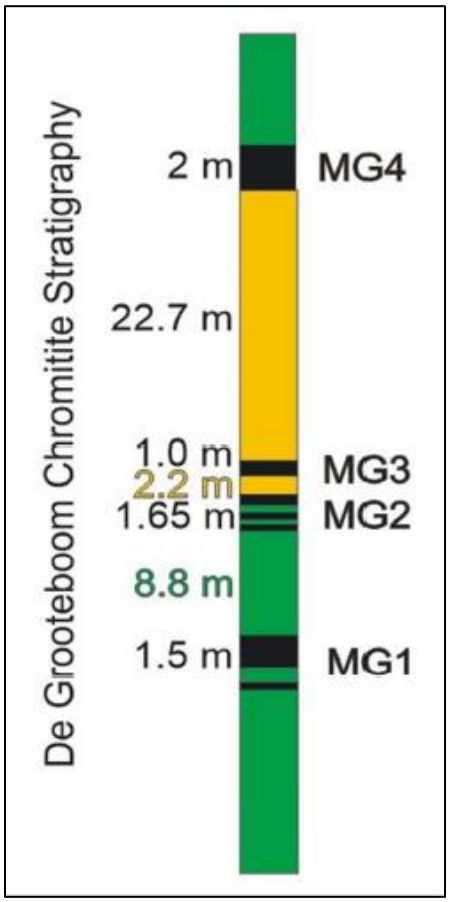


Figure 9-10: De Grootebooom stratigraphy (Kruger, 2003)

9.4.1.1.4 Noise

The results from the noise meter recordings for all the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 9-11 (Plan 6 - Noise Monitoring Locations, Appendix A). A detailed noise report can be found within Appendix E.

The noise level time history graphs per noise measurement location can be seen in Figure 9-11.

Table 9-11: Results of the baseline noise measurements

Sample ID	SANS 10103:2008 rating limit					
	Type of district	**Period**	**Acceptable rating level dBA**	**$L_{Areq,T}$ dBA**	**Maximum/Minimum dBA**	**Date**
N1	Rural	Daytime	45	47	84 / 26	01/04/2015
		Night time	35	45	74 / 33	01/04/2015
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit					

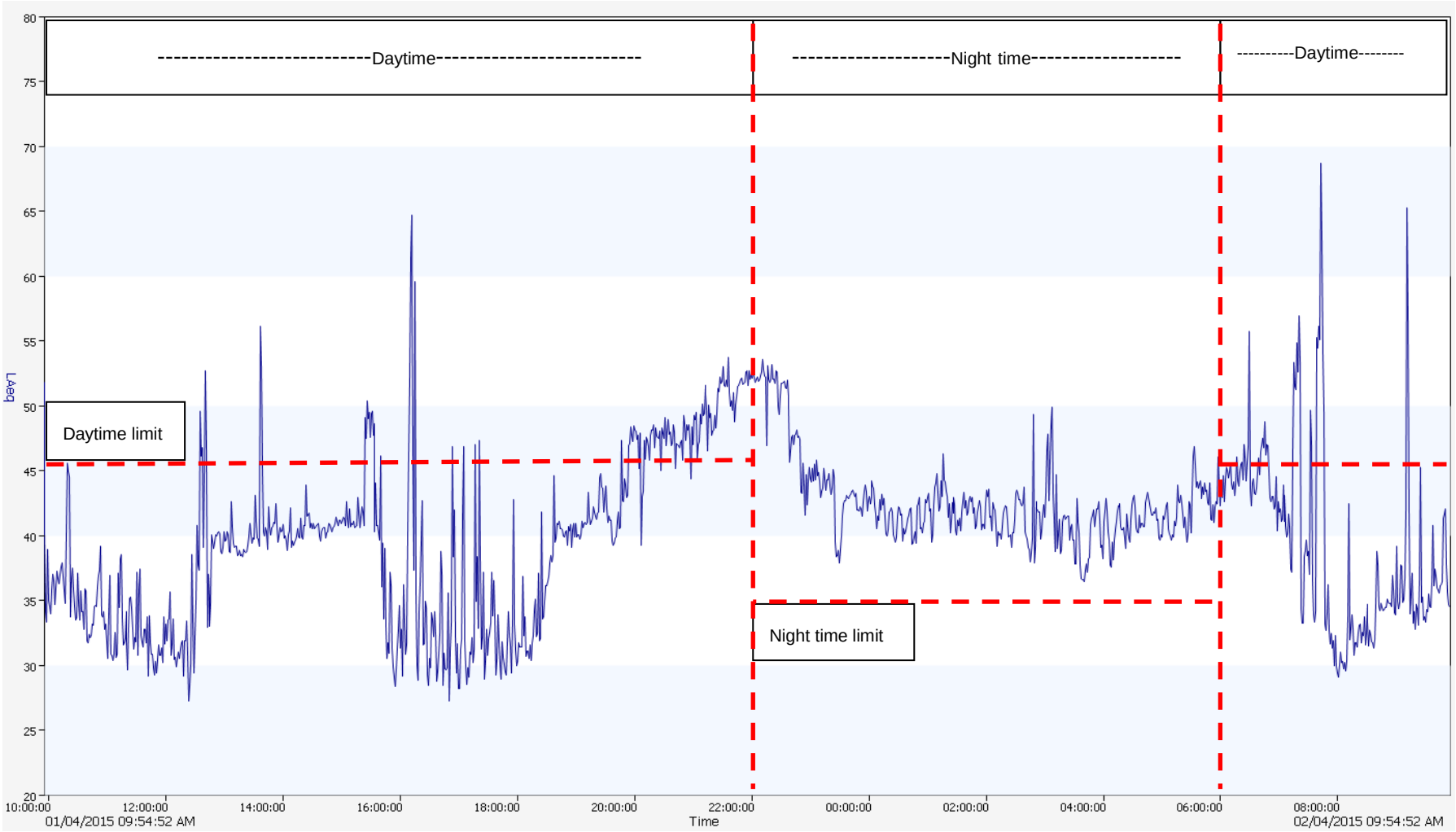


Figure 9-11: Noise time history graph for receptor N1

9.4.1.1.4.1 Daytime Results

Based on the daytime results, the existing ambient noise levels (47dBA) are slightly above the SANS rating levels for the maximum allowable outdoor daytime limit (45dBA) for ambient noise in rural districts. The main contributing noise sources were mainly dogs barking and occasional birdsong and vehicle movement.

9.4.1.1.4.2 Night Time Results

Based on the night time results, the existing ambient noise levels (45 dBA) are above the SANS rating levels for the maximum allowable outdoor night time limit (35 dBA) for ambient noise in rural districts. The main contributing noise sources causing the higher levels are insect noise during the night time.

9.4.1.1.5 Fauna and Flora

The relevant plans relating to the fauna and flora specialist study will be found in Appendix A. A detailed biodiversity report is found within Appendix F.

9.4.1.1.5.1 Fauna

From the desktop study conducted for the Project area, the species listed in Table 9-12 were identified as being possible to occur within the Project area or the immediate vicinity of the proposed mining permit area. It must be noted that some of these species are very sensitive to habitat and in some instances; the likeliness for them to occur is minimal. Red Data and protected mammal species, indicated in Table 9-12 are listed as rare, threatened or endangered, mostly because of their preferred habitat being destroyed or altered, this would include predominantly the terrestrial mammal species such as the South African Hedgehog (*Atelerixs frontalis*), Pangolin (*Manis temminckii*), or because of persecution as is the case with the Serval (*Leptailurus serval*) and the African Leopard (*Panthera pardus*). Relatively unspoilt habitat exists within the vicinity of the study area and although the presence of many of these species is not confirmed, there is a possibility that they may still occur on site.

Table 9-12: Mammal Species of Special Concern that are likely to occur on site

Scientific name	Common name	SA Red Data status	Recorded on site
Amblysomus septentrionalis	Highveld Golden Mole	Near Threatened	
Atelerixs frontalis	South African Hedgehog	Near Threatened	
Chrysospalax villosus	Rough-haired Golden Mole	Critically Endangered	
Cloeotis percivali	Short-eared Trident Bat	Critically Endangered	
Dasymys incomtus	Water Rat	Near Threatened	

Scientific name	Common name	SA Red Data status	Recorded on site
Hyaena brunnea	Brown Hyaena	Near Threatened	x
Leptailurus serval	Serval	Near Threatened	
Lutra maculicollis	Spotted-necked Otter	Near Threatened	
Manis temminckii	Pangolin	Vulnerable	
Mellivora capensis	Honey Badger	Near Threatened	
Miniopterus schreibersii	Schreiber's Long-fingered Bat	Near Threatened	
Myotis tricolor	Temminck's Hairy Bat	Near Threatened	
Myotis welwitschii	Welwitsch's Hairy Bat	Near Threatened	
Pipistrellus rusticus	Rusty Bat	Near Threatened	
Raphicerus sharpie	Sharp's Grysbok	Near Threatened	
Rhinolophus clivosus	Geoffrey's Horseshoe Bat	Near Threatened	
Rhinolophus darlingi	Darling's Horseshoe Bat	Near Threatened	
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	Near Threatened	
Rhinolophus landeri	Lander's Horseshoe Bat	Near Threatened	

Field Investigation Findings

According to the farm owner of the property where the proposed mining permit area is located, both the Brown Hyaena (*Hyaena brunnea*) and the African Leopard (*Panthera pardus*) (both listed as NT) have recently been observed on the property (This discussion was held on the 9th September 2014).

Very few wild mammal species were observed during the site investigation from the 8th to the 9th September 2014; however, the signs of many species from droppings, scats and spoor were identified. The Wahlberg's Epualetted Fruit Bat *(Epomophorus wahlbergi)* roost and the small troop of Vervet Monkey *(Chlorocebus pygerythrus)* were observed in the *Acacia* woodland at the entrance to the property.

9.4.1.1.5.2 Avifauna

Birds were recorded at several preferred areas within the proposed bulk sampling area, as well as generally throughout the site. Points were chosen near avifaunal zones of influence

such as areas where bird parties and colony nesting were evident, as well as in areas of less impacted vegetation type as described by the vegetation assessment. All opportunistic sightings were also recorded throughout the prospecting right area. A total number of 39 species were directly observed throughout the property by the specialist in September 2014. Although no Red Data species were observed, regionally uncommon species were identified and included species such as the Mountain Wagtail (*Motacilla clara*), Lizard Buzzard (*Kaupifalco monogrammicus*) and Red-billed Oxpecker (*Buphagus erythrorhynchus*) – all photographed below. These species were all observed at the base of the koppie where the proposed mining will take place.

Within the actual mining permit area a number of regionally uncommon species were observed, none of which are species of special concern or Red Data. These included notable species such as Freckled Nighjar (*Caprimulgus tritigma*), Lazy Cisticola (*Cisticola aberrans*) and Sentinal Rock Thrush (*Monticola exploratory*) all of which prefer the rocky outcrop micro habitats available throughout the site.

9.4.1.1.5.3 Flora

The study area is characterised by high plant diversity and endemism, with many edaphic plant specialists. Many of the species are xerophytic with adaptations such as succulence and underground storage organs. The species list of plants recorded on site amounted to 42 plant species, although many more may occur. Alien invasion was limited (to one species) and the vegetation resembled the regional vegetation type in which the study occurs. Although cattle were present at lower elevations in the prospecting right area, the Project area was not susceptible to overgrazing due to the high elevation and lack of many palatable grasses.

Three broad habitats were identified:

- Rocky outcrops at the peak of koppies;
- Thicket associated with drainage lines and
- Open rocky savanna along slopes of the De Grooteboom koppie.

Further classification of the site into vegetation units will be done during the Environmental Impact Assessment (EIA) phase.

Rocky outcrops, found at the peak of koppies, were typified by woody species: Stamvrug (*Englerophytum magalismontanum*) and Mountain Kirkia (*Kirkia wilmsii)* succulents: *Crassula alba*, Lydenburg Na-boom *(Euphorbia lydenburgensis*), *Opuntia stricta* and forbs: False Horsewood (*Hippobromus pauciflo*rus) and Mother-in-law's Tongue (*Sansevieria hyacinthoides*).

Thicket vegetation was found to be associated with drainage lines over a substrate of loose rocks. Plant species found here included: Stamvrug (*Englerophytum magaliesmontanum*), Blou Guarri (*Euclea crispa*), Sekhukhune Grape (*Rhoicissus sekukhuniensis*) and Bitter Grape (*R. tridentata*), Sekhukhune Currant (*Searsia sekhukhuniensis*) and Stapelioid Kleinia

(*Kleinia stapeliiformis*). Although these species are strictly terrestrial, the drainage lines are regarded as wetlands based on their position in the landscape. Rainfall in the area is relatively low and as a consequence, typical wetland species such as sedges and hydromorphic grasses.

The majority of the study area was classified as open rocky savanna. The landscape was undulating and soils were shallow owing to the dominance of rocks as a substrate. Woody species: Mountain Cabbage Tree (*Cussonia transvaalensis*), Willow Beechwood (*Faurea saligna*), Common Sugar Bush (*Protea caffra*), Mouse-eared Combretum (*Combretum hereroense*) and Large-fruited Bushwillow (*C. zeyheri*); forbs such as: Gazania sp., Ledebouria sp. and Rhynchosia komatiensis; succulent plant: Aloe marlothii and xerophyte: Black-stick Lily (*Xerophyta retinervis*) were common in this habitat. Many grasses were unidentifiable, as they were not in seed or had died back during the winter months. Common grasses observed during the site visit included: Turpentine Grass (*Cymbopogon popschillii*) and Perrenial Love Grass (*Eragrostis nindensis*).

Flora Species of Special Concern

The PRECIS database lists six national Red Data species for the QDS 2340CC. Species that are provincially protected have been listed under Schedule 12 of LEMA (2003). One national red data plant was recorded on site, namely: *Searsia sekhukhuniensis* (Rare). This species was found along rocky slopes and in non-perennial drainage lines.

The study area was found to be rich in endemic species. Endemism is the ecological state where species are confined to a specific region or habitat. Four endemic species were recorded on site (refer to Appendix F), although additional species may occur. Euclea species A (Schmidt et al. 2004), which is similar to E. linearis, has not been taxonomically classified as yet. This highlights the need for further taxonomic study in the SCPE. One red data species, Searsia sekhukhuniensis, was recorded and has been allocated a ‘Rare’ status.

Ethnobotanical plant species

Ethnobotany is a branch of botany that focuses on the use of plants for medicines and other practical purposes. The use of native plants for ethnobotanical uses can be detrimental to populations that are overexploited.

South Africa has a rich diversity of medicinal plants that not only have a global significance, but also have a cultural and historical role (van Wyk et al. 2009). There is a rapidly growing concern for conservation of medicinal plants that are dwindling in number due to illegal harvesting (Institute of Natural Resources 2003). This is particularly apparent in rural areas where medicinal plants are overexploited by traditional doctors. The medicinal species recorded in the mining permit area were *Aloe marlothii, Euclea undulate, Sansevieria hyacynthoides* and *Xerophyta retinervis*. It is likely that species recorded on site, that are endemic to the SCPE, may harbour medicinal uses but studies are yet to be done to confirm this.

9.4.1.1.6 Topography

Several mining operations exist in the vicinity of the Project area. The closest of these is the Motomolo Mine located to the south-west, Dwars River Mine to the east and the Eastern Chrome Mines to the north. The mining operations area is situated in the north-western corner of the prospecting area and covers an area of approximately 2.26 ha.

The topographical model indicates that the elevation of the mining permit area decreases from 1320 metres above mean sea level (mamsl) in the north-east to 1040 mamsl in the south-west (Plan 7 - Topography, Appendix A). Refer to Appendix G for a detailed Visual Impact Assessment.

The majority of the mining permit area has gentle slopes of between 0° and 8°. Moderate slopes of between 9° and 17° occur in some areas. The steepest slopes occur on the ridges and range from 18° to 58°. The mining permit area is located on a ridge and has isolated slopes of between 0° and 19°. The majority of slopes in the mining permit area are between 20° and 47°.

The Project area and surrounds have an undulating topography, hence the slope aspect / direction of the prospecting area is not in any specific direction. The sides of the ridges and valleys slope in various different directions.

There are ridges running along the eastern side of the prospecting area. Ridges also occur in the south-west of the prospecting area along the banks of the Dwarsrivier River and there is a ridge in the north-eastern part of the prospecting area. The mining permit area is on this ridge in the north-western part of the prospecting area. The Dwarsrivier River flows in a north-westerly direction through the south-western corner of the prospecting area. Several non-perennial streams drain the prospecting area in a westerly and south-westerly direction towards the Dwarsrivier River.

The mining permit area is located on a ridge and the majority of the mining permit area has steep slopes of between 19° and 68° and isolated slopes are between 19° and 41°.

9.4.1.1.7 Soils

The Project area is dominated by shallow rocky soils (Mispah/Glenrosa) on the upper slopes. The flatter slopes shows accumulation of soil and the dominant soil in the downslope region is the deep well drained Hutton soil. Refer to Appendix H for a detailed Soil Report.

The lower slopes are used for subsistence grazing and as a result there is evidence of overgrazing. Large areas have been eroded. The combination of high runoff velocity from the steep slopes and the reduced ground cover (overgrazing) in the lower slopes has contributed significantly to the erosion of the soils in the lower landscape positions. Table 9-13 below summarises the soil, slope, land capability and land potential within the Project area.

Table 9-13: Summary of soil forms, slopes, land capability, and land potential.

Soil form	Slope (%)	Final Land Capability Class
Hutton (Hu)	4	III (Moderate Cultivation)
Glenrosa (Gs)	<5	IV (Low Coltivation / Intensive Grazing)
Glenrosa (Gs)	>5	VI (Moderate Grazing)
Mispah (Ms)	<5	VI (Moderate Grazing)
Mispah (Ms)	>5	VIII (Wilderness)

9.4.1.1.7.1 Dominant soils found

Details of the three dominant soils (Mispah, Glenrosa and Hutton) found within the study area are provided in the following sections (Plan 8 - Soil Forms, Appendix A).

Mispah

The Mispah soil form is an Orthic topsoil on hard rock. These soils are shallow as shown in Figure 9-12. These soils have a limited rooting depth.

Figure 9-12: Mispah soil at the De Groote Boom Project area

Glenrosa (Gs)

The Glenrosa soil form is an Orthic topsoil on a weather rock material. These soils are generally shallow as shown in Figure 9-13. These soils have a limited rooting depth.

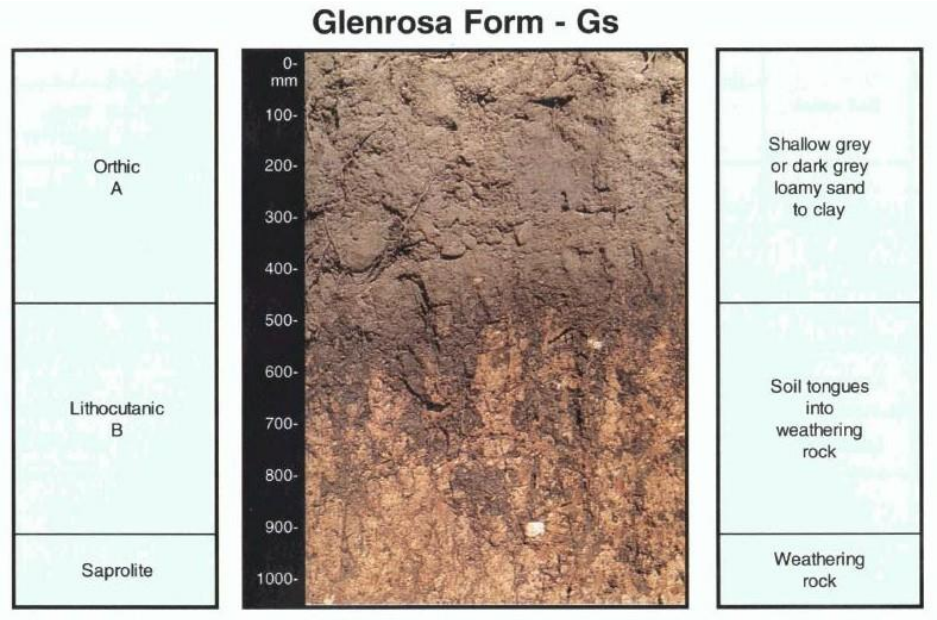


Figure 9-13: The Glenrosa soil form (SASA, 1999)

Hutton (Hu)

The Hutton soil form as shown in Figure 9-14 consists of an Orthic A, Red apedal B, and an unspecified C horizon which could be hard rock, saprolite, or unknown as no limiting layer was identified. These soils are freely drained and as a result, can be slightly acidic due to the low Cation Exchange Capacity (CEC) and thus the low base status. These soils are prime soils for irrigated crop production; however they are marginal to good in dry land conditions.

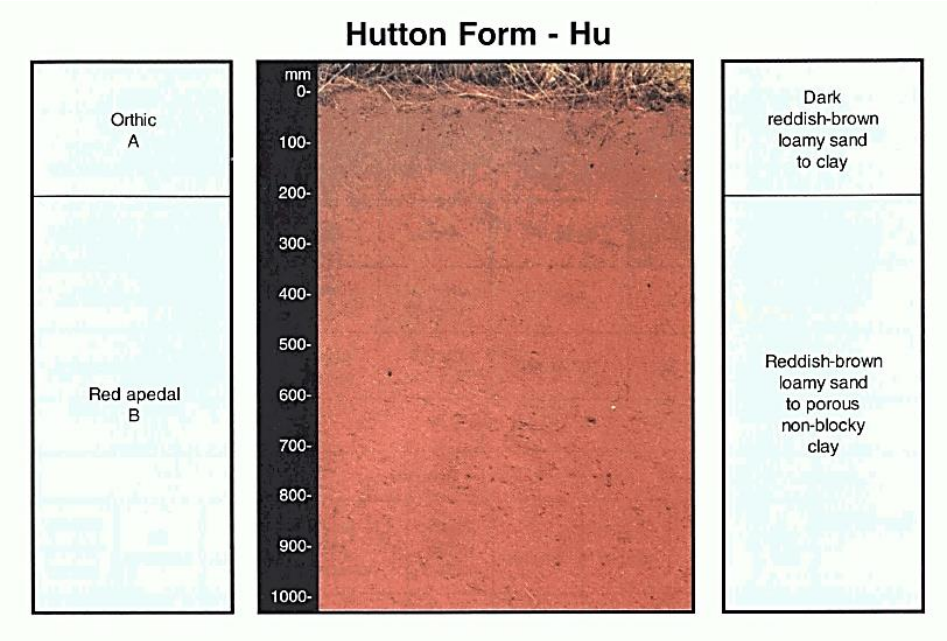


Figure 9-14: The Hutton soil form (SASA, 1999)

9.4.1.1.7.2 Land Capability

Land capability is determined by a combination of soil, and terrain features. An indication is given about the permanent limitations associated with the different land use classes based on the soil physical properties as well as the slope of an area.

The dominant land capability for the area is the Class VI (Moderate Grazing) and Class VIII (Wilderness) (Plan 9 - Land Capability, Appendix A). These are mainly due to the steep slopes. On the footslopes where the slopes are less than 5 % the shallower soils (Mispah/Glenrosa) have a Class IV (Low Cultivation/ Intensive Grazing) land capability. The deeper Hutton soils have Class III (Moderate Cultivation) land. The calculations are shown in the summary Table 9-14.

Table 9-14: The land capability assessment results

Soil form	Depth (m)	Clay (%)	Slope (%)	Permeability Class	Land Capability	Permeability Adjustment	Wetness Adjustment	Rockiness Adjustment	Surface crusting Adjustment	Final Land Capability Class
Hutton (Hu)	>0.6	6	4	3	III (Moderate cultivation)	No Change	W0	R0	t0	III (Moderate cultivation)
Glenrosa (Gs)	0.3	6	<5	3	IV (Low cultivation/ Intensive Grazing)	No Change	W0	R 4	t0	IV (Low cultivation/ Intensive Grazing)
Glenrosa (Gs)	0.3	6	>5	3	VI (Moderate cultivation)	No Change	W0	R 4	t0	VI (Moderate grazing)
Mispah (Ms)	0.3	6	<5	3	VI (Moderate cultivation)	No Change	W0	R 4	t0	VI (Moderate grazing)
Mispah (Ms)	0.3	6	>5	3	VIII (Wilderness)	No Change	W0	R 4	t0	VIII (Wilderness)

9.4.1.1.7.3 Current Land Use

The land use dominating the Project area is natural veld. It has, however been used in some parts for subsistence grazing by the surrounding community. There are portions downslope that show signs of erosion as shown in Figure 9-15.

Figure 9-15: Downslope area, within the De Groote Boom Project area which has been affected by erosion (area indicated by white arrow)

9.4.1.1.8 Surface Water

The specialist surface water report is attached as Appendix I.

On a regional outlook, the De Groote Boom Project is located in the Olifants Water Management Area (WMA-04) within the B41 tertiary drainage region. The Project area is specifically within the B41G quaternary catchment drained by the Groot Dwars River and the Klein Dwars River (Plan 10 - Quaternary Catchments, Appendix A).

On a more local perspective, the Project is located at the foot of a koppie located in the upstream catchment to the tributaries of the Groot Dwars River. The Groot Dwars River flows about 1.5 km to the west of the Project area, in a northern direction. The Groot Dwars River eventually flows into the Steelpoort River which is the major river in the B41 tertiary drainage and flows into the Olifants River.

9.4.1.1.8.1 Surface water quality

Water samples were taken on a site visit conducted on 15 April 2015 at the locations in Table 9-15 and indicated in Plan 11 - Surface Water Sampling Points, Appendix A.

Table 9-15: Surface water quality sampling sites

Sampling Site	Latitude*	Longitude*
SW01	-24.955136º	30.127525º
SW02	-24.928317º	30.108428º
SW03	-24.909045º	30.105407º
SW04	-24.899137º	30.108821º
SW05	-24.888259º	30.112105º
SW06	-24.884455º	30.112247º

*All coordinates in geographic (latitude and longitude) coordinate system, WGS 1984 datum

The water samples were collected as grab samples and were submitted to Aquatico Laboratories (Pty) Ltd, a South African National Accreditation System (SANAS) laboratory for analysis. The water quality results were compared to the South African National Standards (SANS) 241-1:2011 for drinking water quality. Table 9-16 indicates the results.

Results indicated good water quality in terms of SANS 241-1:2011 at all sampling sites with all analysed parameters well within the aesthetic and maximum allowable limits for drinking water quality.

Table 9-16: Water Quality Results for Samples taken on the 15 April 2015 compared to the SANS 241-1:2011 Drinking Water Standards

Sampling Point	Total Dissolved Solids (mg/L)	Nitrate NO_3 as N (mg/L)	Chlorides as Cl (mg/L)	Total Alkalinity as $CaCO_3$ (mg/L)	Sulphate as SO_4 (mg/L)	Calcium as Ca (mg/L)	Magnesium as Mg (mg/L)	Sodium as Na (mg/L)	Potassium as K (mg/L)	Iron as Fe (mg/L)	Manganese as Mn (mg/L)	Conductivity at 25° C (mS/m)	pH-Value at 25° C (pH units)	Aluminium as Al (mg/L)	Fluoride as F (mg/L)	Total Hardness (mg/L)
(Aesthetic water quality - recommended)	<1200	<10	<300	N/S	<250	<150	<70	<200	<50	<0.3	<0.1	<170	5-9.5	<0.3	<1	200
(Drinking water quality - maximum allowable limit)	2400	11	600	N/S	500	300	100	400	100	2	0.5	370	4-5 or 9.5-10	0.5	1.5	300
Exposure Duration (years)	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs
SW01	109	1.14	2.77	98	5.64	17.9	12.6	4.67	0.72	0.004*	0.002*	21.5	8.51	0.002*	0.21*	97
SW02	121	1.90	3.63	103	6.78	18.6	14.6	5.05	0.73	0.004*	0.002*	23.1	8.35	0.002*	0.21*	107

Sampling Point	Total Dissolved Solids (mg/L)	Nitrate NO_3 as N (mg/L)	Chlorides as Cl (mg/L)	Total Alkalinity as $CaCO_3$ (mg/L)	Sulphate as SO_4 (mg/L)	Calcium as Ca (mg/L)	Magnesium as Mg (mg/L)	Sodium as Na (mg/L)	Potassium as K (mg/L)	Iron as Fe (mg/L)	Manganese as Mn (mg/L)	Conductivity at 25° C (mS/m)	pH-Value at 25° C (pH units)	Aluminium as Al (mg/L)	Fluoride as F (mg/L)	Total Hardness (mg/L)
(Aesthetic water quality - recommended)	<1200	<10	<300	N/S	<250	<150	<70	<200	<50	<0.3	<0.1	<170	5-9.5	<0.3	<1	200
(Drinking water quality - maximum allowable limit)	2400	11	600	N/S	500	300	100	400	100	2	0.5	370	4-5 or 9.5-10	0.5	1.5	300
Exposure Duration (years)	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs
SW03	130	1.71	3.64	114	5.93	21.1	15.1	5.77	0.74	0.004*	0.002*	24.6	8.31	0.002*	0.21*	115
SW04	137	1.89	3.22	122	5.64	22.0	15.9	6.30	0.75	0.004*	0.002*	25.0	8.28	0.002*	0.21*	120
SW05	142	2.46	3.72	123	6.56	21.6	15.8	7.23	0.72	0.004*	0.002*	26.2	8.32	0.002*	0.21*	119
SW06	137	2.35	9.85	104	7.16	21.5	16.0	7.52	0.77	0.004*	0.002*	26.6	8.29	0.002*	0.21*	120

9.4.1.1.9 Groundwater

The groundwater specialist report is attached in Appendix J.

9.4.1.1.9.1 Hydrocensus

A hydrocensus was conducted in April 2015 during which existing boreholes (used and unused) were visited and data collected for input into the conceptual and analytical groundwater models and to serve as a baseline groundwater quality data set (Plan 12 - Hydrocensus Monitoring, Appendix A).

9.4.1.1.9.2 Groundwater quality

Eight (8) samples were taken during the hydrocensus and submitted to an accredited laboratory (Aquatico (Pty) Ltd) for water quality analysis.

From the piper diagram shown in Figure 9-16, all samples plot in the left hand quarter indicating a recently recharged or fresh water facies with a Ca/Mg-HCO3 water type. The physical parameters pH, total dissolved solids (TDS) and electrical conductivity (EC) all fall within the recommended ranges and is safe for consuming.

The following conclusions can be reached from the classification of the data against the SANS guidelines:

- All samples and parameters fall within the recommended concentrations ranges except for GBBH4;
- GBBH4 has elevated values of NH4 (4.14 mg/L) above the recommended 1.5 mg/L;
- NH4 is however a common chemical compound found in water and mostly only causes and aesthetic problem with taste and odour; and
- All samples are thus safe for consumption with the baseline water quality of the sampled areas being of good quality.

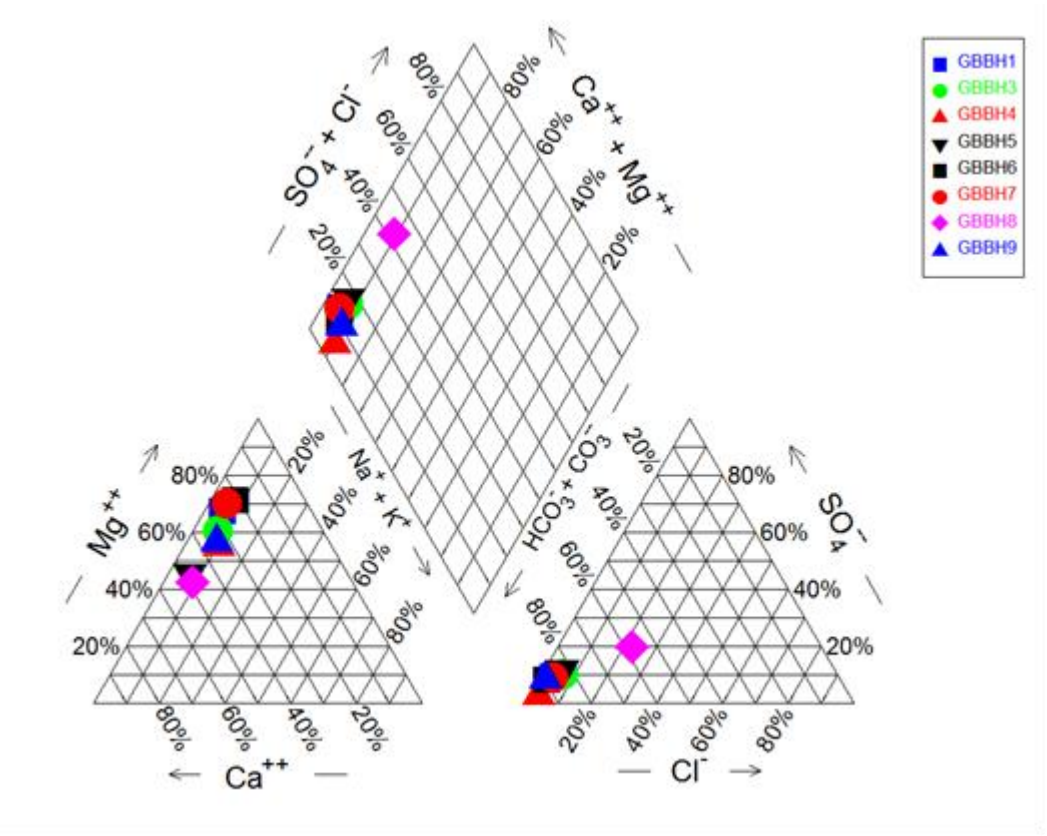


Figure 9-16: Hydrocensus piper diagram

9.4.1.1.10 Social

The Project area is situated in Ward 31 of the Greater Tubatse Local Municipality (GTLM) which is part of the Greater Sekunkune District Municipality (GSDM) in Limpopo Province. The Project shares its border (eastern Project border) with Ward 5 of the Thaba Chweu Local Municipality (TCLM) in Mpumalanga Province. The assessment and presentation of the of the social baseline was carried out through the

The socio-economic characteristics of the Project area within the predetermined study areas are summarised below. A detailed social report is attached in Appendix K.

9.4.1.1.10.1 Population and Demographics

The population of Limpopo Province in 2011 was approximately 5.4 million (Stats SA, 2011). Limpopo Province is divided into five municipal districts: Capricorn, Sekhukhune, Waterberg, Mopani and Vhembe. Ward 31 of the GTLM and Ward 5 of the TCLM have similar surface areas while Ward 18 of the GTLM is much smaller. Each of these wards has similar populations, highlighting the higher population density in the far smaller Ward 18. However, most of this population is accounted for by Burgersfort Town.

The GSDM demonstrate age distributions that are typical of populations with a high growth rate, in that the largest proportions of the population are found in the youngest age brackets.

The dominant language in both the local and regional study areas is Sepedi, with 89% of the GTLM speaking the language, and 75% of the population from Ward 31 (GTLM) speaking Sepedi (Stats SA, 2013).

9.4.1.1.10.2 Educational Status

According to Stats SA (2011), the Limpopo Province educational development is lagging behind those of other provinces. There are 247 schools (primary and secondary) situated in GTLM. Steelpoort and Ohrigstad each have one primary school, with Burgersfort having additional private primary schools and 15 Adult Basic Education and Training (ABET) institutions.

The average population within the GTLM show better education standards than that of the wider GSDM. This trend is reflected in Wards 31 (GTLM) as well. The best education levels exist in Ward 18 (GTLM) with only 5 % of this population having no access to schooling and as much as 27% completing secondary school. Ward 31 (GTLM) and Ward 5 (TCLM) on the other hand, more closely resembles the local and district municipal levels, in that most of the adult population is poorly educated (Stats SA, 2013).

9.4.1.1.10.3 Economic Background

The economy of GSDM depends largely on mining, agriculture, trade and government services. Although agriculture seems to dominate most land use, most of the land that is under cultivation is used for subsistence purposes, with only 30% of the land being under commercial farming. Mining is one of the more dominant economic activities in the GSDM.

Tourism and eco-tourism has the potential to boost the economy in the regional study area but has not been fully developed yet, requiring more attention and consideration (GTLM, 2014).

9.4.1.1.10.4 Employment and Household Income

Ward 31 and Ward 18 of the GTLM show substantially higher employment levels when compared to the regional study area. Ward 5 (TCLM) also shows better employment figures, however, it was indicated during the site visit, that most employment in the Lydenburg/Mashishing area is associated with agriculture and not mining (Stats SA, 2013).

The high unemployment rate in the regional study area (GTLM and the GSDM), is highlighted by the fact that as much as 88% of households in the GSDM survive on R6 400 or less per month, whilst 15% of households had no recorded income. In the GTLM, 85% of households find themselves in a similar position, with 16% having no recorded income. Wards 31 and 18 (GTLM) and Ward 5 (TCLM) show better income earnings than the regional statistics, with 69% of households in Ward 18 and 77% in Ward 31 surviving on R6 400 a month. Although this shows an improvement to economic conditions in the local study area, these figures are still concerning.

9.4.1.1.10.5 Social Infrastructure and Services

The majority of residents at both the local and regional level have access to brick or concrete housing. Within the regional study area, the proportion of households with access to formal housing is higher than that of the local study area, with 89% of people in the GSDM having access to formal housing. Within Ward 31, around 63% of households have access to formal housing, whilst just less than a third (27%) of the population live in informal housing, and 4% live in traditional dwellings. These figures are similar to those wards in the remainder of the local study area.

When looking at the access to improved sanitation in the regional study area, only 9% of the population have access to formal sanitation. The ward level data (local study area) shows that a larger proportion of the population have access to formal sanitation with, Ward 18 and Ward 31 having more than 40% of their population with access to formal sanitation and in Ward 5 (TCLM) this figure is more than 60% (Stats SA, 2013).

Ward 18 of the local study area has the highest proportion of people with access to formal water services (76% of households). Regionally, the provision of water through formal schemes is improving in the GSDM and GTLM. Conversely, in Ward 31 there are a high percentage of people (41%) who obtain water through groundwater extraction (Stats SA, 2013).

The main source of energy in both the regional and local study areas, according to Census 2011 data, is electricity, followed by wood and coal. Approximately 50% of the regional study area use electricity as their main energy source (Stats SA, 2013).

Formal refuse removal is almost entirely absent in the district and local municipalities. Only Ward 5 (TCLM) displays a large proportion of formal refuse removal, although this only represents 55% of households in the ward.

9.4.1.1.11 Heritage

A description of the heritage status of the Project area is set out below and contained within Appendix L.

9.4.1.1.11.1 Geology and Paleontological Sensitivity

The geology underlying the DGP the regional and local study areas is the Bushveld Complex. The Project area lies within the eastern limb of the Rustenburg Layered Suite that date from c. 2 050 Ma to around 2 000 Ma of the Eoproterozioc Era. The predominant rocks that comprise the Rustenburg Layered Suite include gabbro and gabbronorite – both igneous in origin and hence usually devoid of fossils.

9.4.1.1.11.2 Stone Age

Surface scatters of MSA and LSA lithics have been recorded throughout the region, however, these finds are commonly not found *in situ* and provide limited contextual

information. Three MSA surface occurrences were recorded within the local study area, approximately 1.5 km south from the Project area. These lithics were identified in eroded areas as isolated surface scatters and outside of discernible context, therefore providing limited scientific information beyond form, function and technique of manufacture.

Resounding rocks or “rock gongs” are features that are often associated with the San/Bushmen culture. These are natural occurring ironstone boulders that either rest on top of ironstone rocks or other rocks that have natural resonating qualities. While these features are natural and occur all over the country, not all show signs of human interaction and use.

The areas of the rock which were constantly beaten to produce sound show a distinct difference in surface patina to the surrounding cortex of the rock. The rocks were either beaten by hand or by using other rocks and pieces of wood. The “rock gongs” were often used in rain-making rituals and medicine dances in which the concussive and resonating sound helps the shaman enter a trace like state in which he/she enters the “Spirit World” to conduct ritual activities.

9.4.1.1.11.3 Farming Community

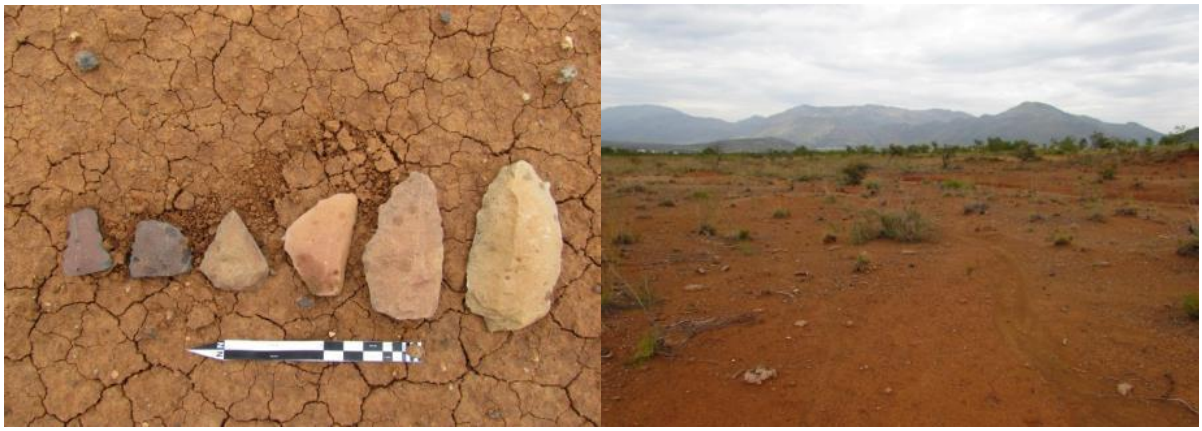
A concentration of *Doornkop* type ceramics was recorded 2.5 km south from the site specific study area. These ceramics were not found *in situ* and no other deposit are archaeological features were identified. Undiagnostic potsherds, lower grinding stones and collapsed stone walls have been recorded within 6.5 km of the Project area. Several communal grinding areas have also been recorded in the surrounding area, the closest can be found 14 km south.

9.4.1.1.11.4 Identified Heritage Resources

Through the HIA reconnaissance, a total of four heritage resources were identified within the site specific study area, described in Table 9-17 and shown in Plan 13 - Identified Heritage Sites, Appendix A. The two heritage resources identified as part of the HSR are also included in Table 9-17 below and in the impact assessment in Section 6.

It must be noted that the proposed power line does not form part of this MPRDA application, and any heritage resources identified near the power line will not be assessed as part of this application.

Table 9-17: Identified heritage resources

Site Name: UAR2967/SA/001	Co-ordinates: -24.926788/ 30.134758	Statement of Significance: Negligible
Description: MSA stone flakes (Figure 9-17) were identified on the surface in a large, extensively eroded area. Many of the tools show some signs of retouch and were made from rhyolite. There is an approximate density of one lithic per m^2 of the MSA tools over an area of approximately 100 m x 100 m. There may be potential deposit within un-eroded areas as the lithics appear to have washed out of the walls of the erosion gully and washed from a higher elevation. This eroded area is located to the west of a non-perennial stream. The MSA flakes are located 80 m from the proposed power line route.		
 Figure 9-17: MSA stone tools identified (left) within a heavily eroded area (right)		
Site Name: UAR2967/IA/002	**Co-ordinates: -24.923997/ 30.133677**	**Statement of Significance: Negligible**
Description: A single potsherd was identified within an eroded area located within 50 m the route of the proposed haul road (See Figure 9-18). The potsherd has a pronounced curve with no decoration. No other archaeological remains or deposit could be identified.		
 Figure 9-18: A single potsherd (left and middle) found near the proposed haul road route (right)		

Site Name: UAR2967/IA/003	Co-ordinates: -24.927510/ 30.135510	Statement of Significance: Negligible

Description: Two decorated ceramic potsherds recorded 10 m from erosion gully as shown in Figure 9-19 below. The decorations included a single line across a potsherd, while the other had a herringbone design. Dense grass cover was present and no other archaeological remains or deposit could be identified.

The potsherds are located 60 m from the proposed power line route.

Figure 9-19: Decorated potsherds (left) and area in which they were identified (right)

Site name: UAR2967/St/004	Co-ordniates: -24.927315/ 30.135534	Statement of Significance: Negligible

Description: Undiagnostic ceramic potsherds and MSA flakes identified within the erosion gully as shown in Figure 9-20. There may be potential deposit within un-eroded areas as the lithics appear to have washed out of the walls of the erosion gully and washed from a higher elevation. The MSA flakes were produced from rhyolite and had some signs of retouch.

The archaeological remains are located 80 m from the proposed power line route.

Figure 9-20: Identified ceramic potsherds and MSA flakes (left) and the erosion gully in which they were identified

Site Name: UAR2967/IA/005	Co-ordinates: -24.922952/ 30.139413	Statement of Significance: Negligible

Description: A Communal activity area was located on a rocky outcrop approximately 50 m from a non-perennial stream (Figure 9-21). The activity area may have been the location of a washing or tanning area. Additionally, it may have been preliminary grinding area; however the areas are not very pronounced suggesting a short occupation. The site consists of three patches where an activity had occurred. No other features or archaeological remains or deposit were identified nearby.

This site is located 20 m from the proposed haul road.

Figure 9-21: Communal activity area (left) and close up of activity area (right)

Site Name: UAR2967/St/006	Co-ordinates: -24.921606/ 30.141130	Statement of Significance: Negligible

Description: A site consisting of a gong rock with five percussion areas, shown in the top left image in Figure 9-22 below. The top rock may have been intentionally placed ontop of the two split rocks in order to create a better sound. On the slope, 3 m below the gong rock, four ceramic potsherds were identified. Based on the *known* presence of *Doornkop / Eiland facies* in the surrounding area, the ceramics may be possibly associated with that facies however the pieces are too small to give a definitive facies. No other archaeological remains or deposit could be identified nearby.

The site is located 150 m from the proposed haul road.

Figure 9-22: Five percussion areas on the possible gong rock (top left), gong rock showing the top rock (top right), potsherds identified downslope of the gong rock (bottom left) and close up of possible decorated Doornkop/Eiland potsherd

9.4.1.2 Description of the current land uses

Current land use has been described above in Section 9.4.1.1.7.3. The land use dominating the Project area is natural veld. It has, however been used in some parts for subsistence grazing by the surrounding community. There are portions downslope that show signs of erosion

9.4.1.3 Description of specific environmental features and infrastructure on the site

The environmental features and infrastructure on site are discussed within Section 5.6.

9.4.1.4 Environmental and current land use map

The environmental and current land use map is shown as Plan 13, Appendix A.

9.5 Methodology used in determining and ranking the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks

The methodology utilised to assess the significance of potential social and heritage impacts is discussed in detail below. The significance rating formula is as follows:

Significance = Consequence x Probability

Where

Consequence = Type of Impact x (Intensity + Spatial Scale + Duration)

And

Probability = Likelihood of an Impact Occurring

In addition, the formula for calculating consequence:

Type of Impact = ***+1*** *(Positive Impact) or* ***-1*** *(Negative Impact)*

The weight assigned to the various parameters for positive and negative social and heritage impacts is provided for in the formula and is presented in Table 9-18. The probability consequence matrix for social and heritage impacts is displayed in Table 9-19, with the impact significance rating described in Table 9-20.

Table 9-18: Social and Heritage Impact Assessment Parameter Ratings

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts ***(Type of Impact = -1)***	***Positive Impacts*** ***(Type of Impact = +1)***			
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or ecosystem. Persistent severe damage. Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	Noticeable, on-going social and environmental benefits which have improved the livelihoods and living standards of the local community in general and the environmental features.	<u>International</u> The effect will occur across international borders.	<u>Permanent: No Mitigation</u> The impact will remain long after the life of the Project.	<u>Certain/ Definite.</u> There are sound scientific reasons to expect that the impact will definitely occur.
6	Significant impact on highly valued species, habitat or ecosystem. Irreparable damage to highly valued items of cultural significance or breakdown of social order.	Great improvement to livelihoods and living standards of a large percentage of population, as well as significant increase in the quality of the receiving environment.	<u>National</u> Will affect the entire country.	<u>Beyond Project Life</u> The impact will remain for some time after the life of a Project.	<u>Almost certain/Highly probable</u> It is most likely that the impact will occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread positive benefits to local communities which improves livelihoods, as well as a positive improvement to the receiving environment.	Province/ Region Will affect the entire province or region.	Project Life The impact will cease after the operational life span of the Project.	Likely The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense social benefits to some people. Average to intense environmental enhancements.	Municipal Area Will affect the whole municipal area.	Long term 6-15 years.	Probable Has occurred here or elsewhere and could therefore occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some.	Local Extending across the site and to nearby settlements.	Medium term 1-5 years.	Unlikely Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by very few of population.	Limited Limited to the site and its immediate surroundings.	Short term Less than 1 year.	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the Project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
1	Limited damage to minimal area of low significance that will have no impact on the environment. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level social and environmental benefits felt by very few of the population.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month.	Highly unlikely/None Expected never to happen.

Table 9-19: Probability Consequence Matrix for Social and Heritage Impacts

Probability	Significance																																					
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
	Consequence																																					

Table 9-20: Significance Threshold Limits

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	**Major (positive)**
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects.	Moderate (negative)

Score	Description	Rating
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)

9.6 Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

The potential impacts are discussed according to each Phase of the proposed Project: the Construction, Operational and Decommissioning Phase. The Project activities are summarised in Table 5-2.

Please refer to the detailed specialist Reports appended to this Report:

- Air Quality (Refer to detailed Report in Appendix D)
- Noise (Refer to detailed Report in Appendix E)
- Biodiversity (Refer to detailed Report in Appendix F)
- Visual and Topography (Refer to detailed Report in Appendix G)
- Soils, Land Capability and Land Use (Refer to detailed Report in Appendix H)
- Surface Water (Refer to detailed Report in Appendix I)
- Geohydrology (Refer to detailed Report in Appendix J)
- Social Impact Assessment (Refer to detailed Report in Appendix K)
- Heritage (Refer to detailed Report in Appendix L)

This section also rates the significance of the potential impacts pre-mitigation and post-mitigation. The impacts below are a result of both the environment in which the activity takes place, as well activity itself. The impacts associated with the proposed Project include the NEMA EIA Regulations Listed Activities, as well as the mining activities to take place at De Groote Boom's mining operation. The methodology utilised to assess the significance of the potential impacts is described in Section 9.5.

9.6.1 Construction Phase

9.6.1.1 Air Quality

Activity No. 1: Augmenting existing roads	
Criteria	**Details / Discussion**
Description of	Road construction involves the removal of rock and earth by explosion or digging

impact	during augmentation. Vegetation is removed, grading and paving takes place using a range of road construction equipment. This often leads to the generation of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$ from the dirt roads. This activity will be short-term, localised, and will have low impacts on the atmospheric environment once the construction phase ceases.				
Mitigation required	There is need for the application of wetting agents or dust suppressant on the dirt road to avoid incessant suspension and re-suspension or entrainment of dust. Vehicle travel speed and distances should be minimised. Encourage car-pool and bulk delivery of materials in order to reduce the number of trip on dirt roads.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 2	7	-35
Post-Mitigation	1	2	(-) 1	6	-24

Activity No. 2: Construction of pollution control dam (PCD)					
Criteria	**Details / Discussion**				
Description of impact	The clearing, scrapping, digging and excavation during the construction of the PCD. The associated activities using construction equipment will result in the generation of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$. This activity will be short-term, localised, and will have low impacts on the atmospheric environment once the construction ceases.				
Mitigation required	There is need for the application of wetting agents or dust suppressant on the dirt road to avoid incessant suspension and re-suspension or entrainment of dust. Vehicle travel speed and distances should be minimised. Encourage car-pool and bulk delivery of materials in order to reduce the number of trip on dirt roads.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 2	7	-35
Post-Mitigation	1	2	(-) 1	6	-24

Activity No. 3: Transport of construction material, mobile plant and equipment to site; and movement of haul trucks and excavator on haul roads.	
Criteria	**Details / Discussion**
Description of impact	Transportation of the workers, mobile plants and materials, haul trucks and excavators on and off site is quite common to operations of this nature. This often leads to the generation of fugitive dust comprising TSP, PM10 and PM2.5, especially from dirt roads as national and provincial roads are tarred. This activity will be short-

	term, localised, and will have low impacts on the atmospheric environment once the construction phase comes to an end.				
Mitigation required	There is need for the application of wetting agents or dust suppressant on the dirt road to avoid incessant suspension and re-suspension or entrainment of dust. Vehicle travel speed and distances should be minimised. Encourage car-pool and bulk delivery of materials in order to reduce the number of trip on dirt roads.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 4	7	-70
Post-Mitigation	2	3	(-) 2	6	-42

Activity No. 4: Storage of material / diesel at site in temporary facilities					
Criteria	**Details / Discussion**				
Description of impact	Impact is associated with spills and odours. These hazardous products include fuel for the trucks, explosives used in blasting and waste or sewage management. The scale, types and amount of equipment and machinery used on site have bearing on the waste generated. Impacts include evaporation of diesel fuel and heavy fuel from temporary tanks and possible spills during loading of fuel from tanks on site that are used for re-fuelling of heavy machinery and trucks. Some of the waste produced includes waste oils, chemicals and hazardous substances.				
Mitigation required	There is a need to develop a hazardous products and waste management plan. Hazardous substances should be stored and handled in accordance with the local regulations, with such substances stored in clearly labelled containers. Employees should be well trained on the handling and storing hazardous chemicals alongside dealing with emergency procedures.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 3	5	-40
Post-Mitigation	1	2	(-) 2	4	-20

Activity No. 5: Site clearing and topsoil removal for mining operation area; and construction of mining cut	
Criteria	**Details / Discussion**
Description of impact	A number of activities, such as land clearing, topsoil removal, loading of material, stockpiling, bulldozing and compaction. Each of the aforementioned activities has its own duration and potential for dust generation. This phase is often associated with the generation of fugitive dust i.e. TSP (total suspended particulate), as well as PM_{10}

	and $PM_{2.5}$ (dust with a size less than 10 µm, and dust with a size less than 2.5 µm giving rise to health impacts). It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the scale and duration of activity, coupled with the prevailing meteorological conditions. The construction phase will be short-term, and presumed localised, and will have low impact that will stop once the construction activities are finalised.
Mitigation required	Removal of topsoil must be limited to non-windy days and months in order to ameliorate suspension of loose particulate matter and subsequent exposure to airborne dust. The area of disturbance must be kept to a minimum at all times and no unnecessary clearing of vegetation must occur. The drop heights when loading topsoil into trucks should be minimised. Water or a binding agent can also be used for dust suppression on exposed surfaces and roads. When using bulldozers and graders, there is need to minimise travel speed and distance to reduce dust generation.

Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	2	(-) 2	7	-49
Post-Mitigation	3	2	(-) 2	6	-42

Activity No. 6: Preparing an area of approximately 2-3 ha for portable plant and infrastructure (crushing, screening, workshops, ablution and offices etc.) and stock piling	
Criteria	**Details / Discussion**
Description of impact	During this phase, it is anticipated there will be construction of infrastructure. This will include crushing, screening, workshops, ablution and offices etc. Excavating, grading levelling and compacting of surfaces will have implications on dust generation.
Mitigation required	To mitigate the impact of construction activities on atmospheric environment, the following measures should be applied: The area of disturbance must be kept to a minimum and no unnecessary digging or scraping must occur on days with high wind speed (>5.4 m/s). Drop heights should be minimised when loading or dumping soil. Water or a binding agent can be used for dust suppression on roads. When using bulldozers and graders, there is need to minimise travel speed and distance. Studies by Watson et al., 1996 showed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 15 mph (24 km/h).

Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	2	(-) 2	7	-49
Post-Mitigation	3	2	(-) 2	5	-35

9.6.1.2 Biodiversity

9.6.1.2.1 Loss of Habitat

Loss of habitat					
Phase	**Construction**				
Criteria	**Details / Discussion**				
Description of impact	▪ Removal of vegetation ▪ Disturbance of the soil ▪ Vehicle operation				
Mitigation required	▪ Minimise the impacted area and clear only what is required ▪ Avoid erosion, manage alien invasive species establishment, ensure the re-establishment of natural vegetation ▪ Employ stormwater management measures				
Parameters	*Severity*	*Spatial scale*	*Duration*	*Probability*	*Significance*
Pre- Mitigation	7	6	(-) 6	6	-115
Post-Mitigation	6	6	(-) 3	6	-90

9.6.1.2.2 Loss of Species of Special Concern

The greatest impact is expected during the construction phase for loss of SSC.

Loss of SSC					
Phase	**Construction**				
Criteria	**Details / Discussion**				
Description of impact	▪ Removal of vegetation ▪ Increased human presence ▪ Machinery and vehicle operation (noise)				
Mitigation required	▪ Minimise the impacted area and clear only what is required ▪ Tag and avoid all Red Data plants ▪ Plant SSC according to a relocation plan as a last resort ▪ Restricting blasting and operation of machinery to daylight hours				
Parameters	*Severity*	*Spatial scale*	*Duration*	*Probability*	*Significance*
Pre- Mitigation	7	6	(-) 6	6	-108
Post-Mitigation	5	6	(-) 6	4	-68

9.6.1.2.3 Impacts to Non-perennial Streams

The greatest impact to drainage areas is expected during the construction phase. A road passing along the koppie, prior to authorisation, has already resulted in disturbance to the natural flow of water through the site.

Disturbance to temporary drainage areas					
Phase	**Construction**				
Criteria	**Details / Discussion**				
Description of impact	▪ Mining of the koppie ▪ Roads crossing drainage areas ▪ Upgrading of existing roads crossing drainage areas and streams				
Mitigation required	▪ Avoid drainage areas as far as possible (by 100m) ▪ Include culverts and gabion structures at road crossings				
Parameters	*Severity*	*Spatial scale*	*Duration*	*Probability*	*Significance*
Pre- Mitigation	4	3	(-) 4	6	-66
Post-Mitigation	3	3	(-) 4	4	-40

9.6.1.3 Surface Water

Activity 1: Augmenting existing roads. Activity 5: Site clearing and topsoil removal for mining operation area; and construction of mining cut.					
Criteria	**Details / Discussion**				
Description of impact	▪ Augmenting existing roads and the removal of vegetation and/or topsoil during excavation exposes the soil, leaving it prone to erosion which causes siltation of the surrounding surface water resources. Polluted surface water resources have reduced availability for downstream water users.				
Mitigation required	▪ Removal of topsoil should be done systematically, only clearing the necessary areas at a time. ▪ Clean and dirty surface water channels should be constructed to divert runoff separately to appropriate storage dams (dirty water to the PCD to avoid eroded soils entering the clean water areas).				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 2	5	-40
Post-Mitigation	3	2	(-) 2	4	-28
Activity 2: Construction of pollution control dam (PCD). **Activity 6: Preparing an area of approximately 2-3 ha for portable plant and infrastructure (crushing, screening, workshops, ablution and offices etc.) and stock piling.**					
Criteria	**Details / Discussion**				
Description of impact	▪ The construction of infrastructure exposes the surface water to the following impacts: ▪ Poorly designed and constructed pollution control dams and other water management facilities pose a threat to the surface water quality if leakage of contaminated water Reports to the surrounding water bodies. ▪ The stockpiles will pose a source of sediment material that can be washed				

	off to the streams and rivers. ▪ Concrete and other impervious surfaces prevent surface water from infiltrating the soil and will increase runoff.				
Mitigation required	▪ Dirty water channels that divert the water to the pollution dams should be constructed surrounding the infrastructure area and initial box cut. ▪ The topsoil stockpiles should be vegetated as soon as possible to prevent erosion, which might cause siltation of the water resources.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 2	4	-32
Post-Mitigation	3	2	(-) 2	4	-28
Activity 3: Transport of construction material, mobile plant and equipment to the site; and movement of haul trucks and excavator on haul roads. **Activity 4: Storage of material / diesel at site in temporary facilities.**					
Criteria	**Details / Discussion**				
Description of impact	▪ The potential impact will arise from potential spillages during transport of construction material, hazardous substances and hydrocarbon containing fuels and lubricants to site. These can be mobilised to surface water resources, resulting in water contamination. ▪ Storage of hazardous substances and diesel onsite has the potential to spill and contaminate water resources.				
Mitigation required	▪ Ensure that spillage control kits are available during transport and on storage sites in case of any accidental leakages of spillages, which can then be cleared immediately. ▪ The temporary storage facilities of fuel, lubricants and explosives must be a hard park, roofed and bunded facility. This will prevent contamination of soils and the possibility of contamination of the surface water resources.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 4	4	-44
Post-Mitigation	3	2	(-) 2	3	-21

9.6.1.4 Geohydrology

The activities during the construction phase that could potentially impact the groundwater include:

Activity 4 – Storage of material / diesel at site in temporary facilities	
Criteria	**Details / Discussion**
Description of impact	▪ Diesel, petrol or other organic fluids and inorganic solvents might be spilled on the ground surface, or leak from surface or underground storage tanks. This could have a potential negative impact on groundwater quality;

	▪ As the water table in the Project area is fairly shallow, it is possible that the spilled organic compounds can reach the groundwater environment; ▪ Oil or fuel spillages from site machinery may collect in the soils; and ▪ During rainfall events, hydrocarbon compounds from oil and fuel in the soils may migrate to the aquifers with water infiltrating through these polluted areas.
Mitigation required	▪ Machinery should be maintained properly. Diesel and other chemicals should be handled appropriately. Re-fuelling protocols must be followed to ensure no diesel is spilled during filling; ▪ Reservoirs must be appropriately bunded; ▪ Silt and oil traps should be well maintained to ensure effective separation of the water and contaminants; ▪ If a considerable amount of fluid is accidentally spilled, the contaminated soil should be removed and disposed at an acceptable dumping facility. The excavation should be backfilled with soil of good quality; and ▪ Boreholes, particularly those located within the construction area have to be monitored for both water level and quality to detect any changes in quality during the construction phase.

Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	1	2	(-) 1	2	-8

Activity 5 – Site clearing and topsoil removal and construction of mining permit area	
Criteria	**Details / Discussion**
Description of impact	▪ The establishment of hard surface areas during infrastructure and access road construction reduces the recharge to the shallow weathered aquifers due to increased runoff; ▪ The initial bench will result in ponding after heavy rainfall that might assist in recharge of the underlying aquifers. This could be seen as grey water entering the groundwater system; and ▪ The development of a well field in the area needs to be carefully managed to reduce water availability impacts on the local private users. If a local aquifer system is over utilised it might have a negative impact on other users in the same system / quaternary catchment.
Mitigation required	▪ Implement a surface water management plan to minimise the volume of dirty water produced thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water; ▪ Implement measures to collect and store clean water that falls within the Project area for use on site e.g. watering of gardens, wash bays and dust suppression. Although the hard surfaces on site will increase runoff thereby reducing recharge of the aquifer, the collection of this water for use on site will reduce the need to pump water from boreholes; ▪ If groundwater resources are selected as one of the water supply options, production boreholes should be spread across the mining permit area and adjacent farms to minimise the construction phase cone of dewatering impacts; and ▪ Treatment of the groundwater might be required for human consumption and construction activities.

Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 1	2	-8
Post-Mitigation	1	2	(-) 1	1	-4

Activity 7 – Use of existing boreholes					
Criteria	**Details / Discussion**				
Description of impact	▪ Small amount of water required for construction of dams, roads and other infrastructure. Continuous abstraction from boreholes for any use might lead to a dewatering cone around the pumping boreholes. These dewatering cones might extend to private or other production boreholes which might result in a reduced volume of water available from the impacted borehole.				
Mitigation required	▪ Keep abstraction rates and volumes from boreholes at the recommended sustainable rates and abstraction periods. Ensure that an effective groundwater monitoring programme is in place to identify impacts at an early stage.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 2	4	-20
Post-Mitigation	1	1	(-) 1	2	-6

9.6.1.5 Soils, Land Capability and Land Use

When topsoil is removed from a soil profile, the profile loses effective rooting depth, water holding capacity and fertility. The largest volumes of topsoil will be removed in preparation for the site infrastructure and the mining permit area. The remove soil will be stockpiled and can be lost if not managed correctly.

9.6.1.5.1 Impact: loss of topsoil as a resource

Criteria	**Details / Discussion**
Description of impact	Impact on soil through removal and stockpiling of soil, as well as the loss of soil through erosion.
Mitigation required	▪ The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; ▪ Stockpiles are to be kept to a maximum height of 4-5m (the practical tipping height of dump trucks); ▪ Topsoil is to be stripped when the soil is dry, as to reduce compaction; ▪ The topsoil 0.3 m of the soil profile should be stripped first and stockpiled separately from the sub soil; ▪ The subsoil approximately 0.7 – 0.9 m thick (on the Hutton soils) will then be stripped and stockpiled separately; ▪ The Mispah and Glenrosa soil forms will only need to be stripped to 0.3m; ▪ Soils to be stripped according to the rehabilitation management plan and stockpiled accordingly; ▪ Foundation excavated soil should also be stockpiled;

Criteria	Details / Discussion				
	▪ Stockpiles are to be maintained in a fertile and erosion free state by sampling and analysing annually for macro nutrients and pH; ▪ The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; ▪ Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; ▪ Prevent unauthorised borrowing of stockpiled soil; ▪ The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ▪ Stormwater management systems need to be put in place to reduce minimise the erosion hazards; ▪ Stockpiled soils must be re-vegetated as soon as possible to reduce the risk of erosion; ▪ Erosion berms are to be put in place where there is a high risk of erosion; ▪ Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.3 m) then subsoil separately; and ▪ Access should be limited to prevent any unnecessary compaction from occurring.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	5	(-) 5	7	-91
Post-Mitigation	2	5	(-) 3	3	-30

9.6.1.5.2 Impact: Hydrocarbon Pollution

Criteria	Details / Discussion				
Description of impact	Impact on soil quality while hydrocarbon spills can occur when heavy mining machinery is used because big machines contain large volumes of oils and diesel. There is a chance of the machines breaking down and/or leaking during mining and removal of topsoil.				
Mitigation required	▪ Prevent any spills from occurring; ▪ If a spill occurs it is to be cleaned up immediately and Reported to the appropriate authorities; ▪ All vehicles are to be serviced in a correctly bunded area or at an off-site location; and ▪ Leaking vehicles will have drip trays place under them where the leak is occurring.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	7	(-) 7	6	-90
Post-Mitigation	1	1	(-) 7	5	-45

9.6.1.5.3 Impact: Loss of land capability

Criteria	Details / Discussion				
Description of impact	Removal of soil layers will impact on the land capability because vegetation can no longer be supported.				
Mitigation required	▪ No land capability mitigation is possible during the construction and operational phases because the land use is changed from natural/subsistence grazing to mining; and ▪ Mitigation of land capability post mining is required through legislation through land rehabilitation.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	5	(-) 6	7	-84
Post-Mitigation	1	5	(-) 5	6	-66

9.6.1.6 Noise

The Construction Phase involves the following activities that may impact on the ambient noise levels:

- Augmenting existing roads;
- Construction of pollution control dam (PCD);
- Transport of construction material, mobile plant and equipment to the site; and movement of haul trucks and excavator on haul roads;
- Site clearing and topsoil removal for mining permit area; and construction of box cut; and
- Preparing an area of approximately 2-3 ha for crushing, screening, stock piling, workshops, ablution and offices etc.

Criteria	Details / Discussion				
Description of impact	▪ Mining machinery and vehicles may increase ambient noise levels at surrounding urban and rural noise sensitive receptors				
Mitigation required	▪ Restricting construction activities to daylight hours where viable; ▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	1	2	(-) 1	2	-8

9.6.1.7 Visual and Topography

The construction phase is characterised by site development and infrastructure construction. This includes transportation of construction material, temporary storage of material / diesel, site clearance and topsoil removal, construction of surface infrastructure. The establishment of infrastructure and the related construction activities will draw attention to the Project area making receptors aware of the development. The construction phase will have negative visual impacts on the receiving environment. The transportation of construction material and the temporary storage of material / diesel will have a minor visual impact. The site clearance and topsoil removal will have a moderate visual impact.

Activity No. 1: Augmenting existing roads.					
Criteria	**Details / Discussion**				
Description of impact	The augmentation of the existing roads will have a negative visual impact on the receiving environment as natural vegetation will be cleared altering the landscape and changing the sense of place from a rural sense of place to a mining dominated sense of place.				
Mitigation required	▪ Do not create numerous roads alongside each other; and ▪ Construction of vegetation berms must be implemented close to roads so that vegetation can be established.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 3	6	-36
Post-Mitigation	1	2	(-) 2	5	-25
Activity No. 2: Construction of pollution control dam (PCD).					
Criteria	**Details / Discussion**				
Description of impact	The construction of the PCD will have a negative visual impact as vegetation will be cleared and the PCD will be visible throughout the duration of the Project.				
Mitigation required	▪ Limit the footprint area of the PCD where possible.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	3	(-) 3	6	-42
Post-Mitigation	1	3	(-) 2	5	-30
Activity No. 3: Transport of construction material, mobile plant and equipment to the site, and movement of haul trucks and excavator on haul roads					
Criteria	**Details / Discussion**				
Description of impact	The transportation of construction material will have a negative visual impact on the receiving environment. Vehicular activity and the resulting dust will draw attention to				

	the Project area. These visual impacts are temporary and will only occur during the construction phase.				
Mitigation required	▪ Roads should be wetted frequently by means of a water bowser to suppress dust; and ▪ Vehicles must be roadworthy and obey the recommended speed limits at all times.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	2	(-) 3	6	-48
Post-Mitigation	3	2	(-) 2	5	-35
Activity No. 4: Storage of material / diesel at site in temporary facilities.					
Criteria	**Details / Discussion**				
Description of impact	The temporary storage of material / diesel will have a negative visual impact on the receiving environment. These visual impacts are temporary and will only occur during the construction phase.				
Mitigation required	▪ Limit the footprint area of the temporary storage facilities where possible.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 3	6	-36
Post-Mitigation	1	2	(-) 2	5	-25
Activity No. 5: Site clearing and topsoil removal for mining operation area; and construction of mining cut					
Criteria	**Details / Discussion**				
Description of impact	The removal of vegetation and topsoil for site clearing will have a negative visual impact on the receiving environment. The Project area will become noticeable to the nearby receptors as it will contrast the surrounding areas.				
Mitigation required	▪ Vegetation and topsoil should only be removed when and where necessary; and ▪ Topsoil stockpiles should be vegetated and positioned to reduce visual disturbance where possible.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 4	6	-48
Post-Mitigation	1	2	(-) 4	5	-35
Activity No. 6: Preparing an area of approximately 2-3ha for portable plant and infrastructure (crushing, screening, workshops, ablution and offices etc.) and stockpiling					
Criteria	**Details / Discussion**				
Description of	The erection of surface infrastructure will have a negative visual impact on the				

impact	receiving environment. This surface infrastructure includes offices, mobile plant, workshops etc. The surface infrastructure will change the sense of place of the Project area from a rural sense of place to an industrial sense of place. These visual impacts will occur for the life of the Project. Infrastructure and mine area lighting will be visible at night resulting in a negative visual impact on the receiving environment. This visual impact will occur for the life of the Project.				
Mitigation required	▪ Do not create numerous roads alongside each other; ▪ Limit the height and footprint area of surface infrastructure where possible; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; ▪ Avoid construction activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If construction activities take place at night, down lighting should be implemented to minimise light pollution; and ▪ Construction of vegetation berms must be implemented close to infrastructure so that vegetation can be established.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	2	(-) 4	6	-42
Post-Mitigation	1	2	(-) 3	5	-30

9.6.2 Operational Phase

9.6.2.1 Air Quality

Activity No. 8: Storage of fuel and lubricants in temporary facilities	
Criteria	**Details / Discussion**
Description of impact	These hazardous products include fuel for the trucks, explosives used in blasting and waste or sewage management. The impacts of the hazardous materials and waste management are related to the types and amount of equipment and machinery used on site. Impacts anticipated include evaporation of diesel fuel and heavy fuel from temporary storage tanks and possible spills on site during re-fuelling of heavy machinery and trucks can lead to a reduction in the quality of air in the immediate vicinity. Damage to containers of bags holding powdery chemicals during material handling can lead to release and subsequent erosion with implication on ambient air quality.
Mitigation required	Hazardous products and waste management plans must be developed and applied. This will encompass the following: identify anticipated waste streams, inspection and waste minimisation procedures, storage locations, and waste-specific management and disposal requirements. Also, a recycling strategy should be entrenched for

	workers to apply.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 3	5	-40
Post-Mitigation	1	2	(-) 2	4	-20

Activity No. 9: Topsoil removal and stockpiling; and extraction and transportation of ore.					
Criteria	**Details / Discussion**				
Description of impact	In the case of De Groote Boom Mine - the topsoil will be removed and stockpiled. ROM will be hauled by road to the crusher using diesel trucks throughout the life of mine. The latter often leads to dust generation. Travel speed on haul roads must be reduced. The reason being that dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 15 mph (24 km/h) (Watson et al., 1996)				
Mitigation required	To mitigate the impacts associated with this activity on atmospheric environment, the travel speed haul roads must be reduced. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 15 mph (24 km/h) (Watson et al., 1996).				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	6	(-) 3	6	-72
Post-Mitigation	3	5	(-) 2	4	-40

Activity No. 10: Vehicular activity on the proposed haul roads. Mining equipment will utilise the haul roads to access open pit areas, as well as to transport ore from the opencast pit to ROM stockpile and waste dump.	
Criteria	**Details / Discussion**
Description of impact	Vehicular activity on the proposed haul roads. Mining equipment will be utilised on haul roads to access open pit areas, as well as to transport ore and waste for stockpiling.
Mitigation required	To mitigate the impacts associated with this activity on atmospheric environment, the travel speed haul roads must be reduced. It is confirmed that the dust generating capacity of particles less than 10 micro meters is reduced by 58% when speed controls are reduced from 25 mph (40 km/h) to 15 mph (24 km/h) (Watson et al., 1996).

Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	6	(-) 3	6	-72
Post-Mitigation	3	3	(-) 2	4	-40

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Activity No. 11: Crushing and screening of ore in mobile plant					
Criteria	**Details / Discussion**				
Description of impact	Ore will be hauled from the pit to the mobile crusher for sizing. The crushing and screening process often have implications on ambient air quality. This is particularly so if the crusher is not enclosed or covered, hence subject to wind erosion.				
Mitigation required	To mitigate the impacts associated with this activity on atmospheric environment, the following measures should be applied: there is need to have water sprays at the crusher, and crushing should take place in an enclosed space to reduce contact with wind.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	6	(-) 3	6	-72
Post-Mitigation	3	5	(-) 2	4	-40

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Activity No. 12: Stockpiling material - operation and maintenance of the stockpiles, including waste and ROM stockpiles					
Criteria	**Details / Discussion**				
Description of impact	The stockpiling of material i.e. ore and waste will be an ongoing process during the life of mine. This activity is associated with dust generation and will have implications on ambient air quality of the area until such time when the vegetation cover is fully established.				
Mitigation required	In order to reduce emissions from stockpiles, mitigation measures such as reducing the drop heights and spray are imperative throughout the lifespan of the mine, with ongoing re-vegetation of topsoil stockpile to avoid exposed surface to wind erosion.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	4	4	(-) 5	6	-78
Post-Mitigation	3	4	(-) 3	4	-40

Activity No. 14: Waste and sewage generation and disposal. All domestic, industrial and hazardous waste is produced during the mining process. Waste includes cans, plastics, used tyres, sewage and oil which must be disposed of in an appropriate manner by a contractor at a licensed waste disposal site.					
Criteria	**Details / Discussion**				
Description of impact	Waste generation peaks during the operational phase as consumption of raw material increases and significant amount of wastes are produced. Hazardous products include fuel, waste oil, chemicals, explosives and waste, sewage, amongst others. This activity also includes evaporation of diesel fuel and heavy fuel from temporary tanks and possible spills during loading and re-fuelling of heavy machinery and trucks. Hazardous storage areas should be kept clear of combustible material and rubbish (e.g. oily rags, oil, grease, carton etc.)				
Mitigation required	There is a need to develop a waste management plan. This will identify anticipated liquid and solid waste streams and will ensure thorough inspection and waste minimisation procedures are in place. Optimum material handling and recycling strategy should be enforced by management and strict adherence on the part of workers during the operation phase. There is need for the provision of secondary containment for fuel storage. Hazardous substances should be stored and handled in accordance with the local regulations and chemicals must be stored in clearly labelled containers. Employees should be trained on the hazards of handling and storing hazardous chemicals. It is essential to ensure regular training and exercise for the staff on the emergency handling of hazardous waste.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	5	(-) 5	5	-65
Post-Mitigation	3	5	(-) 3	4	-44

9.6.2.2 Biodiversity

9.6.2.2.1 Loss of Habitat

No direct loss of habitat is expected during this phase of the Project. Alien plant invasion is, however expected to occur. In addition, vehicular transport through the site may increase the risk of roadkill of fauna species that occur.

Loss of habitat	
Phase	**Operational**
Criteria	**Details / Discussion**
Description of impact	▪ Establishment of alien plant species in disturbed areas
Mitigation	▪ Manage alien invasive species establishment continually through chemical or

required	mechanical removal ▪ Reinstate vegetation cover through concurrent rehabilitation ▪ Erect signage to control the speed limit for trucks and other vehicles moving through the site				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	4	2	(-) 3	6	-54
Post- Mitigation	1	2	(-) 3	4	-24

9.6.2.2.2 Loss of Species of Special Concern

No impacts to SSC are expected during the operational phase.

9.6.2.2.3 Impacts to Non-perennial Streams

No impacts to temporary drainage are expected during the operational phase.

9.6.2.3 Surface Water

Activity 8: Storage of fuel and lubricants in temporary facilities.					
Criteria	**Details / Discussion**				
Description of impact	▪ The potential impact will arise from the mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from surface to the surrounding surface water resources. The leakages could have arisen from the use of the fuels, lubricants or from the storage facilities. This could have an impact on the quality of water.				
Mitigation required	▪ Ensure that spillage control kits to contain the spillages of the contaminants from point of spillage are available on-site. ▪ The temporary storage facilities for fuel, lubricants and explosives must be a hard park, roofed and bunded facility. This will prevent contamination of soils and the possibility of contamination of the surface water resources.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 4	4	-44
Post-Mitigation	3	2	(-) 2	3	-21
Activity 9: Topsoil removal and stockpiling; and extraction and transportation of ore. **Activity 12: Stockpiling material.**					
Criteria	**Details / Discussion**				
Description of impact	▪ Topsoil removal and the extraction of the ore expose the soil and rock, leaving it prone to erosion which causes siltation of the surrounding surface water resources. Polluted surface water resources have reduced availability for downstream water users. ▪ Runoff from stockpiled materials has the potential to contaminate water resources.				
Mitigation	▪ Removal of topsoil and the ore should be done systematically, only clearing the				

required	necessary areas at a time. ▪ Dirty water channels should be constructed around the stockpiled and mining permit area to divert runoff from entering clean water areas (dirty water to the PCD to avoid eroded soils entering the clean water areas).				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 3	5	-45
Post-Mitigation	3	2	(-) 2	4	-28
Activity 10: Vehicular activity on haul roads; and operation of mining equipment.					
Criteria	**Details / Discussion**				
Description of impact	▪ Heavy vehicle activity is likely to have an impact the topography of the haul roads. If not maintained, roads may deteriorate during the rainy season as a result of water erosion causing siltation of the surrounding surface water resources. ▪ Mining equipment that is not serviced and maintained correctly has the potential leak hydrocarbons and hazardous substances, and may potentially pollute water resources.				
Mitigation required	▪ Haul roads should be regularly contoured. ▪ Appropriate culverts and drains should be implemented and regularly maintained to deal with surface water runoff on haul roads. ▪ Ensure mining equipment is regularly serviced and maintained.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 2	5	-40
Post-Mitigation	3	2	(-) 2	4	-28
Activity 13: Water management.					
Criteria	**Details / Discussion**				
Description of impact	▪ A potential channel spill or pipeline burst could result in dirty pit water contaminating surface water runoff. ▪ PCDs can also have a negative impact if they are not well lined, if they crack and seep water or overflow in the event of extreme rainfall to the surface and underground.				
Mitigation required	▪ Channels and pipelines need to be appropriately sized. ▪ The design, construction, maintenance and operation of the PCD that form part of a dirty water system to have a minimum freeboard of 0.8 metres above full supply level and should be able to contain a 1:50 year recurrence, 24-hour storm event. ▪ Maintenance of water structures is essential to ensure efficient operation and identification of potential issues before they arise.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*

Pre-Mitigation	3	4	(-) 4	5	-55
Post-Mitigation	3	2	(-) 2	4	-28

Activity 14: Waste generation and disposal (including sewage).					
Criteria	**Details / Discussion**				
Description of impact	▪ Temporary storage of waste material before collection for disposal may result in leakages which could potentially contaminate water resource or a wetland. ▪ Sewage treatment plant system failure may result in overflows or leakages into the surface water bodies onsite.				
Mitigation required	▪ Ensure that there is no discharge or leakage on the sewage treatment plant, septic tank or French drain system by monitoring and maintenance of the system. ▪ Measures should be in place to reduce system blockages through usage control and educating employees on the best ways to use the system. ▪ The temporary storage facilities waste materials must be a hard park, roofed and bunded facility. This will prevent contamination of soils and the possibility of contamination of the surface water catchment on site when stormwater runoff deposits the contaminated soils into the dam.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 3	5	-45
Post-Mitigation	3	2	(-) 2	4	-28

9.6.2.4 Geohydrology

The activities during the operational phase that could potentially impact the groundwater include:

Activity 8 – Storage of fuel and lubricants in temporary facilities	
Criteria	**Details / Discussion**
Description of impact	▪ Diesel, petrol or other organic fluids and inorganic solvents might be spilled on the ground surface, or leak from surface or underground storage tanks. This could have a potential negative impact on groundwater quality; ▪ As the water table in the Project area is fairly shallow, it is possible that the spilled organic compounds can reach the groundwater environment; ▪ Oil or fuel spillages from site machinery may collect in the soils; and ▪ During rainfall events, hydrocarbon compounds from oil and fuel in the soils may migrate to the aquifers with water infiltrating through these polluted areas.
Mitigation required	▪ Machinery should be maintained properly. Diesel and other chemicals should be handled appropriately. Re-fuelling protocols must be followed to ensure no diesel is spilled during filling; ▪ Reservoirs must be appropriately bunded; ▪ Silt and oil traps should be well maintained to ensure effective separation of the

	water and contaminants; ▪ If a considerable amount of fluid is accidentally spilled, the contaminated soil should be removed and disposed at an acceptable dumping facility. The excavation should be backfilled with soil of good quality; and ▪ Boreholes, particularly those located within the construction area have to be monitored for both water level and quality to detect any changes in quality during the construction phase.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	1	2	(-) 1	2	-8
Activity 9 – Topsoil removal and stockpiling and extraction of ore					
Criteria	**Details / Discussion**				
Description of impact	▪ Stockpile storage of removed topsoil, overburden and ore reserves exposes soil and rock types to conditions which increase the potential for AMD development; ▪ The establishment of hard surface areas during infrastructure and access road construction reduces the recharge to the shallow weathered aquifers due to increased runoff; and ▪ The initial bench will result in ponding after heavy rainfall that might assist in recharge of the underlying aquifers. This could be seen as grey water entering the groundwater system.				
Mitigation required	▪ Implement a surface water management plan to minimise the volume of dirty water produced thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water; ▪ Implement measures to collect and store clean water that falls within the Project area for use on site e.g. watering of gardens, wash bays and dust suppression. Although the hard surfaces on site will increase runoff thereby reducing recharge of the aquifer, the collection of this water for use on site will reduce the need to pump water from boreholes; ▪ Monitor changes in water levels and quality around the Project area, so as to be aware of changes in groundwater conditions; ▪ Engage with groundwater users within the influence of dewatering and arrange for alternative water supply if water supply sites are impacted; ▪ Down gradient groundwater users need to be made aware of changes in water quality which could impact on their health, and an alternative water supply source be provided; and ▪ Implement passive or active treatment options where water quality is unacceptable for release into the environment.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	1	2	(-) 1	2	-8
Activity 11 – Crushing and screening of ore in mobile plant					

Criteria	Details / Discussion				
Description of impact	▪ Water seeping from the pit, stockpiles an pollution control dam can lead to elevated concentrations of heavy metals and other elements in the groundwater environment, and can potentially be acidic; ▪ When this water reaches surface water bodies or the groundwater it can negatively affect the water quality; and ▪ Infrastructure construction activities typically do not have a direct impact on the groundwater environment; however poor construction of infrastructure facilities (including fuel bays and PCD dams) could result in poor performance and therefore potential contamination to the underlying aquifer.				
Mitigation required	▪ Ensure infrastructure construction follows engineering specifications; ▪ Appoint a reputable contractor; ▪ Ensure appropriate maintenance of facilities where and when required; ▪ Where storage facilities are being constructed for hazardous substances include bunded linings where accidental spillage may occur, and proper operation techniques are used; ▪ Where spillages of hazardous substances have occurred, the affected site (if not within bunded work area) should be cleaned (or dug out in the case of soil) and disposed of at a facility capable of handling the specific hazardous waste; and ▪ Stormwater management plan to divert clean water from dirty water and contaminated sites.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	2	2	(-) 1	2	-10
Activity 12 – Stockpiling material					
Criteria	**Details / Discussion**				
Description of impact	▪ Contamination of groundwater via seepage of dirty water from the waste and ore stockpiles.				
Mitigation required	▪ Develop an appropriate groundwater monitoring system and test regularly for changes in water quality and water levels; ▪ Buffer acid generating material with acid neutralising discard material; ▪ Where overburden and interburden (stockpiles with the highest potential for AMD) stockpiles are foreseen as long term requirements the base needs to be lined with neutralising material and drainage system designed to capture surface runoff and seepage to be channelled to the nearest PCD; and ▪ Implement passive or active treatment options where water quality is unacceptable for release into the environment.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 3	3	-21
Post-Mitigation	1	2	(-) 2	2	-10

Activity 13 – Water management					
Criteria	**Details / Discussion**				
Description of impact	▪ Water seeping from the pit, stockpiles an pollution control dam can have elevated concentrations of heavy metals and other elements and can potentially be acidic; and ▪ When this water reaches surface water bodies or the groundwater it can negatively affect the water quality.				
Mitigation required	▪ Dewatering of pit water into pollution control and settling ponds; ▪ Lining PCD and stockpiles to prevent seepage; ▪ Trenches/berms upstream of pit to divert and prevent surface water runoff into pit; and ▪ Stormwater management plan to divert clean water from dirty water and contaminated sites.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 3	4	-36
Post-Mitigation	2	2	(-) 2	3	-18
Activity 14 – Waste generation and disposal (including sewage)					
Criteria	**Details / Discussion**				
Description of impact	▪ Contamination of the aquifer via seepage of waste water, sewage spills or hazardous substances.				
Mitigation required	▪ Hazardous substances must be stored, handled and disposed of according to their specific MSDS sheet; ▪ Infrastructure built to contain waste and sewage or store hazardous substances must be constructed to engineering specification by a reputable contractor; ▪ Infrastructure must be maintained according to the engineering specifications, when and where required, or on a regular basis; and ▪ A reputable contractor is required to remove waste to a disposal facility capable of handling the waste or hazardous substance.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	1	2	(-) 1	2	-8

9.6.2.5 Soils, Land Capability and Land Use

9.6.2.5.1 Impact: loss of stockpiled topsoil as a resource

Criteria	Details / Discussion
Description of impact	Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles where steep slopes are present.

Criteria	Details / Discussion				
Mitigation required	▪ Stockpiles are to be maintained in a fertile, vegetated, and erosion free state; ▪ Stockpiles are to be clearly demarcated; ▪ Ensure proper stormwater management designs are in place; ▪ Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring; ▪ If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; and ▪ Unauthorised borrowing of stockpiled soil materials should be prevented.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	5	(-) 5	7	-91
Post-Mitigation	2	5	(-) 3	3	-30

9.6.2.5.2 Impact: Hydrocarbon Pollution

Criteria	Details / Discussion				
Description of impact	Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils, and diesel to run. There is always a chance of these breaking down and/or leaking.				
Mitigation required	▪ Prevent any spills from occurring; ▪ If a spill occurs it is to be cleaned up immediately and Reported to the appropriate authorities; ▪ All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and ▪ Leaking vehicles will have drip trays place under them where the leak is occurring.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	7	(-) 7	6	-90
Post-Mitigation	1	1	(-) 7	5	-45

9.6.2.5.3 Impact: Loss of Land Use and Land Capability

Criteria	Details / Discussion
Description of impact	Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent because vegetation will be supported and therefore returned to the planned post mining land capability such as arable and or grazing.
Mitigation required	Mitigation is possible because the land use is changed from mining back to natural/grazing as follows:

Criteria	Details / Discussion				
	▪ The rock spoil should be shaped taking the pre-mining landscape into consideration; ▪ The designed post mining landforms should be modelled to establish the post mining landscape stability by using a combination of GIS and erosion modelling techniques by a suitably qualified expert using site specific soil quality data; ▪ The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; ▪ The yellow and red soils should be replaced in upland landscape positions; ▪ The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; ▪ The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; and ▪ Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan.				
Parameters	Spatial	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	5	(-) 6	7	-84
Post-Mitigation	1	5	(-) 4	6	-60

9.6.2.6 Noise

The Operational Phase involves the following activities that may impact on the ambient noise levels:

- Topsoil removal and stockpiling; and extraction and transportation of ore;
- Vehicular activity on haul roads; and operation of mining equipment;
- Crushing and screening of ore in the mobile plant; and
- Stockpiling material.

Criteria	Details / Discussion				
Description of impact	▪ Mining machinery and vehicles may increase ambient noise levels at surrounding noise sensitive receptors				
Mitigation required	▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	5	(-) 2	3	-27
Post-Mitigation	1	5	(-) 1	2	-14

9.6.2.7 Visual and Topography

The operational phase is characterised by mining of material, water management, waste management and crushing and screening. This phase will have moderate negative Impacts on the visual landscape. Waste management will have a minor visual impact.

The most significant visual impact during the operational phase is the extraction of material.

Activity No. 8: Storage of fuel and lubricants in temporary facilities					
Criteria	**Details / Discussion**				
Description of impact	The temporary storage of fuel, lubricants and material will have a negative visual impact on the receiving environment. These visual impacts are temporary and will only occur during the operational phase.				
Mitigation required	▪ Limit the footprint area of the temporary storage facilities where possible.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	3	(-) 3	5	-35
Post-Mitigation	1	3	(-) 2	4	-24
Activity No. 9: Topsoil removal and stockpiling; and extraction and transportation of ore					
Criteria	**Details / Discussion**				
Description of impact	Stockpiling topsoil and extraction of material will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the Project.				
Mitigation required	▪ Topsoil should only be removed when and where necessary; ▪ Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; ▪ Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; ▪ Topsoil and material stockpiles should be positioned to reduce visual disturbance where possible; ▪ Reduce the height and footprint area of topsoil and material stockpiles where possible; ▪ Apply dust suppression techniques to limit the dust from stockpiles; ▪ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; and ▪ Ensure vegetation screens are built and maintained.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 4	6	-54
Post-Mitigation	2	3	(-) 3	5	-40

Activity No. 10: Vehicular activity on haul roads; and operation of mining equipment					
Criteria	**Details / Discussion**				
Description of impact	Vehicular activity on the haul roads will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact. These visual impacts will occur for the life of the Project.				
Mitigation required	▪ Do not create numerous haul roads alongside each other; ▪ Roads should be wetted frequently by means of a water bowser to suppress dust; and ▪ Vehicles must be roadworthy and obey the recommended speed limits at all times.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 4	7	-54
Post-Mitigation	2	3	(-) 3	6	-40
Activity No. 11: Crushing and screening of ore in mobile plant					
Criteria	**Details / Discussion**				
Description of impact	The crushing and screening of ore may generate dust which will have a visual impact.				
Mitigation required	▪ Limit the footprint area of the temporary storage facilities where possible; and ▪ Apply dust suppression techniques where necessary.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	3	(-) 3	6	-42
Post-Mitigation	1	3	(-) 2	5	-30
Activity No. 12: Stockpiling material					
Criteria	**Details / Discussion**				
Description of impact	The stockpiling of material will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the Project.				
Mitigation required	▪ Material stockpiles should be positioned to reduce visual disturbance where possible; ▪ Reduce the height and footprint area of material stockpiles where possible; ▪ Apply dust suppression techniques to limit the dust from stockpiles; ▪ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; and ▪ Ensure vegetation screens are built and maintained.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*

Pre-Mitigation	1	2	(-) 3	6	-36
Post-Mitigation	1	2	(-) 2	5	-25

Activity No. 14: Waste generation and disposal (including sewage)					
Criteria	**Details / Discussion**				
Description of impact	Waste storage on site will have a negative visual impact on the receiving environment. This visual impact will occur until the waste is removed from the site.				
Mitigation required	▪ Limit the footprint area of the waste storage area where possible; and ▪ Limit the quantity and time of waste stored on site.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 2	5	-35
Post-Mitigation	2	3	(-) 1	4	-24

9.6.3 Decommissioning Phase

9.6.3.1 Air Quality

Activity No. 15: Demolition of infrastructure will take place and includes the PCDs, haul roads, pipelines, fuel bay and mine offices and workshop					
Criteria	**Details / Discussion**				
Description of impact	During this activity, dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to state suitable for alternative land uses. There is cleaning-up and removal of various infrastructures. Potential for impacts during this phase will depend on the extent of demolition and rehabilitation efforts during closure as well as features which will remain. The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. Demolition and removal of all infrastructures will cause fugitive dust emissions. Any implication this activity will have on ambient air quality will short-term and localised.				
Mitigation required	In order to mitigate the impacts of demolition and removal of rubbles on the ambient atmosphere, demolition should be done judiciously, especially if it occurs during windy periods (August, September and October) with wind speed ≥ 5.4 m/s. The area of disturbance must be kept to the barest minimum, which would limit the area exposed to wind erosion.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	2	(-) 2	6	-42

Post-Mitigation	3	2	(-) 2	5	-35

Activity No. 16: Vehicular activity: removal of mobile plant / equipment and vehicles					
Criteria	**Details / Discussion**				
Description of impact	Transportation of mobile plants / equipment and other materials from site can lead to the generation of fugitive dust comprising TSP, PM10 and PM2.5. This activity will be short-term, localised, and will have low impacts on the atmospheric environment once the demolition ceases.				
Mitigation required	There is need for the application of wetting agents or dust suppressant on the dirt road to avoid incessant suspension and re-suspension or entrainment of dust. Vehicle travel speed and distances should be minimised. Encourage car-pool and bulk removal of materials in order to reduce the number of trip on dirt roads.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 4	7	-70
Post-Mitigation	2	3	(-) 2	6	-42

Activity No. 17: Rehabilitation of site (As per surface use agreement roads, buildings etc. need not be rehabilitated)					
Criteria	**Details / Discussion**				
Description of impact	Re-vegetation of the remaining footprint of the mine must be done after the reclamation. The impacts on the atmospheric environment during rehabilitation will be limited to the vehicular activity, spreading of soil and profiling/contouring. The impact will be medium-term, very limited on spatial scale, with limited implication on ambient air quality. Infrastructures with surface use agreement i.e. roads and buildings will be passed on to other users.				
Mitigation required	It is recommended that the rehabilitation process begin during the operational phase. The objective is to minimise the area exposed to wind erosion. These measures should reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 2	6	-42
Post-Mitigation	1	2	(-) 2	6	-30

9.6.3.2 Biodiversity

9.6.3.2.1 Loss of Habitat

No direct loss of habitat is expected during this phase of the Project. Alien plant invasion is, however expected to occur as vehicles and machinery move throughout the site and disturb the soil.

Loss of habitat					
Phase	**Decommissioning**				
Criteria	**Details / Discussion**				
Description of impact	▪ Establishment of alien plant species in disturbed areas				
Mitigation required	▪ Manage alien invasive species establishment continually through chemical or mechanical removal ▪ Reinstate vegetation cover through concurrent rehabilitation				
Parameters	***Severity***	***Spatial scale***	***Duration***	***Probability***	***Significance***
Pre- Mitigation	4	2	(-) 3	6	-54
Post- Mitigation	1	2	(-) 3	4	-24

9.6.3.2.2 Loss of Species of Special Concern

No impacts to SSC are expected during the decommissioning phase.

9.6.3.2.3 Impacts to Non-perennial Streams

No impacts to temporary drainage are expected during the decommissioning phase.

9.6.3.3 Surface Water

Activity 15: Demolition / removal of portable and related infrastructure (if applicable).					
Criteria	**Details / Discussion**				
Description of impact	▪ The potential impact will arise during demolition of infrastructure, where mobilisation of contaminants such as fuels containing hydrocarbons, waste, explosives, PCD material to the surface water resources resulting in the contamination of those resources.				
Mitigation required	▪ Accredited contractors must be used for disposal and transport of demolition material. ▪ Ensure that spillage control kits to contain the contaminants from point of spillage are available on-site.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 3	5	-45

Post-Mitigation	2	2	(-) 2	4	-24
Activity 16: Vehicular activity: removal of mobile plant / equipment and vehicles.					
Criteria	**Details / Discussion**				
Description of impact	▪ Heavy vehicle activity used during the decommissioning phase is likely to have an impact on the topography of the roads. If not maintained, roads may deteriorate during the rainy season as a result of water erosion causing siltation of the surrounding surface water resources.				
Mitigation required	▪ Roads should be regularly contoured and road infrastructure (e.g. culverts) maintained.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 2	5	-40
Post-Mitigation	3	2	(-) 2	4	-28
Activity 17: Rehabilitation of site (As per surface use agreement roads, buildings etc. need not be rehabilitated).					
Criteria	**Details / Discussion**				
Description of impact	▪ Rehabilitation will have a positive impact on the water quantity and quality of the disturbed site. However, should rehabilitation not take place, then long term impacts on surface water resources may result.				
Mitigation required	▪ Disturbed areas should be contoured and vegetated to allow for good drainage. ▪ Where rehabilitation (grass seeding of topsoil cover) is not effective, the associated soil erosion should be mitigated by installing silt traps. ▪ To complement the rehabilitation process, water quality monitoring should be implemented until 3 years post closure, so as to capture any negative residual impacts that could surface years later.				
Parameters	*Duration*	*Spatial*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	7	5	(-) 7	6	-114
Post-Mitigation	6	3	(+) 3	6	72

9.6.3.4 Geohydrology

The activities during the decommissioning phase that could potentially impact the groundwater include:

Activity 17 – Rehabilitation of site (as per surface use agreement roads, buildings etc. need not be rehabilitated)	
Criteria	**Details / Discussion**
Description of	▪ Potential ponding of water inside the mined out pit might lead to potential seepage of water onto surface further downstream. If the pit lake water is of

impact	poor quality then the aquifers and surface water resources might be impacted by seepage with elevated salt and metal content; ▪ Water seeping from the pit, stockpiles an pollution control dam can have elevated concentrations of heavy metals and other elements and can potentially be acidic; and ▪ When this water reaches surface water bodies or the groundwater it can negatively affect the water quality.				
Mitigation required	▪ Trenches/berms upstream of pit to divert and prevent surface water runoff into pit; ▪ Backfilling of pit with waste rock material reducing the area; and ▪ Stormwater management plan to divert clean water from dirty water and contaminated sites.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 3	3	-21
Post-Mitigation	1	2	(-) 2	2	-10

9.6.3.5 Soils, Land Capability and Land Use

During the decommissioning phase the sites will be rehabilitated. These impacts are described below along with their mitigation measures.

9.6.3.5.1 Impact: loss of topsoil as a resource

Criteria	**Details / Discussion**				
Description of impact	When topsoil is replaced on the surface for rehabilitation purposes it is vital to try minimise the impacts on the topsoil by following the mitigation measures.				
Mitigation required	▪ The slopes are to be kept as shallow as possible to reduce runoff and erosion; ▪ A bowl scraper is to be avoided as this piece of machinery compacts soil; ▪ Soil replacement should be in accordance with pre-mining land capability requirements; ▪ Placed soils are to be maintained in a fertile and erosion free state by sampling them annually for macro nutrients and pH; ▪ The handling of the topsoil will be minimise to ensure the soil's structure does not deteriorate; ▪ Compaction of the topsoil will be avoided; ▪ The replaced soils will be vegetated in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ▪ Soils will be replaced according to the soil types.				
Parameters	*Spatial*	*Duration*	*Severity*	*Probability*	*Significant rating*
Pre-Mitigation	3	5	(-) 5	7	-91
Post-Mitigation	2	5	(-) 3	3	-30

9.6.3.5.2 Impact: Compaction & Erosion

Criteria	Details / Discussion				
Description of impact	Compaction occurs when heavy machinery drives over soils and compresses them. Erosion is grouped with compaction as compacted areas increase the erosion hazards that are present by reducing vegetation cover and increasing runoff potential.				
Mitigation required	▪ Limit access to one route; ▪ Deep rip compacted areas to allow for natural vegetation regrowth; ▪ Ensure proper stormwater management designs are in place; ▪ If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; and ▪ Replaced soils to be re-vegetated and designed according to Chamber of Mines Rehabilitation Guidelines.				
Parameters	*Spatial*	*Duration*	*Severity*	*Probability*	*Significant rating*
Pre-Mitigation	1	7	(-) 7	6	-90
Post-Mitigation	1	3	(-) 3	4	-28

9.6.3.5.3 Impact: Hydrocarbon/Slurry Pollution

Criteria	Details / Discussion				
Description of impact	Hydrocarbon spills occur when using heavy machinery, as they all use oils and diesel to run. There is a chance of these breaking down and/or leaking. Hydrocarbons have a devastating effect on the soil quality.				
Mitigation required	▪ Prevent any spills from occurring; ▪ Educate labour force on procedures for emergency spill clean ups; ▪ If a spill occurs it is to be cleaned up immediately and Reported to the appropriate authorities; ▪ All vehicles are to be serviced in a correctly bunded area; and ▪ Leaking vehicles will have drip trays place under them where the leak is occurring				
Parameters	*Spatial*	*Duration*	*Severity*	*Probability*	*Significant rating*
Pre-Mitigation	1	7	(-) 7	6	-90
Post-Mitigation	1	1	(-) 7	5	-45

9.6.3.6 Noise

The Decommissioning Phase involves the following activities that may impact on the ambient noise levels:

- Demolition / removal of portable and related infrastructure (if applicable);
- Vehicular activity: removal of mobile plant / equipment and vehicles; and
- Rehabilitation of site (As per surface use agreement roads, buildings etc. need not be rehabilitated).

Table 9-21: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the decommissioning phase

Criteria	Details / Discussion				
Description of impact	▪ Mining machinery and vehicles may increase ambient noise levels at surrounding urban and rural noise sensitive receptors.				
Mitigation required	▪ Restricting construction activities to daylight hours where viable; ▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	3	-18
Post-Mitigation	1	2	(-) 1	2	-8

9.6.3.7 Visual and Topography

The decommissioning phase is characterised by demolition of infrastructure and rehabilitation including the re-contouring of the disturbed areas. This phase will have mainly neutral visual impacts on the receiving environment. The surface infrastructure is relatively small scale and its demolition and removal will have a minor neutral impact. The spreading of topsoil, profiling and contouring, and re-vegetation will have a moderate neutral impact.

Activity No. 15: Demolition / removal or portable and related infrastructure (if applicable)					
Criteria	**Details / Discussion**				
Description of impact	Demolition and removal of infrastructure will have a neutral visual impact on the receiving environment. This will help to reverse some of the changes that occurred when the infrastructure was constructed.				
Mitigation required	▪ Ensure that all unnecessary infrastructure is demolished and removed from the site.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*

Pre-Mitigation	1	2	(-) 3	6	-36
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				
Activity No. 16: Vehicular activity: removal of mobile plant/equipment and vehicles					
Criteria	**Details / Discussion**				
Description of impact	Vehicular activity on the haul roads will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact. These visual impacts will occur for the life of the Project.				
Mitigation required	▪ Do not create numerous haul roads alongside each other; ▪ Roads should be wetted frequently by means of a water bowser to suppress dust; and ▪ Vehicles must be roadworthy and obey the recommended speed limits at all times.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	(-) 2	6	-36
Post-Mitigation	1	2	(-) 2	5	-25
Activity No. 17: Rehabilitation of site (as per surface use agreement roads, buildings etc. need not be rehabilitated)					
Criteria	**Details / Discussion**				
Description of impact	Rehabilitation by replacement of topsoil and re-contouring of the disturbed areas will have a neutral visual impact on the receiving environment. The aim of rehabilitation is to return the Project area to a state similar to the pre-mining state. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.				
Mitigation required	▪ Re-contouring disturbed areas to create a free-draining topography; ▪ Spread topsoil over the disturbed area; and ▪ Re-vegetate the disturbed area.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 4	6	-54
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

9.7 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 advantages and disadvantages of the site layout have been discussed in the various specialist Reports. For the reasons provided above in Section 9.1, no alternatives have been considered for this Project.

Please refer to the detailed specialist Reports appended to this Report:

- Air Quality (Refer to detailed Report in Appendix D)
- Noise (Refer to detailed Report in Appendix E)
- Biodiversity (Refer to detailed Report in Appendix F)
- Visual and Topography (Refer to detailed Report in Appendix G)
- Soils, Land Capability and Land Use (Refer to detailed Report in Appendix H)
- Surface Water (Refer to detailed Report in Appendix I)
- Geohydrology (Refer to detailed Report in Appendix J)
- Social Impact Assessment (Refer to detailed Report in Appendix K)
- Heritage (Refer to detailed Report in Appendix L)

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

The identification of risks and the mitigation measures that could be applied have been discussed above in Section 9.6.

9.9 Motivation where no alternatives sites were considered

No property alternatives have been considered as the envisaged mining operations will occur on properties already utilised for the mining operations and where De Groote Boom has negotiated surface rights.

9.10 Statement motivating the alternative development location within the overall site

For the reasons discussed in Section 9.7, no alternative development locations have been considered for this Project.

10 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

As the site layout was informed by environmental and technical studies, as well as due to the location of the chrome ore, the initial layout has not changed substantially during the PPP or impact ranking. The impacts and risks identified in Section 9 are therefore applicable to the final site layout plan (Plan 4 - Environmental Features, Appendix A).

11 Assessment of each identified potentially significant impact and risk

(The potential impacts per activity are detailed in Table 11-1below. The impacts per phase of the Project are outlined in Section 9, Item 3 (g)(v) above and indicate the mitigation measures proposed, as well as the impact significance pre-mitigation and post mitigation.

Table 11-1: Assessment of Each Identified Impact

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
Construction Phase						
Employment of workers and procurement of construction materials.	Loss of farm labour.	Socio-economic	Construction Phase Operational Phase	Negligible Negative	Control through: ▪ Employment Strategy and recruitment policy ▪ Grievance Mechanism	Negligible Negative
	Population Influx – Pressure on Resources	Socio-economic	Construction Phase Operational Phase	Moderate Negative	Manage through: ▪ Grievance Mechanism	Minor Negative
	Population Influx – Social Pathologies	Socio-economic	Construction Phase Operational Phase	Moderate Negative	Manage and control through: ▪ Awareness Campaigns	Minor Negative
	Population Influx – Community Conflict	Socio-economic	Construction Phase Operational Phase	Minor Negative	Manage and minimise through: ▪ Employment Strategy and recruitment policy ▪ Grievance Mechanism	Minor Negative
	Health and Safety	Socio-economic	Construction Phase Operational Phase	Moderate Negative	Prevent through: ▪ Awareness Campaigns ▪ Maintenance Programme ▪ Grievance Mechanism	Minor Negative
	Job Creation and Skills Training	Socio-economic	Construction Phase Operational Phase	Minor Positive	Enhance through: ▪ Employment Strategy and recruitment policy	Moderate Positive
	Job Creation (Multiplier Effect) and Population Influx	Socio-economic	Construction Phase Operational Phase	Minor Positive	Enhance through: ▪ Development Plan ▪ SMME register.	Moderate Positive
1. Activity 1: Augmenting existing roads **And**	Fugitive dust generation.	Air Quality	Construction Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
2. Activity 2: Construction of PCD **And** **3. Activity 3: Transport of construction material, mobile plant and equipment to the site; and movement of haul trucks and excavator on haul roads**		Topography and Visual Environment	Construction Phase	Minor Negative	Monitor and manage through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme. ▪ Municipal Liaising.	Negligible Negative
	Hydrocarbon Contamination	Surface Water	Construction Phase Operational Phase Decommissioning Phase	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative
4. Activity 4: Storage of material / diesel at site in temporary facilities	Hydrocarbon Contamination	Soils	Construction Phase Operational Phase Decommissioning Phase	Moderate Negative	Remedy through: ▪ Emergency Response Plan	Minor Negative
		Surface Water	Construction Phase Operational Phase Decommissioning Phase	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative
		Groundwater	Construction Phase Operational Phase Decommissioning Phase	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative
	Visual and topographical impact.	Topography and Visual Environment	Construction Phase Operational Phase	Negligible Negative	Avoid and minimise through: ▪ Mine Plan	Negligible Negative
5. Activity 5: Site clearing and topsoil removal for mining operation area; and construction of mining cut	Fugitive dust generation.	Air Quality	Construction Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
		Visual Environment	Construction Phase	Moderate Negative	Avoid and minimise through: ▪ Mine Plan	Minor Negative
	Alteration of the visual environment and topography	Topography and Visual Environment	Construction Phase	Moderate Negative	Avoid and minimise through: ▪ Mine Plan	Minor Negative
	Degradation to soil resources.	Soils	Construction Phase Operational Phase	Moderate Negative	Prevent through: ▪ Soil Rehabilitation Plan; ▪ Stormwater Management Plan	Negligible Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
	Vegetation and habitat loss.	Fauna and flora	Construction Phase	Moderate Negative	Remedy through: ▪ Conservation Management Plan; ▪ Rehabilitation Plan ▪ Alien Invasive Management Plan.	Minor Negative
	Destruction of Wetlands	Wetlands	Construction Phase	Major Negative	Remedy through: ▪ Wetland Off-Set Strategy	N/A
	Hydrocarbon Contamination	Wetland and Aquatic Ecology	Construction Phase	Moderate Negative	Remedy and manage through: ▪ Emergency Response Plan; ▪ Stormwater Management Plan.	Minor Negative
	Sedimentation and siltation of watercourses	Surface Water	Construction Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan.	Minor Negative
	Water level reduction and contamination	Groundwater	Construction Phase Operational Phase	Minor Negative	Manage and prevent through: ▪ Stormwater Management Plan. ▪ Groundwater Monitoring Plan	Minor Negative
	Noise generation.	Noise	LoM	Negligible Negative	Manage and prevent through: ▪ Regular Vehicle Inspections.	Negligible Negative
	Destruction of graves	Heritage	Construction Phase Operational Phase	Major Negative	Manage and remedy through: ▪ Conservation Management Plan ▪ Grave Relocation Plan	Moderate Negative
	Degradation of cultural significance and health and safety risk to next of kin	Heritage	Construction Phase Operational Phase	Moderate Negative	Remedy through: ▪ Entitlement Framework	Moderate Positive
6. Activity 6: Preparing an area of approximately 2-3 ha for portable plant and infrastructure (crushing, screening, workshops, ablution	Fugitive dust generation.	Air Quality	Construction Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
	Topography and visual alteration.	Topography and Visual Environment	Construction Phase	Minor Negative	Avoid and minimise through: ▪ Mine Plan	Minor Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
and offices etc.) and stockpiling	Degradation to soil resources.	Soils	Construction Phase Operational Phase	Moderate Negative	Prevent through: ▪ Soil Rehabilitation Plan; ▪ Stormwater Management Plan	Negligible Negative
	Influx of alien invasive vegetation.	Fauna and flora	Construction Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan; ▪ Alien Invasive Management Plan.	Minor Negative
	Sedimentation and siltation of watercourses	Wetland and Aquatic Ecology	Construction Phase	Minor Negative	Monitor and prevent through: ▪ Aquatic Monitoring Programme ▪ Stormwater Management Plan.	Minor Negative
		Surface Water	Construction Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan.	Negligible Negative
	Noise generation.	Noise	LoM	Negligible Negative	Manage and prevent through: ▪ Regular Vehicle Inspections.	Negligible Negative
	Degradation of cultural significance and health and safety risk to next of kin	Heritage	Construction Phase Operational Phase	Moderate Negative	Remedy through: ▪ Entitlement Framework	Moderate Positive
	Fugitive dust generation.	Air Quality	Construction Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
	Topography and visual alteration.	Topography and Visual Environment	Construction Phase Operational Phase	Moderate Negative	Manage through: ▪ Mine Plan. ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Moderate Negative
	Degradation to soil resources.	Soils	Construction Phase Operational Phase	Moderate Negative	Prevent through: ▪ Soil Rehabilitation Plan; ▪ Stormwater Management Plan	Negligible Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
	Influx of alien invasive vegetation.	Fauna and flora	Construction Phase	Minor Negative	Monitor and manage through: ▪ Stormwater Management Plan; ▪ Alien Invasive Management Plan.	Minor Negative
	Sedimentation and siltation of watercourses	Wetland and Aquatic Ecology	Construction Phase	Minor Negative	Monitor and manage through: ▪ Aquatic Monitoring Programme ▪ Stormwater Management Plan.	Minor Negative
		Surface Water	Construction Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan.	Negligible Negative
	Acid Mine Drainage Formation	Groundwater	Construction Phase Operational Phase	Moderate Negative	Prevent and monitor through: ▪ Stormwater Management Plan. ▪ Groundwater Monitoring Plan. ▪ Conceptual and Numerical Model.	Minor Negative
7. Activity 7: Use of existing drilled / new boreholes	Fugitive dust generation.	Air Quality	Construction Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
	Topography and visual alteration.	Topography and Visual Environment	Construction Phase	Major negative	Avoid and minimise through: ▪ Mine Plan	Major negative
	Degradation to soil resources.	Soils	Construction Phase Operational Phase	Moderate Negative	Prevent through: ▪ Soil Rehabilitation Plan; ▪ Stormwater Management Plan	Negligible Negative
	Hydrocarbon contamination.	Groundwater	Construction Phase Operational Phase Decommissioning Phase	Minor Negative	Remedy and monitor through: ▪ Emergency Response Plan ▪ Groundwater Monitoring Programme	Negligible Negative
	Noise generation.	Noise	LoM	Negligible Negative	Prevent and manage through: ▪ Regular Vehicle Inspections.	Negligible Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
Operational Phase						
Employment of workers.	Loss of farm labour.	Socio-economic	Construction Phase Operational Phase	Negligible Negative	Control through: ▪ Employment Strategy and recruitment policy ▪ Grievance Mechanism	Negligible Negative
	Population Influx – Pressure on Resources	Socio-economic	Construction Phase Operational Phase	Moderate Negative	Manage through: ▪ Grievance Mechanism	Minor Negative
	Population Influx – Social Pathologies	Socio-economic	Construction Phase Operational Phase	Moderate Negative	Manage and minimise through: ▪ Awareness Campaigns	Minor Negative
	Population Influx – Community Conflict	Socio-economic	Construction Phase Operational Phase	Minor Negative	Manage and minimise through: ▪ Employment Strategy and recruitment policy ▪ Grievance Mechanism	Minor Negative
	Health and Safety	Socio-economic	Construction Phase Operational Phase	Moderate Negative	Prevent through: ▪ Awareness Campaigns ▪ Maintenance Programme Grievance Mechanism	Minor Negative
	Job Creation and Skills Training	Socio-economic	Construction Phase Operational Phase	Minor Positive	Enhance through: ▪ Employment Strategy and recruitment policy	Moderate Positive
	Job Creation (Multiplier Effect) and Population Influx	Socio-economic	Construction Phase Operational Phase	Minor Positive	Enhance through: ▪ Development Plan ▪ SMME register.	Moderate Positive
8. Activity 8: Storage of fuel and lubricants in temporary facilities.	Hydrocarbon contamination	Soils	LoM	Moderate Negative	Remedy through: ▪ Emergency Response Plan	Minor Negative
		Wetlands and Aquatic Ecology	LoM	Minor Negative	Remedy and manage through: ▪ Emergency Response Plan ▪ Stormwater Management Plan ▪ Aquatic Monitoring Programme	Minor Negative
		Surface Water	LoM	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative
		Groundwater	LoM	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
9. Activity 9: Topsoil removal and stockpiling; and extraction and transportation of ore **And** **10. Activity 10: Vehicular activity on haul roads; and operation of mining equipment** **And** **11. Activity 11: Crushing and screening of ore in mobile plant**	Fugitive dust generation.	Air Quality	Operational Phase	Minor Negative	Monitor and manage through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
	Alteration in the topography and visual environment.	Topography and Visual Environment	Operational Phase	Moderate Negative	Avoid and minimise through: ▪ Mine Plan	Moderate Negative
	Contamination of water resources and alteration of drainage patterns.	Surface Water	Operational Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan	Minor Negative
	Destruction of upstream tributaries and reduction in water in the catchment.	Surface Water	Operational Phase	Moderate Negative	▪ N/A	N/A
	Noise generation	Noise	Construction Phase Operational Phase	Negligible Negative	Control through: ▪ Quality control procedures.	Negligible Negative
	Fugitive dust generation.	Air Quality	Operational Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
		Visual Environment	Operational Phase	Minor Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
	Hydrocarbon contamination	Soils	LoM	Moderate Negative	Remedy through: ▪ Emergency Response Plan	Minor Negative
		Wetlands and Aquatic Ecology	LoM	Minor Negative	Remedy and manage through: ▪ Emergency Response Plan ▪ Stormwater Management Plan ▪ Aquatic Monitoring Programme	Minor Negative
	Transpiration prevention and road deaths.	Fauna and Flora	Operational Phase	Moderate Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
	Sedimentation and siltation of water resources	Wetlands and Aquatic Ecology	Operational Phase	Minor Negative	Remedy and manage through: ▪ Emergency Response Plan ▪ Stormwater Management Plan ▪ Aquatic Monitoring Programme	Minor Negative
		Surface Water	Operational Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan	Negligible Negative
	Noise generation	Noise	Construction Phase Operational Phase	Negligible Negative	Prevent and manage through: ▪ Vehicle Maintenance Plan.	Negligible Negative
PCD	Contamination of water resources	Wetlands and Aquatic Ecology	Operational Phase	Minor Negative	Monitor and manage through: ▪ Stormwater Management Plan ▪ Aquatic Monitoring Programme	Minor Negative
		Surface Water	Operational Phase	Minor Negative	Manage and prevent through: ▪ Stormwater Management Plan	Negligible Negative
		Groundwater	Operational Phase	Minor Negative	Monitor and manage through: ▪ Stormwater Management Plan ▪ Groundwater Monitoring Programme ▪ Emergency Response Plan	Negligible Negative
12. Activity 12: Stockpiling material	Fugitive dust generation.	Air Quality	Operational Phase	Moderate Negative	Monitor and manage: through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Minor Negative
	Alteration to the topography and visual environment.	Topography and Visual Environment	Operational Phase	Moderate Negative	Minimise through: ▪ Mine Plan ▪ Vegetation Monitoring	Minor Negative
	Loss of topsoil resources due to erosion.	Soils	Operational Phase	Moderate Negative	Manage and prevent through: ▪ Stormwater Management Plan	Negligible Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
	Sedimentation and siltation of water resources	Wetlands and Aquatic Ecology	LoM	Minor Negative	Manage and remedy through: ▪ Emergency Response Plan ▪ Stormwater Management Plan ▪ Aquatic Monitoring Programme	Minor Negative
		Surface Water	Operational Phase	Minor Negative	Manage and prevent through: ▪ Stormwater Management Plan	Negligible Negative
	Acid Mine Drainage Formation	Groundwater	Operational Phase	Minor Negative	Manage and prevent through: ▪ Stormwater Management Plan ▪ Groundwater Monitoring Programme	Minor Negative
13. Activity 13: Water Management	Alteration to the topography and visual environment.	Topography and Visual Environment	Operational Phase	Moderate Negative	▪ N/A	N/A
	Contamination of water resources	Wetlands and Aquatic Ecology	Operational Phase	Minor Negative	Monitor and manage through: ▪ Stormwater Management Plan ▪ Aquatic Monitoring Programme	Minor Negative
		Surface Water	Operational Phase	Minor Negative	Prevent through: ▪ Stormwater Management Plan	Negligible Negative
		Groundwater	Operational Phase	Negligible Negative	Monitor and manage through: ▪ Stormwater Management Plan ▪ Groundwater Monitoring Programme	Negligible Negative
14. Activity 14: Waste generation and disposal (including sewage)	Alteration of the topography and visual environment	Topography and Visual Environment	Decommissioning Phase	Negligible Negative	Remedy through: ▪ IWWMP ▪ Rehabilitation Plan ▪ Closure Plan	Negligible Negative
	Waste material contamination	Soils	Decommissioning Phase	Moderate Negative	Prevent and avoid through: ▪ Emergency Response Plan ▪ IWWMP	Minor Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
		Surface Water	Decommissioning Phase	Minor Negative	Prevent and avoid through: ▪ Emergency Response Plan ▪ IWWMP	Negligible Negative
	Alteration to the topography and visual environment.	Topography and Visual Environment	Operational Phase	Minor Negative	Minimise through: ▪ Mine Plan ▪ Vegetation Monitoring	Negligible Negative
	Contamination of water resources	Surface Water	Operational Phase	Minor Negative	Prevent and manage through: ▪ Stormwater Management Plan ▪ IWWMP	Negligible Negative
		Groundwater	Operational Phase	Minor Negative	Prevent and manage through: ▪ Stormwater Management Plan ▪ Groundwater Monitoring Programme ▪ IWWMP	Negligible Negative
Decommissioning Phase						
15. Activity 15: Demolition / removal of portable and related infrastructure	Fugitive dust generation	Air Quality	Decommissioning Phase	Minor Negative	Monitor and manage through: ▪ Dust Management Plan. ▪ Dust Monitoring Programme.	Negligible Negative
	Alteration of the topography and visual environment	Topography and Visual Environment	Decommissioning Phase	Minor Negative	Remedy through: ▪ Rehabilitation Plan ▪ Closure Plan	N/A
	Hydrocarbon and waste material contamination	Soils	Decommissioning Phase	Moderate Negative	Manage through: ▪ Emergency Reponses Plan ▪ IWWMP	Minor Negative
	Alien Invasive Vegetation establishment	Fauna and Flora	Decommissioning Phase Post-Closure	Negligible Negative	Manage through: ▪ Alien Invasive Management Programme	Negligible Negative
	Sedimentation and contamination of water resources	Wetlands and Aquatic Ecology	Decommissioning Phase	Minor Negative	Monitor and remedy through: ▪ Emergency Response Plan ▪ Aquatic Monitoring Programme	Minor Negative
		Surface Water	Decommissioning Phase	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
	Noise generation	Noise	Decommissioning Phase	Negligible Negative	Prevent and manage through: ▪ Vehicle Maintenance Plan	Negligible Negative
16. Activity 16: Vehicular activity: removal of mobile plant / equipment and vehicles	Hydrocarbon contamination	Soils	Decommissioning Phase	Moderate Negative	Remedy through: ▪ Emergency Response Plan	Minor Negative
		Surface Water	Decommissioning Phase	Minor Negative	Remedy through: ▪ Emergency Response Plan	Negligible Negative
		Groundwater	Decommissioning Phase	Negligible Negative	Monitor and remedy through: ▪ Emergency Response Plan ▪ Groundwater Monitoring Programme	Negligible Negative
17. Activity 17: Rehabilitation of the site	Fugitive dust generation.	Air Quality	Operational Phase Decommissioning Phase	Moderate Negative	Monitor and manage through: ▪ Dust Management Plan. ▪ Vegetation Monitoring	Minor Negative
	Alteration of the topography and visual environment	Topography and Visual Environment	Decommissioning Phase	Moderate Negative	Remedy through: ▪ Rehabilitation Plan ▪ Closure Plan	N/A
	Hydrocarbon contamination	Soils	Decommissioning Phase	Moderate Negative	Prevent and control through: ▪ Emergency Reponses Plan	Minor Negative
	Reduction in land capability	Soils	Decommissioning Phase Post Closure	Moderate Negative	Prevent through: ▪ Rehabilitation Plan ▪ Closure Plan ▪ Vegetation Monitoring	Minor Negative
	Vegetation and habitat establishment	Fauna and Flora	Operational Phase Decommissioning Phase	Negligible Negative	Remedy and enhance through: ▪ Rehabilitation Plan ▪ Vegetation Monitoring ▪ Alien Invasive Management Programme	Minor Positive
	Restoration of water quality and quantity.	Surface Water	Operational Phase Decommissioning Phase	Minor Positive	Remedy through: ▪ Rehabilitation Plan ▪ Closure Plan ▪ Vegetation Monitoring ▪ Surface Water Monitoring	Minor Positive

Activity	Potential Impact	Aspects Affected	Phase	Significance Pre-Mitigation	Mitigation Type	Significance Post-Mitigation
	Acid Mine Drainage Formation	Groundwater	Operational Phase Decommissioning Phase	Minor Negative	Manage and control through: ▪ Rehabilitation Plan ▪ Groundwater Monitoring Programme	Minor Negative
	Noise generation	Noise	Operational Phase Decommissioning Phase	Negligible Negative	Manage and prevent through: ▪ Vehicle Maintenance Plan	Negligible Negative

Please refer to the detailed specialist Reports appended to this Report, for the impact assessments conducted as part of this Study:

- Air Quality (Refer to detailed Report in Appendix D);
- Noise (Refer to detailed Report in Appendix E);
- Biodiversity (Refer to detailed Report in Appendix F);
- Visual and Topography (Refer to detailed Report in Appendix G);
- Soils, Land Capability and Land Use (Refer to detailed Report in Appendix H);
- Surface Water (Refer to detailed Report in Appendix I);
- Geohydrology (Refer to detailed Report in Appendix J);
- Social Impact Assessment (Refer to detailed Report in Appendix K); and
- Heritage (Refer to detailed Report in Appendix L).

12 Summary of specialist Reports

Numerous specialist impact assessments were undertaken for the proposed Project. Table 12-1details the specialist studies undertaken for the proposed Project.

Table 12-1: Specialist studies undertaken for the De Groote Boom Project

List of studies undertaken	Recommendations of specialist Reports	Specialist Recommendations that have been included in the EIA Report	Reference to applicable section of Report where specialist recommendations have been included
Air Quality Impact Assessment	▪ Significance of impacts ▪ Mitigation measures ▪ Monitoring Programme	X	All mitigation and management measures, as well as monitoring programmes, included in this Report were recommended by the Air Quality Specialist. The Air Quality Impact Assessment Report is included in Appendix D.
Biodiversity Impact Assessment	▪ Significance of impacts ▪ Mitigation measures ▪ Monitoring Programme	X	All mitigation and management measures, as well as monitoring programmes, included in this Report were recommended by the Fauna and Flora Specialist. The Biodiversity Impact Assessment for De Groote Boom is included in Appendix F.
Surface Water Impact Assessment	▪ Significance of impacts ▪ Mitigation measures ▪ Monitoring Programme	X	All mitigation and management measures, as well as monitoring programmes, included in this Report were recommended by the Surface Water Specialist. The Surface Water Impact Assessment Report is included in Appendix I.
Geohydrology Impact Assessment	▪ Significance of impacts ▪ Mitigation measures	X	All mitigation and management measures included in this Report were recommended by the Groundwater Specialist. The Geohydrology Impact Assessment is included in Appendix J.
Soils, Land Capability and Land Use	▪ Significance of impacts ▪ Mitigation measures	X	All mitigation and management measures included in this Report were recommended by the Soil Specialist. The Soils, Land Capability and Land Use Report is included in Appendix H.
Social Impact Assessment	▪ Significance of impacts ▪ Mitigation measures	X	All mitigation and management measures included in this Report were recommended by the Social Scientist. The Social Impact Assessment Report is included in Appendix K.
Noise Impact Assessment	▪ Significance of impacts ▪ Mitigation measures	X	All mitigation and management measures included in this Report were recommended by the Noise Specialist. The Noise Impact Assessment Report is included in Appendix E.
Visual and Topography Impact Assessment	▪ Significance of impacts ▪ Mitigation measures	X	All mitigation and management measures included in this Report were recommended by the Topography and Visual Specialist. The Visual and Topography Impact Assessment Report is included in Appendix G.
Heritage Impact Assessment	▪ Significance of heritage resources. ▪ Recommendations.	X	All mitigation and management measures included in this Report were recommended by the Heritage Specialist. The Heritage Impact Assessment Report is included in Appendix L.

X - denotes Yes. The specialist recommendations can be found in the following specialist reports:

- Air Quality (Refer to detailed Report in Appendix D);
- Noise (Refer to detailed Report in Appendix E);
- Biodiversity (Refer to detailed Report in Appendix F);
- Visual and Topography (Refer to detailed Report in Appendix G);
- Soils, Land Capability and Land Use (Refer to detailed Report in Appendix H);
- Surface Water (Refer to detailed Report in Appendix I);
- Geohydrology (Refer to detailed Report in Appendix J);
- Social Impact Assessment (Refer to detailed Report in Appendix K); and
- Heritage (Refer to detailed Report in Appendix L).

13 Environmental impact statement[4]

In accordance with the EIA Regulations GN R543 31 (2) (n), the EAP must provide an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation must be stated.

An impact assessment has been undertaken, which has incorporated extensive consultation with and participation of I&APs. It is the EAP's opinion that due process has been followed. Where impacts have been found to be potentially significant, various mitigation measures to manage and monitor the impacts of the Project have been proposed.

In Digby Wells's professional opinion, there are no anticipated impacts that constitute a fatal flaw for the proposed Project. Nevertheless, the recommended mitigation measures must be implemented in order to minimise the impacts and ensuring compliance with current legislative requirements.

It is recommended that the proposed Project is allowed to proceed on the assumption that the environmental and social management commitments are adhered to, the Project description remains as per the description provided in this document and considering the positive social impacts associated with the Project.

13.1 Summary of the key findings of the environmental impact assessment

The Environmental Impact Statement is utilised to summarise all of the potential environmental impacts identified during each phase of the proposed Project. The significance of the impacts associated with the Project, pre-mitigation and post-mitigation, is summarised in Table 13-1.

[4] This section corresponds with Item 3(l) of the EIA Regulations, 2014

Table 13-1: Summary of the Potential Impacts on the Biophysical Environment

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
Construction Phase	Air Quality	Fugitive dust generation from augmenting existing roads	-35	-24
		Fugitive dust generation from the construction of pollution control dam	-35	-24
		Fugitive dust generation from transport of construction material, mobile plant and equipment to site; and movement of haul trucks and excavator on haul road	-70	-42
		Evaporation of diesel fuel and heavy fuel from temporary tanks and possible spills during loading of fuel from tanks on site that are used for re-fuelling of heavy machinery and trucks	-40	-20
		Fugitive dust generation from Site clearing and topsoil removal and construction	-49	-42
		Fugitive dust generation from preparing for portable plant, infrastructure and stock piling	-49	-35
	Biodiversity	Loss of suitable habitats from the removal of vegetation; the disturbance of the soil; and vehicle operation	-115	-90
		Loss of fauna and flora species from the removal of vegetation; increased human presence; machinery and	-108	-68

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
		vehicle operation		
		Impacts to Non-perennial Streams through; mining of the koppie; roads crossing drainage areas; upgrading of existing roads crossing drainage areas and streams-66	-66	-40
	Surface Water	Sedimentation and contamination of surface water resources.	-40	-28
		Construction of infrastructure exposes the surface water to the following impacts: poorly designed PCDs can contaminate water resources to the surrounding water bodies; stockpiles may cause sedimentation; concrete and other impervious surfaces prevent surface water from infiltrating the soil and will increase runoff.	-32	-28
		Potential spillages during transport of construction material, hazardous substances and hydrocarbon containing fuels and lubricants to site.	-44	-21
	Geohydrology	Groundwater contamination	-18	8
		Establishment of hard surface areas during infrastructure and access road construction reduces the recharge to the shallow weathered aquifers due to increased runoff	-8	-4

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
		Continuous abstraction from boreholes for any use might lead to a dewatering cone around the pumping boreholes	-20	-6
	Soils, Land Capability and Land Use	Loss of topsoil resources as a resource Soil erosion and degradation.	-91	-30
		Hydrocarbon pollution	-90	-45
		Loss of land capability	-84	-66
	Noise	Noise generation through mining machinery and vehicles may increase ambient noise levels at surrounding urban and rural noise sensitive receptors	-18	-8
	Visual	Alteration of visual environment through augmenting existing roads	-36	-25
		Alteration of visual environment through the construction of the PCD	-42	-30
		Alteration of visual environment through vehicular activity and the resulting dust	-48	-35
		Alteration of visual environment through the temporary storage of material / diesel	-36	-25

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
		Alteration of visual environment through the removal of vegetation and topsoil for site clearing	-48	-35
		Alteration of visual environment through the erection of surface infrastructure	-42	-30
Operational Phase	Air Quality	Damage to containers of bags holding powdery chemicals during material handling can lead to release and subsequent erosion with implication on ambient air quality	-40	-20
		Fugitive dust generation from topsoil removal and stockpiling; and extraction and transportation of materials; vehicular activity on haul roads; and operation of mining equipment; and crushing and screening of ore in mobile plant	-72	-40
		Fugitive dust generation from the operation and maintenance of the stockpiles, including waste and ROM stockpiles	-78	-40
		Evaporation of diesel fuel and heavy fuel from temporary tanks and possible spills during loading and re-fuelling of heavy machinery and trucks	-65	-44
	Biodiversity	Loss of suitable habitats through the establishment of alien plant species in disturbed areas as well as road kill from	-54	-24

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
		increases vehicular movement		
	Surface Water	Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from surface to the surrounding surface water resources	-44	-21
		Siltation of the surrounding surface water resources through erosion	-45	-28
			-40	-28
		Potential channel spill or pipeline burst could result in dirty pit water contaminating surface water runoff	-55	-28
		Contamination of surface water resources resulting from temporary storage of waste material before collection for disposal may result in leakages	-45	-28
	Geohydrology	Groundwater contamination from storage of fuel and lubricants in temporary facilities	-18	-8
		Stockpile storage of removed topsoil, overburden and ore reserves exposes soil and rock types to conditions which increase the potential for AMD development	-18	8
		Water seeping from the pit, stockpiles an pollution control dam can lead to elevated concentrations of heavy metals	-18	-10

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
		and other elements in the groundwater environment		
		Contamination of groundwater via seepage of dirty water from the waste and ore stockpiles	-21	-10
		Contamination of aquifer	-18	-8
	Soils, Land Capability and Land Use	Loss of topsoil resources as a resource Soil erosion and degradation.	-91	-30
		Hydrocarbon pollution	-90	-45
		Loss of land capability	-84	-60
	Noise	Noise generation	-27	-14
	Visual	Alteration of visual environment through the temporary storage of fuel, lubricants and material	-35	-24
		Alteration of visual environment through the stockpiling topsoil and extraction of material and	-54	-40
		Alteration of visual environment through the vehicular activity on the haul roads	-54	-40

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
		Alteration of visual environment through the generation of dust from crushing and screening of ore	-42	-30
		Alteration of visual environment through the	-36	-25
		Alteration of visual environment through the	-35	-24
Decommissioning Phase	Air Quality	Fugitive dust generation from the demolition of infrastructure	-42	-35
		Fugitive dust generation from vehicular activity: removal of mobile plant / equipment and vehicles	-70	-42
		Fugitive dust generation from site rehabilitation	-42	-30
	Biodiversity	Destruction of suitable habitats	-54	-24
	Surface Water	Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from surface to the surrounding surface water resources	-45	-24
		Siltation of the surrounding surface water resources through erosion	-40	-28
		Rehabilitation will have a positive impact on the water quantity and quality of the disturbed site	-114	-72

Project Phase	Receiving Environment	Impact Description	Pre-Mitigation Significance	Post-Mitigation Significance
	Geohydrology	Potential impact on quality of groundwater and aquifer	-21	-10
	Soils, Land Capability and Land Use	Loss of topsoil resources as a resource	-91	-30
		Compaction & Erosion	-90	-28
		Hydrocarbon/ slurry pollution	-90	-45
	Noise	Noise generation	-18	-8
	Visual		-36	This is a positive impact with a neutral net benefit
			-36	-25
		Alteration of visual environment	-54	This is a positive impact with a neutral net benefit

13.2 Final Site Map

The composite plan for the Project area, indicating sensitive areas, heritage resources watercourse buffers, is included as Plan 15, Appendix A.

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

The positive and negative implications and risks associated with the Project have been set out in Section 9.5. As discussed previously there are no Project related alternatives.

Refer in addition to the detailed specialist Reports appended to this Report:

- Air Quality (Refer to detailed Report in Appendix D);
- Noise (Refer to detailed Report in Appendix E);
- Biodiversity (Refer to detailed Report in Appendix F);
- Visual and Topography (Refer to detailed Report in Appendix G);
- Soils, Land Capability and Land Use (Refer to detailed Report in Appendix H);
- Surface Water (Refer to detailed Report in Appendix I);
- Geohydrology (Refer to detailed Report in Appendix J);
- Social Impact Assessment (Refer to detailed Report in Appendix K); and
- Heritage (Refer to detailed Report in Appendix L).

14 Proposed impact management objectives and the impact management outcomes for inclusion in the EMPR

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

This EMP addresses the environmental impacts during the Construction, Operational, Decommissioning and Post-Closure Phases of the Project. Due regard must be given to environmental protection during the entire Project. A number of environmental recommendations are therefore made to achieve environmental protection.

The environmental and social objectives are set to allow the mining of the chromite and all associated mineral resources in an environmental and socially responsible fashion while ensuring that sustainable closure can be achieved. To achieve closure the correct decisions need to be taken during the planning phase of the Project.

14.1 Environmental Objectives and Goals

The environmental objectives for the construction and operational phases are to:

- Protect the biophysical environment from any impacts that cannot be mitigated and that will negatively impact on biodiversity on a regional scale;
- Reserve the water resources in line with the objectives of the integrated catchment management and thereby ensure that the limited available resources are utilised to the maximum benefit of the country and its inhabitants;
- Ensure that activities are carried out so as to aid rehabilitation;
- Ensure a safe environment for people to live in as is stipulated in the constitution.

14.2 Socio-economic Objectives and Goals

The following socio-economic objectives should be attained during the construction, operation, and decommissioning phases of the De Groote Boom mining operations.

- Adhere to an open and transparent communication procedure with stakeholders at all times.
- Ensure that accurate and regular information is communicated to I&APs in a manner which is understandable and accessible.
- Mitigate negative impacts.
- Enhance Project benefits and minimise negative impacts through intensive consultation with stakeholders.
- Assemble adequate, accurate, appropriate, and relevant socio-economic information relating to the context of the operation.
- Ensure that recruitment strategies for the mine, prioritise the sourcing of local labour, and share in gender equality.
- Ensure an atmosphere of equality and non-discrimination among the workforce.
- Contribute to the development of functional literacy and numeracy among employees.
- Empower the workforce to develop skills that will equip them to obtain employment in other sectors of the economy.
- Contribute to the development of a self-reliant (not dependent on the mine) community surrounding the area of operation.
- Ensure that decommissioning and retrenchments take place in a legally compliant and humane manner.

14.3 Historical and Cultural Aspects

Sites of historical and cultural significance will have to be removed or relocated before the onset of mining operations. The objectives to be met are:

- To instil a sense of value in the local inhabitants for the relevant artefacts and structures by the treatment afforded to them by the mining operation.
- To encourage the preservation of cultural structures not affected by mining.

15 Aspects for inclusion as conditions of authorisation[5]

The authorisation should be subject to the following conditions:

- The Project should remain in full compliance with the requirements of the EMP and with all regulatory requirements;
- The EMP should be implemented by one or more senior and qualified environmental practitioners who have competence and credibility to interpret the requirements of the EIA and the EMP, and who must be issued with a written mandate by De Groote Boom to provide guidance and instructions to the contractors;
- Stakeholder engagement must be maintained during the construction, operational and closure/ rehabilitation phases of the Project, with the emphasis on on-going provision of information pertaining to the Project, and with the goal of maintaining constructive and mutually respectful stakeholder relations;
- A detailed record of all activities related to environmental and social management, as well as stakeholder engagement, should be retained for review and audit by independent parties for all phases of the Project. The audit findings should be made available to the relevant environmental and local authorities; and
- Any substantive changes to the Project configuration should be the subject of environmental assessments and should result in amendments to the EMP. Information related to any such changes should be made available to the authorities as well as for public review in the spirit of full disclosure.

16 Description of any assumptions, uncertainties and gaps in knowledge

16.1 Air Quality

Although there are existing mining and industrial activities taking place in the vicinity of the De Groote Boom project, ambient PM10 and PM2.5 is not being undertaken at the moment. Since these pollutants are regulated, air quality monitoring is deemed essential as best practice to establish background concentrations prior to mining. Background air quality assessment will be limited to the proposed dust monitoring network which will be commissioned towards the end of May 2015. The data will be used to determine current dust deposition rates in the area. In the absence of site specific information, the air quality and climate assessment was carried out as a desktop study, using modelled meteorological data.

[5] This section corresponds with Item 3(m) of the EIA Regulations, 2014

Once specific data is available, the EMP will be updated accordingly. Monitoring will need to continue during mining as the day to day activities from the proposed De Groote Boom operation will inevitably result in some level of impacts on the ambient air quality of the area

17 Reasoned opinion as to whether the proposed activity should or should not be authorised[6]

17.1 Reasons why the activity should be authorised or not

The authorisation of this Project will allow De Groote Boom to produce and supply the various grades of chrome ore to a wide spectrum of industrial and commercial establishments and will benefit the Gross Domestic Product (GDP) of not only the municipality, but also the Province as a whole.

In addition, as stated in the MPRDA, the Government's objective is to maximise the benefit of the nation's mineral resources for the benefit of all South Africans. By continuing the production of ore from the mining permit area this objective can be accomplished.

17.2 Conditions that must be included in the authorisation

These conditions have been listed in Section 15 above

18 Period for which the environmental authorisation is required

The mining permit is required for a period of 2 years.

19 Undertaking

The undertaking required to meet the requirements of this section is provided at the end of the EMP Report in Part B, Section 12.

20 Financial provision

As part of the requirements of the MPRDA, Digby Wells calculated the environmental closure liability for De Groote Boom according to the DMR guidelines. The financial provision will be made available to the DMR by De Groote Boom in the form of a guarantee from a financial institution to ensure that adequate rehabilitation will be undertaken following the Life of Mine for De Groote Boom.

The closure liability focused on the proposed mining activities only (since there is a possibility that the operation will proceed to a full Mining Right) and the cost for rehabilitation and closure of the proposed site according to the DMR Guideline format is R2 148 139.

[6] This section conincides with Item 3(q) of the EIA Regulations, 2014

20.1 Explain how the aforesaid amount was derived

The closure liability cost for De Groote Boom was calculated according to the DMR's "Guideline Document for the Evaluation of the Quantum of Closure-related Financial Provision Provided by a Mine".

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

The DMR rates were published in 2005 and, due to inflation, are thus no longer accurate. As per the DMR's "Guideline Document for the Evaluation of the Quantum of Closure-related Financial Provision Provided by a Mine", the Master Rates for the DMR spreadsheet have been updated based on new rates released by the DMR in 2012. An inflationary figure for 2015 was then added to the 2014 rates to reflect the current 2015 rates.

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

- The mineral mined;
- The risk class of the mine;
- Environmental sensitivity of the mining permit area;
- Type of mining operation; and
- Geographic location.

Please refer to the Rehabilitation Report under Appendix M - Table 3 provides a summary of the estimate calculated cost for each component for the proposed Project.

20.2 Confirm that this amount can be provided for from operating expenditure

This amount can be provided by the Applicant through the mechanism of a Trust or a bank guarantee.

21 Specific Information required by the competent Authority[7]

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

The Social Impact Assessment has been included in Appendix K.

Impacts were identified in terms of a number of categories, related to physical intrusion resulting from Project activities, economic pull factors, as well as indirect impacts. Impacts

[7] This section coincides with Item 3(w) if the EIA Regulations, 2014.

are discussed in detail in the report and appropriate mitigation measures are recommended to ameliorate negative impacts and enhance positive ones. A summary of potential impacts are tabled below:

Table 21-1: Table

Cause of Impact	Aspects	Impact
Effects on the local economy	Positive impacts	Sustained employment during construction and operation
		Short-term growth of the local economy
	Negative impacts	Dependency on the mine to provide extensive local economic development.
Effects from impacts to the physical environment	Positive impacts	Improvements to local infrastructure
	Negative impacts	Physical Intrusion impacts
		Land acquisition and loss of grazing land.
Effects of Population influx	Negative impacts	Community opposition – arising from unmanaged expectations
		Increased social pathologies
		Increased pressure on local services/ resources.

21.1.1 Sustained employment during construction and operation

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Sustained employment during construction and operation				
Enhancement required	▪ Maximise and monitor local recruitment where required ▪ Consult local labour recruitment offices ▪ Prevent nepotism/corruption in local recruitment structures ▪ Promote employment of women and youth ▪ Train locally-recruited construction workers for longer-term employment where possible"				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Enhancement	2	3	(+) 4	5	45
Post-Enhancement	2	3	(+) 5	6	60

21.1.2 Short-term growth of the local economy

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Short-term growth of the local economy				
Enhancement required	As for maximising employment benefits. Also: ▪ Development of a register of local SMMEs ▪ Linkages with skills development/ SMME development institutions ▪ SMME skills development as part of mine LED initiatives ▪ Explore opportunities for collaboration with other mining/electricity enterprises on LED/CSR projects				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Enhancement	4	2	(+) 2	4	32
Post-Enhancement	4	3	(+) 3	5	50

21.1.3 Dependency on the mine to provide extensive local economic development

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Dependency on the mine to provide extensive local economic development				
Mitigation required	▪ Support economic diversification through development of alternative markets ▪ Proactively and effectively implement mine closure plan ▪ Collaborate with adjacent mining companies to develop and implement sustainable community projects"				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 5	5	(-) 55
Post-Mitigation	3	3	(-) 3	5	(-) 45

21.1.4 Improvements to local infrastructure

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Improvements to local infrastructure				
Enhancement required	▪ Integration with mine and local government plans (for infrastructure maintenance and development) ▪ Collaboration with other mining companies in terms of infrastructure upgrades				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Enhancement	3	3	(+) 3	4	36
Post-Enhancement	3	3	(+) 4	6	60

21.1.5 Physical Intrusion impacts

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Physical Intrusion impacts				
Mitigation required	▪ Traffic control and signage to prevent speeding, and appropriate training for drivers/operators ▪ Implementing continuous maintenance programme ▪ Fencing of mine site ▪ Community awareness raising/education ▪ Establishment of Project Grievance Mechanism ▪ Optimise mine plan to limit disruption of movement patterns ▪ Inform communities of planned construction activities that would affect vehicle/pedestrian traffic				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	2	3	(-) 5	4	(-) 40
Post-Mitigation	2	3	(-) 4	4	(-) 35

21.1.6 Land acquisition and loss of grazing land

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Land acquisition and loss of grazing land				
Mitigation required	▪ Optimise Project design to avoid/limit displacement/loss of land ▪ Adequate compensation to displaced farmers where losses occur ▪ Where required (through change of mine plan) develop a resettlement planning document to guide any displacement"				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	7	(-) 5	6	(-) 78
Post-Mitigation	1	7	(-) 4	5	(-) 60

21.1.7 Community opposition – arising from unmanaged expectations

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Community opposition – arising from unmanaged expectations				
Mitigation required	▪ Maximise local employment ▪ Clearly communicate preferential local employment policy to discourage influx ▪ Implement effective communication strategy to discuss Project plans, thus managing expectations ▪ Enforce code of conduct for contractors & employees in terms of interaction with local communities				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 5	4	(-) 44
Post-Mitigation	3	3	(-) 4	3	(-) 30

21.1.8 Increased social pathologies

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Increased social pathologies				
Mitigation required	▪ Implement HIV/AIDS and substance abuse awareness ▪ Make HIV/AIDS/STD prevention programmes a condition of contract for suppliers/sub-contractors ▪ Control access at site to prevent the presence of sex workers ▪ Establish clear rules and regulations for access to the mine site ▪ Work with local health service providers to provide services and health surveys also on substance abuse ▪ Establish liaison structures with local police and local community policing forums				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 6	4	(-) 48
Post-Mitigation	3	3	(-) 5	3	(-) 33

21.1.9 Increased pressure on local services/resources

Activity No/Project phase: Construction and Operation					
Criteria	**Details / Discussion**				
Description of impact	Increased pressure on local services/resources				
Mitigation required	▪ Discourage influx of job-seekers by prioritising employment of unemployed local community members ▪ Liaise with local municipality to ensure that expected population influx is taken into account in land management strategies ▪ Create synergies with local government IDP and other companies in potential community projects				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	3	3	(-) 5	5	(-) 55
Post-Mitigation	3	3	(-) 4	4	(-) 40

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

The Heritage Impact Assessment is included in Appendix L.

The cultural significance of identified heritage resources located within and near the Project area is presented in Table 21-2. The assigned values take into consideration the importance of individual resources in relation to scientific and social criteria, as well as the integrity of the resource. The heritage resources were not assessed in relation to the aesthetic criteria as they do not portray good examples of art or design.

All six identified heritage resources were given a field rating of General Protection IV C. In terms of the NHRA, these are resources protected under general protection in terms of Sections 34 to 37. The sites have a negligible value in historical, scientific and social criteria because these are undiagnostic finds that cannot be associated with a particular group of people. The rating was informed by credible information sources such as other impact assessment Reports which indicate that isolated occurrences of ceramics, lithics, gong rocks and communal grinding area such as these are common in the Limpopo/Mpumalanga region. No site context could be established as the resources were degraded to the extent where no information potential exists. Single occurrences such as these sites are inherently without site integrity. Taking these characteristics into account, the heritage resources were given a negligible heritage value.

Table 21-2: Summary of Statements of Significance for identified heritage resources

Resource ID	Type	Description	CS	Field Rating	Latitude	Longitude
UAR/2967/SA/001	Occurrence	Stone Age lithic scatter	Negligible	General Protection IV C	-24.926788	30.134758
UAR2967/IA/002	Occurrence	Iron Age potsherd scatter	Negligible	General Protection IV C	-24.923997	30.133677
UAR2967/IA/003	Occurrence	Iron Age potsherd scatter	Negligible	General Protection IV C	-24.927510	30.135510
UAR2967/IA/004	Occurrence	Iron Age potsherd and Stone Age lithic scatter	Negligible	General Protection IV C	-24.927315	30.135534
UAR2967/IA/005	Feature	Activity area	Negligible	General Protection IV C	-24.922952	30.139413
UAR2967/St/006	Site	Iron Age potsherd scatter and possible gong rock	Negligible	General Protection IV C	-24.921606	30.141130

During the construction phase, the following activities may cause a direct impact to identified heritage resources:

- Activity 1: The construction and/or widening of roads will cause damage to or destroy any physical heritage resources that may be present in the impact footprint;
- Activity 2 and 6: Construction of facilities and infrastructure will cause damage to or destroy any physical heritage resources that may be present in the footprint areas; and
- Activity 5: Physical alteration of land in excess of 5 ha will change the character of the land and possibly destroy *in situ* heritage resources.

The impact assessment for the identified heritage resources is summarised in Table 21-3 to Table 21-5 below.

Table 21-3: Summary of impact assessment in regards to activity 1

IMPACT DESCRIPTION: Direct impact caused by Activity 1 to heritage resources with negligible CS				
Predicted for Project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Where mitigations are not implemented, Project related activities will destroy any possible heritage resources.	Consequence: Moderately detrimental (-10)	Significance: Minor - negative (-50)
Extent	Limited (2)	Possible heritage impacts will affect resources that are, or may be, present in the construction footprint area.		
Intensity x type of impact	Very low - negative (-1)	Given the CS of the *identified* heritage resources, the intensity will be very low.		
Probability	Likely (5)	Without appropriate mitigation, impacts on heritage resources are likely to occur.		
MITIGATION: Although the identified artefacts and sites were assigned a negligible Cultural Significance (CS) and are located outside the construction footprint areas, they are evidence of past occupation and therefore there is a likelihood that subsurface deposits, material and features may exist. A watching				

<table>
<tr><td colspan="5">brief must be undertaken during road construction activities to monitor for any archaeological or historical heritage that may be exposed. It is important to note that in the event that any significant heritage is exposed, a permitted Phase 2 Archaeological Assessment may be required.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short term (2)</td><td>Implementing a watching brief during construction activities will ensure that significant heritage resources are recorded and salvaged before destruction.</td><td rowspan="3">Consequence: Negligible (5)</td><td rowspan="4">Significance: Negligible - positive (25)</td></tr>
<tr><td>Extent</td><td>Very limited (1)</td><td>The watching brief will identify heritage sites, localising any possible impact to the site itself.</td></tr>
<tr><td>Intensity x type of impact</td><td>Low - positive (2)</td><td>Recording heritage resources and sites if they are exposed during construction activities will contribute to the general heritage record of the area. However, should exposed sites be determined to have high CS, this contribution will increase.</td></tr>
<tr><td>Probability</td><td>Likely (5)</td><td colspan="2">It is likely that a qualified archaeologist will be able to identify exposed resources during construction and thereby reduce the negative impact, i.e. complete, unrecorded destruction.</td></tr>
</table>

Table 21-4: Summary of impact assessment in regards to activity 2 and 6

IMPACT DESCRIPTION: Direct impact caused by Activity 2&6 to heritage resources with negligible CS				
Predicted for Project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Where mitigations are not implemented, construction of facilities and infrastructure will destroy any possible heritage resources.	Consequence: Moderately detrimental (-10)	Significance: Minor - negative (-50)
Extent	Limited (2)	Possible heritage impacts will affect resources that are, or may be, present in the construction footprint area.		
Intensity x type of impact	Very low - negative (-1)	Given the CS of the identified heritage resources, the intensity will be very low.		
Probability	Likely (5)	Without appropriate mitigation, impacts on heritage resources are likely to occur.		
MITIGATION: Although the identified artefacts and sites were assigned a negligible CS and are located outside the construction footprint areas, they are evidence of past occupation and therefore there is a likelihood that subsurface deposits, material and features may exist. A watching brief must be undertaken during infrastructure and facility construction activities to monitor for any archaeological or historical heritage that may be exposed. It is important to note that in the event that any significant heritage is exposed, a permitted Phase 2 Archaeological Assessment may be required.				
POST-MITIGATION				
Duration	Short term (2)	Where mitigations are implemented, construction of facilities and infrastructure will result in negligible impacts for a very short period of time.	Consequence: Negligible (5)	Significance: Negligible - positive (25)
Extent	Very limited (1)	The impact of the		

		prospecting will be very limited		
Intensity x type of impact	Low - positive (2)	Recording heritage resources and sites if they are exposed during construction activities will contribute to the general heritage record of the area. However, should exposed sites be determined to have high CS, this contribution will increase.		
Probability	Likely (5)	It is likely that a qualified archaeologist will be able to identify exposed resources during construction and thereby reduce the negative impact, i.e. complete, unrecorded destruction.		

Table 21-5: Summary of impact assessment in regards to activity 5

IMPACT DESCRIPTION: Direct impact caused by Activity 5 to heritage resources with negligible CS				
Predicted for Project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Where mitigations are not implemented, construction of mining permit area and infrastructure will destroy any possible heritage resources.	Consequence: Moderately detrimental (-10)	Significance: Minor - negative (-50)
Extent	Limited (2)	Possible heritage impacts will affect resources that are, or may be, present in the mining footprint area.		
Intensity x type of impact	Very low - negative (-1)	Given the CS of the identified heritage resources, the intensity will be very low.		

<table>
<tr><td>Probability</td><td>Likely (5)</td><td>Without appropriate mitigation, impacts on heritage resources are likely to occur.</td><td></td></tr>
<tr><td colspan="4">MITIGATION:
Although the identified artefacts and sites were assigned a negligible CS and are located outside the construction footprint areas, they are evidence of past occupation and therefore there is a likelihood that subsurface deposits, material and features may exist. As the koppie has very steep slopes, in-situ deposit is unlikely; however structures such as stone walls may be present. Therefore chance finds procedures must be developed and implemented for the construction of the mining permit area. This will outline the process that must be followed should any archaeological or historical heritage be exposed or identified during the construction of the mining permit area. It is important to note that in the event that any significant heritage is exposed, a permitted Phase 2 Archaeological Assessment may be required.</td></tr>
<tr><td colspan="4">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Short term (2)</td><td>Implementing CFPs during construction will ensure that significant heritage resources are recorded and salvaged before destruction.</td><td rowspan="4">Consequence: Negligible (5)</td><td rowspan="5">Significance: Negligible - positive (20)</td></tr>
<tr><td>Extent</td><td>Very limited (1)</td><td>The CFP will identify heritage sites, localising any possible impact to the site itself.</td></tr>
<tr><td>Intensity x type of impact</td><td>Low - positive (2)</td><td>Recording heritage resources and sites if they are exposed during construction activities will contribute to the general heritage record of the area. However, should exposed sites be determined to have high CS, this contribution will increase.</td></tr>
<tr><td>Probability</td><td>Probable (4)</td><td colspan="2">It is probably that a trained site foreman/ Environmental Officer will be able to identify exposed resources during construction and thereby reduce the negative impact, i.e. complete, unrecorded destruction.</td></tr>
</table>

While there may be a direct impact on the identified heritage resources, they have a negligible cultural significance and therefore do not require any further mitigation. They have been sufficiently recorded and do not require any further investigation.

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

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

Part B: Environmental Management Programme Report[8]

This Environmental Management Plan contains guidelines, operating procedures and rehabilitation/ pollution control requirements which will be binding on the holder of the mining permit/ prospecting permission/ reconnaissance permission after approval of the Environmental Management Plan. It is essential that this portion be carefully studied, understood, implemented and adhered to at all times.

[8] This Part B coincides with Appendix 4 of the EIA Regulations, 2014

1 Details of the EAP

The requirement for the provision of the details and expertise of the EAP are included in PART A, section 1(a). Please refer to Part A: Sections 2.1 and 2.2 as well as Table 2-1.

2 Description of the aspects of the activity

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, Section 2.1 and 2.2.

3 Composite Map

The composite plan can be found in Appendix A, Plan 15 - Composite Plan.

4 Description of Impact management objectives including management statements

4.1 Determination of closure objectives

The following list serves to guide the setting of environmental objectives for mine closure.

- The majority of the Project area has gentle slopes of between 0° and 8°;
- The Project area is characterised by high plant diversity and endemism, with many edaphic plant specialist species;
- The predominant soil type for the mining permit area is Hutton soil;
- The Project area is a nationally important area and is an official threatened ecosystem known as the Sekhukhune Mountainlands;
- The Project area is located at the foot of a koppie located in the upstream catchment to the tributaries of the Groot Dwars River;
- Existing mining operations in close proximity;
- Existing tourism and conservation/ hospitality operations in close proximity;

Measures required containing or remedying any causes of pollution or degradation or migration of pollutants, both for closure of the mine and post-closure are listed below:

- Implement a waste management procedure for general and hazardous waste on site;
- Ensure immediate clean-up of any spills as per the emergency response procedures;
- Establish and maintain dirty stormwater control measures in line with regulatory requirements, until such time as potentially polluting areas are rehabilitated
- Contain pollutants at source by storing and handling potentially polluting substances on impermeable substrates, within bunded areas and with the capacity to contain spills;

- Design, construct and operate the waste dumps with runoff control measures;
- Control dust emissions through the implementation of the air quality management plan; and
- Rehabilitate the site in line with a detailed closure plan to be developed prior to decommissioning.

4.2 Volumes and rate of water use required for the operation

Approximately 4 000 litres of water per day will be required for the ablutions and additional quantities of water will be required for dust suppression.

4.3 Has a water use licence has been applied for?

No application for a water use licence has been made. If it subsequently appears that any activity for the mining permit operation will trigger any of the uses defined in Section 21 of the National Water Act, 1998 that are not covered under a General Authorisation, an application for a water use licence will be submitted to the Department of Water and Sanitation.

4.4 Impacts to be mitigated in their respective phases

The proposed mitigation measures and its compliance with the relevant standards are presented in Table 4-1.

Table 4-1: Impacts to be mitigated

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Construction Phase						
Activity 1: Augmenting existing roads And Activity 2: Construction of PCD	Air Quality	Construction Phase	Local	▪ Ensure that the areas of disturbance are minimised and restricted to the required footprint areas; and ▪ Ensure that dust suppressants are applied to exposed surfaces.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Ongoing and Daily during: LoM.
	Biodiversity	Construction Phase	Limited	▪ Vegetate open and exposed areas to prevent soil erosion and the establishment of alien invasive vegetation; ▪ Ensure a Stormwater Management Plan is implemented; and ▪ Alien invasive vegetation to be identified and removed throughout the LoM.	▪ Conservation Management Plan; and ▪ Alien Invasive Management Plan in accordance with: ▪ NEM:BA; and ▪ ECA.	▪ Ongoing during: ▪ LoM.
	Surface Water	Construction Phase	Local	▪ Ensure that the topsoil stockpiles are vegetated to prevent soil erosion; ▪ Implement Stormwater Management designs to prevent erosion and divert dirty water to the appropriate storage dam (PCD); and ▪ The design, construction, operation and maintenance of water management facilities must be in accordance with GN R 704 capacity requirements. The PCD must have a freeboard of 0.8 m and must be able to contain a 1: 50 year, 24 hour extreme rainfall event.	▪ Stormwater Management Plan in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing during: ▪ Construction Phase.
	Soils, Land Capability and Land Use	Construction Phase Operational Phase	Local	▪ Ensure soils are stripped and stockpiled prior to the excavation of infrastructure foundations; and ▪ Implement Stormwater Management designs to prevent erosion.	▪ Soil Rehabilitation Plan; and ▪ Stormwater Management Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ Ongoing and Weekly during: ▪ Construction Phase and Operational Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Noise	LoM	Project Area	▪ Ensure construction activities are only undertaken during daylight hours; ▪ Construction related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and ▪ Ensure equipment and machinery is switched off when not in use.	▪ Regular Vehicle Inspections in accordance with: ▪ NEM:AQA; and ▪ ECA.	▪ Daily and according to Maintenance Plan during: ▪ Construction Phase.
	Visual	Construction Phase	Limited	▪ Limit the footprint areas of the of the surface infrastructure, where possible, especially the width of the haul road; ▪ Ensure that access and haul roads are contoured to limit erosion from surface runoff, preventing further alteration to the topography; ▪ Establish vegetation, where possible, to aid in screening infrastructure; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape; ▪ Metals structures should be galvanised or painted with a neutral matt finish; and ▪ Limit construction activities at night and down lighting must be used to minimise light pollution.	▪ Mine Plan Development	▪ Ongoing during: ▪ Construction Phase and Operational Phase.
Activity 3: Transport of construction material, mobile plant and equipment to the site; and movement of haul trucks and excavator on haul	Air Quality	Construction Phase	Local	▪ Ensure that dust suppressants are applied to gravel or unpaved roads that are in use; ▪ Vehicles will obey speed limits; and ▪ Bulk delivery of materials should be maximised to reduce the frequency of deliveries.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Daily; and ▪ As required during: ▪ LoM

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
roads	Surface Water	Construction Phase Operational Phase Decommissioning Phase	Local	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ NWA; ▪ GN R 704; ▪ Best Practice Guidelines	▪ As required during: ▪ LoM.
	Visual	Construction Phase	Local	▪ Ensure liaison with the local authorities for the maintenance and upkeep of roads; ▪ Ensure that dust suppressants are applied to gravel or unpaved roads that are in use; and ▪ Vehicles will obey speed limits.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Daily; and ▪ As required during: ▪ Construction Phase and Operational Phase.
Activity 4: Storage of material / diesel at site in temporary facilities	Surface Water	Construction Phase Operational Phase Decommissioning Phase	Local	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ NWA; ▪ GN R 704; ▪ Best Practice Guidelines	▪ As required during: ▪ LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Geohydrology	Construction Phase Operational Phase Decommissioning Phase	Local	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place; and ▪ Groundwater monitoring of the water quality and levels must take place quarterly especially for the water supply boreholes to ensure a sustainable resource and identify impacts on local users.	▪ Emergency Response Plan; ▪ Vehicle Maintenance Plan; and ▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R 704; ▪ Best Practice Guidelines	▪ As required and Quarterly during: ▪ LoM.
	Soils, Land Capability and Land Use	Construction Phase Operational Phase Decommissioning Phase	Very Limited	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; ▪ CARA; and ▪ Hazardous Substances Act, 1973	▪ As required during: ▪ LoM.
	Visual	Construction Phase Operational Phase	Limited	▪ Limit the footprint areas of the of the storage facilities, where possible.	▪ Mine Plan Development	▪ Ongoing during: ▪ LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Activity 5: Site clearing and topsoil removal for mining operation area; and construction of mining cut	Air Quality	Construction Phase	Local	▪ The area of disturbance must be restricted to the required footprint size; ▪ Ensure that only vegetation within the designated areas is removed; ▪ The drop heights used during the loading of the cleared soils into trucks should be minimised as far as possible; and ▪ Ensure that dust suppressants are applied exposed surfaces and unpaved roads.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Ongoing and Daily during: ▪ Construction Phase and Operational Phase.
	Biodiversity	Construction Phase	Municipal	▪ Ensure site clearing is restricted to the footprint of the designated areas to limit the degradation and destruction of natural habitats; ▪ Vegetate open and exposed areas to prevent soil erosion and the establishment of alien invasive vegetation; ▪ Restrict access and avoid areas of identified faunal and floral SSC, that are adjacent to the mining activities; ▪ Floral and faunal SSC within the mining activities must be rescued and relocated; ▪ Restrict access and avoid sensitive landscapes, such as wetlands and ridges, that are adjacent to the mining operations; ▪ Topsoil that will be used for rehabilitation within one year must be stockpiled according to the Rehabilitation Plan. Compaction of stockpiled topsoil must be avoided to ensure the seed bank is viable; ▪ Alien invasive vegetation to be identified and removed throughout the LoM; ▪ A wetland off-set strategy must be implemented.	▪ Conservation Management Plan; and ▪ Alien Invasive Management Plan in accordance with: ▪ NEM:BA; ▪ ECA; ▪ Stormwater Management Plan in accordance with; ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing during: ▪ Construction Phase and Operational Phase.
	Surface Water	Construction Phase	Local	▪ Ensure site clearing is limited to the designated areas, and ▪ Implement Stormwater Management designs to prevent erosion and divert dirty water to the appropriate storage dams (PCD).	▪ Stormwater Management Plan; and ▪ Rehabilitation Plan in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing during: ▪ Construction Phase and LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Geohydrology	Construction Phase Operational Phase	Local	▪ Ensure cut off canals are utilised to minimise water ingress; ▪ Ensure that a stormwater management plan is in place to separate clean and dirty water; and ▪ Groundwater monitoring of the water quality and levels must take place quarterly, especially for the water supply boreholes to ensure a sustainable resource and identify impacts on local users.	▪ Emergency Response Plan; ▪ Vehicle Maintenance Plan; and ▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R 704; ▪ Best Practice Guidelines	▪ Ongoing and Quarterly during: ▪ Construction Phase and Operational Phase and LoM.
	Soils, Land Capability and Land Use	Construction Phase Operational Phase	Local	▪ Ensure soils are stripped using an excavator bucket and dump trucks; ▪ Minimise topsoil stockpile heights as far as possible; ▪ Ensure soils are stripped when unsaturated to prevent and avoid soil compaction; ▪ Ensure soils are stripped in accordance with the Rehabilitation Soil Management Plan. It is recommended that the topsoil (upper 0.3 m) and subsoil (0.7 m to 0.9 m in thickness) of the soil profile should be stripped and stockpiled separately; ▪ Ensure soils are stripped and stockpiled prior to the excavation of infrastructure foundations; and ▪ Implement Stormwater Management designs to prevent erosion.	▪ Soil Rehabilitation Plan; and ▪ Stormwater Management Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ Ongoing and Weekly during: ▪ Construction Phase and Operational Phase.
	Noise	LoM	Project Area	▪ Ensure site clearing activities are only undertaken during daylight hours; ▪ Mining related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and ▪ Ensure equipment and machinery is switched off when not in use.	▪ Regular Vehicle Inspections in accordance with: ▪ NEM:AQA; and ▪ ECA.	▪ Daily and according to Maintenance Plan during: ▪ Construction Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Activity 6: Preparing an area of approximately 2-3 ha for portable plant and infrastructure (crushing, screening, workshops, ablution and offices etc.) and stockpiling	Visual	Construction Phase	Local	▪ Ensure vegetation and topsoil is only be cleared when necessary and within the demarcated areas; ▪ Ensure topsoil stockpiles are vegetated as soon as possible; and ▪ Ensure topsoil stockpiles are contoured and have a steepness of less than 18° to prevent slope failure and erosion and aid in vegetation establishment.	▪ Mine Plan Development in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ As required and Monthly during: ▪ Construction Phase.
	Air Quality	Construction Phase	Local	▪ Ensure that the areas of disturbance are minimised and restricted to the required footprint areas; ▪ Minimise drop heights during the stockpiling of soils; and ▪ Vehicles will obey speed limits. Graders and heavy vehicle speeds should be reduced, where possible, to prevent dust emissions (as an example, a 58% reduction is dust generating capacity occurs when reducing speeds from 40 km per hour to 24 km per hour (Watson et al., 1996)).	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Daily and Ongoing during: ▪ LoM.
	Biodiversity	Construction Phase	Limited	▪ Vegetate open and exposed areas to prevent soil erosion and the establishment of alien invasive vegetation; ▪ Ensure a Stormwater Management Plan is implemented; ▪ Alien invasive vegetation to be identified and removed throughout the LoM; ▪ Ensure the statutory buffers are implemented from the wetlands systems and watercourses; and ▪ Ensure a Stormwater Management Plan is implemented	▪ Conservation Management Plan; and ▪ Alien Invasive Management Plan in accordance with: ▪ NEM:BA; ▪ ECA; and ▪ Stormwater Management Plan.	▪ Ongoing during: ▪ LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Surface Water	Construction Phase	Local	▪ Ensure that the topsoil stockpiles are vegetated to prevent soil erosion; ▪ Implement Stormwater Management designs to prevent erosion and divert dirty water to the appropriate storage dams (PCDs); and ▪ The design, construction, operation and maintenance of water management facilities must be in accordance with GN R 704 capacity requirements. The PCDs must have a freeboard of 0.8 m and must be able to contain a 1: 50 year, 24 hour extreme rainfall event.	▪ Stormwater Management Plan in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing during: ▪ Construction Phase.
	Soils, Land Capability and Land Use	Construction Phase Operational Phase	Local	▪ Ensure soils are stripped and stockpiled prior to the excavation of infrastructure foundations; and ▪ Implement Stormwater Management designs to prevent erosion.	▪ Soil Rehabilitation Plan; and ▪ Stormwater Management Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ Ongoing and Weekly during: ▪ Construction Phase and Operational Phase.
	Noise	LoM	Project Area	▪ Ensure construction activities are only undertaken during daylight hours; ▪ Construction related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and ▪ Ensure equipment and machinery is switched off when not in use.	▪ Regular Vehicle Inspections in accordance with: ▪ NEM:AQA; and ▪ ECA.	▪ Daily and according to Maintenance Plan during: ▪ Construction Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Visual	Construction Phase	Limited	▪ Ensure topsoil and overburden are only cleared when necessary and from the demarcated areas; ▪ Limit the footprint areas of the of the surface infrastructure, where possible, especially the width of the haul road; ▪ Establish vegetation, where possible, to aid in screening infrastructure; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape; ▪ Metals structures should be galvanised or painted with a neutral matt finish; and ▪ Limit construction activities at night and down lighting must be used to minimise light pollution.	▪ Mine Plan Development	▪ Ongoing during: ▪ Construction Phase and Operational Phase.
Operational Phase						
Activity 7: Use of existing drilled / new boreholes	Air Quality	Operational Phase	Local	▪ Ensure water sprays are utilised during drilling activities to suppress dust generation.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ As required during: ▪ Operational Phase.
	Surface Water	Operational Phase	Local	▪ All water within the open cut areas must be stored in the PCD to prevent the contamination of clean water resources; and ▪ A Stormwater Management Plan must be compiled with clean and dirty water channels and berms constructed to divert runoff to the appropriate storage dams. The channels and berms must be inspected regularly and maintained.	▪ Stormwater Management Plan; and ▪ Surface Water Monitoring Programme in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing and Monthly during: ▪ Operational Phase.
	Noise	Construction Phase Operational Phase	Project Area	▪ Ensure equipment and machinery is switched off when not in use.	▪ ECA.	▪ Prior to drilling activities during: ▪ Operational Phase.
	Visual	Operational Phase	Local	▪ Establish and maintain vegetation screens to reduce the visual impact; and ▪ Ensure water sprays are utilised during drilling activities to suppress dust generation.	▪ Mine Plan Development.	▪ As required during: ▪ Operational Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Surface Water	LoM	Municipal	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ As required during: ▪ LoM.
	Geohydrology	LoM	Local	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place; and ▪ Groundwater monitoring of the water quality and levels must take place quarterly especially for the water supply boreholes to ensure a sustainable resource and identify impacts on local users.	▪ Emergency Response Plan; ▪ Vehicle Maintenance Plan; and ▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ As required and Quarterly during: ▪ LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Activity 8: Storage of fuel and lubricants in temporary facilities	Soils, Land Capability and Land Use	LoM	Very limited	▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and ▪ Vehicles with leaks must have drip trays in place.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; ▪ CARA; and ▪ Hazardous Substances Act, 1973	▪ As required during: ▪ LoM.
Activity 9: Topsoil removal and stockpiling; and extraction and transportation of ore And Activity 10: Vehicular activity on haul roads; and operation of mining equipment And	Air Quality	Construction Phase	Local	▪ The area of disturbance must be restricted to the required footprint size; ▪ Ensure that only vegetation within the designated areas is removed; ▪ The drop heights used during the loading of the cleared soils into trucks should be minimised as far as possible; and ▪ Ensure that dust suppressants are applied exposed surfaces and unpaved roads.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Ongoing and Daily during: ▪ Construction Phase and Operational Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Activity 11: Crushing and screening of ore in mobile plant	Biodiversity	Construction Phase	Municipal	▪ Ensure site clearing is restricted to the footprint of the designated areas to limit the degradation and destruction of natural habitats; ▪ Vegetate open and exposed areas to prevent soil erosion and the establishment of alien invasive vegetation; ▪ Restrict access and avoid areas of identified faunal and floral SSC, that are adjacent to the mining activities; ▪ Floral and faunal SSC within the mining activities must be rescued and relocated; ▪ Restrict access and avoid sensitive landscapes, for example wetlands, that are adjacent to the mining operations; ▪ Topsoil that will be used for rehabilitation within one year must be stockpiled according to the Rehabilitation Plan. Compaction of stockpiled topsoil must be avoided to ensure the seed bank is viable; and ▪ Alien invasive vegetation to be identified and removed throughout the LoM.	▪ Conservation Management Plan; and ▪ Alien Invasive Management Plan in accordance with: ▪ NEM:BA; and ▪ ECA.	▪ Ongoing during: ▪ Construction Phase and Operational Phase.
	Surface Water	Construction Phase	Local	▪ Ensure site clearing is limited to the designated areas, and ▪ Implement Stormwater Management designs to prevent erosion and divert dirty water to the appropriate storage dam (PCD).	▪ Stormwater Management Plan; and ▪ Rehabilitation Plan in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing during: ▪ Construction Phase and LoM.
	Geohydrology	Construction Phase Operational Phase	Local	▪ Ensure cut off canals are utilised to minimise water ingress; ▪ Ensure that a stormwater management plan is in place to separate clean and dirty water; and ▪ Groundwater monitoring of the water quality and levels must take place quarterly, especially for the water supply boreholes to ensure a sustainable resource and identify impacts on local users.	▪ Emergency Response Plan; ▪ Vehicle Maintenance Plan; and ▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R 704; ▪ Best Practice Guidelines	▪ Ongoing and Quarterly during: ▪ Construction Phase and Operational Phase and LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
Activity 12: Stockpiling material	Soils, Land Capability and Land Use	Construction Phase Operational Phase	Local	▪ Ensure soils are stripped using an excavator bucket and dump trucks; ▪ Minimise topsoil stockpile heights as far as possible; ▪ Ensure soils are stripped when unsaturated to prevent and avoid soil compaction; ▪ Ensure soils are stripped in accordance with the Rehabilitation Soil Management Plan. It is recommended that the topsoil (upper 0.3 m) and subsoil (0.7 m to 0.9 m in thickness) of the soil profile should be stripped and stockpiled separately; ▪ Ensure soils are stripped and stockpiled prior to the excavation of infrastructure foundations; and ▪ Implement Stormwater Management designs to prevent erosion.	▪ Soil Rehabilitation Plan; and ▪ Stormwater Management Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ Ongoing and Weekly during: ▪ Construction Phase and Operational Phase.
	Noise	LoM	Project Area	▪ Ensure site clearing activities are only undertaken during daylight hours; ▪ Mining related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and ▪ Ensure equipment and machinery is switched off when not in use.	▪ Regular Vehicle Inspections in accordance with: ▪ NEM:AQA; and ▪ ECA.	▪ Daily and according to Maintenance Plan during: ▪ Construction Phase.
	Air Quality	Operational Phase	Municipal	▪ Monitor the establishment of vegetation.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Monthly during: ▪ Operational Phase.
	Surface Water	Operational Phase	Local	▪ Ensure a Stormwater Management Plan is implemented; and ▪ Monitor surface water resources up and downstream of the Project area to identify potential contamination.	▪ Stormwater Management Plan; and ▪ Surface Water Monitoring Programme in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing and Monthly during: ▪ Operational Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Geohydrology	Operational Phase	Limited	▪ Buffer acid generating overburden material with acid neutralising material, where possible; ▪ Divert water run-off from the stockpiles to the PCD to prevent water ingress; and ▪ Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and seepage.	▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Ongoing and Monthly during: ▪ Operational Phase.
	Soils, Land Capability and Land Use	Operational Phase	Local	▪ Ensure stockpiles are maintained in a fertile and erosion free state by sampling and analysing for macro nutrients and pH on an annual basis; ▪ Ensure topsoil stockpiles are vegetated to prevent erosion; ▪ Ensure access to the stockpiles is restricted to prevent unauthorised use and borrowing of topsoil; ▪ Ensure topsoil stockpiles are clearly demarcated; and ▪ Implement Stormwater Management designs to prevent erosion.	▪ Stormwater Management Plan; and ▪ Soil Rehabilitation Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ Annually and ongoing during: ▪ Construction Phase and Operational Phase.
Activity 14: Waste generation and disposal (including sewage)	Surface Water	Decommissioning Phase	Local	▪ The design, operation and maintenance of the sewage treatment must be conducted in a manner that can accommodate the number of people it is designed for and be in compliance with GN R 704 of the NWA; ▪ The sewage facilities must be monitored and maintained to ensure there are no leaks or discharges; ▪ Monitor surface water resources up and downstream of the Project area to identify potential contamination; and ▪ Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor; ▪ Waste must be separated at source and stored in demarcated areas; ▪ Reputable and accredited contractors will be used for the transport and disposal of wastes and demolished material off-site.	▪ Waste Management in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines; and ▪ ECA.	▪ Weekly during: ▪ LoM.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Geohydrology	Operational Phase	Limited	▪ The design, operation and maintenance of the sewage treatment must be conducted in a manner that can accommodate the number of people it is designed for and be in compliance with GN R 704 of the NWA; ▪ Monitored and maintained the sewage facilities to ensure there are no leaks or discharges; ▪ Separated waste at its source and store it in appropriately designated areas for disposal at a licensed facility or by a reputable contractor; ▪ Ensure that a stormwater management plan is in place to separate clean and dirty water; and ▪ Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage.	▪ Stormwater Management Plan; and ▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Monthly and Quarterly during: ▪ Operational Phase and LoM.
	Soils, Land Capability and Land Use	Decommissioning Phase	Very Limited	▪ Ensure wastes are separated at source and disposed of by a reputable contractor.	▪ Waste Management in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Weekly during: ▪ LoM.
	Visual	Decommissioning Phase	Limited	▪ Limit the footprint area of the waste management facilities; ▪ Waste must be stored away from surface water and drainage lines; and ▪ General and hazardous waste must be removed and disposed of frequently at a registered disposal site.	▪ Waste Management in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines; and ▪ ECA.	▪ Weekly during: ▪ LoM.
Decommissioning Phase						
Activity 16: Vehicular activity: removal of mobile plant / equipment and vehicles And Activity 15: Demolition / removal of portable and	Air Quality	Decommissioning Phase	Local	▪ The area of disturbance must be restricted to the required footprint size; ▪ Demolition activities should be undertaken judiciously during windy periods (winds greater than 5.4 m per second); and ▪ The area of disturbance must be minimised to limit the area exposed to wind erosion.	▪ Dust Management Plan; and ▪ Dust Monitoring Programme in accordance with: ▪ NEM:AQA	▪ Ongoing during: ▪ Decommissioning Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
related infrastructure	Biodiversity	Decommissioning Phase	Limited	▪ Restrict vehicles and machinery to existing roads and designated areas to prevent vegetation destruction; and ▪ Alien invasive vegetation to be identified and removed throughout the LoM; and ▪ Establish and implement an Alien Invasive Management Programme.	▪ Stormwater Management Plan; ▪ Conservation Management Plan; and ▪ Alien Invasive Management Plan in accordance with: ▪ NEM:BA; and ▪ ECA.	▪ Ongoing during: ▪ Decommissioning Phase and LoM.
	Surface Water	Decommissioning Phase	Local	▪ Reputable and accredited contractors will be used for the transport and disposal of wastes and demolished material off-site; ▪ All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; and ▪ Vehicles with leaks must have drip trays in place.	▪ IWWMP; ▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines	▪ As required during: ▪ LoM.
	Soils, Land Capability and Land Use	Decommissioning Phase	Very limited	▪ Ensure that demolished infrastructure is removed off-site and disposed of by a reputable contractor; ▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; and ▪ Vehicles with leaks must have drip trays in place.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; ▪ CARA; and ▪ Hazardous Substances Act, 1973	▪ As required during: ▪ LoM.
	Noise	Decommissioning Phase	Project Area	▪ Ensure demolition activities only take place during daylight hours; ▪ Demolition related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and ▪ Ensure equipment and machinery is switched off when not in use.	▪ Regular Vehicle Inspections in accordance with: ▪ NEM:AQA; and ▪ ECA.	▪ Daily and according to Maintenance Plan during: ▪ Decommissioning Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Visual	Decommissioning Phase	Limited	▪ Demolish all unnecessary infrastructure; ▪ Ensure that all demolished infrastructure is removed from site's surface; and ▪ Ensure that rehabilitated areas are rehabilitated and vegetated.	▪ Rehabilitation Plan; and ▪ Closure Plan in accordance with: ▪ ECA.	▪ As required during: ▪ Decommissioning Phase and Post-Closure.
Activity 17: Rehabilitation of the site	Air Quality	Operational Phase Decommissioning Phase	Local	▪ Replacement of overburden and topsoil should be undertaken judiciously during windy days (winds speeds greater than 5.4 m per second); ▪ Ensure the rehabilitated areas are vegetated to prevent erosion and surface exposure to winds; and ▪ Monitor the establishment of vegetation.	▪ Rehabilitation Plan in accordance with: ▪ NEM:AQA	▪ Ongoing and Monthly during: ▪ Operational Phase, Decommissioning Phase and Post-Closure.
	Biodiversity	Operational Phase Decommissioning Phase	Local	▪ Vegetate disturbed and rehabilitated area with indigenous vegetation; ▪ Monitor vegetation establishment and implement erosion control measures, if required; ▪ Alien invasive vegetation to be identified and removed throughout the LoM; and ▪ Establish and implement an Alien Invasive Management Programme.	▪ Rehabilitation Plan; and ▪ Alien Invasive Management Plan in accordance with: ▪ NEM:BA; and ▪ ECA.	▪ As required and Ongoing during: ▪ Operational Phase, Decommissioning Phase and Post-Closure.
	Surface Water	Operational Phase Decommissioning Phase	Local	▪ Rehabilitation activities must be monitored to ensure that the pre-mining drainage pattern is emulated and that vegetation establishment is successful; ▪ The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies; ▪ Monitor surface water resources up and downstream of the Project area to identify potential contamination and residual impacts; and ▪ Where rehabilitation (grass seeding of topsoil cover) is not effective, the associated soil erosion must be mitigated by installing silt traps in affected areas.	▪ Rehabilitation Plan in accordance with: ▪ NEMA.	▪ Monthly during: ▪ Operational Phase, Decommissioning Phase and Post-Closure.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Geohydrology	Operational Phase Decommissioning Phase	Municipal	▪ Ensure that the backfilled material is compacted where possible and the pre-mining drainage pattern is emulated; ▪ Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage. The monitoring programme will assist with the identification of potential AMD occurring. All contaminated water must be contained in the PCD; ▪ The rehabilitated voids must be flooded as soon as possible to create anaerobic conditions to reduce the amount of time the potential acid producing material is exposed to oxygen. This will reduce the potential AMD risk and volumes; and ▪ The backfill material must be placed in such a manner to reduce the potential leaching impacts on the underlying aquifers. Material with a high neutralising effect needs to be placed at the bottom followed by waste rock. The top layers can again be material with a high neutralising capacity. The top layer needs to ensure free draining of the rain water from the rehabilitated areas.	▪ Rehabilitation Plan; and ▪ Groundwater Monitoring Programme in accordance with: ▪ NWA; ▪ GN R. 704; ▪ Best Practice Guidelines.	▪ Quarterly and as required during: ▪ Operational Phase, Decommissioning Phase.

Project Activities	Aspects Affected	Phase	Size and Scale of Disturbance	Mitigation Measure	Compliance with Standards	Time Period for Implementation
	Soils, Land Capability and Land Use	Decommissioning Phase	Very limited	▪ Ensure that the topography of rehabilitated areas takes the pre-mining landscape into consideration and that the topography is free draining; ▪ Ensure that the soil layers are backfilled in reverse order of the stripping and the subsoil must underlie the topsoil; ▪ All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated; ▪ Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; ▪ All vehicles and machinery to be serviced in a hard park area or at an off-site location; ▪ Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973); ▪ Vehicles with leaks must have drip trays in place; ▪ Investigate soil quality prior to establishment of vegetation on rehabilitated areas through representative sampling and laboratory analysis. Soil fertility and acidity must be corrected prior to vegetation establishment, if required; and ▪ Monitor vegetation establishment.	▪ Emergency Response Plan; and ▪ Vehicle Maintenance Plan in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; ▪ Hazardous Substances Act, 1973 ▪ Soil Rehabilitation Plan; and ▪ Soil monitoring in accordance with: ▪ MPRDA Regulation 56 (1) to (8); soil pollution and erosion control; and ▪ CARA.	▪ Ongoing and prior to vegetation; ▪ As required during: ▪ LoM.
	Noise	Operational Phase Decommissioning Phase	Project Area	▪ Rehabilitation related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g. installed exhaust mufflers); and ▪ Ensure equipment and machinery is switched off when not in use.	▪ Regular Vehicle Inspections in accordance with: ▪ NEM:AQA; and ▪ ECA.	▪ Daily and according to Maintenance Plan during: ▪ Decommissioning Phase.
	Visual	Decommissioning Phase	Local	▪ The open cut must be backfilled as much as possible; ▪ The rehabilitated area must be contoured and profiled to create a free-draining topography emulating the pre-mining topography; and ▪ Topsoil must be backfilled over the rehabilitated area and vegetated.	▪ Rehabilitation Plan; and ▪ Closure Plan in accordance with: ▪ NEMA.	▪ As required during: ▪ Decommissioning Phase and Post-Closure.

5 Impact management outcomes

A description of impact management outcomes, identifying the standard of impact management required for the various environmental aspects are presented in Table 5-1.

Table 5-1: Mitigation and Management Plan

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Whether listed or not listed. (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.	***(E.g. dust, noise, drainage surface disturbance, flying rock, surface water contamination, groundwater contamination, air pollution, etc.)***		***Modify, remedy, control, or stop through (e.g. noise control measures, stormwater control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc.)*** ***E.g. Modify through alternative method, control through noise control, control through management and monitoring, remedy through rehabilitation.***	***Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:-*** ***Upon cessation of the individual Activity or Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.***	***A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities***
Please refer to Table 5-2 for activities.	Please refer to Table 13-1 for potential impacts.	Please refer to Table 4-1 for aspects identified.	Please refer to Table 4-1for mitigation measures.	Please refer to Table 4-1 for time period for implementation.	Please refer to Table 4-1 for policies and legislative context.

6 Impact Management Actions

The recommended action plans for impact management are set out in Table 5-1 above.

7 Financial provision

South Africa's legislation places the responsibility of mitigating environmental damage as a result of mining operations on mining companies. The liability exists throughout the life of the mine, and beyond in terms of residual impacts. The broad rehabilitation objectives are to restore the mined area to its predetermined state; to restore the land to the previous land capability and to ensure there is no net loss of biodiversity.

The key legislation governing the requirements for legislation for rehabilitation is contained in the following acts:

- The National Environmental Management Act (Act 107 of 1998, NEMA);
- The Mineral and Petroleum Resources Development Act (Act 28 of 2002, MPRDA); and
- The National Water Act (Act of 1998, NWA).

7.1 Determination of the amount of Financial Provision

The closure cost assessment involves the quantification of mining and infrastructure components and applying rates to rehabilitate each component. The environmental liability is described in monetary terms in order for a financial provision to be set aside in a dedicated fund for closure and rehabilitation purposes. The provision can be calculated based on a planned versus unplanned closure scenario. A planned closure scenario considers what activities would need to take place upon closure of the mine after the ore body has been depleted. Unplanned closure determines what provision should be set aside in the event of premature closure of the mine. In other words the liability is determined as and when the mine was to abruptly close.

For the purposes of this Report the approach followed was an unplanned closure scenario within the first year of mining. In addition it is based on the mine plans available to date and should be used as a guide only in determining the quantum required for unplanned closure.

The dedicated trust fund or other mechanism ensures that funds are available for closure. Funds allocated, must be re-assessed on an annual basis to ensure that closure costs can be met for effective rehabilitation of the site. Funds should also be available for planned or unplanned closure at any phase of the mine's life.

It should be noted that the calculated amount excludes the costs to maintain accommodation and industrial facilities on site during the closure period and also excludes any costs associated with staff retrenchment. In addition the calculations do not account for any value recovered from the sale of the plant or other material.

7.1.1 Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation

The rehabilitation of De Groote Boom mine will require significant levels of control and monitoring during implementation if the desired objectives are to be achieved. In brief, these objectives are:

- Return impacted land, to a sustainable land use in agreement with the current landowner or next landowner or user;
- Remove mining infrastructure that cannot be used by a subsequent land owner or a third party. Where buildings can be used by a third party, arrangements must be made to ensure their long-term sustainable use;
- Ensure that as little water as possible seeps out of the various sections of the mine and where this is unavoidable, to ensure that the water is contained or treated if it does not meet statutory water quality requirements;
- Follow a process of closure that is progressive and integrated into the short and long-term plans and that will assess the closure impacts proactively at regular intervals throughout Project life;
- Implement progressive rehabilitation measures, beginning during the construction phase wherever possible;
- Leave a safe and stable environment for both humans and animals and make their condition sustainable;
- To prevent soil and surface/groundwater contamination by managing water on site;
- Comply with national closure and rehabilitation regulatory requirements;
- Form active partnerships with local communities to take management of the land after the Project has ceased, where possible; and
- To maintain and monitor all rehabilitated areas following re-vegetation for the prescribed period. If monitoring shows that the objectives have been met, an application for closure can be made.

Closure will include some form of rehabilitation. Rehabilitation can be divided into two different streams, namely concurrent rehabilitation and final rehabilitation. Concurrent rehabilitation must be carried out along with the operations, and will decrease the final liability that the mine will carry at the time of closure. This concurrent rehabilitation will be carried out within the context of the EMP. Final rehabilitation will be carried out once the mine goes into its closure phase. This final rehabilitation will be carried out within the context of the closure plan (Bailie, 2006).

The closure and rehabilitation plan should be modified and adapted as the Project continues and more knowledge is generated about the environment and the impacts of the Project.

Consequently a more detailed rehabilitation plan will be developed as more information is available.

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

All the closure objectives based on the post mining land use will be consulted with interested and affected parties (I&AP) during the Public Participation Process (PPP) as part of the EMP process. All I&APs will be included in the stakeholder database and will be notified of any documentation related to the Project and where these can be accessed.

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

A plan showing the location and aerial extent of the proposed operation, including the anticipated mining permit area at the time of closure is provided in Plan 1 - Local Setting and Plan 4 - Environmental Features, Appendix A.

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

The closure objectives are regarded as guidelines for what the rehabilitation plan should entail. The rehabilitation plan will detail how rehabilitation will need to be undertaken and will include management of soil resources and placement of soil once mining is completed. In addition to this the rehabilitation plan also contains information associated with re-shaping of the landforms, operational and post-closure water management, replacement of soils, re-vegetation of the landscape; and monitoring and maintenance. The successful rehabilitation of the site will ensure the rehabilitated area is free draining, erosion free and produce sustainable vegetation as per the closure objectives stated above.

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

The financial provision was calculated by means of the DMR's standard method for assessment of mine closure. The closure liability only focused on the proposed mining activities and the cost for rehabilitation and closure of the proposed site according to the DMR Guideline format is R2 148 139. A summary of the calculated closure liability costs is presented in Table 7-1 below.

Table 7-1: Closure liability for the proposed De Groote Boom Minerals Mine

CALCULATION OF THE QUANTUM							
		Location:	De Groote Boom Minerals				
	Digby Wells Environmental	**Date:**	14-May-15				
			A	**B**	**C**	**D**	**E=A*B*C*D**
	Description:	**Unit:**	**Quantity**	**Master rate**	**Multiplication**	**Weighting**	**Amount**
	Class C (Low Risk)				**factor**	**factor 1**	**(Rands)**
Component			**Step 4.5**	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	m^3	0.00	12.29	1.00	1.20	R 0
2 (A)	Demolition of steel buildings & Structures	m^2	0.00	171.24	1.00	1.20	R 0
2 (B)	Demolition of reinforced concrete buildings & structures	m^2	0.00	252.35	1.00	1.20	R 0
3	Rehabilitation of access roads	m^2	10000.00	30.65	1.00	1.20	R 367 778
4(A)	Demolition & rehabilitation of electrified railway lines	m	0.00	297.41	1.00	1.20	R 0
4(B)	Demolition & rehabilitation of non electrified railway lines	m	0.00	162.23	1.00	1.20	R 0
5	Demolition of housing &/or administration facilities	m^2	0.00	342.48	1.00	1.20	R 0
6	Opencast rehabilitation including final voids & ramps	ha	5.00	179531.13	**0.52**	1.20	R 560 137
7	Sealing of shafts, adits & inclines	m^3	0.00	91.93	1.00	1.20	R 0
8(A)	Rehabilitation of overburden & spoils	ha	0.00	119687.42	1.00	1.20	R 0
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	ha	1.06	149068.51	1.00	1.20	R 189 615
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	0.00	432965.63	**0.66**	1.20	R 0
9	Rehabilitation of subsidised areas	ha	0.00	100220.18	1.00	1.20	R 0
10	General surface rehabilitation	ha	2.03	94812.62	1.00	1.20	R 230 964
11	River diversions	ha	0.00	94812.62	1.00	1.20	R 0
12	Fencing	m	0.00	108.15	1.00	1.20	R 0
13	Water management	ha	0.00	36050.43	**0.25**	1.20	R 0
14	2 to 3 years of maintenance & aftercare	ha	8.09	12617.65	1.00	1.20	R 122 492
15 (A)	Specialist study	SUM		**0.00**	**0.00**	1.20	R 0
15 (B)	Specialist study	SUM		**0.00**	**0.00**	1.20	R 0
						(Sum of items 1 to 15 Above)	**R 1 470 985.87**
	Weighting factor 2 (step 4.4)			**1.05**		**Sub Total 1**	**R 1 544 535.16**
	Preliminary and General			12% of Subtotal 1			R 185 344
	Contingency			10% of Subtotal 1			R 154 454
						Sub Total 2	**R 1 884 332.90**
						VAT (14%)	R 263 806.61
						Grand Total	**R 2 148 139.50**

7.1.6 Confirm that the financial provision will be provided as determined

De Groote Boom will update its financial provision annually and will contribute to a trust fund or other form of financial guarantee for rehabilitation provision, as required in terms of Section 24P of NEMA, as amended. Contributions to the fund will be made in accordance with the requirements of tax legislation and policy and this will be made up in a manner acceptable to the Department of Mineral Resources (DMR).

8 Monitoring compliance with and performance assessment

A legal compliance and EMS audit will be regularly conducted by professional consultants throughout the life of the mine, to monitor the EIA and EMP process and the rehabilitation process and to advise on any mitigation measures which need to be added to the existing programmes.

A Report will be submitted to mine management annually covering all aspects investigated during the audit, and providing suggestions and recommendations as to how the rehabilitation programme is progressing, and any improvements which could be made.

The Audit will be conducted according to the following acts and regulations;

- National Water Act,1998 (Act No. 36 of 1998) (NWA);
- MPRDA;
- NEMA; and
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA).

The audit will take into consideration the management principles and strategies stated in the Environmental Management Programme, and assess whether this strategy is providing the required results. Any flaws found in the rehabilitation process will be included in the Report along with the recommended mitigation measures.

A Report will be compiled in accordance with the above listed government acts, on a biannual basis to mine management, who may then decide the appropriate actions to be taken, along with an updated financial provision.

8.1 Monitoring of impact management actions

On-going monitoring and management measures need to be implemented to provide the early warning systems necessary to avoid environmental emergencies. The relevant weekly, monthly and quarterly monitoring programmes of respective environmental aspects will indicate whether mitigation or intervention is required. Should circumstances lead to unacceptable risks, emergency systems and procedures have been designed and will be implemented in the case of an emergency to prevent or minimise the consequential environmental damage.

The most crucial aspect of the emergency system is the identification and communication of the emergency to the appropriate persons. Consequently, the names of the appropriate contact person, together with their contact numbers will be prominently displayed around the facility. The contact details will be updated on a regular basis. First-party employees, such as security, safety superintendents, mine overseers and environmental officers, will be trained to respond to the responsible personnel in the event of an emergency.

Management activities which will be conducted to control the Project actions, activities or processes which have the potential to pollute or result in environmental degradation are detailed below:

8.1.1 Air Quality

8.1.1.1 Dust Monitoring Programme

The monitoring of dust deposition rates will commence towards the end of May 2015. It is advised that such monitoring be continued during the project life in order to establish historical repository of data needed to fully understand/address fugitive and airborne dust emissions from the proposed operation of De Groote Boom Mine. If sources of fugitive dust are managed effectively, there will be overall reduction in exposure concentrations, associated ailments, reduced risk of damage to property, improved visibility, and fewer disturbances to existing flora and fauna habitats.

8.1.1.2 PM_{10} Monitoring Programme

De Groote Boom management should consider setting up PM_{10} monitoring site(s) in the area, to collect data for future assessment of ambient air quality, which will be useful should the mine come under scrutiny from regulatory agencies (proactive approach). Monitoring sites should be selected judiciously, and calibration of monitoring instruments should be conducted once a year to ensure the integrity of the measured data.

8.1.1.3 Gaseous Monitoring Programme

It is recommended that the management of De Groote Boom conduct monitoring of relevant gases i.e. sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and volatile organic compounds (VOCs) in the vicinity of the proposed operation at least seasonally. Other gases such as CO, CO_2 and O_3 can be included in the suite of pollutants sampled in the area.

8.1.2 Soil Management

Considering the importance of and formation timeframes associated with soil properties, it is evident that managing soil stockpiles adequately must have a high priority for the De Groote Boom Project. The topsoil and subsoil must be stored separately and the topsoil stockpile must be limited in height to prevent compaction.

Progressive monitoring of the stripping, stockpiling, shaping of rehabilitated areas and the replacement of topsoil will ensure the successful post-mining land and soil rehabilitation. Monitoring should take place on at least a quarterly basis and should involve the following:

- Inspection of stripping depths and the separation of topsoil and subsoil;
- Inspection of the stockpiles to manage degradation, erosion and pollution;
- Inspection of the rehabilitated areas to ensure that the pre-mining drainage lines are emulated; and
- Random inspections of soil thickness on rehabilitated areas.

In light of the study findings, the following recommendations for the stripping and stockpiling of soils are suggested;

- Soil stockpiles must not exceed a height of 4-5 m (practical tipping height for dump trucks) to prevent compaction;
- Stockpiles should be re-vegetated as quickly as possible to reduce or prevent erosion;
- Stockpiles should be demarcated and logged, as to make sure the right stockpiles (soil types) are used when rehabilitating; and
- Limit the slopes on the stockpiles to 1:3 to reduce erosion losses, or place a smaller berm around the edge of each stockpile to contain any erosion;

The major concern for this area is the potential for erosion due to the steep slopes. Stockpiles and reshaped land must be re-vegetated as quickly as possible to reduce the erosion hazards.

8.1.3 Biodiversity

Flora and fauna monitoring is recommended using the stratified random sampling technique across transects through the site and that fauna and flora species are recorded as they are encountered. Alien species should be monitored for up to five years unless no recruitment is recorded for one year. Fixed-point photography should be undertaken at specific points on either side of each transect, at 1.5 m from the ground. The following should be adhered to for the monitoring programme:

- Monitoring must take place annually;
- Monitoring must be completed by qualified specialists;
- Adaptive management must be applied;
- Monitoring during the wet season is essential; and
- Findings must be compared to previous years.

The following management and monitoring plans are recommended as part of the project:

- Biodiversity Land Management Plan;
- Fauna and Flora Monitoring plan and
- Alien Invasive Management Plan

8.1.4 Surface Water

A surface water monitoring plan is crucial for the early detection of surface water quality impacts and will be used to determine when mitigation measures have failed, or whether additional management and mitigation measures are required. Surface water monitoring must be implemented throughout the LoM, as well as for three years following closure.

The impacts on water quality will be determined by comparing the monitoring data against the SANS 241-1:2011 drinking water quality standards. Water quality monitoring is recommended at the locations provided in Plan 11 and indicated in Table 9-16.

The surface water monitoring plan is detailed in Table 8-1.

Table 8-1: Surface Water Monitoring Programme

Monitoring Element	Comment	Frequency	Responsibility
Water quality	Ensure that monitoring is implemented to cover all mining activity areas. Recommended monitoring sites are shown in Plan 11 Water quality parameters that need to be analysed are shown in Table 9-16.	-Monthly during construction. - Reduce to quarterly on rehabilitated areas. - This can further be reduced to biannually (wet and dry season). -Monitoring needs to carry on three years after the project has ceased, as is standard practice to detect residual impacts.	Specialist Environmental Quality
Water quantity	Flow monitoring should be carried out in channels and pipelines and at facilities on site. Monitoring water levels in dams and channels. Records of Pit dewatering to be recorded.	-Instantaneous where automatic flow meters are in place for real time measurements. -Where there are no automatic flowmeters weekly monitoring needs to be done. -In operational areas, daily records need to be kept	Specialist Environmental Quality
Physical structures and SWMP performance	Personnel should have a walk around facilities to determine the facilities conditions and pick out any anomalies such as leaks or overflows and system malfunctions.	Continuous process and yearly formal report	Specialist Environmental Quality

Monitoring Element	Comment	Frequency	Responsibility
	Dams are inspected for silting and blockages of inflows, pipelines for hydraulic integrity; monitor the overall SWMP performance.		
Meteorological data	Measure rainfall	Real time system if in place	Sampler
Rehabilitation	Perform and monitor continuous rehabilitation sites	Continuous	Specialist Environmental Quality

8.1.5 Groundwater

8.1.5.1 Monitoring Locations

A preliminary groundwater monitoring programme has been established based on the data collected during the April 2015 hydrocensus, as listed in Table 8-2.

A quarterly groundwater monitoring programme is recommended and should include at least five of the boreholes identified during the hydrocensus. No boreholes or any groundwater monitoring points were identified north of the mining permit area or towards the west where the other mining operations are located. It has been assumed that these mines should have active groundwater monitoring programmes in place, but in order to define the potential impacts from De Groote Boom it is recommended to drill additional monitoring boreholes along the western perimeter of the proposed mining permit area.

A quarterly monitoring programme should be initiated with the following objectives:

- The generation of baseline, as well as continuous data for the life of mine;
- To serve as an early detection system to allow for remedial and mitigation measures to be taken for the mining permit area and affected region;
- The identification of current sources and/or areas of contamination and the extent thereof (and later associated with mining which constitutes legal implications or liabilities associated with risks of contamination migrating off site);
- Assessment of compliance with standards and relevant legislation i.e. Department of Water and Sanitation Guidelines; and
- Assessment of the impacts of the construction or mining operation and activities on the receiving environment.

The monitoring programme should also be reviewed and updated on an annual basis to ensure that the groundwater monitoring and impact assessment is accurate and effective.

Table 8-2: Monitoring locations

BH ID	Latitude	Longitude	Sample	Water level
GBBH3	24.93485°	30.13704°	Yes	Yes
GBBH4	24.93280°	30.13528°	Yes	Yes
GBBH5	24.93008°	30.14350°	Yes	Yes
GBBH8	24.93095°	30.14299°	Yes	Yes
GBBH9	24.93010°	30.13591°	Yes	Yes

8.1.5.2 Groundwater Sampling Protocol

All water samples should be taken in accordance with the Department of Water and Sanitation (DWS), Department of Health (DoH) and Water Research Commission's (WRC) "Quality of Domestic Water Supplies: Volume 2: Sampling Guide" (2000).

One litre bottles should be used to collect the water samples at each site. Groundwater levels and the borehole status must be noted. Bailing equipment must be used to purge the boreholes and take a representative sample, if the borehole is not equipped with a pump. Approximately two to three times the volume of the water contained within the borehole should be purged before a water sample is taken.

Groundwater samples must be stored in a cooler box, before being submitted to a SANAS accredited laboratory for analysis.

The following sampling protocol needs to be followed for metal and inorganic sample collection:

- Water levels should be measured using a dip meter;
- Each borehole should be purged using installed pump equipment or in the event of no equipment in a borehole, clean disposable polyethylene bailers. The purging involves abstracting three borehole volumes of water; or through continuous water quality monitoring, purging until the electrical conductivity value stabilised;
- Water levels should be allowed to stabilise prior to sampling. Each borehole is then sampled by collecting a one litre sample in a sterilized plastic bottle for laboratory analyses;
- Samples must be transferred to a cooler box in the field and kept cool prior to being submitted to the laboratory; and
- The pH and EC meter must be calibrated daily using standard solutions obtained from the instrument supplier.

8.1.5.2.1 Sample Analysis

Samples taken during monitoring runs should be submitted to a SANAS accredited laboratory and analysed for the following parameters (Table 8-3).

Table 8-3: Parameter list for monitoring water quality

Chemical Parameters
Cl; SO_4; NO_3 -N; NO_2 - N; PO_4; NH_{3+4}, Fluoride
Al, Ca, Fe, K, Mg, Mn, Na, Cr, Cu, Ni, Cd, Co, Pb, Zn
pH & Electrical Conductivity (EC)
Total Hardness
Total Alkalinity
Total Dissolved Solids (TDS)
Dissolved oxygen
Bicarbonate as HCO_3 (Alkalinity)
Carbonate as CO_3 (Alkalinity)
Cr (III)
Pb
B
Hg
As and Se
Acidity
Uranium

8.2 Monitoring and Reporting frequency

Table 8-4 discusses the monitoring and reporting frequency.

8.3 Responsible persons

De Groote Boom will establish and appoint an environmental manager at senior mine management level, who will be provided with all necessary resources to carry out the management of all environmental aspects of the site as a primary function, for example:

- Compliance with environmental legislation and EMP commitments;
- Implementing and maintaining an environmental management system;
- Developing environmental emergency response procedures and coordinating personnel during incidents;
- Manage routine environmental monitoring and data interpretation;
- Environmental troubleshooting and implementation of remediation strategies; and

- Closure planning.

Table 8-4 sets out roles and responsibilities with respecting to the monitoring programme.

8.4 Time period for implementing impact management actions

Table 8-4 captures the time period for implementing impact management actions.

8.5 Mechanism for monitoring compliance

8.5.1 Performance Assessments

Performance assessments will be conducted by professional consultants on an annual basis throughout the life of mine, to monitor the EMP process and the rehabilitation process and advice on any mitigation measures which need to be added to the existing programmes.

A Report will be submitted to mine management annually covering all aspects investigated during the audit, and providing suggestions and recommendations as to how the rehabilitation programme is progressing, what the general environmental performance of the Project is, and any improvements which could be made.

An assessment of compliance to applicable legislation will be included in the assessment and will take into consideration the management principals and strategies stated in the Environmental Management Programme, and assess whether this strategy is providing the required results. Any flaws found in the rehabilitation process will be included in the Report along with the recommended mitigation measures.

A Report will be compiled on an annual basis to mine management, who may then decide the appropriate actions to be taken, along with an updated financial provision.

The following are identified impacts which require monitoring programmes:

- Site clearing and drilling: Removal of vegetation;
- Drilling: Soil erosion;
- Drilling: Dust and noise;
- Drilling: Water generated;
- Drilling: Cleaning of machinery before relocating to another site to prevent the spread of invasive and alien floral species;
- Drilling: Groundwater levels and quality;
- Heritage landscape;
- Hydrocarbon spillages;
- Ablution facilities;
- Domestic waste; and

- Fires.

The functional requirements for the above monitoring programmes are described below:

- Removal of vegetation: Vegetation cleared from the site will be stored adjacent to the mining site and removed from the site should it not be adequate to use during rehabilitation. Only the necessary vegetation, required for the establishment of the site, will be cleared and indigenous trees will be avoided;
- Soil erosion: All topsoil removed will be stored in a stockpile and protected from erosion for use during the rehabilitation. Daily site inspection by the site manager will take place to ensure that all soil erosion mitigation measures are in place and implemented;
- Dust and noise: Roads should be sprayed with water to suppress dust and the soil stockpiles with a plastic liner. The drill should be maintained and serviced regularly, and a silencing system should be fitted, if possible. Drilling is to only take place between sunrise and sunset;
- Water generated: Water generated from the drilling should be captured and treated as hazardous waste, since drill fluids will be present in the water;
- Machinery: Cleaning of machinery and equipment will be performed in a dedicated area to avoid the spread of alien invasive floral species to other areas and will take place before leaving the mining site;
- Access roads: Machinery operators and drivers should be made aware of the possible safety hazards that they could pose;
- Groundwater: Groundwater levels and quality should be monitored so as to ensure that surrounding farms are not affected by the drilling activities;
- Heritage landscape: A Watching Brief should be implemented during site establishment in the event that Heritage Resources are discovered;
- Use of hydrocarbons: During drilling, a spill tray will be placed under the machinery to collect any hydrocarbon leaks and spillages. Should spillages occur, the soil will be removed and treated as hazardous waste using bioremediation techniques. Should the soil not be adequately treated on-site, the soil should be removed from the site and disposed of at a waste handling facility;
- Ablution facilities: The contents of chemical toilets should be emptied on a regular basis, at least weekly, to prevent spillages (as an alternative french drains may be used);
- Domestic waste: Bins will be placed at each site to collect the domestic waste and will be disposed of at a registered waste handling facility. The waste in the rubbish bins will be removed on a daily basis by the contractor;
- Wetlands (if applicable) will be avoided; and

- No open fires are permitted in the Project area.

Table 8-4 sets out the method of monitoring the implementation of the impact management actions, the frequency of monitoring the implementation of the impact management actions, an indication of the persons who will be responsible for the implementation of the impact management actions, the time periods within which the impact management actions must be implemented and the mechanism for monitoring compliance with the identified impact management actions.

Table 8-4: Monitoring and Management of Environmental Impacts

Activities	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles And Responsibilities (For the Execution of the Monitoring Programmes)	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Actions
All activities throughout the LoM.	Dust generation	▪ The monitoring of dust deposition rates will commence towards the end of May 2015. It is recommended that particulate monitoring of ambient PM10 and PM2.5 be initiated alongside the dust deposition network ▪	▪ Environmental Manager; ▪ Environmental Control Officer ▪ Air Quality Specialist	Dust monitoring, Pm_{10} monitoring and Gaseous monitoring will take place. Dust buckets will then have to be monitored every month, with a Report compiled every quarter. Should the Reports indicate that the NEM: AQA NDCR are exceeded, additional mitigation measures must be implemented.
	Loss of soil resources and land capability	▪ Inspection of stripping depths and separation of topsoil and subsoil during stockpiling; ▪ Inspection of stockpiles to manage and prevent erosion; ▪ Inspection of rehabilitated areas to ensure that the surface is free-draining; ▪ Random inspections of soil thickness on rehabilitated areas; and ▪ Fertility and acidic analysis and amelioration procedures prior to vegetation establishment.	▪ Mine Manager ▪ Environmental Manager; ▪ Environmental Control Officer ▪ Soil Specialist.	Inspection of stripping depths must be ongoing during site clearance activities and stockpiling to ensure that soils are stored separately. Stockpiles should be monitored on a monthly basis to manage potential soil erosion. The testing and analysis for macro nutrients and pH must be sampled on an annual basis and results kept to plan for rehabilitation. The rehabilitation activities must be monitored and random samples selected for to test for soil thickness. The land must be shaped and sampled and remediation techniques implemented, if necessary, prior to vegetation establishment.
	Loss of biodiversity	▪ Floral and faunal Species of Special Concern (SSC) must be rescued and relocated, should they occur within the disturbed areas; ▪ Faunal and Floral SSC in the Project area, but not within the directly disturbed mine areas, should be monitored; and ▪ Alien invasive vegetation must be controlled on a monthly basis.	▪ Environmental Manager; ▪ Environmental Control Officer	Monitoring must take place at least on an annual basis and especially during the wet season. Results of the monitoring must be recorded and compared to previous years' results to keep track of the populations of the faunal and floral species. Monthly monitoring for alien invasive vegetation must take place and managed according to the NEM:BA requirements.
	Contamination to surface water resources	▪ The following constituents must be tested for: ▪ Aluminium and iron; ▪ Sodium, calcium, sulfate, chloride and potassium ▪ Manganese, magnesium and fluoride; ▪ Nitrate and ammonium; and ▪ pH, electrical conductivity and TDS.	▪ Environmental Manager; ▪ Environmental Control Officer	Surface water monitoring must take place from the onset of the Construction Phase, throughout the LoM and for a period of 3 years following closure. Sampling must be undertaken on a monthly basis during the Construction Phase, as well as during the initial stages of the Operational Phase. Should the water sampling indicate that there are no impacts to the surface water quality, sampling can be reduced to a quarterly basis. All sampling results must be recorded to track potential quality changes or deterioration.

9 Indicate the frequency of the submission of the performance assessment/ environmental audit Report

The environmental manager will conduct internal management audits against the commitments in the EMP. These audits will be conducted on an on-going basis until final closure. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with mining regulation R527, an independent professional will conduct an EMP performance assessment every two years. The site's compliance with the provisions of the EMP and the adequacy of the EMP Report relative to the on-site activities will be assessed in the performance assessment.

As a minimum, the following documents will be submitted to the relevant authorities from the start of construction until mine closure:

- EMP performance assessment, submitted every two years to DMR;
- Updated closure and rehabilitation cost estimate, submitted annually to the DMR;
- Water monitoring Reports, submitted annually to the Department of Water and Sanitation – these Reports will not only present monitoring data but will also provide interpretations of trends in the data and Reporting on compliance with water quality guidelines;
- Air monitoring Reports, submitted annually to the DMR and LEDET; and
- A detailed plan for decommissioning/ closure, submitted to DMR at least five years prior to decommissioning.

10 Environmental Awareness Plan

General environmental awareness will be fostered among everyone working on this Project (including consultants and contractors) to encourage the implementation of environmentally sound practices throughout its duration. This will ensure that environmental incidents are minimised and environmental compliance maximised.

The purpose of an Environmental Awareness Plan is to outline the methodology that will be used to inform the mine's employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with in order to avoid contamination or the degradation of the environment. The awareness plan is primarily a tool to introduce and describe the requirements of the range of environmental and social plans for the Project during the Life of the Project.

The environmental awareness plan ensures that training needs are identified and appropriate training is provided. The environmental awareness plan should communicate:

- Importance of conformance with the environmental policy, procedures and other requirements of good environmental management;

- The significant environmental impacts and risks of an individual's work activities and the environmental benefits of improved performance;
- Individual's roles and responsibilities in achieving the aims and objectives of the environmental policy; and
- The potential consequences of not complying with environmental procedures.

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

In order for the environmental awareness policy to be effective, the issues raised through it need to be communicated through meetings, consultations and progress reviews. The following are the minimum steps that will be taken to ensure communication is effective:

- The agendas of all company board meetings will have an item where issues environmental Projects are discussed and feedback is given;
- Provide progress Reports on the achievement of policy objectives and level of compliance with the approved EMPR, to the DMR;
- Ensure environmental issues are realised at monthly mine management executive committee meetings and at all relevant, mine wide meetings, at all levels; and
- Ensure environmental issues are discussed at all general liaison meetings with local communities and other I&APs.

Regular meetings and daily meetings with "Tool Box" talks and monthly Reports will be conducted. Information of any environmental risk which may result from employee's work will also be communicated with them via Company's newsletter.

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

The following table indicates the manner in which risks relating to pollution or degradation of the environment will be dealt with.

Phase	Aspect	Environmental Risk	Communication Strategy				Mitigation Activity
			Management	Administration	Mine workers	Contractors	
Operational Phase	Soil	Loss of structure and fertility. Contamination of soils. Loss of soil through erosion.	Workshop	Course	Induction & Monthly Meetings	Induction & Monthly Meetings	Stockpiled to height of less than 4 m and vegetated. Hydrocarbon spill kit kept on site and rehabilitation area designated. Areas of erosion Reported on a monthly basis and rehabilitated.
	Animals	Habitat loss Fire Hazard Disturbance					Remediation of the soil and re-vegetation will restore animal habitat. Hunting and trapping prohibited on the mine property. Open fires will be prohibited on the property. Report any rare or endangered species.
	Vegetation	Removal of vegetation Invader species					Red Data species Reported and protected. Invader species will be eradicated on site. Disturbed areas will be rehabilitated and re-vegetated.

Phase	Aspect	Environmental Risk	Communication Strategy				Mitigation Activity
			Management	Administration	Mine workers	Contractors	
	Surface water	Contaminated runoff from the mining property					All contaminated water to be stored and treated on site before being returned to the catchment.
	Groundwater	Acid mine drainage could cause contamination. Potential to de-water natural springs.	Workshop	Course	Induction & Monthly Meetings	Induction & Monthly Meetings	Acid Mine Drainage generation will be communicated to mine management to allow an understanding of the process. Exposure to oxygen of acid generating material will be limited through cladding or flooding. Water ingress into the pits will be prevented to limit AMD. All dirty water will be collected in the dirty water system during the operational phase.
	Air quality	Dust generation by blasting and trucks					Dust will be suppressed by water cart on the haul roads and in the disturbed area of the mine.
Decommissioning Phase	Soil	Lack of soil fertility	Workshop	Course	Induction	Induction	Fertilisation programmes will be introduced.
	Vegetation	Alien Species					Remove alien species & plant only indigenous vegetation.
	Surface water	Acid mine drainage – Decrease	Workshop	Course	Induction	Induction	Monitoring of water sources

Phase	Aspect	Environmental Risk	Communication Strategy				Mitigation Activity
			Management	Administration	Mine workers	Contractors	
		quality of the water source/s					
	Groundwater	Acid mine drainage – Contamination of aquifers					Monitoring of water sources

10.2.1 Emergency response plan

The environmental management programme and associated management options are intended to minimise environmental risk as far as possible. Should, however, circumstances lead to unacceptable risks, emergency systems and procedures have been designed and will be implemented to prevent or minimise the consequential environmental damage. The environmental emergency contingency plan addresses any reasonably anticipated failure (most probable risk) for the entire mining permit area and focuses on incidents that could cause environmental emergencies.

The most crucial aspect of the emergency system is the identification and communication of the emergency to the appropriate persons. Consequently, the names of the appropriate contact persons together with their contact numbers would be prominently displayed around the facility. The contact details will be updated on a regular basis. First-party employees (such as security, safety superintendents, mine overseers, environmental officers) will be trained to respond to the responsible personnel in the event of an emergency.

Each person's responsibility would be cleared with him/her beforehand and a copy of the emergency contingency plan would be distributed to each person, including the responsible and/or affected persons not associated with the mine:

- Disaster management and firefighting agencies,
- Downstream water supply authorities,
- Downstream users that could be affected in the case of an emergency such as neighbouring mines, farmers and local communities;
- Relevant government authorities such as the Department of Water and Sanitation (DWS) and the DMR; and
- Approved professional person (engineer).

It must be ensured that operating and supervisory staff is familiar with the emergency plan, and that the content thereof is understood and familiar to them. The emergency procedures will therefore be included in the induction programme of the mine. Regular training sessions in this regard on a more business-specific basis will be performed.

The emergency response plan will be updated as circumstances change or operating procedures are amended, and as a minimum in the event of:

- Any additional recommendations made by a professional engineer (annual safety inspections) or environmental auditors;
- Any change in operational procedures and/or management of the mining activity;
- The identification of any issues of concern or additional risks as a result of regular inspections and/or monitoring results; and
- Any unplanned or unforeseen emergency situation.

10.2.1.1 Objectives

Emergencies and risks that have been listed here include: accidents, fires, hydrocarbon spillages and flooding.

If the emergency has potential to affect surrounding communities, they will be alerted via alarm signals or contacted in person. The surrounding community will be informed prior to mining taking place, of the potential dangers and emergencies that exist, and the actions to be taken in such emergencies.

Communication is vital in an emergency and thus communication devices, such as mobile phones, radios, pagers or telephones, must be available around the mine. A checklist of emergency response participants must be consulted and the relevant units notified.

The checklist includes:

- fire department;
- police;
- emergency health services such as ambulances, paramedic teams, poisons centres;
- hospitals, both local and for evacuation for specialist care;
- public health authorities;
- environmental agencies, especially those responsible for air, water and waste issues;
- other industrial facilities in the locality with emergency response facilities;
- public works and highway departments, port and airport authorities; and
- public information authorities and media organisations.

The conceptual emergency response plan will be only implemented once the mine becomes operational. Therefore, it will be of paramount importance that the plan be reviewed after an incident or accident to ensure that the necessary measures are in place to protect the environment and protect the mine against liability claims that could result. In addition, a yearly review of the emergency response plan will be carried out, irrespective of whether an incident occurred during that year.

10.2.1.2 Emergency Situations

The following is a list of potential emergencies that could occur:

10.2.1.2.1 Accidents

In the case of a medical accident or problem, a first aid kit will be available on the mine.

A checklist of emergency response participants must be consulted and the relevant units notified. In this case, many of the emergency services will be sourced from the nearest main town.

10.2.1.2.2 Fire

Veld fires and fires resulting from other sources must be handled with extreme caution. Fire extinguishers will be placed around the mine.

Procedure:

- The alarm will be activated to alert occupants of the mine in the event of a fire;
- In the event of a small fire the fire extinguishers placed around the mine should be used to contain and extinguish the fire;
- In the event of a large fire, the local area council's fire department will be consulted; and
- All staff will receive training in response to a fire emergency on site.

10.2.1.2.3 Hydrocarbon spillage

Hydrocarbons such as diesel, petrol, and oil will be kept on site as fuel for the mine machinery. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

Procedure:

- In the event of a small spillage, the soil will be excavated and treated;
- In the event of a large spillage, adequate emergency equipment for spill containment or collection such as additional supplies of booms and absorbent materials will be available and if required, a specialised clean-up crew will be called in to decontaminate the area; and
- After a major spill water quality samples of any water sources utilised within 500m from the spill will be monitored for hydrocarbons for the next three months on a monthly basis and further remediation recommended based on the results thereof.

10.2.1.2.4 Flooding

Heavy rainfall could cause the PCD to overflow. If this water leaves the site is will enter water resources on site and cause contamination. Procedures must be put in place to ensure that there is a quick response to these events and damage is kept to a minimum.

10.2.1.3 Implementation

All employees of the De Groote Boom mining operation will be trained in the above mentioned procedures as part of the mine induction process. De Groote Boom will ensure that all emergency numbers are located in various locations around the site and these locations are known to all employees for easy accessibility in the event of an emergency.

11 Specific information required by the Competent Authority

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) and National Environmental Management Act, 1998, Act 107 of 1998), as amended, (NEMA) which provides in Section 24P that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision will be reviewed annually.

12 Undertaking

The EAP herewith confirms:

- the correctness of the information provided in the Reports
- the inclusion of comments and inputs from stakeholders and I&APs;
- the inclusion of inputs and recommendations from the specialist Reports where relevant; and
- the acceptability of the Project in relation to the finding of the assessment and level of mitigation proposed.

Signature of the Environmental Assessment Practitioner:	
Name of Company:	Digby Wells and Associates (South Africa) (Pty) Ltd
Date:	19 May 2015

Appendix A: Plans

Appendix B: Curricula Vitae of EAP and Specialists

Appendix C: Public Participation Report

Appendix D: Air Quality Impact Assessment Report

Appendix E: Noise Impact Assessment Report

Appendix F: Biodiversity Impact Assessment Report

Appendix G: Topography and Visual Impact Assessment Report

Appendix H: Soils Impact Assessment Report

Appendix I: Surface Water Impact Assessment Report

Appendix J: Geohydrology Impact Assessment Report

Appendix K: Social Impact Assessment Report

Appendix L: Heritage Impact Assessment Report

Appendix M: Closure and Rehabilitation Report