VAN ZYL SILLIMANITE

PROPOSED MINING OF SILLIMANITE ON THE FARM WORTEL 42, PORTION 1, NAMAQUALAND MAGISTERIAL DISTRICT, NORTHERN CAPE PROVINCE

DRAFT BASIC ASSESSMENT REPORT

FEBRUARY 2020

REFERENCE NUMBER: **NC 30/5/1/3/2/10799 MP**

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EXECUTIVE SUMMARY

Van Zyl Sillimanite (Pty) Ltd ("VZS") applied for a mining permit to mine 5 ha of Portion 1 of the farm Wortel 42 which falls in the Khâi-Ma Local Municipality in the Registration Division of Namaqualand RD, Northern Cape Province.

The area earmarked for the proposed mining falls on a section of the farm that was previously used for sillimanite re-mining and the intention of this application is to develop the existing stockpile into a quarry. The mining methods will make use of blasting by means of explosives in order to loosen the hard rock. The material is then loaded and hauled out of the excavation to the mobile crushing and screening plants. The sillimanite will be screened to various sized stockpiled upon which it will be stockpiled and transported to clients via trucks and trailers. All activities will be contained within the boundaries of the site. Blasting will occur once every six (6) to eight (8) weeks.

The proposed mining area is approximately 5 ha in extent and the applicant, VZS, intents to win the material for at least 2 years with a possible extension of another 3 years. The sillimanite to be removed will be used for cement or refactoring industries in the vicinity. The proposed quarry will therefore contribute to building contracts in and around the Pella / Pofadder / Aggeneys area.

The proposed project triggers listed activities in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and the Environmental Impact Assessment Regulations 2014 (as amended 2017) and therefore requires an environmental impact assessment (basic assessment process) that assess project specific environmental impacts and alternatives, consider public input, and propose mitigation measures, to ultimately culminate in an environmental management programme that informs the competent authority (Department of Mineral Resources) when considering the environmental authorisation. This report, the Draft Basic Assessment Report, forms part of the departmental requirements, and presents the first report of the EIA process.

Should the MP be granted and the mining of sillimanite be allowed, the Van Zyl Sillimanite project will comprise of activities that can be divided into 3 key phases namely the:

(1) *Site establishment/construction phase* which will involve the demarcation of the permitted mining area and required buffer no-go zones (if applicable) pertaining to areas of significant importance identified during the environmental impact assessment.

(2) *Operational phase* that entails the mining of sillimanite from the earmarked footprint area via conventional open cast mining methods. The mining method will make use of blasting in order to loosen the hard rock; upon which the loosened material will be transported to the crushing and screening processing plant where it will be screened to various sized stockpiles, before it is sold and transported from site to clients.

(3) *Decommissioning phase* which entails the rehabilitation of the affected environment prior to the submission of a closure application to the Department of Mineral Resources (DMR). The permit holder will further be responsible for the seeding of all rehabilitated areas. Once the full mining area is rehabilitated, the mining permit holder will be required to submit a closure application to the DMR in accordance with section 43(4) of the MPRDA, 2002. The Closure Application will be submitted in terms of Regulation 62 of the MPRDA, 2002, and Government Notice 940 of NEMA, 1998 (as amended).

Preferred Site

Layout Alternative 2 was identified by the project team as the preferred option due to the following:

- The natural vegetation of the earmarked footprint was previously altered by sillimanite mining, and although vegetation did re-establish through succession it is still in a transformed state.
- The layout of A2 was defined to include the maximum available mining area with the least possible area of recovering vegetation.
- This layout includes the stockpiled sillimanite source to the south-west identified by the geologist, while still allowing the application to apply for a mining permit (within 5 ha limit).
- The remote location of the proposed footprint (>20 km from Aggeneys) highly reduces the potential of the operations impacting the air and noise quality of surrounding residents.
- The mining area can be reached by an existing road that connects to a provincial gravel road. No new road infrastructure need to be constructed.

Public Participation Process

VZS previously (28 June 2019) applied for a mining permit (NC 30/5/1/3/2/10771 MP) for the mining of sillimanite on 5 ha of Portion 1 of the farm Wortel 42, Namaqualand RD, Northern Cape. Initial public participation started on 10 of July 2019. The stakeholders and I&AP's were informed of the project by means of I&AP comment/notification letters that were sent directly to the contact persons, and a 30-days commenting period were allowed that ended on 13 August 2019. On-site notices were placed and the project was advertised in the Gemsbok Newspaper. A Draft Basic Assessment report (DBAR) was distributed to the I&AP's and stakeholders upon which comments could be lodged until 22 September 2019. This application (10771 MP) was subsequently rejected by the Department of Mineral Resources (DMR) due to the presence of another dormant mining permit on the same footprint. The dormant application was withdrawn, and a new mining permit application (NC 30/5/1/3/2/10799 MP) for environmental authorisation was submitted by VZS on 21 November 2019 that was accepted by the DMR on 20 January 2020.

As the project proposal remains similar, and the same I&AP's and stakeholders are involved, the comments received on the first application (10771 MP) are deemed applicable to this application (10799 MP) and were therefore incorporated into this DBAR that will be distributed for perusal and commenting to the I&AP's and stakeholders listed below. A 30-day commenting period, ending 20 March 2020, will be allowed for perusal of the documentation and submission of comments. The comments received on the DBAR will be incorporated into the Final Basic Assessment Report (FBAR) to be submitted for decision making to DMR.

Basic Assessment Report

The basic assessment report identifies the potential positive and negative impacts that the proposed activity will have on the environment and the community as well as the aspects that may impact on the socio-economic conditions of directly affected persons, and proposes possible mitigation measure that could be applied to modify / remedy / control / stop the identified impacts.

The key finding of the environmental impact assessment entail the following:

Flora Assessment:

- The vegetation of the study site resembles a severely modified and transformed form of Eastern Gariep Rocky Desert surrounded by mostly natural vegetation. Ground truthing of the site confirmed that the vegetation of the site is relatively uniform overall, with little turnover across the site, which corroborates its classification as a single type.
- The species observed along the access roads can be successfully avoided and it is recommended that following the final route selection a qualified Botanist should conduct a walkthrough of the mentioned road sections, wherein all conservation important / sensitive flora is mapped. From a floristic perspective both routes are acceptable if the above-mentioned mitigation measures are implemented.
- During the site survey no listed Red Data floral species were recorded within the surveyed site. A total of nine (9) species were however recorded which are protected within either National Forest Act or within the Northern Cape Nature Conservation Act.
- The Botany Study concluded that is highly unlikely that this development will have an impact on the status of the Ecosystem and Vegetation Types due to the limited extent of the mine as well as the presence of already disturbed areas within the footprint. Furthermore, this mine will not have a significant impact on the services and functions provided by the surrounding natural habitats and development within this area is regarded as acceptable. Subsequently the proposed development area is largely well located in terms of avoiding sensitive receptors and the development will not compromise the survival of any specific flora or terrestrial vertebrate species on the study area or beyond if mitigation measures are fully implemented.

Other Site Specific Environmental Aspects:

- No sites of archaeological or cultural importance were identified during the site inspection located in the mining footprint area.
- The fauna at the site will not be impacts on by the proposed mining activity as they will be able to move away or through the site, without being harmed.
- There are no rivers, streams or wetlands within close proximity of the mining area.
- Although the proposed activity will have a cumulative impact on the ambient noise levels, the impact is deemed compatible with the current operations and of low significance.

- The nearest residential dwelling to the proposed mining area is a farm house of the adjacent landowner approximately 6.2 m north-west of the mining area. As the prevalent wind direction is in a south-south-eastern direction the adjacent hill will screen dust generated at the Wortel quarry from the operations/residents on the opposite side. Should the Applicant however implement the mitigation measures proposed in this document and the EMPr the impact on the air quality of the surrounding environment is deemed to be of low-medium significance.
- The viewshed analysis showed that the visual impact of the proposed mining operation will be of low significance, especially as no permanent structures will be constructed. Should the Applicant successfully rehabilitate the mining area (upon closure), the only residual visual impact will be that of the quarry pit to be developed as a landscape feature.
- The topography of the site will be altered in that a depression will be created with stepped side walls as mining progress.
- Upon closure the site will be rehabilitated and sloped to insure that the visual impact on the aesthetic value of the area is kept to a minimum. The site will have a neat appearance and be kept in good condition at all times.

During the environmental impact assessment process the feasibility of the proposed site was assessed to identify fatal flaws that are deemed as severe as to prevent the activity continuing, or warrant a site or project alternative. The outcome of the assessment showed that should the mitigation measures and monitoring programmes proposed in this document be implemented, no fatal flaws could be identified that prevents the activity continuing.

Environmental Management Programme (EMPR)

The EMPR provides a description of the impact management outcomes and closure objectives. It presents the impacts to be mitigated in their respective phases as well as stipulates the mitigation measures to be applied on site.

The financial provision amount that will be necessary for the rehabilitation of damages caused by the operation, both sudden closures during the normal operation of the project and at final, planned closure gives a sum total of R 541 393.35.

ABBREVIATIONS

BID	Background Information Document
DBAR	Draft Basic Assessment Report
DEAT	Department of Environment, Agriculture and Tourism
DMR	Department of Mineral and Resources
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPR	Environmental Management Programme
FBAR	Final Basic Assessment Report
GN	Government Notice
GNR	Government Notice Regulation
HIA	Heritage Impact Assessment
I&AP's	Interested and Affected Parties
LED	Local Economic Development
NEMA	National Environmental Management Act, 1998
NC	Northern Cape Province
MHSA	Mine Health and Safety Act
MPRDA	Minerals and Petroleum Resources Development Act, 2002
PPP	Public Participation Process
PPE	Personal Protective Equipment
Ptn.	Portion
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SHE	Safety, Health and Environmental
WMA	Water Management Area
VZS	Van Zyl Sillimanite

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ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

NAME OF APPLICANT: Van Zyl Sillimanite (Pty) Ltd
TEL NO: 083 391 8749 / 054 464 0110
FAX NO: 054 464 0110
POSTAL ADDRESS: PO. BOX 688, Keimoes, 8860

FILE REFERENCE NUMBER SAMRAD: NC 30/5/1/3/2/10799 MP

I. Important Notice

In terms of the Mineral and Petroleum Resources Development Act (Act 29 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 can be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

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

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

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

2. Objective of the Basic Assessment Process

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

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

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

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

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

(i) The nature, signification, consequence, extent, duration, and probability of the impacts occurring to; and

(ii) The degree to which these impacts –

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be managed, avoided or mitigated;

(e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to –

(i) identify and motivate a preferred site, activity and technology alternative;

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

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

PART A: SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

3. Contact Person and correspondence address

a) Details of: Greenmined Environmental

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) the proponent must appoint an independent Environmental Assessment Practitioner (EAP) to undertake the environmental impact assessment (EIA) of any activities regulated in terms of the aforementioned Act. Van Zyl Sillimanite (Pty) Ltd (hereinafter referred to as "VZS") appointed Greenmined Environmental (Pty) Ltd (hereinafter referred to as "Greenmined") to undertake the study needed. Greenmined has no vested interest in VZS or the proposed project and declares its independence as required by the Environmental Impact Assessment Regulations, 2014 (as amended April 2017) (EIA Regulations).

i) Details of the EAP

Name of the Practitioner:	Greenmined Environmental Yolandie Coetzee
Tel No.:	011 966 4390 / 082 734 5113
Fax No.:	086 546 0579
E-mail address:	yolandie.c@greenmined.co.za

ii) Expertise of the EAP.

(1) The qualifications of the EAP

(With evidence).

Mrs. Yolandie Coetzee has a B.Sc. Degree in Microbiology and Biochemistry and an Honours Degree in Environmental Sciences. Please find full CV attached in Appendix L.

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

(In carrying out the Environmental Impact Assessment Procedure)

Yolandie Coetzee is an Environmental Consultant with 8 years' experience in the environmental sector. She specialized the last 5 years in the rehabilitation of mines where she conducted the conceptual rehabilitation and management designs and the closure plans and programs. She has also been involved in a number of other environmental projects including railway sidings, filling stations, abattoir's, logistics hub, prospecting and mining sites where she compiled environmental management plans, environmental impact assessments, environmental audits, due diligences, IWULA's/IWWMP's and alien invasive encroachment programs.

She studied at the University of Potchefstroom where she has successfully completed her undergraduate degree in microbiology and biochemistry and her Honours degree in environmental sciences. See a list of past project attached as Appendix L.

b) Location of the overall Activity

Table 1: Location of the overall activity

Farm Name:	Portion 1 of the farm Wortel 42
Application area (Ha)	5 h**a**
Magisterial district:	Khâi-Ma Local Municipality, Namaqualand Magisterial District
Distance and direction from the nearest town	The farm Wortel 42 is situated approximately 74,7km west of Pofadder and 148 km east of Springbok in the Northern Cape Province.
21 digit Surveyor General Code for each farm portion	C05300000000004200001

c) Locality map

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

The requested map is attached as Appendix B.

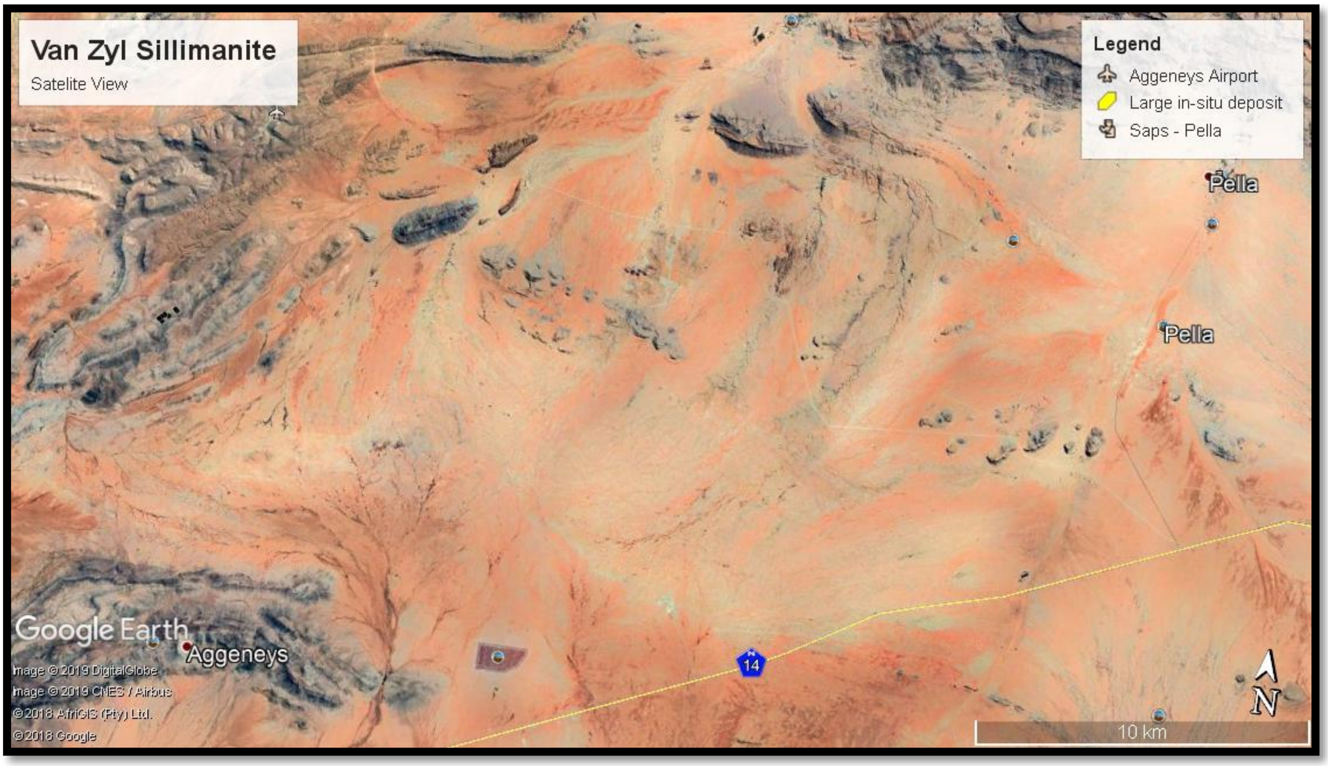

Figure 1: Satellite view of the proposed mining permit area (red polygon) of Van Zyl Sillimanite (image obtained from Google Earth).

d) Description of the scope of the proposed overall activity.

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

VZS applied for a mining permit to mine 5 ha of Portion 1 of the farm Wortel 42 which falls in the Khâi-Ma Local Municipality in the Registration Division of Namaqualand, Northern Cape Province.

The area earmarked for the proposed mining falls on a section of the farm that was previously used for sillimanite re-mining and the intention of this application is to develop the existing stockpile into a quarry. The mining methods will make use of blasting by means of explosives in order to loosen the hard rock. The material is then loaded and hauled out of the excavation to the mobile crushing and screening plants. The sillimanite will be screened to various sized stockpiled upon which it will be stockpiled and transported to clients via trucks and trailers. All activities will be contained within the boundaries of the site. Blasting will occur once every six (6) to eight (8) weeks.

The proposed mining area is approximately 5 ha in extent and the applicant, VZS, intents to win the material for at least 2 years with a possible extension of another 3 years. The sillimanite to be removed will be used for cement or refactoring industries in the vicinity. The proposed quarry will therefore contribute to building contracts in and around the Pella / Pofadder / Aggeneys area.

See attached as Appendix C a copy of the site activities map for the proposed project.

i) Listed and specified activities

Table 2: Listed and specified activities triggered by the associated mining activities

NAME OF ACTIVITY 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...etc. Etc.)	**SIZE AND SCALE OF DISTURBANCE** (volumes, tonnages and hectares or m^2)	**LISTED ACTIVITY** Mark with an X where applicable or affected	**APPLICABLE LISTING NOTICE** (GNR 324, GNR 325, GNR 326 OR GNR 327)
Demarcation of site with visible beacons.	5 ha	N/A	Not listed
Stripping and stockpiling of topsoil.	5 ha	**X**	GNR 324 EIA Regulations LN 3 of 2017 Activity 12 GNR 327 EIA Regulations LN 1 of 2017 Activity 26, 27, 28
Drilling and blasting.	±2 ha	**X**	GNR 327 EIA Regulations LN 1 of 2017 Activity 21, 26, 28
Excavation, loading and hauling to the processing area.	±2 ha	**X**	GNR 327 EIA Regulations LN 1 of 2017 Activity 21, 26, 28

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
Crushing and Screening	±1 ha	X	GNR 327 EIA Regulations LN 1 of 2017 Activity 21, 26, 28
Stockpiling and transportation of material from site	±2 ha	X	GNR 327 EIA Regulations LN 1 of 2017 Activity 21, 26, 28
Sloping and landscaping upon closure of the mining area.	5 ha	X	GNR 327 EIA Regulations LN 1 of 2017 Activity 22
Replacing the topsoil and vegetating the disturbed area.	5 ha	X	GNR 327 EIA Regulations LN 1 of 2017 Activity 22

ii) Description of the activities to be undertaken

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

VZS applied for a mining permit to mine 5 ha of Portion 1 of the farm Wortel 42 which falls in the Khâi-Ma Local Municipality in the Registration Division of Namaqualand, Northern Cape Province. The farm Wortel 42 is situated approximately 75 km west of Pofadder and 148 km east of Springbok. The commodity of interest is Sillimanite (SI).

The area earmarked for the proposed mining falls on a section of the farm that was previously used for sillimanite re-mining and the intention of this application is to develop the existing stockpiles into a quarry.

The GPS coordinates of the proposed mining permit are as follow:

Table 3: Proposed location of the mining permit area.

SITE COORDINATES				
LABEL	DECIMAL DEGREES		DEGREES MINUTES SECONDS	
	LAT (SOUTH)	LONG (EAST)	LAT (SOUTH)	LONG (EAST)
F	-29.109535°	18.828481°	29°06'34.32"	18°49'42.53"
G	-29.110928°	18.826355°	29°06'39.34"	18°49'34.88"
H	-29.110800°	18.825951°	29°06'38.88"	18°49'33.42"
J	-29.111021°	18.825573°	29°06'39.67"	18°49'32.06"
K	-29.111286°	18.825539°	29°06'40.63"	18°49'31.94"
L	-29.111869°	18.824520°	29°06'42.72"	18°49'28.27"
M	-29.112184°	18.824118°	29°06'43.86"	18°49'26.82"
N	-29.112532°	18.824121°	29°06'45.11"	18°49'26.83"
P	-29.112709°	18.823924°	29°06'45.75"	18°49'26.12"
Q	-29.112984°	18.823964°	29°06'46.74"	18°49'26.27"
R	-29.113337°	18.823956°	29°06'48.01"	18°49'26.24"

SITE COORDINATES				
LABEL	DECIMAL DEGREES		DEGREES MINUTES SECONDS	
	LAT (SOUTH)	LONG (EAST)	LAT (SOUTH)	LONG (EAST)
S	-29.113620°	18.823755°	29°06'49.03"	18°49'25.52"
T	-29.114034°	18.823181°	29°06'50.52"	18°49'23.45"
U	-29.114294°	18.823344°	29°06'51.46"	18°49'24.04"
V	-29.114255°	18.823572°	29°06'51.31"	18°49'24.86"
W	-29.113535°	18.824151°	29°06'48.72"	18°49'26.94"
X	-29.113310°	18.824528°	29°06'47.91"	18°49'28.30"
Y	-29.111395°	18.826631°	29°06'41.02"	18°49'35.87"
Z	-29.109957°	18.828808°	29°06'35.84"	18°49'43.70"

Figure 2: Proposed location of the mining project

Should the Mining Permit (MP) be issued, and the mining of Sillimanite is allowed, the proposed project will comprise of activities that can be divided into three key phases (discussed in more details below) namely the:

a) Site Establishment / Construction phase:

Site establishment will involve the demarcation of the permitted mining area and required buffer no-go areas (if any) pertaining to areas of importance identified during the environmental impact assessment. Site establishment will also necessitate the clearing of vegetation, the stripping and stockpiling of topsoil (if available), and the introduction of mining machinery.

Upon stripping, the topsoil will be stockpiled along the boundaries of the mining area to be used during the rehabilitation phase. Topsoil stripping will be restricted to the areas to be used for Sillimanite stockpiling and mining. The complete A-horizon (topsoil – the top 100 – 200 mm of soil which is generally darker coloured due to high organic matter content) will be removed. If it is unclear where the topsoil layer ends the top 300 mm of soil has to be stripped. The topsoil berm will measure a maximum of 1.5 m high and should be planted with indigenous grass species if vegetation does not naturally establish within 6 months of stockpiling to prevent soil erosion and to discourage growth of weeds. The roots of the grass will also improve the viability of the soil for rehabilitation purposes.

The mining activities related to this phase will consist out of the following:

- Demarcation of the Mining Boundaries:

Pursuant to receipt of an Environmental Authorisation (EA) and Mining Permit (MP), and prior to site establishment, the boundaries of the mining area will be demarcated.

- Clearing of Vegetation:

  The vegetation type of the earmarked footprint is classified as the Eastern Gariep Rocky Desert vegetation type. The botanist found the vegetation of the study area to resemble a severely modified and transformed form of the vegetation type. However, the proposed activity will still require the removal of indigenous vegetation during the site establishment- and operational phases to access the mineral. In the circumstance, upon receipt of the EA and prior to site establishment, it is proposed a qualified botanist conduct a plant identification walkthrough with site management to identify the plants in need of a destruction/removal permit (if any). Bush clearance will only commence upon receipt of the destruction/removal plant permit (if applicable). The environmental control officer (ECO) will assess the compliance of the permit holder with the conditions of the plant permit.

- Stripping and stockpiling of topsoil:

  It is proposed that topsoil removal be restricted to the exact footprint required during the operational phase of the activity. The topsoil will be stockpiled at a designated signposted area within the mining boundary, to be replaced during the rehabilitation of the area. It will be part of the obligations of site management to prevent the mixing of topsoil heaps with overburden/other soil heaps. The complete A-horizon (the top 100 – 200 mm of soil which is generally darker coloured due to high organic matter content) will be removed. If it is unclear where the topsoil layer ends the top 300 mm of soil will be stripped. The topsoil berm will measure a maximum of 1.5 m in height in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.

- Access Road:

  The existing farm- and provincial roads currently used to gain access to the property will be used to transport the sillimanite from the mining site to the client. Two access road options were identified during the planning phase namely:

  1. Access Road Option 1:

     The figure below shows the layout of the first option. The route follows the main gravel road (branching off the tarred Pella road) before turning onto the existing farm road (red line in figure below) that traverse Portion 1 of the farm Rozynbosch 41, and then enters into Portion 1 of the farm Wortel 42 (yellow farm boundary in figure below) from where it leads up to the proposed mining area. The access road is ±14 km from where it enters Rozynbosch 41/1 to where it enters the proposed mining area. The main gravel road is in good condition and no upgrade of the road surface is required. The last ±14 km of the route, although intact, does have sections that will need to be upgraded to accommodate mining related vehicles. Should this route be identified as the preferred option, the upgrade of the applicable sections will take place in agreement with the landowner. The road upgrades will remain below the thresholds of the NEMA, 1998 EIA Regulations, 2017 (LN 324 Activity 14, 18 & LN 327 Activity 12, 56). Once the preferred route was identified VZS will contact the DWS to enquire whether an application in terms of Section 21 C & I is required.

     From a practical perspective this option is more preferred as the farm road section of the route is ±6 km shorter than Access Road Option 2.

Figure 3: Satellite view showing the first option for the access road (red line) to the proposed mining area (yellow polygon).

2. Access Road Option 2:

The figure below shows the layout of the second road option. The route follows the main gravel road (branching off the tarred Pella road) before turning onto the existing farm road (red line in figure below) that traverse the Remainder of the farm Wortel 42, and then enters into Portion 1 of the farm Wortel 42 from where it leads up to the proposed mining area. The access road is ±20 km from where it enters Wortel 42/RE to where it enters the proposed mining area. The main gravel road is in good condition and no upgrade of the road surface is required. The last ±20 km of the route, although intact, does have sections that will need to be upgraded to accommodate mining related vehicles. Should this route be identified as the preferred option, the upgrade of the applicable sections will take place in agreement with the landowner. The road upgrades will remain below the thresholds of the NEMA, 1998 EIA Regulations, 2017 (LN 324 Activity 14, 18 & LN 327 Activity 12, 56). Once the preferred route was identified VZS will contact the DWS to enquire whether an application in terms of Section 21 C & I is required.

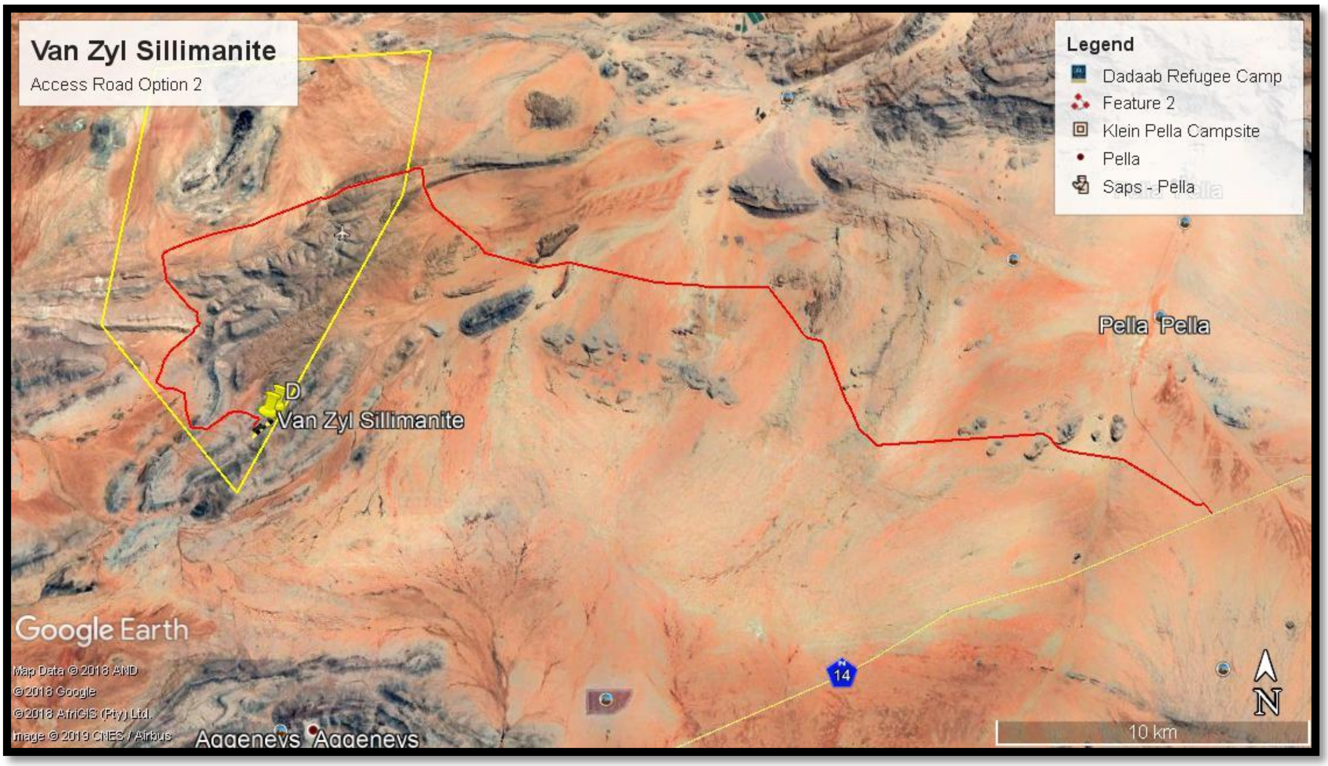

Figure 4: Satellite view showing the second option for the access road (red line) to the proposed mining area (yellow polygon).

The botanist confirmed that both the access road options (as discussed above) will traverse exiting roads, resulting in a minimal impact on natural vegetation. It was proposed that following the final route selection a qualified botanist should conduct a walk-through of the mentioned road sections, wherein all (if any) conservation important/sensitive flora is mapped for protection or removal upon receipt of the appropriate permits.

- Introduction of Mining Machinery:

  The infrastructure to be established at the mine will be of temporary nature and is expected to consist of at least the following:

  - Drilling equipment;
  - Excavating equipment;
  - Earth moving equipment;
  - Crushing and screening plants.
  - Site Office (6 m Containers);
  - Security Gate;
  - Site vehicles;
  - Parking area for visitors and site vehicles;
  - Wash bay;
  - Bunded diesel (20 000 l tank) and oil storage facilities;
  - Ablution Facilities (6 m Container with Septic Tank); and
  - Weigh Bridge.

  All diesel storage will be below the threshold of the EIA Regulations, 2014 (as amended 2017) of the National Environmental Management Act, 1998 (Act No 107 of 1998). A 20 000 l diesel storage tank will be installed on site, to be place in a bund with a 110% holding capacity. Corrosion resistant tanks, pipes and detectors must be used and must comply with the relevant SANS 10131:2004 standards. A chemical toilet (flushable) will be established on site to be used by the employees.

b) <u>Operational phase:</u>

The proposed mine will entail the development of the existing sillimanite stockpiles into a quarry. The mining method will make use of blasting means of explosives in order to loosen the hard rock. The material is then loaded and hauled out of the excavation from the primary crushing plant (in the pit) to the mobile crushing and screening plants at the processing area. The processed sillimanite will be stockpiled and transported to clients via trucks and trailers. All activities will be contained within the boundaries of the site. Blasting will occur once every six (6) to eight (8) weeks. The noise caused by blasting will be instantaneous and of short duration. As there are no residents within close proximity to the proposed mining area, the blasting at the site will not have an adverse effect on surrounding landowners. The applicant will ensure that all surrounding residents are informed of each blasting event. The sillimanite to be removed from the quarry will be used for cement or refactoring industries in the vicinity.

The mining activities will consist out of the following:

- Stripping and stockpiling of topsoil;
- Blasting;
- Excavating;

- Crushing;
- Stockpiling and transporting;
- Sloping and landscaping upon closure of the site; and
- Replacing the topsoil and vegetation the disturbed area.

Approximately six (6) workers will be employed at the site. Mining will be done in daylight hours, and from time to time it may be required to work an alternative Saturday. No processing or blasting will take place over weekends.

The water needed for the proposed activity will stem from the need for dust suppression within the excavation and along the haul roads as well as for the processing of the mineral at the plant. Water will be abstracted from a borehole to be drilled on site. A water truck will be used to spray access roads to alleviate dust generation. It is proposed that the mining activities will require between 2 000 – 4 000 l water per day. The drilling of the borehole will be licensed with the DWS in accordance with NWA (Act No. 104 of 1998), Section 21 activities.

Due to the nature of the project, very little general- and/or hazardous waste (if any) will be generated as a direct result of the mining activities. Any general waste generated during the operational phase, will be contained in a sealable refuse bin to be taken to the local landfill site at Pofadder. Hazardous waste will mainly be the result of accidental spillages or breakdowns. Such contaminated areas will be cleaned up immediately (within two hours of the occurrence) and contaminated soil will be contained in designated hazardous waste containers to be stored at the hazardous waste storage area from where it will be removed by a registered hazardous waste handling contractor. Waste separation will be conducted on site and send for recycling as far as practical.

c) <u>Decommissioning phase:</u>

The decommissioning phase entails the rehabilitation of the affected environment prior to the submission of a closure application to the Department of Mineral Resources (DMR). The main closure objective is for the quarry pit to be made safe, and the remainder of the site to be returned to agricultural use (grazing). The perimeter of the quarry pit will be subject to top-dressed with topsoil and vegetated with an appropriate grass mix if vegetation does not naturally establish in the area within six months of the replacement of the topsoil.

Control of weeds and alien invasive plant species will be an important aspect after topsoil replacement and seeding (if applicable) was done in an area. Site management will implement an alien invasive plant management plan (see Appendix M) during the 12 months' aftercare period to address germination of problem plants in the area.

The decommissioning activities will consist of the following:

- Sloping and landscaping the mining area;

- Replacing of topsoil;
- Vegetating the reinstated area; and
- Controlling the invasive plant species.

The Applicant will comply with the minimum closure objectives as prescribed by the DMR and detailed below:

- Rehabilitation of the excavated area:

  The excavated area must serve as a final depositing area for the placement of overburden. Rocks and coarse material removed from the excavation must be dumped into the excavation.

  No waste may be permitted to be deposited in the excavations.

  Once overburden, rocks and coarse natural materials has been added to the excavation and it was profiled with acceptable contours and erosion control measures, the topsoil previously stored must be returned to its original depth over the area.

  The area must be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally or regionally occurring flora, should natural vegetation not re-establish within 6 months from closure of the site.

  If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

- Rehabilitation of the office, processing- and stockpile areas:

  On completion of operations, all structures or objects at the camp/office site, no longer required by the landowner, shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002);

  All processing infrastructure and stockpiled material must be removed;

  Where the office, processing- and/or stockpile areas have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface needs to be ripped or ploughed to a depth of at least 300mm and the topsoil previously stored adjacent the site, must be spread evenly to its original depth over the whole area;

Topsoil spreading may only be done at a time of year when vegetation cover can be established as quickly as possible afterwards, so that erosion of returned topsoil by both rain and wind, before vegetation is established, is minimized. The best time of year is the end of the rainy season, when there is moisture in the soil for vegetation establishment and the risk of heavy rainfall events is minimal;

A cover crop must be planted and established immediately after spreading of topsoil to stabilize the soil and protect it from erosion. It is important that rehabilitation be taken up to the point of crop stabilization. Rehabilitation cannot be considered complete until the first cover crop is well established;

If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification;

Photographs of the office, processing- and stockpiling areas, before and during the mining operation and after rehabilitation, must be taken at selected fixed points and kept on record for the information of the Regional Manager;

The rehabilitated area must be monitored for erosion, and appropriately stabilized if any erosion does occur.

- Final rehabilitation:

Rehabilitation of the surface area shall entail landscaping, levelling, top dressing, land preparation, seeding (if required) and maintenance, and invasive plant species clearing.

All mining equipment, and other items used during the mining period must be removed from the site (section 44 of the MPRDA).

Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site. Waste separation will be conducted on site and send for recycling as far as practical. Adequate waste receptacle and recycle bins will be placed on the site for all waste generated from daily operations (e.g. waste containers, food packaging, etc. Waste oils and greases (Hazardous waste) generated by the machinery and equipment on site will be collected by a registered contractor for the disposal at a licensed hazardous waste disposal facility.

The management of invasive plant species must be done in a sporadic manner during the life of the mining activities. Species regarded as Category 1a and 1b invasive species in terms of NEM:BA (National Environmental Management: Biodiversity Act 10 of 2004 and regulations applicable thereto) will be eradicated from the site.

Final rehabilitation shall be completed within a period specified by the Regional Manager.

Once the mining area was rehabilitated the permit holder is required to submit a closure application to the Department of Mineral Resources in accordance with section 43(4) of the MPRDA, 2002 that states: *"An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the prescribed environmental risk report".* The Closure Application will be submitted in terms of Regulation 62 of the MPRDA, 2002, and Government Notice 940 of NEMA, 1998.

e) Policy and Legislative Context

Table 4: Policy and legislative context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (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 frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)	**REFERENCE WHERE APPLIED**	**HOW DOES THIS DEVELOPMENT COMPLY AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT.** (E.g. in terms of the National Water Act a Water Use License has/has not been applied for)
Mineral and Petroleum Resources Development Act, 2002, (Act No. 28 of 2002) Section 27	Part A (d) Description of the scope of the proposed overall activity. Application for a mining permit Ref No: NC30/5/1/3/2/10799MP	Mineral and Petroleum Resources Development Act, 2002, (Act No. 28 of 2002) - Section 27 – Application for a mining permit submitted to DMR-NC.
National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2017 - GNR 324 LN 3 of 2017 Activity 12 - GNR 327 LN 1 of 2017 Activity 21 - GNR 327 LN 1 of 2017 Activity 22 - GNR 327 LN 1 of 2017 Activity 26 - GNR 327 LN 1 of 2017 Activity 27 - GNR 327 LN 1 of 2017 Activity 28	Part A (d) (i) Listing and specified activities. Application for environmental authorisation Ref No: NC30/5/1/3/2/10799MP	Application for environmental authorisation submitted to DMR-NC.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT.
National Environmental Management: Air Quality Control Act, 2004 (Act No 39 of 2004) read together with applicable amendments and regulations thereto specifically the National Dust Control Regulations, GN No R827	Part A (iv) (1) (a) Type of environment affected by the proposed activity – *Air and Noise Quality.*	The mitigation measures proposed for the site take into account the NEM:AQA, 2004 and the National Dust Control Regulations.
National Water Act, 1998 (Act No 36 of 1998) read together with applicable amendments and regulations thereto.	Part A (iv) (1) (a) Type of environment affected by the proposed activity – *Aquatic Features.*	The mitigation measures proposed for the site includes specifications of the NWA, 1998.
National Environmental Management Act: Biodiversity Act, 2004 (Act No. 10 of 2004) and amendments. Regulation on the Threatened and Protected plant species.	Biophysical Environment	The mitigation measures proposed for the site includes specifications of the NEM:BA, 2004
National Environmental Management: Waste Act, 2008 (Act No 59 of 2008) read together with applicable amendments and regulations thereto. NEM:WA, 2008: National norms and standards for the storage of waste (GN 926)	Part A(ii) Description of the activities to be undertaken: *Operational phase – Waste Handling*	The mitigation measures proposed for the site take into account the NEM:WA.
Mine Health and Safety Act, 1996 (Act No. 29 of 1996)	The mitigation measures proposed for the site includes specifications of the MHSA. Part A (iv) (1) (viii) The possible mitigation measures that could be applied on the level of risk – *Management of Health and Safety Aspects.*	The operational phase of the site will trigger the MHSA. The mitigation measures proposed for the site includes specifications of the MHSA, 1996
National Heritage Resources Act, 1999 (No. 25 of 1999)	Cultural and Heritage Environment. Part A(iv)(1)(a) Type of environment affected by the proposed activity – *Human Environment*	No aspects of the project could be identified that triggers the NHRA. A Notice of Intent to Develop in terms of Section 38(8) of the NHRA, 1999 was submitted to SAHRA on 17 April 2019 to determine the action required for the proposed project. SAHRA requested that a HIA and Paleontological Study be conducted. The mitigation measures proposed for the site includes specifications of the NHRA, 1999.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	Part A (iv) (1) (a) Type of environment affected by the proposed activity: *Physical Environment – Geology and Soil.* Part A (iv) (1) (viii) The possible mitigation measures that could be applied on the level of risk – *Management of weeds- or invader plants*.	The mitigation measures proposed for the site includes specifications of the CARA, 1983.
Land Use Planning Ordinance, 1985 (Ordinance 15 of 1985)	Land use zoning requirements	Land rezoning will be conducted once the mining permit application has been converted to a Mining Right application.
National Forest Act, 1998 (Act No 84 of 1998	Biophysical Environment	Should the proposed walk-through identify plants in need of removal permits, these applications will be in terms of the Northern Cape Conservation Act/Ordinance.
Northern Cape Nature Conservation Ordinance 8 of 1969		
Northern Cape Nature Conservation Act, 2009 (No. 9 of 2009)		
Cape Nature and Environmental Conservation Ordinance 9 of 1974		
Khâi-Ma Local Municipality Spatial Planning and Land Use Management By-law 2013	Description of the current land uses	Land rezoning will be conducted once the mining permit application has been converted to a Mining Right application.
Northern Cape Planning and Development Act, 1998 (No 7 of 1998)		
Northern Cape Spatial Planning and Land Use Management Bill 2012		
Khâi-Ma Local Municipality Integrated Development Plan		
Spatial Planning and Land Use Management Act, Act 16		
Public Participation Guideline in terms of the NEMA EIA Regulations	Part A(ii) Details of the Public Participation Process Followed Application for a mining permit Ref No: NC 30/5/1/3/2/10799 MP Application for a Environmental Authorisation Ref No: NC 30/5/1/3/2/10799 MP	Public Participation Guideline in terms of the NEMA EIA Regulations

f) Need and desirability of the proposed activities.

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

The increase in building, construction and road maintenance projects in the vicinity of the property triggered the need of the applicant to trade with the available sillimanite. The proposed mining will also contribute to the diversification of activities on the property, extending it from agriculture to include small scale mining. This process will form part of educating the local farmers on small scale mining. The need is to find sillimanite, qualify and quantify the sillimanite to develop a business model.

The quarry itself will provide various short term jobs during the construction, operation and decommissioning phases. VZS would also provide jobs and skills to local people. The quarry will also be rehabilitated post mining and thereafter revert to grazable land.

This area, close to Pella, are well known for their rehabilitated historic diamond mining operations and socio-economic poverty.

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

The proposed site earmarked for the mining of the sillimanite entails an area previously used for mining. The proposed site was identified as the preferred alternative due to the following reasons:

- The mining site offers the mineral sought after;
- The proposed sites were previously used for mining activities, thus minimal environmental damage will occur;
- The mining area can be reached by an existing farm road that connects to a provincial gravel road. No new road infrastructure need to be constructed;
- Due to the small size of the activity and the remote location of the mining area the potential impacts on the surrounding environment, associated with mining is deemed to be of low significance; and
- No residual waste as a result of the mining activity will be produced that needs to be treated on site. Any general waste that may be produced on-site will be contained in sealed refuse bins to be transported to the local municipal landfill site. The amount of hazardous waste to be produced at the site will be minimal and will mainly be as a result of accidental leakage. Contaminated soil (contained in sealed bins) will be collected from site by a hazardous waste handling removal company to be disposed of at a registered hazardous waste handling site.

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

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

i) Details of The Development Footprint Alternatives Considered.

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:
(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) The option of not implementing the activity.

The applicant identified three (3) alternatives for the proposed mining activity namely:

1. **Layout Alternative 1 (A1) (Non-Preferred Alternative):** Layout Alternative 1 was initially identified by VZS to allow for the mining of the sillimanite resource on the property. The layout of A1 falls within the GPS coordinates as listed in the table below:

Table 5: GPS coordinates of Layout Alternative 1 (Non-Preferred Alternative)

SITE COORDINATES – LAYOUT ALTERNATIVE 1				
LABEL	DECIMAL DEGREES		DEGREES MINUTES SECONDS	
	LAT (SOUTH)	LONG (EAST)	LAT (SOUTH)	LONG (EAST)
A	-29.112377°	18.823869°	29°06'44.56"	18°49'25.93"
B	-29.112956°	18.824833°	29°06'46.64"	18°49'29.40"
C	-29.111350°	18.826667°	29°06'40.86"	18°49'36.00"
D	-29.109693°	18.829060°	29°06'34.89"	18°49'44.62"
E	-29.109234°	18.828563°	29°06'33.24"	18°49'42.83"
F	-29.111230°	18.825413°	29°06'40.43"	18°49'31.49"
G	-29.111287°	18.825538°	29°06'40.563	18°49'31.94"
H	-29.111854°	18.824543°	29°06'42.67"	18°49'28.35"

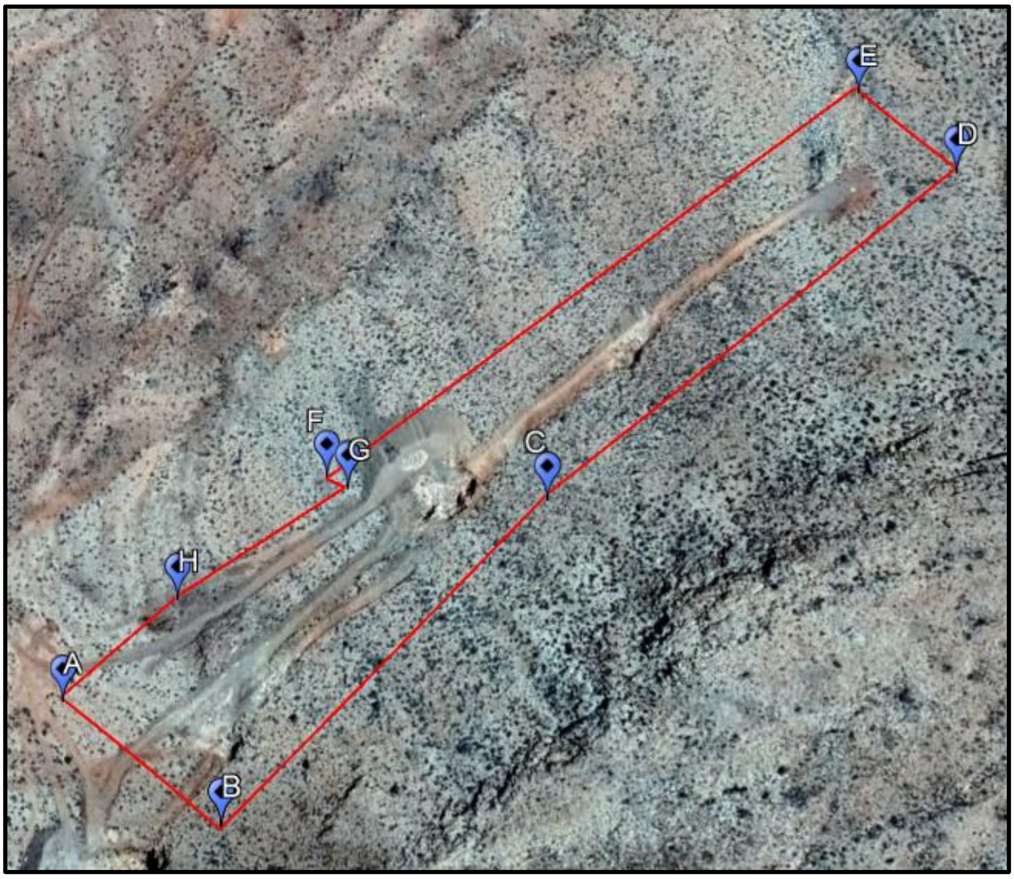

Figure 5: Satellite view showing the position of Layout Alternative 1 (red polygon) within the surrounding landscape (image obtained from Google Earth).

Layout Alternative 1 was considered by the applicant and project team during the assessment phase of the environmental impact assessment, but were **not deemed** to be **the preferred option** due to the following:

- Although the proposed footprint offers the mineral sought after, the geologist identified an additional area, to the south-west, that should be included in the application. To add this area to the mining permit footprint without crossing the allowable 5 ha limit of a mining permit, an alteration of the site layout was proposed (see Layout Alternative 2).

2. **Layout Alternative 2 (A2) (Preferred Alternative):** Layout Alternative 2 was derived from the assessment of A1 as discussed above. The layout of A2 falls within the GPS coordinates as listed in the table below:

Table 6: GPS coordinates of Layout Alternative 2 (Non-Preferred Alternative)

SITE COORDINATES – LAYOUT ALTERNATIVE 2				
LABEL	**DECIMAL DEGREES**		**DEGREES MINUTES SECONDS**	
	LAT (SOUTH)	**LONG (EAST)**	**LAT (SOUTH)**	**LONG (EAST)**
F	-29.109535°	18.828481°	29°06'34.32"	18°49'42.53"
G	-29.110928°	18.826355°	29°06'39.34"	18°49'34.88"
H	-29.110800°	18.825951°	29°06'38.88"	18°49'33.42"
J	-29.111021°	18.825573°	29°06'39.67"	18°49'32.06"
K	-29.111286°	18.825539°	29°06'40.63"	18°49'31.94"
L	-29.111869°	18.824520°	29°06'42.72"	18°49'28.27"
M	-29.112184°	18.824118°	29°06'43.86"	18°49'26.82"
N	-29.112532°	18.824121°	29°06'45.11"	18°49'26.83"
P	-29.112709°	18.823924°	29°06'45.75"	18°49'26.12"
Q	-29.112984°	18.823964°	29°06'46.74"	18°49'26.27"
R	-29.113337°	18.823956°	29°06'48.01"	18°49'26.24"
S	-29.113620°	18.823755°	29°06'49.03"	18°49'25.52"
T	-29.114034°	18.823181°	29°06'50.52"	18°49'23.45"
U	-29.114294°	18.823344°	29°06'51.46"	18°49'24.04"
V	-29.114255°	18.823572°	29°06'51.31"	18°49'24.86"
W	-29.113535°	18.824151°	29°06'48.72"	18°49'26.94"
X	-29.113310°	18.824528°	29°06'47.91"	18°49'28.30"
Y	-29.111395°	18.826631°	29°06'41.02"	18°49'35.87"
Z	-29.109957°	18.828808°	29°06'35.84"	18°49'43.70"

Figure 6: Satellite view showing the position of Layout Alternative 2 (green polygon) within the surrounding landscape (image obtained from Google Earth).

Layout Alternative 2 was identified by the project team as the **preferred option** due to the following:

- The natural vegetation of the earmarked footprint was previously altered by sillimanite mining, and although vegetation did re-establish through succession it is still in a transformed state.
- The layout of A2 was defined to include the maximum available mining area with the least possible area of recovering vegetation.
- This layout includes the stockpiled sillimanite source to the south-west identified by the geologist, while still allowing the application to apply for a mining permit (within 5 ha limit).
- The remote location of the proposed footprint (>20 km from Aggeneys) highly reduces the potential of the operations impacting the air and noise quality of surrounding residents.
- The mining area can be reached by an existing road that connects to a provincial gravel road. No new road infrastructure need to be constructed.

3. **Site Alternative 3 (Non-Preferred Alternative):** A third alternative, ±6.3 km north-east of A1 & A2, was considered during the initial phase of the project, but this alternative was found to be environmentally and practically unsuitable. The GPS coordinates of Site Alternative 3 is as listed in the table below:

Table 7: GPS coordinates of Layout Alternative 1 (Non-Preferred Alternative)

SITE COORDINATES – SITE ALTERNATIVE 3				
LABEL	DECIMAL DEGREES		DEGREES MINUTES SECONDS	
	LAT (SOUTH)	LONG (EAST)	LAT (SOUTH)	LONG (EAST)
A	-29.055264°	18.846189°	29°03'18.95"	18°50'46.28"
B	-29.056242°	18.846189°	29°03'22.47"	18°50'46.28"
C	-29.055850°	18.846917°	29°03'21.06"	18°50'48.90"
D	-29.054833°	18.847839°	29°03'17.40"	18°50'52.22"
E	-29.054500°	18.847836°	29°03'16.20"	18°50'52.21"
F	-29.054408°	18.847767°	29°03'15.87"	18°50'51.96"
G	-29.052250°	18.848917°	29°03'08.10"	18°50'56.10"
H	-29.051897°	18.847806°	29°03'06.83"	18°50'52.10"

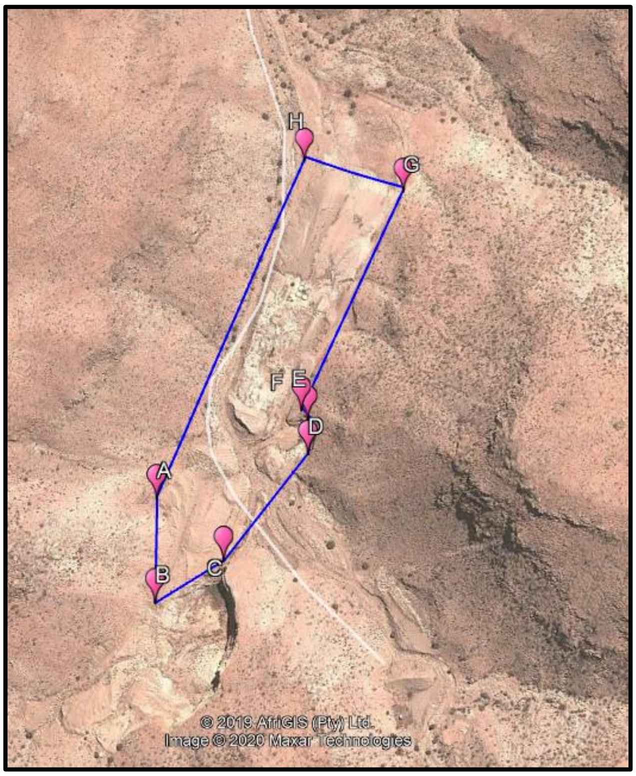

Figure 7: Satellite view showing the position of Site Alternative 3 (blue polygon) within the surrounding landscape (image obtained from Google Earth).

Site Alternative 3 was **not** deemed a **preferred option** due to the following:

- Although the site was previous mined and is therefore a brown field site, accessibility is problematic. The site is situated in a very mountainous area with limited road access. This will necessitate the construction/intensive upgrade of access roads.
- The geologist found only low grade sillimanite in this area.
- The biodiversity related impacts associated with this alternative were deemed too high without the need or motivation to justify it.

4. No-go Alternative:

The no-go alternative entails no change to the status quo and is therefore a real alternative that needs to be considered. The sillimanite to be mined from the site will be used by the cement- or refactoring industries in the vicinity, if however, the no-go alternative is implemented the applicant will not be able to utilize the mineral present in the area. This could have major impacts on aspects such as transporting of material to construction sites from far off mining areas, cost effectiveness of material, impact on roads and road users due to long distance hauling of sillimanite and loss of income to the Aggeneys / Pella business area due to the multiplier effect. VZS also committed to maintain the access road for the duration of the mining permit.

The no-go alternative was not deemed to be the preferred alternative as:

- The applicant will not be able to supply in the demand of the cement and refactory industries of the area,
- The application, if approved, would allow the applicant to utilize the available Sillimanite as well as provide employment opportunities to local employees. Should the no-go alternative be followed these opportunities will be lost to the applicant, potential employees and clients,
- The applicant will not be able to diversify the income of the property.

ii) Details of the Public Participation Process Followed

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

VZS previously (28 June 2019) applied for a mining permit (NC 30/5/1/3/2/10771 MP) for the mining of sillimanite on 5 ha of Portion 1 of the farm Wortel 42, Namaqualand RD, Northern Cape. Initial public participation started on 10 of July 2019. The stakeholders and I&AP's were informed of the project by means of I&AP comment/notification letters that were sent directly to the contact persons, and a 30-days commenting period were allowed that ended on 13 August 2019. The table below shows a list of the I&AP's and stakeholders that were informed of the project. On-site notices were placed at the site entrance to the farm Wortel 42 as well as the Khâi Ma Local Municipality in Pofadder on 10 July 2019. The project was also advertised in the Gemsbok Newspaper on 10 July 2019. A Draft Basic Assessment report (DBAR) was distributed to the I&AP's and stakeholders upon which comments could be lodged until 22 September 2019.

This application (10771 MP) was subsequently rejected by the Department of Mineral Resources (DMR) due to the presence of another dormant mining permit on the same footprint. The dormant application was withdrawn, and a new mining permit application (NC 30/5/1/3/2/10799 MP) for environmental authorisation was submitted by VZS on 21 November 2019 that was accepted by the DMR on 20 January 2020.

As the project proposal remains similar, and the same I&AP's and stakeholders are involved, the comments received on the first application (10771 MP) are deemed applicable to this application (10799 MP) and were therefore incorporated into this DBAR that will be distributed for perusal and commenting to the I&AP's and stakeholders listed below. A 30-day commenting period, ending 20 March 2020, will be allowed for perusal of the documentation and submission of comments. The comments received on the DBAR will be incorporated into the Final Basic Assessment Report (FBAR) to be submitted for decision making to DMR.

Table 8: List of stakeholders that were notified of the proposed VZS mining application.

DEPARTMENT	PHYSICAL ADDRESS	POSTAL ADDRESS	CONTACT	TEL NUMBER	FAX NUMBER	EMAIL	DATE CONTACTED
Kai-Ma Local Municipality	-	P.O. Box 106 Pofadder 8890	Municipal Manager Mr Obegang PA: Natasha	054 933 1022 054 933 1017	054 933 0252	munman@kaima.gov.za	10/07/2019
Kai-Ma Local Municipality *Ward 4*	-	P.O. Box 106 Pofadder 8890	Ward Councillor: Mr. Quincy	054 971 0062 073 590 3617	054 971 0062	Ron.quincy@gmail.com novilitytswere@gmail.com	10/07/2019
Namakwa District Municipality	-	-	Municipal Manager: Mr Christiaan Fortuin PA: Chrisinte	053 712 8700	-	munmansec@namakwa-dm.gov.za	10/07/2019
Department of Agriculture, Land Reform and Rural Development	-	Private Bag X5018 Kimberley 8300	Head of Department: Mr W D Mothibi	053 838 9102 083 448 9151	053 831 3635	fortunec@ncpg.gov.za alexander@hantam.co.za ACloete@ncpg.gov.za ngoltz@ncpg.gov.za	10/07/2019
Department of Environment and Nature Conservation	Sasko Building 90 Long Street Kimberley 8301	Private Bag X6102 Kimberley 8300	Director for Environmental Quality Management Mr B Fisher Mr. Denver van Heerden	053 807 7431 082 463 0224 053 807 7305	086 654 3050 053 832 1035	bfisher@ncpg.gov.za, tmakaudi@ncpg.gov.za	10/07/2019

DEPARTMENT	PHYSICAL ADDRESS	POSTAL ADDRESS	CONTACT	TEL NUMBER	FAX NUMBER	EMAIL	DATE CONTACTED
Department of Economic Development and Tourism	Cnr Knight & Stead Street Market Square Post Office Building NetlifeTowers 13th Floor Room 1313 Kimberley 8300	Private Bag X6108 Kimberley 8300	Head of Department: Mr S Mabilo Miss U Ngomane	053 839 4002	053 832 6805	npaulse@ncpg.gov.za ungomane@ncpg.gov.za	10/07/2019
Department of Roads and Public Works	9-11 Stokroos Street, Squarehill Park, Kimberley 8300	P.O. Box 3132 Kimberley 8300	Head of Department: Mr Kholekile Nogwili PA: Ms. Natasha Corns	053 839 2241 053 839 2109	053 839 2291	KNogwili@ncpg.gov.za ncorns@ncpg.gov.za	10/07/2019
Department of Water and Sanitation	-	P.O. Box 3132 Kimberley 8300	Chief Director: Mr. A Abrahams	053 830 8803 082 883 6741	053 831 4534	AbrahamsA@dwa.gov.za	10/07/2019
Department of Labour	Labria House Cnr Pniel & Compound Road Kimberley 8301	-	Head of Department Zolile Albanie	053 838 1500	053 832 9386	zolile.albanie@labour.gov.za	10/07/2019
South African Heritage Resource Agency	Hyesco Arcade 4-8 Old Main Road Kimbelery 8300	P.O. Box 2458 Kimberley 8300	Nqabisa Mkalipi	053 807 5700	053 831 6501	ksmuts@sahra.org.za	10/07/2019
Commission Of Restitution Land Right	-	P.O. Box 2458 Kimberley 8300	-	053 075 7000	053 831 6501	Nqabusa.mkalipi@drdlr.gov.za	25/04/2019

DEPARTMENT	PHYSICAL ADDRESS	POSTAL ADDRESS	CONTACT	TEL NUMBER	FAX NUMBER	EMAIL	DATE CONTACTED
SANRAL	-	Private Bag X19 Belville 7535	Ms Nicola Abrahams	021 957 4600	-	abahamsn@nra.co.za	10/07/2019
SANBI	-	-	M Mokonoto	021 843 5000	-	m.mokonoto@sambi.org.za	10/07/2019
Succulent Karoo Ecosystems Programme (SKEP)	-	-	Mr. Abe Koopman	-	-	a.koopman@sanbi.org.za E. Marinus2@sanbi.org.za	10/07/2019
WESSA	-	-	-	-	-	wessanc@yahoo.com	10/07/2019
Endangered Wildlife Trust	-	Private Bag X11 Modderfontein 1609	Head of Conservation and Business Dr. Ina Little	011 372 3600	011 608 4682	ianl@ewt.org.za	10/07/2019
Botanical Society of South Africa	-	-	Mr Mark Botha	021 799 8800	021 797 2376	info@botanicalsociety.co.za Mark@botanicalsociety.co.za conmeyer@megaserve.net	10/07/2019
Agri Namakwa and Associated Farmers Associations	-	-	Mr Danie Jacobs	054 983 2785 071 499 1167	-	kammasoas@vodamail.co.za	10/07/2019

Table 9: Registered landowner of the earmarked property

PROPERTY DESCRIPTION				I&AP / LANDOWNER	TITLE DEED
CADASTRAL CODE	FARM	PTN	HA		
C05300000000004200001	Wortel 42	1	5691,4113HA	VAN DEN HEEVER PETRONELLA CATHARINA	T60530/2014

Table 10: List of interested and affected parties that were notified of the proposed VZS mining application

I&AP	POSTAL ADDRESS	PHYSICAL ADDRESS	TELEPHONE	CELL	EMAIL	DATE CONTACTED
Pieter Andrias van Den Heever Wortel 42 (Ptn 0) RE	-	-	054 933 0817	082 535 3408	renosterkopdruiwe@oseiland.co.za	10/07/2019
Petronella (Petru) Catharina Van Den Heever Wortel 42 Ptn 1	P.O. Box 167 Pofadder 8890	-	054 933 0177	072 570 2995 071 897 1637	Pcvdheever50@gmail.com	10/07/2019
Izak Jacobus van Niekerk	-	1 Penge Road, Aggeneys, Northern Cape, RSA	054 983 9202 0549839203	-	-	10/07/2019
Black Mountain Mining /Vedanta Resources Pieter Venter	-	-	054 983 9802	-	Pventer@vendataresources.co.za	10/07/2019
Oonab Boerdery CC Mr. Edmund Agenbach	P.O. Box 235 Springbok 8240	-	054 983 2283	083 5444 632	Edmund.agenbach@gmail.com	10/07/2019
Pofadder Municipality	P.O. Box 106 Pofadder 8890	Municipal Manager Mr Obegang PA: Natasha	(054) 933 1022 (054) 933 1017	-	munman@kaima.gov.za	10/07/2019
Klein Pella Guesthouse Karsten Boerdery	-	-	-	-	piet@karsten.co.za Kpgastehuis@karsten.co.za	10/07/2019

iii) Summary of issues raised by I&AP's

Table 11: Summary of issues raised by I&AP's

Interested and Affected Parties List the name of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted	**Date Comments Received**	**Issues raised**	**EAP's response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
<u>AFFECTED PARTIES</u>				
Landowner/s				
Pieter van den Heever	10th July 2019 16 August 2019	Requested that the BID to be send in Afrikaans. Biggest concern is that trucks will make a lot of dust.	See the dust related mitigation measures proposed in the following line.	As per Part A(3)(h)(viii) and Part B of the EMPR.
Dust will be generated by the movement of earthmoving equipment, the loading of material and transporting of material from site. The trucks driving on site has to comply with the speed limits. Loads will be flattened to ensure that minimal spillage of the material takes place during transportation. Topsoil stockpiles will be planted with indigenous grass species to ensure that exposed surface areas are minimised, reducing windblown dust from the site. The vegetation will also assist in capturing wind born dust and minimising the spread of dust from the site. Dust generation on the access and haul roads as well as mechanical excavation can be managed through the implementation of dust suppression measures via water carts and a sprinkler system. The applicant has to conduct formal dust monitoring on site to provide management with an effective management tool for mitigating the impact of the mining permit activity on the surrounding environment with regard to dust pollution.				
Petru Van Den Heever	N/A	No comments/objections received.	N/A	Refer to Appendix I for the landowner agreement and comments letter.
Lawful occupier/s of the land				
N/A	N/A	N/A	N/A	N/A
Landowners or lawful occupiers on adjacent properties				
Isak Jacobus van Niekerk	N/A	No objections received.	N/A	Refer to Appendix I for proof of correspondence.
Black Mountain Mining (BMM) (Vedanta) Koos Smit	20 August 2019 27 September 2019	BBM registered as an I&AP in the name of Vedanta Resources and submitted the comments as listed below.	The response of Greenmined follows in the second to next line.	As per Part A(3)(h)(iv) & (viii) & (k) and Part B of the EMPR. Refer to Appendix O1 for a full copy of the Botanical Study.

Interested and Affected Parties	Date Comments Received	Issues raised	EAP's response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.

Comments received from Vedanta on 27 September 2019 regarding this application:

BMM would kindly comment on the Background Information Document as follows:

1. Portion 1 of the farm Wortel 42 was identified by DENC as a B1 List Property (Annexure B1) to the Biodiversity Offset Agreement between BMM and DENC. The Offset Agreement forms part of the Environmental Authorization of the BMM Gamsberg Zinc Mine and instruct BMM to sign a Biodiversity Offset Agreement with DENC. Properties identified as part of the B1 list have IUCN red listed flora species as well as sensitive plant communities that requires protection;

2. This farm was therefore identified as a potential biodiversity offset farm due to its biodiversity sensitivity;

3. BID only include the following authorizations:
   a. NEMA – BAR;
   b. MPRDA – EMP
   c. What water uses will be required and will this require a Water use license and/or GA regarding 21 c and I water uses? Was this investigated?
   d. Will any watercourse be crossed and are there any 21 c and I water uses that will be triggered?
   e. Any other water uses under National Water Act that will be triggered?

4. Biophysical
   a. Climate and Rain
      i. Please provide the references used for rainfall and temperature descriptions.
      ii. To our information – Aggeneys average rainfall is 87.2 mm per annum
      iii. Where will vehicles be services?

5. Sensitive Landscape
   a. The Gamsberg Nature Reserve was declared on 5 August 2019 and is located adjacent to the farm Wortel 42 Portion 1 - Gamsberg Nature Reserve was proclaimed under the Protected Areas Act – and includes the follow surface areas:
      i. REM of the farm Rozynbosch 41
      ii. Ptn 2 of the farm Rozynbosch 41;
      iii. Farm Achab 57; and
      iv. REM of the farm Vogelstruishoek 88
   b. Information in BID is therefore outdated.
   c. Sensitive areas described in the BID refers to Protected areas and dry river beds – was any detailed site specific vegetation conducted?

6. Flora
   a. Sensitive vegetation types and IUCN red listed species are present in the areas and a site specific flora assessment must be conducted to identify any sensitive plant communities, IUCN red data listed species, as well as any protected species as listed by the Northern Cape Nature Conservation Act, The NEMBA TOPS list and IUCN red data listed species;
   b. Should any of the above be present, a search and rescue protocol must be compiled and submitted as well as a protection plan to protect these sensitive areas in the surrounding areas;
   c. Contradicting statements – stated that no Protected plant was observed during site visit and the recommend permit applications:
   d. Sensitive vegetation within surrounding areas include an extensive list and should be properly investigated and assessed. A detailed infield assessment needs to be conducted by arid ecologist / Botanist familiar with succulent plants. Please refer to Table 1 below regarding BMM information as compiled by Dr Phil Desmet and Mark Botha as part of Portion 2 of the farm Wortel vegetation contribution as part of Biodiversity vegetation types and habitats.

7. Fauna
   a. A detailed fauna assessment must be conducted

8. Access roads
   a. All road crossing that crosses water courses / river beds that will be upgrade will require a 21 c and i water use.
   b. Please provide a map showing all water courses as well existing roads and planned roads that will be upgrade;
   c. Erosion management plan must be compiled to prevent/limit erosion

Black Mountain Mining would like to comment on the **Draft Basic Assessment Report** – with special reference to Flora section and biodiversity sensitivity as follows:

1. The Applicant, Van Zyl Sillimanite intends to apply for a mining permit, 5ha, Wortel 42, Portion 1, Khâi Ma Local Municipality, Namakwa District Municipality, and Namaqualand Magisterial District, Northern Cape Province. The area earmarked for the proposed mining falls on a section of the farm that was previously used for mining activities and the intention of this application is to increase the area to a quarry.
   BMM comment: BMM want to put on record that Portion 1 of the farm Wortel 42 is located adjacent to the newly declared Gamsberg Nature Reserve that was declared as a Nature Reserve under the Protected Area Act on the 5 August 2019. The farm was included in Annexure B_ B1 properties to the Biodiversity Offset Agreement between DENC and BMM as per requirement of the Environmental Authorization that was granted by DENC to BMM in 2013. Portion 1 of the farm Wortel 42 was therefore identified as a biodiversity sensitive and important for conservation of biodiversity.

2. An application for environmental authorisation will be submitted in terms of section 16 of The Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 Of 2002) And The National Environmental Management Act, 1998 (Act No. 107 Of 1998 NEMA) As Well as The Environmental Impact Assessment Regulations as Amended 2017.
   BMM comment: Will the applicant also apply for a Water Use license for water uses that will be triggered due to the proposed development? Especially regarding Section 21 c and I water uses associated with access road crossing of rivers/streams and the associated upgrade of such roads?

3. The environmental impact assessment identified a Critical Biodiversity Area (CBA) that extend throughout the property of the proposed mining area. This area is also highlighted in terms of the Mining and Biodiversity Guideline as an area of high biodiversity importance with a corresponding rating of high risk for mining.

BMM comment Will Biodiversity Offset consider compensating for loss of sensitive Biodiversity? CBA must be avoided at all times. What will the impact of drilling and blasting and associated dust be on CBA vegetation types and Species of special concern? Will any IUCN red listed species, endemic and near endemic species be translocated? Any search and rescue plan and protection plan for such species being developed that will be implemented?

4. As the prevalent wind direction is in a southern direction, the hills and ridges in the surrounding environment will screen dust generated at VZS from the operations/residents. Should the applicant implement the mitigation measures proposed in this document and the EMPR the impact on the air quality of the surrounding environment is deemed to be of low-medium significance.
   BMM comment: Was the impact of dust on sensitive vegetation types and/or IUCN red listed species considered? What will the residual impact be on such species? This must be investigated and search and rescue and protection plan must be compiled.

5. Other legislation:
   BMM comment: Was the following consulted:
   1. National Environmental Management: Biodiversity Act as wells as the Threatened and Protected species regulations considered?
   2. The Northern Cape Nature Conservation Act considered – Protected Species Lists;
   3. The National Forest Act (*Boscia albitrunca* and *Acacia erioloba*; amongst others)
   4. The National Water Act?

6. In the circumstance, upon receipt of the EA and prior to site establishment, a qualified botanist will conduct a plant identification walkthrough with site management to identify the plants in need of a destruction/removal permit. Bush clearance will only commence upon receipt of the destruction/removal plant permit. The environmental control officer (ECO) will assess the compliance of the permit holder with the conditions of the plant permit.
   BMM comment: It is recommended that a detailed infield vegetation assessment be conducted and that a sensitivity map, from a flora point of view be compiled and that a list of all red listed, endemic and near endemic species, as well as all species with Conservation importance and listed as protected by Northern Cape Conservation Act as well as NEMBA: TOPS listed species be identified.

7. Due to the nature of the project and the fact that no infrastructure will be established on site, very little if any general waste will be generated as a direct result of the mining activities. Any waste generated during the operational phase, will be contained in a sealable refuse bin to be taken to the local landfill site at Pofadder.
   BMM comment: Access road to Pofadder – through which properties will this access road cross?

8. Figure page 16
   BMM comment: Please indicate all stream/river crossing on Figure as well as sensitive vegetation types/infrastructure developments. Adjacent farms that will be crossed by the access roads

9. Figure Page 17
   BMM comment: Please indicate all stream/river crossing on Figure as well as sensitive vegetation types/infrastructure developments. Adjacent farms that will be crossed by the access roads

10. National Environmental Management Act: Biodiversity Act, 2004 (Act No. 10 of 2004) and amendments
BMM comment: The document only refers to NEMBA regarding Alien Invader Species. What about TOPS listed species?

11. Northern Cape Nature Conservation Act No. 9 of 2009 - No aspects on site could be identified that needs protection –
Was a proper infield assessment conducted to identify any flora sensitive areas? As the area is located in CBA area, an infield assessment should be conducted and a sensitivity map compiled based on flora sensitivity such as sensitive plant communities, IUCN, NEMBA: TOPS and Northern Cape Conservation Act Red listed species. The area falls within the Bushmanland Inselberg Region and Succulent Karoo Biome – an area of Plant Endemism and therefore a proper vegetation assessment is required.

12. Flora section:
BMM comment: Information provided needs to be re-assessed. The fact that the area is located in CBA will require that an infield assessment be conducted to groundtruth the flora component. A fine scale vegetation map must be compiled and a proper infield assessment is required to determine the presence and distribution of IUCN red listed plants, the presence of Threatened or Protected Species as listed by the National Environmental Management Biodiversity Act regarding the threatened or protected species regulations and lists, as well as the presence and distribution of protected species as listed by both the Northern Cape Nature Conservation Act and the National Forest Act. Information regarding protected plants as well as threatened and protected species in the DBAR is not acceptable and a proper infield assessment is required by a registered botanist/arid ecologist.
Available information as compiled by Desmet 2013 that are useful for the BAR but that was not consulted or included in the DBAR but a true reflection of the flora species and plant communities on the relevant farm are summarized below:

The area is located with Bushmanland Inselberg Regions and the Succulent Karoo Biome and are located within the Centre of Plant Endemism. The farm Wortel lies within an area of what is termed the “Bushmanland Inselberg Region” (BIR Desmet 2013, described the areas as follows:

This BIR includes all the large, quartzite-capped inselbergs located in the northern Bushmanland plains in South Africa covering an area of about 6300km2 (Figure 1). These inselbergs are distributed in an east-west line marking approximately the southern edge of the Orange River valley. A feature of all these inselbergs is their relatively flat, quartzite-capped plateaus and associated quartzite rock/boulder covered scree-slopes and aprons. The richness and diversity of the flora is dramatically associated with the presence of quartzite rock. The “BIR and plains region” (Figure 1) includes the Bushmanland plains as far south as Gamoep. The plains in the south-west shares flora affinities with the plains around the core area (e.g. *Ihlenfeldtia excavata, Conophytum calculus* subsp. *vanzylii, Titanopsis hugoschlecterii*). The BIR boundary in the east is defined by the distribution of the Aggeneys Gravel Vygieveld vegetation types. This vegetation type is endemic to the BIR and its distribution is strongly linked to the influence of winter rainfall. The BIR could be regarded as that area of Bushmanland significantly under the influence of the winter rainfall climate. The BIR is located on the boundary between winter and summer rainfall systems of southern Africa. The vegetation of the plains and warmer north-facing aspects is characteristic of the Nama Karoo Biome whereas that of cooler higher-elevation plains and south-facing aspects is characteristic of the Succulent Karoo Biome. The overlap of two biomes is a unique feature of the BIR flora and sets these inselbergs apart from other inselbergs elsewhere in the Nama Karoo. Most rainfall arrives in the form of thunderstorms in late-summer/autumn and averages 70mm/year. The moisture regime of the inselbergs is augmented by fog during winter months coming from valley fog associated with the Koa River valley (see title page picture) or low cloud from passing winter cold fronts. Therefore, the vegetation of the inselbergs is adjusted to a narrow growth period from about February to May accommodating the grown requirements of both summer and winter rainfall species. The low annual rainfall; erratic timing of rainfall events; occurrence of fog; and, the availability of moisture in the late summer through autumn period are important determinants of the flora allowing both summer and winter rainfall floras to co-exist which in part contribute to the uniqueness of the BIR. The flora of these inselbergs forms a distinct centre of plant endemism located within the larger Eastern Gariep Centre of Endemism. The Eastern Gariep Centre of endemism encompasses the arid Orange River valley between Vioolsdrif and Pofadder/Onseepkans. Although geographically close (<50km), the large mountains of the Orange River valley such as Pella Berg and Dabenoris are floristically distinct housing many Eastern Gariep endemics that do not occur outside the valley on the comparatively cooler Bushmanland inselbergs. There are many species endemic to the Bushmanland Inselbergs and the BIR in itself defines a distinct centre of endemism termed the “Bushmanland

Inselberg Centre of Endemism" or sometimes the "Gamsberg Centre of Endemism" as this inselberg lays at the floristic centre of this region and also drawing attention to the fact that the endemism is associated with the inselbergs and not the sandy Bushmanland plains that comprise 90% of the region. The Bushmanland inselbergs effectively comprise an archipelago of rocky "islands" within a "sea" of sand. These "islands" share common floristic affinities but show distinct east-west and north south gradients in species turnover and population-level variation. The surrounding sandy plains form a continuous vegetation fabric that is widespread beyond this region. The inselbergs have almost no floristic affinities with the vegetation on the surrounding sandy plains – chalk and cheese!

The inselbergs at the core of the BIR are of significant conservation importance:

a. The Gamsberg is the largest inselberg located in the center of a "Centre of Endemism" that includes the major inselbergs of (from east to west) Namies, Achab, Gamsberg, Aggeneysberg, Witberg, Haramoep and Wortel. These inselbergs define the core area of the Bushmanland Inselberg Region.
b. Relative to the surrounding sandy plains, and other world deserts, the inselbergs and associated rocky plains have very high levels of species diversity.
c. Many species are range restricted being associated with specific regionally rare habitats mainly different types of gravel patches, namely quartz, calcrete and feldspar.
d. Some of the azonal habitats associated with the inselbergs such as the kloofs and freshwater springs are regionally very rare features and fulfil vital ecological process functions such as providing climate change refuges.
e. The Gamsberg is the largest inselberg in Bushmanland and has the greatest diversity of habitats of conservation concern, the largest extent of these habitats and also the highest number of species compared to all other inselbergs in the BIR.

In addition, the vegetation wise contribution of Portion 1 of the farm Wortel 42, as provided to BMM by Desmet and Botha 2013 as part of the Biodiversity Offset calculation Tables as part of the Biodiversity Offset Agreement between DENC and BMM summarized the property wise contribution as followed:

The above vegetation types are not described within the DBAR report due to lack of site specific flora assessment.

13. The DBAR reports described the following:

According to Marsh et al. (2009) a total of 854 plant species have been recorded in the Khâi Ma Local Municipality area. As many as 41 species are known to be endemic to the area and a further 20 are potentially endemic. Many of the most special plants can be found within the fine grained quartz patches – an area that typically contains a number of special dwarf succulents (Marsh et al. 2009). The Bushmanland Inselbergs are a remarkable feature of this landscape. In total, this 31,400- hectare area includes 429 plant species, of which 67 are found only in this hotspot and 87 are Red List species (Marsh et al. 2009). A Threatened Species and Species of Conservation Concern list was obtained from the POSA database on the SANBI website. Threatened species are those that are facing high risk of extinction, indicated by the categories Critically Endangered, Endangered and Vulnerable. Species of Conservation Concern include the Threatened Species, but additionally have the categories Near Threatened, Data Deficient, Critically Rare, Rare and Declining. This is in accordance with the new Red List for South African Plants (Raimondo et al. 2009). In addition to the list above (Table 5 of the DBAR), *Aloe dichotoma* Masson (Vu) are also found within the area. The majority of the threatened species and species of conservation concern may potentially occur on the rocky inselbergs and/or quartz plains. The only protected tree which may occur within the area is *Acacia erioloba* (Camel Thorn). This tree may be present within the mining permit area on the sandy plains, but has not been observed during the site investigation. A further protected species is the halfmens *Pachypodium namaquanum*. The majority of succulent plants are classified as protected plant species. It can be concluded that although no statutory conservation area exists within the distribution range of the identified vegetation type, very little of the area has been transformed. A local exception is the mine area close to Aggeneys, where mining infrastructure and mine dumps, and also residential areas, transformed some areas. The proposed mining permit area is situated in an area of biodiversity importance. The most important areas are the Inselbergs, including their quartz gravel foot slopes. The dry grassy plains are of relatively less biodiversity importance. Although the proposed mining permit campaign will not result in a progressive loss of ecological sensitive and important habitat units or ecosystem functioning, the areas identified as being of high ecological sensitivity must be avoided and the proposed activities must be in accordance with the conservation policies of the relevant authorities.

BMM Comment: The inclusion of the list of Species of Conservation Concern (SANBI website, Quarter degree square Grid 2918BB) as include in Table 5 as well as species listed in Table 6 requires that a detailed infield assessment within the proposed development footprint are conducted in order to determine if any of the SCC are present that may be impacted on. Without the groundtruthing, infield assessment and mapping of such species and the compilation of a sensitivity map – the impact assessment cannot be seen as accurate and a true reflection of the associated impacts. It is therefore required that a detailed flora assessment within the 5ha development footprint area are conducted to determine the presence and distribution of SCC as well as sensitivity plant communities and the distribution of red listed species. Should any Endemic, near-endemic, IUCN red listed species, NEMBA TOPS and Protected species as per Northern Cape Nature Conservation Act and the National Forest Act be recorded, a proper Search and Rescue as well as Protected Plan must be compiled.

14. The DBAR described the Endemic Taxon as follows:
The small tree *Ozoroa namaquensis* and the leaf succulent dwarf shrub *Tylecodon suplhurreus* is endemic to the region. The study site is located within the area of jurisdiction of the Khâi Ma Local Municipality (KMLM). The KMLM comprises virtually the entire extent of the Bushmanland Inselberg priority area. The latter is one of the nine zones identified through the Succulent Karoo Ecosystems Project (SKEP) process as important conservation areas in the Succulent Karoo. Inselbergs are important refugia for plants and animals and act as steppingstones for rock-loving species migrating east west across the sand-covered plains of Bushmanland. The isolation of populations has led to diversification within the dwarf succulent shrublands, creating remarkable local populations of plant life. The area is unique, containing many rare and fragile habitat types. These unique and confined areas are host to a remarkable number of endemic plants (Marsh et al. 2009). According to SANBI & DEAT (2009) none of the ecosystems occurring on the mining permit area are considered as threatened ecosystems. Nonetheless, the areas north of Aggeneys are considered as Critical Biodiversity Areas (CBAs) within the Namakwaland District. The main vegetation types occurring on the mining permit area are classified in terms of Mucina & Rutherford (2006), as Eastern Gariep Plains Desert and Eastern Gariep Rocky Desert. An additional unit is the Dry Drainage Lines (Spruits).

BMM Comment: The two species listed in DBAR can be seen as an underestimation of the presence of endemic taxon and it is recommended that a site specific infield assessment are conducted to assess the presence and distribution of other endemic taxon in the development footprint area. In addition, the presence of CBA within and/or adjacent to the proposed development needs to be assessed and groundtruth and if required a Biodiversity Offset Report should be compiled and submitted with the FBAR for consideration as Portion 1 of the farm Wortel has been identified as land with conservation importance and as an area earmarked for Biodiversity Offset.

15. Surface water:
BMM Comment: Was a desktop study conducted regarding the presence of any NFEPA wetlands, rivers and/or pans within the proposed area of development? If not, please include in FBAR

16. Figure 31
BMM Comment: The Gamsberg Nature Reserve was proclaimed under the Protected Area Act on 5 August 2019 and include the farms Rozynbosch 41 Portion 2 and REM;

17. Page 94
BMM Comment: Contradicting Statement – Refers to the Bushmanland Nama Karoo Biome versus the Desert Biome under the flora description earlier on in the document:

18. Page 95 stated that there are no Protected Areas in the area
BMM Comment: This is incorrect as the Gamsberg Nature Reserve was proclaimed on 5 Aug 2019 and includes the adjacent properties namely Portion 2 and REM of the farm Rozynebosch 41

19. Mining and Biodiversity Guidelines

    BMM Comment: The Gamsberg Nature Reserve are located adjacent to the proposed development on Portion 2 and REM of the farm Rozynbosch 41. In addition, the area is located within a CBA area. According to Mining and Biodiversity Guideline, the proposed development falls with an area that is high risk for mining as the area is located in an area of high biodiversity. An EIA should therefore be undertaken with the potential of Biodiversity Offset. Detailed Flora assessment within the development footprint area is therefore required to map the flora sensitivity as well as the presence and distribution of threatened and protected species. The DBAR does refers that a Biodiversity Offset Report will be compiled and submitted as part of FBAR – please share this report for comments prior to inclusion n FBAR.

20. Biodiversity Priority Area - Page 97 refers to "10km wide buffers around National Parks and World Heritage Sites (or alternatively specifically defined buffers approved by the Minister according to DEA's buffer zone policy for National Parks or gazetted under the. Parks, World Convention Act) and 5km buffers around other protected areas, Heritage excluding Gauteng where there are no buffers around protected areas. In these areas environmental impact assessments should be required for a range of activities that impact on biodiversity value, sense of place, visual sensitivity of the natural landscape and cultural value of Nature Reserves.

    BMM Comment: This means that due to the Proclamation of the Gamsberg Nature Reserve adjacent, and most probably closer than 5km from the proposed development – that a full EIA is required.

21. Page 100 - CBAs in the Namakwa District Municipality. CBAs are terrestrial (T) and aquatic (A) features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (Namakwa District Biodiversity Sector Plan, 2008). The purpose of CBAs is to indicate spatially the location of critical or important areas for biodiversity in the landscape. The legend can be clarified as follows:

    a. CBA 2: Natural landscapes:
        i. Ecosystems and species fully intact and undisturbed
        ii. These are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and r avoidance of conflict with other land or resources uses.
        iii. These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost, then targets will not be met.
        iv. These are landscape that are at or past their limits of acceptable change

    BMM Comment: It is therefore of critical importance that a site specific assessment of vegetation be conducted to identify the site specific fine scale plant communities as well as presence of any threatened or protected species with the proposed area of development and then re-assess the vegetation impact assessment. A biodiversity Offset Reports should be compiled based on the outcome of the infield site specific vegetation assessment.

22. An offset study is needed as the development falls in a CBA area. From this it has been concluded that an Ecological and Wetland Specialist needs to be consulted. This report will be included into the Final BAR.

    BMM Comment: This is in line with recommendation made in the BMM review. Engagement with Elsabe Swart and other DENC representatives are therefore important to take this forward.

23. Impact Assessment Tables

BMM Comments: Without a fine scale flora assessment and sensitivity map of the representative vegetation types as well as the presence and distribution of threatened and protected species (IUCN Red list flora species; NEMBA: TOPS list species and Protected Species as listed by the Northern Cape Nature Conservation Act) an accurate impact assessment due to the proposed development within the CBA area cannot be assessed. It is recommended that these be conducted and once completed that the Impact Assessment of the flora be update accordingly. The

<table>
<tr><th>Interested and Affected Parties</th><th>Date Comments Received</th><th>Issues raised</th><th>EAP's response to issues as mandated by the applicant</th><th>Section and paragraph reference in this report where the issues and or response were incorporated.</th></tr>
<tr><td colspan="5">impact of fall out dust on such species should also be addressed. The impact on flora and the reversibility of the impact is questionable and should be revised. Impact of dust on these threatened and protected species should be re-evaluated to determine the impact of dust on these species.</td></tr>
<tr><td colspan="5"><u>Response to BBM's comments on the BID (of the previous application – 10771 MP):</u>

1 & 2: Your comment is noted, however the footprint of the offset agreement is unclear as no appendices/maps accompanied your comments. Greenmined did consult the EIA Screening toolkit as per the NEMA legislation and the results showed that the application area falls within a CBA2 area with sensitive plant species, but no off-set/exclusion area could be identified. Greenmined also looked at the SANBI LUDS report but were unable to find such an exclusion area. The botanical study showed that the proposed footprint of the mining area is highly disturbed and no listed Red Data plant species were noted within the earmarked area. The protected species, identified by the botanist, will either be protected or permits will be obtained for the removal of the plants prior to commencement. This process will be guided by a qualified botanist. It must be noted that all the mining activities will be contained within the 5 ha mining boundary and that the natural areas outside of the boundaries will not be affected by the proposed activity. It is therefore believed that the potential biodiversity offset area can still be applied to the farm Wortel 42.

3. A borehole will be drilled on the farm for the abstraction of process water. This water use will be registered with DWS in accordance with NWA (Act No. 104 of 1998), Section 21 activities. The applicant will make use of the existing roads to access the mining area (as discussed in the DBAR). Should the upgrade of any of the road sections fall within the footprint of a watercourse the DWS will be contacted to confirm the necessity of a Section 21 C & I application in terms of the NWA, 1998. If needed, such an application will be submitted before commencement.

4. The references were added to the DBAR. Regular vehicle maintenance will take place within the service bay area of an off-site workshop. Should emergency services be needed this will be performed at the on-site workshop at a designated area developed for such purposes.

5. The Gamsberg Nature Reserve was declared on the 5th of August 2019, after the first application for a mining permit (10771MP) was made to the DMR. The BID was distributed to the I&APS on the 10th of July 2019, before the reserve was proclaimed. The findings of the botanical study was incorporated into this DBAR to be distributed for public comments. Should the proposed activity stay within the approved footprint area and the mitigation measures listed in this document be implemented the activity will not have an impact on the nearby Gamsberg Nature Reserve.

6. The findings of the botanist were incorporated into this document and a search and rescue protocol is part of the mitigation measures proposed for the project.

7. As stated in the DBAR, fauna will be able to move away from site during the mining activities. Greenmined is of the opinion that based on the nature, size and site specific conditions a detailed faunal assessment is not warranted.

8. As stated above, the necessary WUL applications will be made before commencement of any listed activities in terms of the NWA, 1998. Please refer to Appendix D for a copy of the Road Map. Erosion control will be managed and mitigated as part of the EMPR (Part 2 of the DBAR).</td></tr>
</table>

Response to BBM's comments on the DBAR (of the previous application – 10771 MP):

1. Greenmined takes note of your comment and supports the continued use of the sensitive areas on Portion 1 of the farm Wortel 42 as a biodiversity offset area. The proposed mining activity will not affect the newly declared Gamsberg Nature Reserve as mining will be contained to the approved 5 ha footprint.

2. A borehole will be drilled on the farm for the abstraction of process water. This water use will be registered with DWS in accordance with NWA (Act No. 104 of 1998), Section 21 activities. The applicant will make use of the existing roads to access the mining area (as discussed in the DBAR). Should the upgrade of any of the road sections fall within the footprint of a watercourse the DWS will be contacted to confirm the necessity of a Section 21 C & I application in terms of the NWA, 1998. If needed, such an application will be submitted before commencement.

3. As mentioned in this report, the footprint of the proposed mining area was kept to the previously disturbed historic mining area. The botanist concluded that the vegetation of the study site is severely modified and transformed. The specialist did recommend a pre-construction walkthrough of the access roads that was added to the mitigation measures/conditions of the EMPR. The study further stated that it is highly unlikely that this development will have an impact on the status of the Ecosystem and Vegetation Types due to the limited extent of the mine as well as the presence of already disturbed areas within the footprint. Furthermore, this mine will not have a significant impact on the services and functions provided by the surrounding natural habitats and development within this area and is regarded as acceptable.

4. The potential impact of dust on plants was considered, and the assessment showed it to be of low significance should the mitigation measures proposed in this document be implemented.

5. The listed legislation were considered as part of the environmental impact assessment. Refer to Part A(3)(e) Policy and Legislative Context.

6. The botanical specialist study was conducted and the findings of the report were incorporated into this DBAR. Also refer to Appendix O1 for a full copy of the document.

7. The general waste will be transported along either Access Road Option 1 or 2 (as discussed in the DBAR), and then along the provincial gravel road that links up with the tarred Pella road. The road will either travel through Wortel 42/1 and Rozynbosch 41/1 or Wortel 42/1 and Wortel 42/RE before joining the provincial gravel road.

8. Please refer to Part A(3)(d)(ii) *Description of the scope of the proposed overall activity* and Part A(3)(h)(iv) *The Environmental attributes associated with the alternatives* for this information.

9. See comment above.

10. The presence of listed species within the study area were considered as part of the botanical study attached as Appendix O1 to this report.

11. The botanical study was conducted and incorporated into the DBAR.

12. Prior to his inspection, the botanist was furnished with the information provided by BBM and as such it was considered during the assessment.

13. The comment was noted and a botanical study was commissioned and incorporated into the DBAR.

<table>
<tr><th>Interested and Affected Parties</th><th>Date Comments Received</th><th>Issues raised</th><th>EAP’s response to issues as mandated by the applicant</th><th>Section and paragraph reference in this report where the issues and or response were incorporated.</th></tr>
<tr><td colspan="5">14. The comment was noted and a botanical study was commissioned and incorporated into the DBAR.

15. The desktop study was conducted and is discussed in this report under Part A(3)(h)(iv)(1)(c)(v) Site Specific Surface Water.

16. Comment noted.

17. Comment noted and addressed in this report.

18. Comment noted and addressed in this report.

19. The footprint of the proposed mining operation was contained to the previously disturbed area so as to prevent disturbance to the surrounding sensitive areas. The botany study was conducted and incorporated into this report. Based on the findings of the report and the highly disturbed nature of the proposed development area no offset area was deemed applicable.

20. The proposed mining operation on Portion 1 of the farm Wortel 42 does not trigger any listed activities in terms of GNR 325 Listing Notice 2 and therefore a full EIA process is not required. Listed activities in terms of GNR 324 Listing Notice 3 requires a basic assessment process to be followed.

21. The botanical study was conducted and the findings were incorporated into the DBAR.

22. The botanist did not identify the need for an offset area as the development footprint was contained to the previously disturbed areas and no undisturbed natural area will be lost as a result of the proposed activity. However, should the DENC identify a need for an offset area this will be considered by the Applicant.

23. The botanical study was conducted and the findings were incorporated into the DBAR. The findings of the report advised the assessment of the potential impacts.</td></tr>
<tr><td>Oonab Boerdery CC</td><td>N/A</td><td>No objections received. Please refer to Appendix I for proof of the public participation process.</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Sophia Luyt</td><td>N/A</td><td>No objections received. Please refer to Appendix I for proof of the public participation process.</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Albertus Johannes van den Heever</td><td>N/A</td><td>No objections received. Please refer to Appendix I for proof of the public participation process.</td><td>N/A</td><td>N/A</td></tr>
<tr><td>JC Strauss Agriculture (Pty) Ltd</td><td>N/A</td><td>No objections received. Please refer to Appendix I for proof of the public participation process.</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Gemeenskapsontwikkelintrust Witbank</td><td>N/A</td><td>No objections received. Please refer to Appendix I for proof of the public participation process.</td><td>N/A</td><td>N/A</td></tr>
</table>

Interested and Affected Parties	**Date Comments Received**	**Issues raised**	**EAP's response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
Pella Plaaslike Ontwikkeling	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Haramoep Boerdery CC	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Frank Bassigtwaighte Aggenbach	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Municipal councillor				
Khâi Ma Local Municipality *Ward 4 Mr. Quincy*	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Municipality				
Khâi Ma Local Municipality Municipal Manager Mr Obegang	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Namakwa District Municipality Mr. Christiaan Fortuin	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWS				
Department of Economic Development and Tourism Head of Department: Mr. S Mabilo	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Department of Roads and Public Works Head of Department: Mr Kholekile Nogwili	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
SANRAL Me Nicole Abrahams	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Department of Labour Head of Department Mr Albanie	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A

Interested and Affected Parties	**Date Comments Received**	**Issues raised**	**EAP's response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
Communities				
Dept. Land Affairs				
Department of Agriculture, Land Reform and Rural Development Head of Department: Mr W D Mothibi	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Commsion Of Restitution Land Right	25 April 2019	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Traditional Leaders				
Dept. Environmental Affairs				
Department of Environment and Nature Conservation Director for Environmental Quality Management Mr B Fisher	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Other Competent Authorities affected				
South African Heritage Resource Agency Natasha Higgit	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Department of Water and Sanitation Mr A Abraham	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
SANBI M Mokonoto	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A

Interested and Affected Parties	Date Comments Received	Issues raised	EAP's response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
Succulent Karoo Ecosystem Programme (SKEP) Mr. Abe Koopman	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
WESSA	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Endangered Wildlife Trust	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Botanical Society of South Africa Mr. Mark Botha	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Agri Namakwa and Associated Farmers Associations Mr. Danie Jacobs.	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
INTERESTED PARTIES				
Karsten Boerdery	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A
Klein Pella Guesthouse	N/A	No objections received. Please refer to Appendix I for proof of the public participation process.	N/A	N/A

iv) The Environmental attributes associated with the alternatives.

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

(3) Baseline Environment

(a) Type of environment affected by the proposed activity.

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

Climate

According to the saexplorer website, Aggeneys normally receives about 34 mm of rain per year, with most of the rainfall occurring mainly during autumn. The chart below shows the average rainfall values for Aggeneys per month. It receives the lowest rainfall (0 mm) in December and the highest (9 mm) in March. The monthly distribution of average daily maximum temperatures (centre chart) shows the average midday temperatures for Aggeneys range from 17.7 ºC in July to 31.6 ºC in January. The region is coldest during July when temperatures drops to 3 ºC on an average during the night. Refer to chart below (lower right) for an indication of the monthly variation of average minimum daily temperatures.

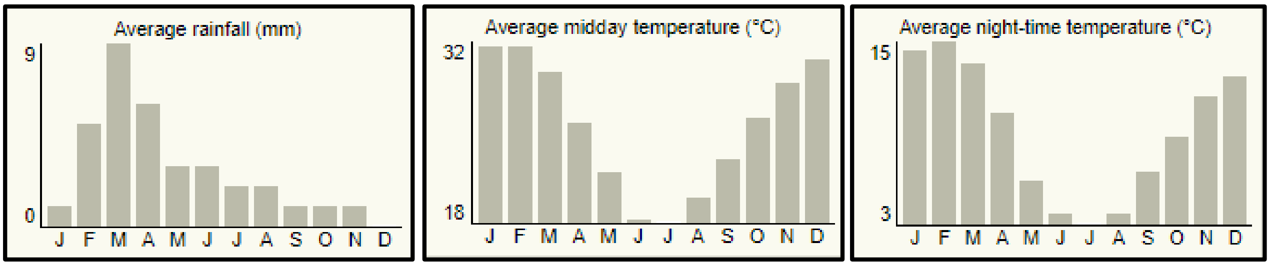

Figure 8: Statistical representation of the average rainfall, midday temperatures and night-time temperatures for the Aggeneys region (Chart obtained from saexplorer).

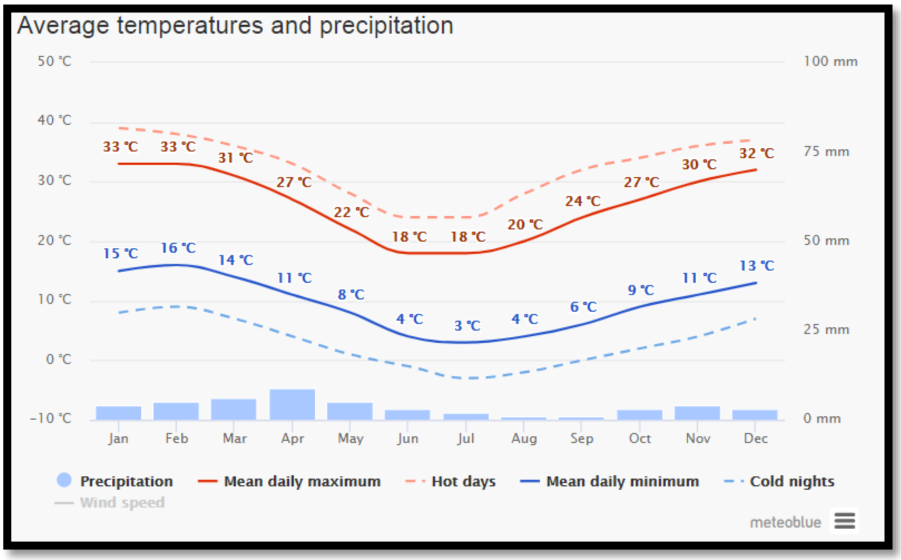

Figure 9: Average rainfall and temperature for Aggeneys (image obtained from meteoblue).

The figure below shows the monthly number of sunny, partly cloudy, overcast and precipitation days. Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast. As indicated in the figure below, the sunniest days are in June-July during winter, with overcast and precipitation days occurring in the summer season in March (Meteoblue, 2018).

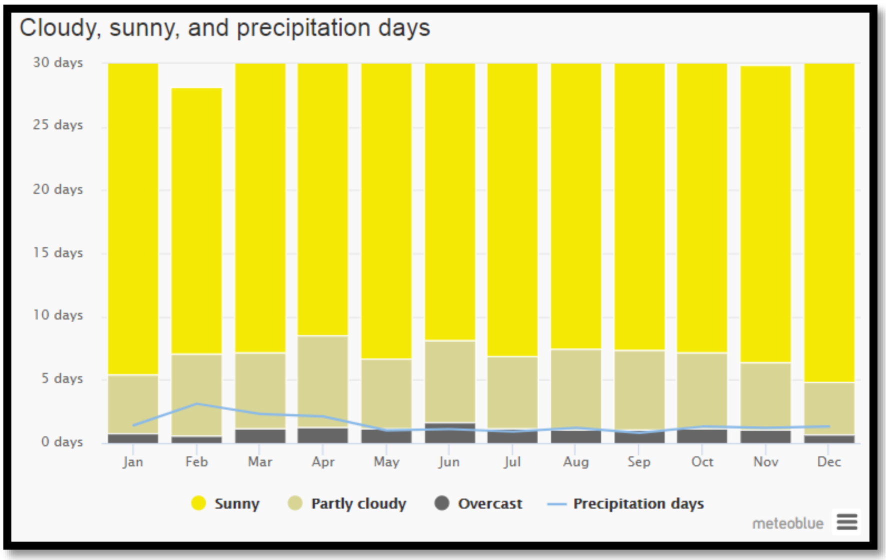

Figure 10: Cloudy, sunny and precipitation days of Aggeneys (image obtained from meteorblue, 2018).

The maximum temperature diagram for Aggeneys displays how many days per month reach certain temperatures. As indicated in the figure below, the hottest temperatures occur during the summer season with temperatures reaching from 17.9 °C in June to 32.7 °C in January and the coldest during July when the mercury drops to 1.3 °C on average during the night when frost can occur. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Aggeneys range from 19.1 °C in June to 33.2 °C in January. The region is the coldest during July when the mercury drops to 1 °C on average during the night. Consult the figure below for an indication of the monthly variation of average minimum daily temperatures (Explorer, 2018) (Meteoblue, 2018).

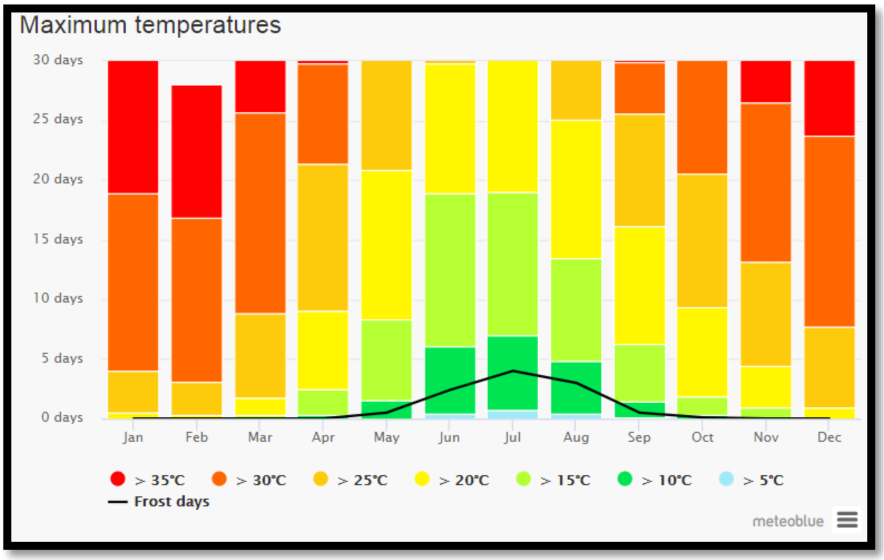

Figure 11: Maximum temperatures of Aggeneys.

The precipitation diagram for Aggeneys shows how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated. Aggeneys normally receives about 132 mm of rain per year, with most rainfall occurring mainly during autumn. It receives the lowest rainfall in July and the highest in (38 mm) in March (Meteoblue, 2018) (Explorer, 2018).

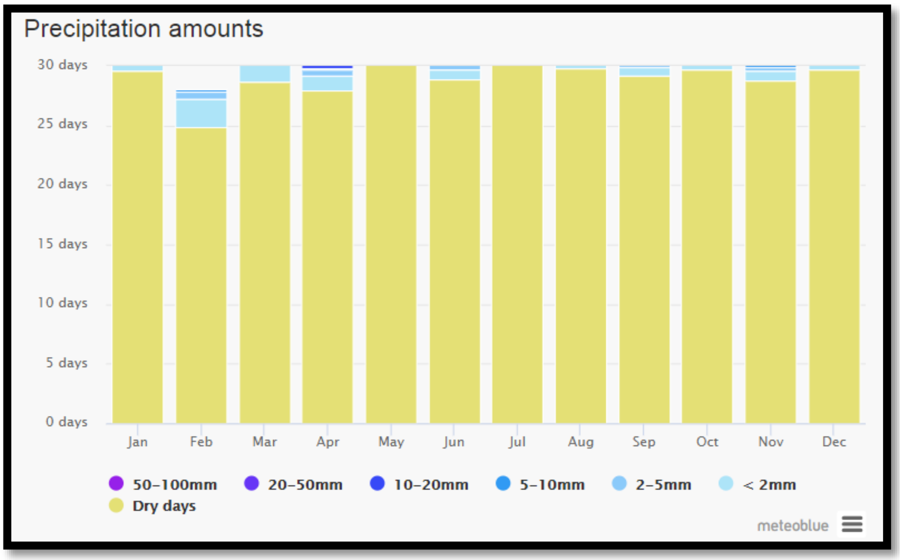

Figure 12: Precipitation amounts for Aggeneys.

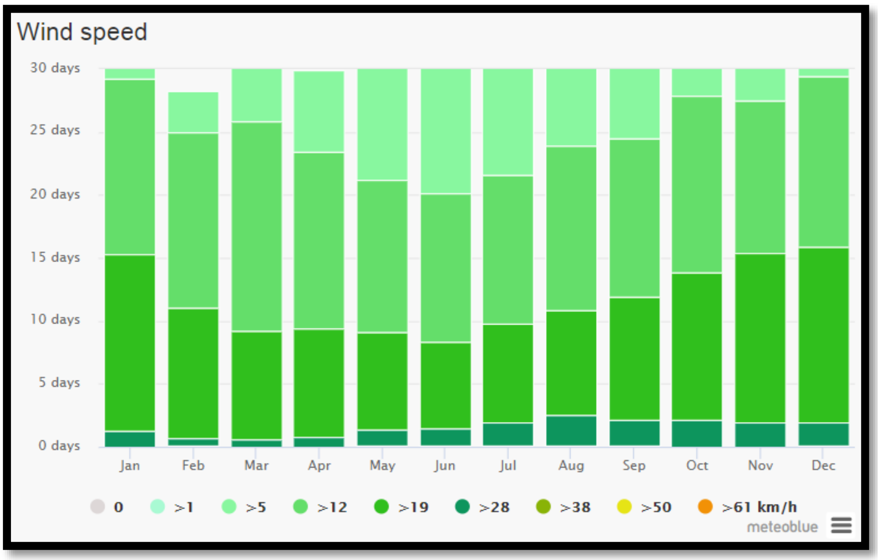

Figure 13: Average wind speeds in Aggeneys.

The above diagram shows the days per month, during which the wind reaches a certain speed. As seen from the figure above, the average wind speeds over the summer season is calculated to be about 19 km/h whereas in the winter season in drops to 5 km/h.

The wind rose for Aggeneys shows how many hours per year the wind blows from the indicated direction. As seen from the figure below, the average wind rose in Aggeneys is a Southerly and South-South Easterly wind, this can be during winter and summer times.

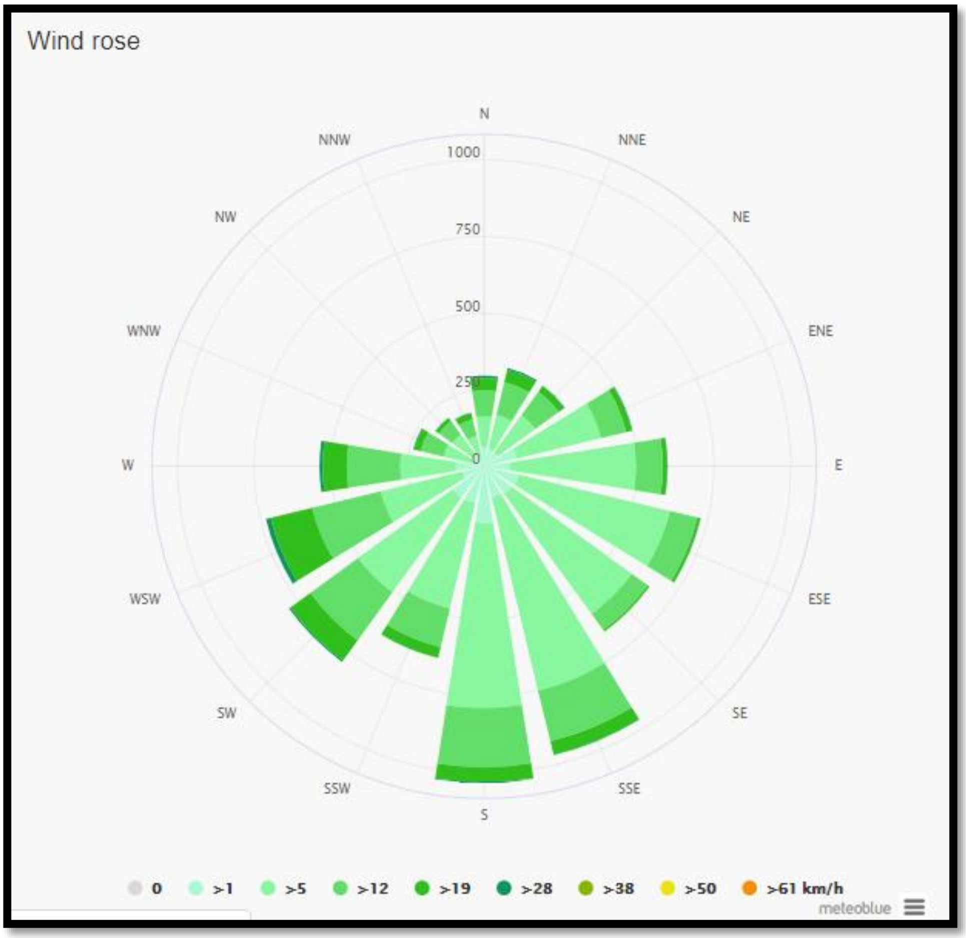

Figure 14: Wind rose for Aggeneys.

Geology

Supracrustal rocks occur in several discontinuous east-west-trending belts within the Bushmanland Terrane, increasing in abundance toward the south in the vicinity of Garies. The heterogeneity of rocks types and the disruption cause by thrust-related deformation and the voluminous sheet-like intrusions make correlation difficult. Moore (1989) suggested a broad two-fold subdivision into a southern succession (Bitterfontein-Kammieskroon area), compromising basal quartzofeldspathic gneisses, and overlying feldspathic sillimanite and garnet-cordierite gneisses, and a northern succession (Springbok-Steinkopf-Pofadder area) known as the Bushmanland Group, which comprises basal leucocratic gneisses and overlying sillimanite and mica-sillimanite schists.

In the region west of Pofadder, Colliston et al. (1989) subdivided the supracrustal rocks of their Aggeneys Terrane into six formations (Wortel, Witputs, Skelmpoort, T'hammaberg, Hotson and Koeris. These were later grouped together as the Aggeneys Subgroup of the Bushmanland Group by Praekelt and Schoch (1997), who provided detailed descriptions of all the formations.

The basal Wortel Formations (650 to 920 m thick) consists of interlayers of biotite-sillimanite schist and sub-ordinate sillimanite, which is magnetite-bearing in places. Lenses of amphibolite occur sporadically, while sillimanite was mined for many years from sillimanite lenses in this formation. In the east mainly leucocratic biotite gneiss and quartz-feldspar gneiss of the Stalhoek Complex and lesser amounts of leucocratic biotite gneiss occur, with intercalations of calc-silicate rocks, mafic gneiss, and a sillimanite -schist association of the Hom Subgroup, Bushmanland Group. In the west the area consist of granodiorite, adamellite, leucoSillimanite, tonalite, and diorite of the Vioolsdrift Suite and intermediate and acid volcanic of the Haib Subgroup of the Orange River Group (all of the above of Mokalian age). Very rocky substrate with little to no soils. Land type lc.

There is limited soils in the area with mostly rock outcrops or mountains. On the lower laying areas, soils have minimal development and are usually shallow on hard or weathered rock, with or without intermitted diverse soils. Lime is generally present in part or most of the landscape.

The application areas are situated in the Koa River valley, which is striking from southeast to northwest, where it eventually joins the Orange River just west of Black Mountain in the Bushmanland region. The paleo Orange River mouth, in Pre-Cambrian time, was at the same position where the Olifants River mouth is on the west coast of South Africa. The Paleo River linked with the present river where Prieska is today. The Paleo River that flowed in a south-westerly direction, was rerouted when the Cape fold belt was uplifted in the mid Palaeozoic Era. This event forced the river in a north-westerly direction, creating the Koa River, today known as the Koa River valley. The diamonds that were transported to the Atlantic Ocean at that stage was then transported along the Koa River were it was partly deposited due to the widening of the valley at places, especially in the Bosluispan/Bitterputs area. This opening up of the valley caused a lost in energy of the transporting medium and the heavier material, such as diamonds, dropped out of suspension, hence the occurrence of the commodity along the Koa River Valley.

The asymmetric uplift of the subcontinent during the Cenozoic Era was responsible for the northerly shift of the Orange River and it's rerouting at Prieska, leaving the south-western extent of the paleo Orange River and the Koa River dry. (Paul Grobbelaar. B.Sc Geology).

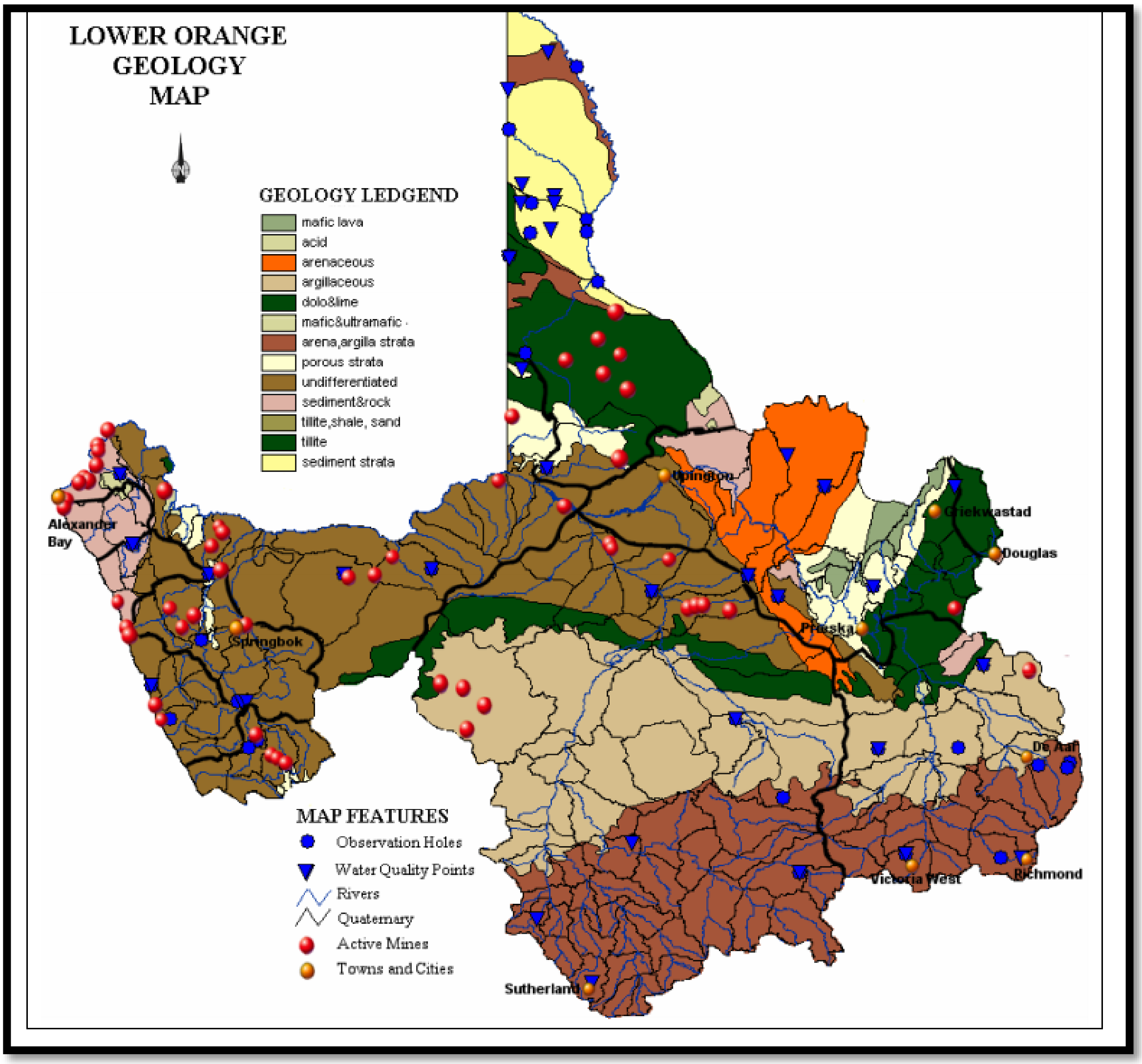

Figure 15: Simplified Geology of the WMA

The Wortel Subgroup is subdivided into the Aluminous Schist (bottom) and White Sillimanite Formations (top). Quartz- biotite- sillimanite- muscovite schist forms the bulk of the Aluminous Schist Formation. The White Sillimanite Formation consists off layered to massive, white to light grey weathering metasillimanite.

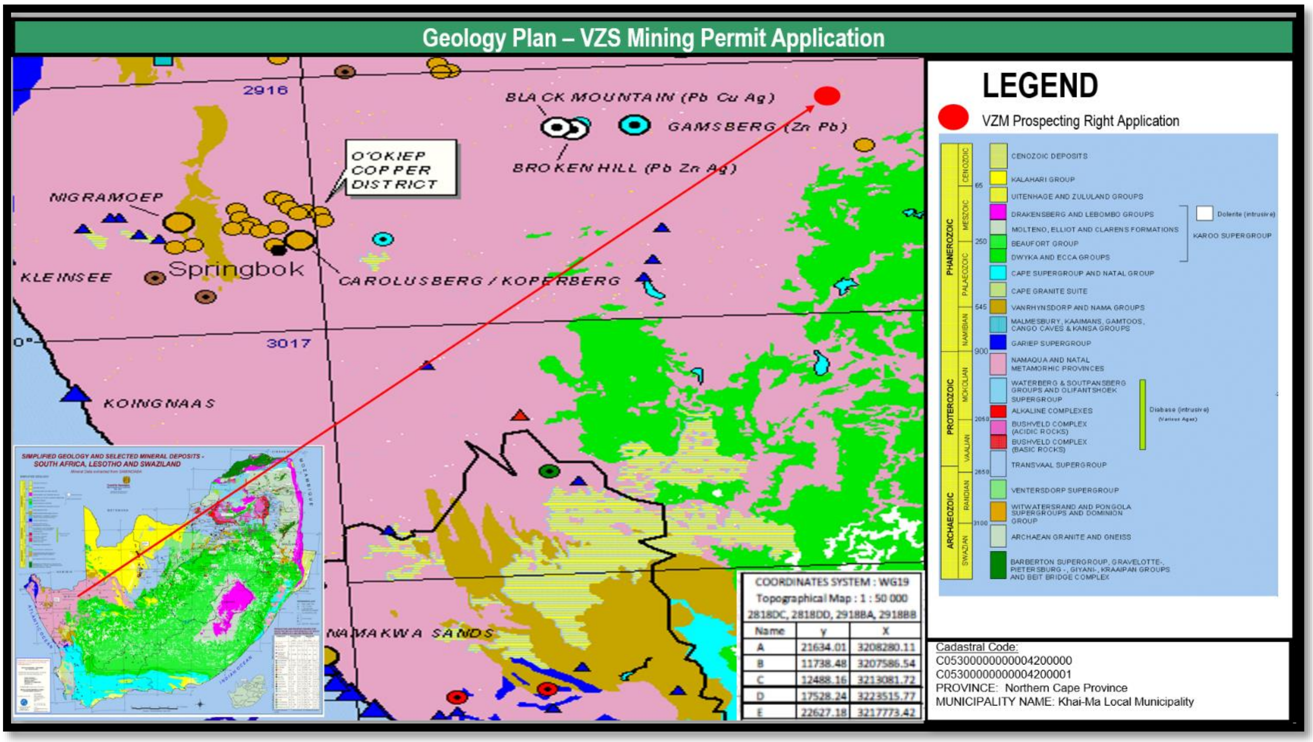

Figure 16: Geology Plan for VZS Mining Permit Application

Topography

Mountainous and undulating landscape situated within the Witberg mountains. The only environmental feature that may proof significant is a relative major non-perennial stream. The topography of Portion 1 and Portion 0 of Wortel 42 are quite different from one another. The topography of the northern portion of Portion 0 (RE) of Wortel 42 can be described as plains, or rolling plains (irregular plains) with open high hills or ridges and level plains with some relief. There is also high open hills or ridges in the north.

The topography of Portion 1 is described as high hills or ridges with rolling or irregular plains and low hills or ridges to the west of the property and plains with open low hills or ridges towards the south of the property. The slope of the area varies from lower than 2% to higher than 20% steep gradients.

Also refer to Part A (3)(h)(iv)(1)(c)(i) Site Specific Topography

Soil, land use and land capability

The area is known for soils with minimal development potential that are usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime generally present in part or most of the landscape. Freely drained, structure less soils quaternary sheet-wash alluvial deposits, sands, deep in places; in south, red yellow apendal, freely drained soils with a high base status. Land types includes Ag and Ae.

Also refer to Part A (3)(h)(iv)(1)(c)(ii) Site Specific Soil, Land Use and Land Capability.

Flora

(Information extracted from the Botanical Study and Assessment, Nkurenkuru Ecology & Biodiversity January 2020 attached as Appendix O1)

According to the broad-scale vegetation pattern as described in the Botanical Study and Assessment (Botha & Keet 2020), the site lies entirely within the Eastern Gariep Rocky Desert vegetation type (Mucina & Rutherford, 2006). The vegetation unit comprises about 2 568 km^2 of land area and is classified as Least Threatened, since its conservation target is 34% with 99.7% of the unit still remaining; the vegetation type has thus not significantly been transformed.

The vegetation type comprises all the rocky desert areas along the Orange River, including Groot Pellaberge, Dabenorisberge, Abbasasberge, and many smaller mountains between Pella and Vioolsdrif, with an altitudinal range of about 250 – 1 205 m at the highest peak of the Groot Pella.

Variation in habitat types are mainly controlled by topography, aspect, local climate and lithology. The vegetation type is characterised by hills and mountains mostly with bare rock outcrops that are very sparsely covered with shrubby vegetation. The southern ravines and rocky drainage lines are typically covered by a higher cover of plants including; *Abutilon pycnodont, Asparagus suaveolens, Ficus cordata, Searsia populifolia* and *S. viminalis*. On the higher southern slopes *Justicia orchioides* is often dominant, with localised grassland directly below steep cliffs (*Enneapogon scaber, Triraphis ramosissima* and *Danthoniopsis ramosa*). The south facing quartzite cliffs and steep slopes support chasmophytes such as *Ficus ilicina, Aloe dabenorisana* and *Bowiea gariepensis*. On the summits and higher northern slopes there is a much higher diversity of succulent species such as *Euphorbia avasmontana, Aloe dichotoma, A. microstigma* subsp. *microstigma, Pelargonium aridum* and *Kleinia longiflora* (Mucina & Rutherford, 2006) *(a) Species of Conservation Concern*

A total of about 32 red data plant species is known to occur in the broad area surrounding the site, as obtained from the SANBI SIBIS database and Threatened Species Programme, Red List of South African Plants (2011) (see Appendix O1 for a list of the species as presented in the Botanical Study and Assessment). The majority of these species are from the Aizoaceae (which includes the formerly classified family of Mesembryanthemaceae, now regarded as a subfamily of Aizoaceae). They are associated with many of the quartzite patches of the surrounding areas, as well as the dry north facing mountain slopes. As a result, the actual number of species of conservation concern which may occur within the site should be significantly less, since the site is not characterised by dense patches of quartz which typically host many endemics and red listed species However, the endemic and endangered *Anacampseros herreana* was observed on the way to the site at a different locality among quartzite pebbles, and it is possible that this species might occur in the vicinity of the site, since the site does have some quartzite elements (although to a much lesser degree than the surrounding areas).

Furthermore, apart from the previous observed red data species a total of 258 species have been recorded which are protected within the Northern Cape Nature Conservation Act (Act No. 9 of 2009). Of these 258 species, only 12 species are Specially Protected namely; *Ozoroa dispar, O. namaensis, O. namaquensis, Pachypodium namaquanum, Aloe dabenorisana, Pelargonium carnosum, P. crithmifolium, P. pulchellum, P. spinosum, P. xerophyton, Pelargonium* spp. and *Ornithogalum bicornutum*. The high number of protected species are mainly due to the fact that the entire Mesembryanthemaceae Sub Family (Aizoaceae Family), Crassulaceae Family and Euphorbia Genus (Euphorbiaceae Family) are protected within this Act. These species are extremely diverse and abundant with this area.

(b) National Protected Areas Expansion Strategy (NPAES)

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine-scale planning which may identify a range of different priority sites based on local requirements, constraints, and opportunities.

According to the NPAES spatial data (Holness, 2010), the proposed mining footprint is located outside of any Focus Area. However, the mining footprint is located in close proximity to the Kamiesberg Bushmanland Augrabies NPAES. Subsequently this NPAES Focus Area will not be impacted by the proposed VZS Mine. The proposed access road options traverses' small portions that is included in this NPAES, however due to the fact that only existing roads will be utilised, there will be no impact on this potential protected area as a result of the access road.

The Gamsberg Nature Reserve was proclaimed under the Protected Areas Act, 2003 (Act No 57 of 2003) and declared on 5 August 2019 on the following properties:

- Achab 59
- Remainder of Vogelstruishoek 88
- Remainder of Rozynbosch 41
- Portion 2 of Rozynbosch 41

Portion 2 of the farm Rozynbosch 41 borders Portion 1 of the farm Wortel 42, on which the proposed mining area was identified, to the east. As mentioned earlier, Access Road Option 1 turns from the main gravel road (that connects with the tarred Pella Road) traversing Portion 1 of the farm Rozynbosch 41 before entering Portion 1 of the farm Wortel 42 (see Appendix D). Access Road Option 2 crosses over the Remainder of the farm Wortel 42 after turning from the main gravel road, before entering Portion 1 of the farm Wortel 42 to provide access to the proposed mining area. No mining related activities will enter into/onto Portion 2 of the farm Rozynbosch 41 or the nearby Gamsberg Nature Reserve, and the mining activities will therefore not impact the adjacent protected area.

(c) National Level of Conservation Priorities (Threatened Ecosystems)

The vegetation types of South Africa have been categorized according to their conservation status which is, in turn, assessed according to the degree of transformation and rates of conservation. A national process has been undertaken to identify and list threatened ecosystems that are currently under threat of being transformed by other land uses. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act or NEMBA: National list of ecosystems that are threatened and in need of protection, G 34809, GoN 1002, 9 December 2011). The NEMBA provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected.

According to Mucina and Rutherford (2006), the vegetation type of the study area is classified as Least Threatened with a conservation target of 34%. Currently, none of the vegetation type is conserved in statutory conservation areas. Only 0.3% of this vegetation type has been transformed. Furthermore, this area is not listed within the Threatened Ecosystem List (NEMA:BA). It is highly unlikely that this development will have an impact on the status of the Vegetation Type due to the extent of the development as well as the presence of already disturbed areas within the footprint (existing mine) and the fact that only existing access roads will be used.

(d) Critical Biodiversity Areas and Broad Scale Ecological Processes

Critical Biodiversity Areas have been identified for all municipal areas of the Northern Cape Province (Oosthuysen & Holness, 2016) and are published on the SANBI website (bgis.sanbi.org). This biodiversity assessment identifies CBAs which represent biodiversity priority areas that should be maintained in a natural to near natural state. According to these maps, large tracks of land within the region falls either within Critical Biodiversity Areas 2 (CBA2) or Ecological Support Areas (ESA).

The entire mining footprint is located within a CBA2. Furthermore, both access road options will traverse mostly CBA2 and Other Natural Areas with small areas listed as CBA1 being impacted. These CBA2 areas are regarded as largely intact and undisturbed, with intermediate irreplaceability or flexibility in terms of the area required to meet biodiversity targets. The isolated patches of CBA1 are mainly associated with natural, undisturbed inselbergs, steep slopes, large plateaus and corridors along major watercourse systems. These habitats provide unique niche habitats, refuge for sensitive flora and fauna (in the face of potential climate change) and they are typically susceptible to erosion if the vegetation cover is removed.

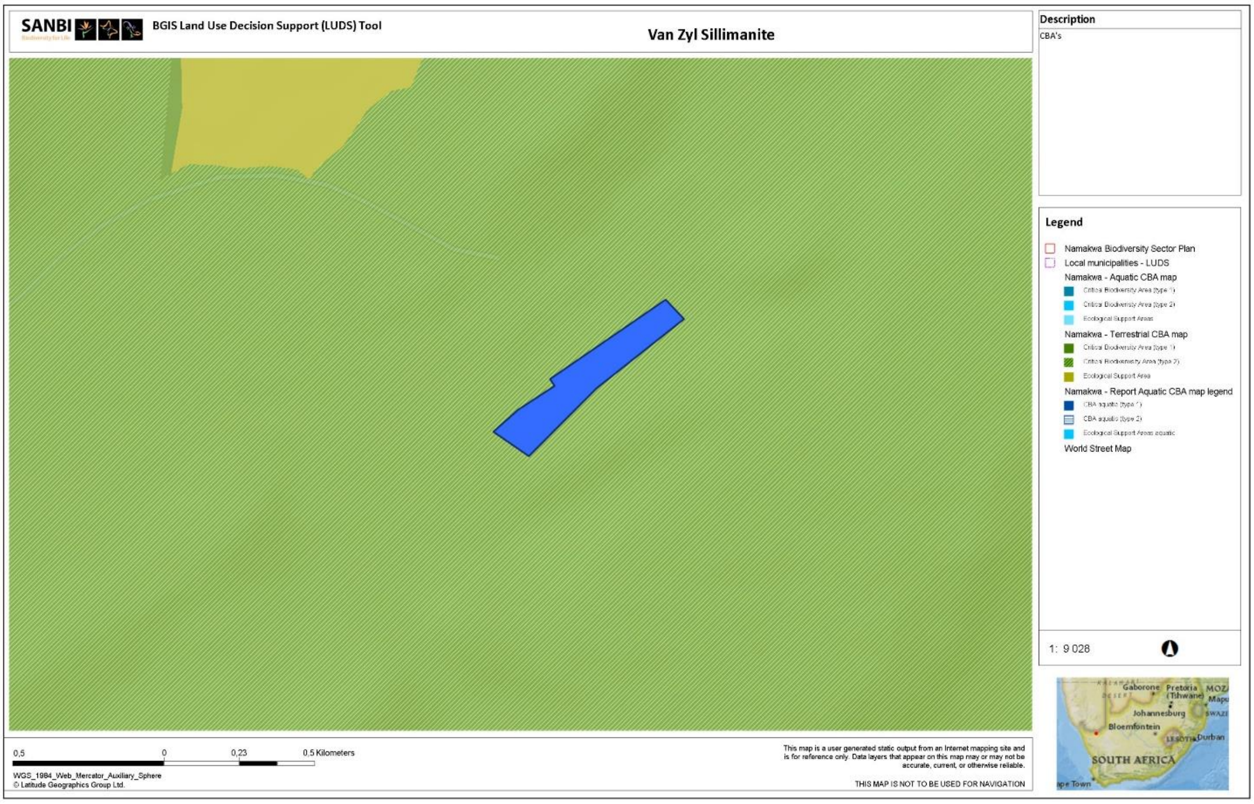

Figure 17: Layout of the Mining Permit area where the green shading presents the CBA.

However, the preferred mining footprint is located almost entirely within the historical mining footprint which is in a highly disturbed and transformed state. Subsequently this area contains very few natural elements and similarly contribute very little to the functionality and services that would typically characterise such a classification (CBA2). As such, if the proposed development is restricted to the footprint area provided in this report, minimal impacts would occur on the surrounding natural areas, listed as CBA2. In terms of the access roads, both options are along existing roads and would also subsequently have a minimal impact on the CBA areas.

(e) Mining and biodiversity guidelines

According to the Mining and Biodiversity Guidelines (as presented in Figure 18) the mining area is situated within an area of high biodiversity importance with a corresponding rating of high risk for mining. The table below provides the definition of an area of high biodiversity importance.

Table 12: Category (High) of biodiversity priority areas in relation to their biodiversity importance and implications for mining.

Category	Biodiversity property areas	Risk for mining	Implications for mining
High Biodiversity Importance	• Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves) • Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas) • Other identified priorities from provincial spatial biodiversity plans • High water yield areas are possible. • Coastal Protection Zone • Estuarine functional zone • *Note that the status of buffer areas of World Heritage Sites is subject to a current intra-governmental process.	**High risk for mining**	High risk for These areas are important for conserving biodiversity, for supporting or buffering other biodiversity mining biodiversity priority areas, and for maintaining important ecosystem services for particular importance communities or the country as a whole. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and limitations for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.

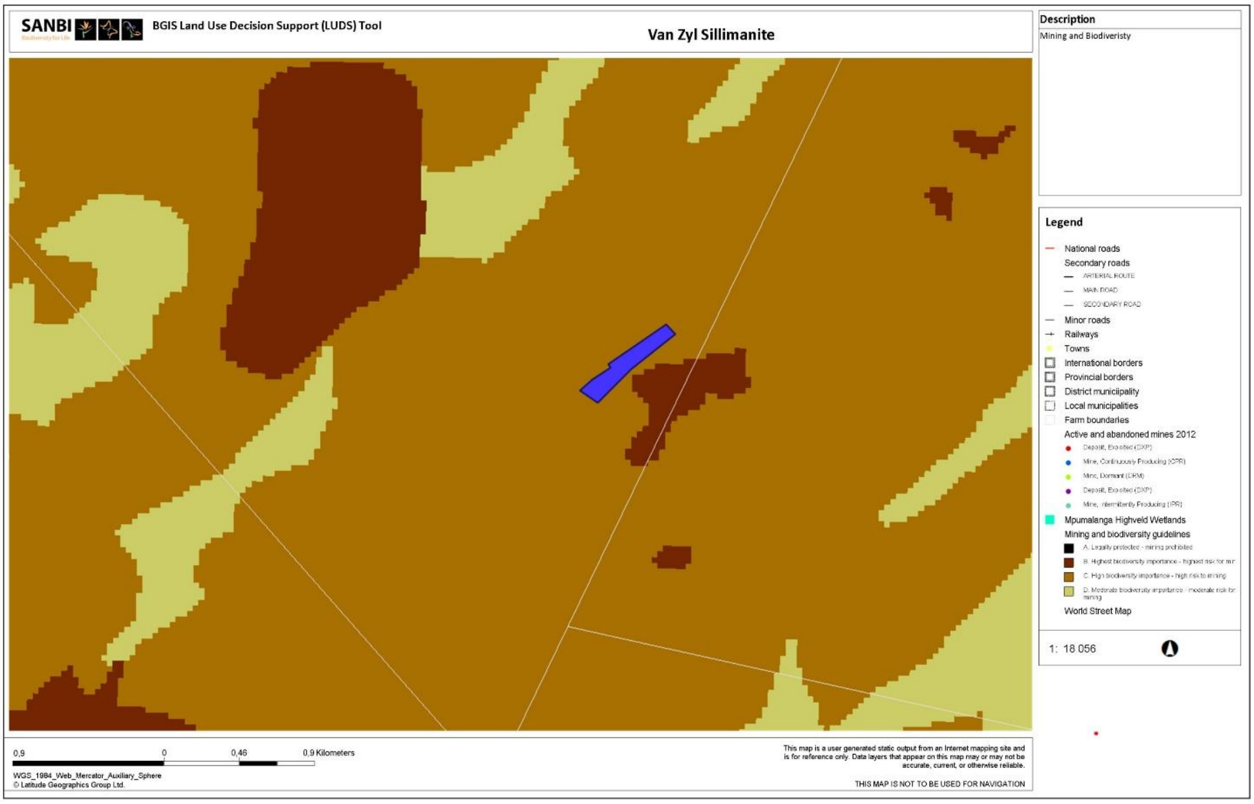

Figure 18: Mining and Biodiversity Guidelines Map (SANBI) (DEA, 2013) where the brown area shows areas of high biodiversity importance, dark brown – highest biodiversity areas and beige – areas of moderate importance.

Although the site is situated within an area of high biodiversity importance, the nature and scale of the proposed mining permit activities is such that it cannot be considered a threat to biodiversity. The footprint of the proposed mining area was kept to the already disturbed areas on the property and the access roads will be kept to already existing roads.

The Botanical Study mentioned that cumulative impacts of developments on population viability of species can be reduced significantly if new developments are kept as close as possible to existing developed and/or transformed areas or, where such is not possible, different sections of development be kept as close together as possible. Due to the extent of this proposed mining footprint (smaller than 5 ha) as well as the location of the mining area within an already largely transformed and disturbed area along with the similar locations and sizes of the other proposed mining area (VZS Mine) these mining activities will have a very limited contribution to the cumulative impacts of the area and will not:

- compromise the ecological functioning of the larger "natural" environment; and
- disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

Also refer to Part A (3)(h)(iv)(1)(c)(iii) Site Specific Flora

Fauna

Various small mammals and reptiles occur on the property. Larger herbivore species are very scares or absent due to the conflicting land use. Animals that may occur in the area will be very similar to those found around Pella / Aggeneys and surrounding towns. The fauna at the site will not be impacted by the proposed mining activity as they will be able to move away or through the site, without being harmed. Most of the natural wild fauna left within these areas are nocturnal; such as the silver back jackal, bat ear fox, cape hare and several other rodent species.

Mammals

The farm Wortel, comprise largely of natural habitats, subject to relatively low stocking levels of livestock (sheep, goats and cattle) with the most disturbed areas occurring around the farm houses and outbuildings, water points and access tracks. The local occurrences of mammals are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupiculous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of global distribution ranges.

From a mammal habitat perspective, two of the four major habitats identified above are very prominent on the study site, namely terrestrial and rupiculous (rock-dwelling) habitat. Very little arboreal and wetland-associated habitat occurs on the study site. Although not obvious in dry conditions, during periods of exceptional rainfall there are watercourses that flow, supporting a range of unusual biodiversity. Arboreal habitat is almost non-existent on the study site. A few *Acacia* species and other small trees and bushes occur scattered in the dunes. A few Quiver trees (*Aloe dichotoma*) occur on some of the mountain slopes.

At least fifty six mammal species are expected to occur within the study area (Table below). It should be noted that potential occurrences is interpreted as to be possible over a period of time as result of expansion and contractions of population densities and ranges which stimulate migration. The feral mammal species expected to occur on the study site (e.g. house mice, house rats, dogs and cats) were omitted from the assessment since these species are normally associate with human settlements. Mammals reliant on wetland and arboreal habitats were omitted from the list of occurrences since these habitat-types are absent from the study site. As such a species richness of 56 species in an area with average habitat diversity and a low carrying capacity is presented below.

Table 13: Mammal diversity. The species deduced to occupy the site (Systematics and taxonomy as proposed by Bronner et.al [2003] and Skinner and Chimimba [2005])

	SCIENTIFIC NAME	ENGLISH NAME
*	*Macroscelides proboscideus*	Round-eared elephant shrew
Y	*Elephantulus rupestris*	Western rock elephant shrew
Y	*Orycteropus afer*	Aardvark
Y	*Procavia capensis*	Rock dassie
Y	*Lepus capensis*	Cape hare
Y	*Lepus saxatilis*	Scrub hare
Y	*Pronolagus rupestris* Smith"s	Smith"s red rock rabbit
Y	*Hystrix africaeaustralis*	Cape porcupine
Y	*Petromus typicus*	Dassie rat
Y	*Pedetes capensis*	Springhare
Y	*Xerus inaurus*	South African ground squirrel
?	*Graphiurus ocularis*	Spectacled dormouse
*	*Rhabdomys pumilio*	Four-striped grass mouse
*	*Mus minutoides*	Pygmy mouse
*	*Aethomys namaquensis*	Namaqua rock mouse
Y	*Parotomys brantsii*	Brant"s whistling rat
Y	*Parotomys littledalei*	Littledale"s whistling rat
*	*Desmodillus auricularis*	Cape short-tailed gerbil
*	*Gerbillurus paeba*	Hairy-footed gerbil
*	*Gerbillurus vallinus*	Brush-tailed hairy-footed gerbil
DD*	*Gerbilliscus leucogaster*	Bushveld gerbil
*	*Petromus typicus*	Dassie rat
*	*Gerbilliscus brantsii*	Highveld gerbil
?	*Saccostomus campestris*	Pouched mouse

	SCIENTIFIC NAME	ENGLISH NAME
*	*Malacothrix typical*	Gerbil mouse
*	*Petromyscus collinus*	Pygmy rock mouse
?	*Papio hamadryas*	Chacma baboon
DD*	*Crocidura cyanea*	Reddish-grey musk shrew
?	*Sauromys petrophilus*	Flat-headed free-tailed bat
*	*Tadarida aegyptiaca*	Egyptian free-tailed bat
?	*Cistugo seabrai*	Angolan hairy bat
*	*Neoromicia capensis*	Cape serotine bat
?	*Eptesicus hottentotus*	Long-tailed serotine bat
?	*Nycteris thebaica*	Egyptian slit-faced bat
?	*Rhinolophus fumigatus*	Rüppel"s horseshoe bat
NT?	*Rhinolophus clivosus*	Geoffroy"s horseshoe bat
NT?	*Rhinolophus darlingi*	Darling"s horseshoe bat
?	*Rhinolophus capensis*	Cape horseshoe bat
?	*Rhinolophus denti*	Dent"s horseshoe bat
Y	*Proteles cristatus*	Aardwolf
Y	*Caracal*	Caracal
Y	*Felis silvestris*	African wild cat
?	*Felis nigripes*	Black-footed cat
*	*Genetta*	Small-spotted genet
*	*Suricata suricatta*	Suricate
Y	*Cynictis penicillata*	Yellow mongoose
?	*Galerella sanguinea*	Slender mongoose
?	*Galerella pulverulenta*	Cape grey mongoose
Y	*Otocyon megalotis*	Bat-eared fox
Y	*Vulpes chama*	Cape fox
Y	*Canis mesomelas*	Black-backed jackal
NT?	*Mellivora capensis*	Honey badger
*	*Ictonyx striatus*	Striped polecat
Y	*Oryx gazella*	Gemsbok
Y	*Antidorcas marsupialis*	Springbok
	Raphicerus campestris	Steenbok
Y	*Oreotragus oreotragus*	Klipspringer

Y Definitely present or have a high probability to occur;
***** *Medium probability to occur based on ecological and distributional parameters;*
? *Low probability to occur based on ecological and distributional parameters.*

Red Data species rankings as defined in Friedmann and Daly"s S.A. Red Data Book / IUCN (World Conservation Union) (2004) are indicated in the first column: CR= Critically Endangered, En = Endangered, Vu = Vulnerable, LR/cd = Lower risk conservation dependent, LR/nt = Lower Risk near threatened, DD = Data Deficient. All other species are deemed of Least Concern.

All Red Data species listed in Table 13 as Critically Endangered, Rare, Near Threatened or Data Deficient are discerning species and became endangered as result of the deterioration of their preferred habitats. No other Red Data or sensitive species are deemed present on the site, since the site falls outside the distributional ranges of some species, or does not offer suitable.

Four pertinent matters emerge from the list of mammals compiled during the site visit and the subsequent desktop study:

1. The species assemblage is typical of a western semi-arid region (particularly species such as the elephants shrew species, the ground squirrel, the spectacled dormouse, the various gerbil species, the dassie rat, whistling rats, the black-footed cat, the bat-eared fox, the Cape fox,.);
2. The species richness of 56 is typical of an extensive area such as the property (5000 ha) and of adjoining areas, with a near-natural degree of connectivity;
3. Land-use practices and civilization pressures are geared to low-key grazing with a focus on concomitant floral conservation to benefit year-round grazing, which are conducive to species richness; and
4. Field observations suggested that population levels were low during the site visit.

Population fluctuations are not uncommon, and often have a domino effect (for instance when prey population densities decrease in numbers, this will have an adverse effect on carnivore and raptor numbers). The rest of the species richness is made up from common and robust mammals with wide distributional ranges such as aardvarks, springhares, four-striped grass mouse, porcupines, the caracal, the genet, the two mongoose species, the black-backed jackal etc.

The role of insectivorous bats in an ecosystem is often under-estimated, whereas their susceptibility to reigning environmental conditions is under-appreciated. Bats are sensitive to adverse daytime environmental conditions and predation, and suitable daytime roosting sites are of cardinal importance. Especially the mountains have many boulders and rock faces forming many overhangs and deep crevices suitable for daytime roosts.

The proposed mining permit activities will not result in a progressive loss of ecological sensitive and important habitat units, ecosystem function e.g. reduction in water quality, loss of faunal habitat, and of loss/displacement of threatened or protected fauna. The project will not affect mammals which may occur on site in a significant manner. Taking cognisance of the above, the main conservation objectives for mammals on the site are to avoid the mountains and their gravel skirts and the drainage lines, including the untransformed adjacent grassy plains.

Herpetofauna

From a herpetological habitat perspective, the identified terrestrial and rupiculous (rockdwelling) habitats are of significance. Man-made rupiculous habitat exists in the form of homesteads and its surrounding outbuildings, built dams and worker accommodation. These man-made habitats are often islands in the sea of terrestrial habitat and provides excellent artificial habitat for many rupiculous reptile species. In addition, connectivity across the area is fair and real opportunities for migration exist.

The Northern Cape is renowned for its biodiversity and the herpetofauna is no exception to the rule. It is especially true for reptiles in general and lizards in particular. Based on the habitat available on site, a variety of reptile and some amphibian species are expected to occupy the mining permit area. Very few trees occur on the study site, which provided habitat for arboreal (tree-living) herpetofauna. As a result arboreal species like the Kalahari tree skink are excluded from the species list (Table 14).

Table 14: Reptile and Amphibian species diversity deduced to be present on site Systematic arrangement and nomenclature according to Branch (1998), Alexander and Marais (2007), Minter, et.al (2004) & Du Preez and Carruthers (2009)

	SCIENTIFIC NAME	ENGLISH NAME
	CLASS: REPTILIA	**REPTILES**
	Order: TESTUDINES	**TORTOISES & TERRAPINS**
	Family:Testudinidae	**Tortoises**
Y	*Psammobates tentorius verraxii*	Karoo Tent Tortoise
	Order: SQUAMATA	**SCALE-BEARING REPTILES**
	Suborder:LACERTILIA	**LIZARDS**
	Family: Gekkonidae	**Geckos**
Y	√ *Chondrodactylus angulifer*	Giant Ground Gecko
*	***** *Goggia lineate*	Striped Dwarf Leaf-toed Gecko
?	**?** *Goggia rupicola*	Namaqualand Dwarf Leaf-toed Gecko
?	**?** *Lygodactylus bradfieldi*	Bradfield"s Dwarf Gecko
Y	√ *Chondrodactylus bibronii*	Bibron"s Tubercled or Thick-toed Gecko
?	**?** *Pachydactylus labialis*	Northern Cape Thick-toed or Northern Cape Gecko
?	**?** *Pachydactylus capensis*	Cape Thick-toed or Cape Gecko
Y	√ *Pachydactylus mariquensis*	Marico Thick-toed Gecko
?	**?** *Pachydactylus namaquensis*	Namaqua Thick-toed Gecko
?	**?** *Pachydactylus rugosus*	Rough Thick-toed Gecko
Y	√ *Ptenopus garrulus*	Barking Gecko
	Family: Agamidae	**Agamas**
?	**?** *Agama aculeata*	Ground Agama
Y	√ *Agama anchietae*	Anchieta"s Agama
Y	√ *Agama atra*	Southern Rock Agama
	Chamaeleonidae	**Chameleons**
Y	√ *Chamaeleo namaquensis*	Namaqua Chameleon

	SCIENTIFIC NAME	ENGLISH NAME
	Family: Scincidae	**Skinks**
Y	√ *Acontias lineatus*	Striped Legless Skink
?	**?** *Acontias gracilicauda namaquensis*	Thin-tailed Legless Skink
Y	√ *Trachylepis capensis*	Cape Skink
Y	√ *Trachylepis occidentalis*	Western Three-striped Skink
Y	√ *Trachylepis sulcata*	Western Rock Skink
	Family:Lacertidae	**Old World Lizards or Lacertids**
Y	√ *Meroles suborbitalis*	Spotted Desert Lizard
?	*? Pedioplanis laticeps*	Cape Sand Lizard
Y	√ *Pedioplanis lineoocellata*	Spotted Sand Lizard
Y	√ *Pedioplanis namaquensis*	Namaqua Sand Lizard
*	***** *Pedioplanis inornata*	Plain Sand Lizard
*	***** *Nucras tessellata*	Western Sandveld Lizard
?	**?** *Agama aculeata*	Ground Agama
Y	√ *Agama anchietae*	Anchieta"s Agama
Y	√ *Agama atra*	Southern Rock Agama
	Family: Gerrhosauridae	**Family: Gerrhosauridae Plated Lizards**
?	*? Cordylosaurus subtessellatus*	Dwarf Plated lizard
?	*?Vu Gerhosaurus typicus* Namaqua	Namaqua Plated Lizard
	Family: Cordyidae	**Family: Cordyidae**
*	***** *Cordylus polyzonus*	Karoo Girdled Lizard
Y	*? Platysaurus broadleyi*	Augrabies or Broadley"s Flat Lizard
	Family: Varanidae	**Family: Varanidae Monitors**
Y	√ *Varanus albigularis*	Rock Monitor
	Suborder: SERPENTES	**Suborder: SERPENTES SNAKES**
	Family: Typhlopidae	**Family: Typhlopidae Blind Snakes**
*	***** *Rhinotyphlops lalandei*	Delalande"s Beaked Blind Snake
*	***** *Rhinotyphlops schinzi*	Schinz"s Beaked Blind Snake
	Family: Leptotyphlopidae	**Thread Snakes**
*	***** *Leptotyphlops occidentalis*	Namaqua Worm or Western Thread Snake
	Family: Colubridae Typical Snakes	**Typical Snakes**
Y	*Lamprophis capensis*	Brown House Snake
?	*Lamprophis guttatus*	Spotted House Snake
?VU	*Lamprophis fiskii*	Fisk"s House Snake
	Pseudaspis cana	Mole Snake
?	*Prosymna bivittata*	Two-striped Shovel-snout
Y	*Prosymna frontalis*	South-western Shovel-snout
Y	*Dipsina multimaculata*	Dwarf Beaked Snake
Y	*Psammophis notostictus*	Karoo Whip or Sand Snake
Y	*Psammophis trinasalis*	Kalahari Sand Snake
Y	*Psammophis leightoni namibensis*	Namib Sand Snake
?	*Psammophis crucifer* Crossed	Crossed Whip Snake
Y	*Dasypeltis scabra*	Common or Rhombic Egg Eater
Y	*Telescopus beetzii* Beetz"s	Tiger Snake
	Family: Elapidae	**Cobras, Mambas and Others**
Y	*Aspidelaps lubricus* Coral Shield Cobra	Coral Shield Cobra
Y	*Naja nivea* Cape Cobra	Cape Cobra
Y	*Naja nigricollis* Black-necked Spitting Cobra	Black-necked Spitting Cobra
	Family: Viperidae	**Adders**
Y	*Bitis caudalis*	Horned Adder
Y	*Bitis arietans*	Puff Adder
?	*Bitis xeropaga*	Desert Mountain Adder
?	*Bitis cornuta*	Many-horned Adder
	CLASS: AMPHIBIA	**AMPHIBIANS**
	Order: ANURA	**FROGS**

	SCIENTIFIC NAME	ENGLISH NAME
	Family: Pipidae	**Clawed Frogs**
?	*Xenopus laevis*	Common Platanna
	Family: Bufonidae Toads	
?	*Vandijkophrynus gariepensis*	Karoo Toad
*	*Vandijkophrynus robinsoni* Paradise Toad	Paradise Toad
	Family: Microhylidae Rubber Frogs	
?	*Phrynomantis annectens* Marled Rubber Frog	Marled Rubber Frog
	Family: Breviceptidae Rain Frogs	
?	*Breviceps namaquensis* Namaqua Rain Frog	Namaqua Rain Frog
	Family: Pyxicephalidae	
?	*Amietia fuscigula*	Cape River Frog
*VU	*Strongylopus springbokensis*	Namaqua Stream Frog
?	*Cocosternum boettgeri* Boettger"s	Boettger"s Caco or Common Caco
*	*Cocosternum namaquense*	Namaqua Caco
*	*Tomopterna delalandii*	Cape Sand Frog
?	*Tomopterna tandyi* Tandy"s	Tandy"s Sand Frog

Y Definitely there or have a high probability of occurring;
** Medium probability of occurring based on ecological and distributional parameters;*
? Low probability of occurring based on ecological and distributional parameters.

Red Data species rankings as defined in Branch, The Conservation Status of South Africa's threatened Reptiles": 89 – 103. In: - G.H.Verdoorn & J. le Roux (editors), „The State of Southern Africa's Species (2002) and Minter, et. Al, Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (2004) are indicated in the first column: CR= Critically Endangered, En= Endangered, Vu = Vulnerable, NT = Near Threatened, DD = Data Deficient. All other species are deemed of Least Concern.

<u>Red Data Listed Reptiles</u>

The study site area falls outside the natural range of the speckled padloper, Namaqua day Gecko, Lawrence's girdled lizard, Armadillo girdled lizard, Loma's blind legless skink, Namaqua dwarf adder and the Southern African python.

The Namaqua plated lizard inhabits dry sandy areas and rocky hillsides (McLachlan 1988), which is abundantly present on the study site. This species has been recorded from Springbok (McLachlan 1988). Although the possibility is very small that this species may occur on the study site, it may potentially be present.

Very few Frisk's house snake specimens are ever collected and little is known of its biology. There is a specimen collected from Steinkopf in the Ditsong National Museum of Natural History (Transvaal Museum) (Broadley 1990). It is very difficult to confirm whether this cryptic snake is present on any study site, but it is highly unlikely that it occurs on this particular study site.

Red Data Listed Amphibians

The study site falls outside the natural range of giant bullfrogs, desert rain frog and the Karoo caco. It is unlikely that these species will occur on the mining permit area.

The Namaqua stream frog occurs in areas which receive annual rainfall of < 60mm. In this arid environment, these frogs are restricted to the proximity of springs, seps, small permanent and non-permanent streams and artificial impoundments (Channing 2004). The study site contains some of these water sources and the fact that a fragmented sub-population has been recorded at the nearby Gamsberg, makes the occurrence of this frog species on the study site a possibility. As a result, it is important that the drainage lines must be avoided and remain unaffected.

As indicated previously, the proposed mining operation is temporary in nature and will result in the disturbance of a relatively small surface areas upon which the disturbed areas will be rehabilitated. The proposed mining permit activities will therefore not result in a progressive loss of ecological sensitive and important habitat units, ecosystem function e.g. reduction in water quality, loss of faunal habitat, and of loss/displacement of threatened or protected fauna. The project will not affect reptiles and amphibians which may utilise the site in a significant manner. Taking cognisance of the above, the main conservation objectives for herpetofauna are to avoid the mountains and their gravel skirts and the drainage lines, including the untransformed adjacent grassy plains.

Birds

Based on the habitats identified on site, a wide variety of bird species occurs, and is expected to occur on the mining permit area. Table 15 shows the bird species expected to occur on and around the mining permit area:

Table 15: Birds species expected to occur on and around the site

COMMON ENGLISH NAME	SCIENTIFIC NAME	STATUS CODES (SEE BELOW)		
		RD	S	E
Common Ostrich	*Struthio camelus*			
Maccoa Duck	*Oxyura maccoa*			
Egyptian Goose	*Alopochen aegyptiaca*			
South African Shelduck	*Tadorna cana*			
Spur-winged Goose	*Plectropterus gambensis*			
Cape Teal	*Anas capensis*			
Yellow-billed Duck	*Anas undulata*			

COMMON ENGLISH NAME	SCIENTIFIC NAME	STATUS CODES (SEE BELOW)		
		RD	S	E
Cape Shoveler	*Anas smithii*		B/NBM	
Red-billed Teal	*Anas erythrorhyncha*			
Southern Pochard	*Netta erythrophthalma*			
Acacia Pied Barbet	*Tricholaema leucomelas*			
African Hoopoe	*Upupa africana*			
Swallow-tailed Bee-eater	Bee-eater *Merops hirundineus*			
European Bee-eater	*Merops apiaster*			
White-backed Mousebird	*Colius colius*			
Red-faced Mousebird	*Urocolius indicus*			
Burchell's Coucal	*Centropus burchellii*			
Alpine Swift	*Tachymarptis melba*		BM	
Common Swift	*Apus apus*		NBM	
Bradfield's Swift	*Apus bradfieldi*			
Little Swift	*Apus affinis*			
Owl	*Tyto alba*			
Cape Eagle-Owl	*Bubo capensis*			
Spotted Eagle-Owl	*Bubo africanus*			
Freckled Nightjar	*Caprimulgus tristigma*			
Rufous-cheeked Nightjar	*Caprimulgus rufigena*		BM	
Rock Dove	*Columba livia*			
Speckled Pigeon	*Columba guinea*			
Laughing Dove	*Streptopelia senegalensis*			
Cape Turtle-Dove	*Streptopelia capicola*			
Namaqua Dove	*Oena capensis*			
Ludwig's Bustard	*Neotis ludwigii*	**VUL**		
Kori Bustard	*Ardeotis kori*	**VUL**		
Karoo Korhaan	*Eupodotis vigorsii*			
African Rail	*Rallus caerulescens*			
Red-knobbed coot	*Fulica cristata*			
Namaqua Sandgrouse	*Pterocles namaqua*			
Double-banded Sandgrouse	*Pterocles bicinctus*			
Marsh Sandpiper	*Tringa stagnatilis*		**NBM**	
Common Greenshank	*Tringa nebularia*		**NBM**	
Wood Sandpiper	*Tringa glareola*		**NBM**	
Common Sandpiper	*Actitis hypoleucos*		**NBM**	
Ruddy Turnstone	*Arenaria interpres*		**NBM**	
Little Stint	*Calidris minuta*		**NBM**	
Curlew Sandpiper	*Calidris ferruginea*		**NBM**	
Ruff	*Philomachus pugnax*		**NBM**	
Spotted Thick-knee	*Burhinus capensis*			
Black-winged Stilt	*Himantopus himantopus*			
Pied Avocet	*Recurvirostra avosetta*			
Common Ringed Plover	*Charadrius hiaticula*			
Kittlitz's Plover	*Charadrius pecuarius*			
Three-banded Plover	*Charadrius tricollaris*			
Chestnut-banded Plover	*Charadrius pallidus*	**NT**		
Blacksmith Lapwing	*Vanellus armatus*			
Crowned Lapwing	*Vanellus coronatus*			
Double-banded Courser	*Rhinoptilus africanus*			
Burchell's Courser	*Cursorius rufus*			
White-winged Tern	*Chlidonias leucopterus*		NBM	
Black-shouldered Kite	*Elanus caeruleus*			
Yellow-billed Kite	*Milvus aegyptius*			

COMMON ENGLISH NAME	SCIENTIFIC NAME	STATUS CODES (SEE BELOW)		
		RD	S	E
Black-chested Snake-Eagle	*Circaetus pectoralis*			
Black Harrier	*Circus maurus*	NT		(*)
Southern Pale Chanting Goshawk	*Melierax canorus*			
Gabar Goshawk	*Melierax gabar*			
Steppe Buzzard	*Buteo buteo*		NBM	
Jackal Buzzard	*Buteo rufofuscus*			(*)
Verreaux's Eagle	*Aquila verreauxii*			
Martial Eagle	*Polemaetus bellicosus*	VU		
Secretarybird	*Sagittarius serpentarius*	VU		
Pygmy Falcon	*Polihierax semitorquatus*			
Rock Kestrel	*Falco rupicolus*			
Greater Kestrel	*Falco rupicoloides*			
Red-necked Falcon	*Falco chicquera*			
Lanner Falcon	*Falco biarmicus*	NT		
Little Grebe	*Tachybaptus ruficollis*			
Yellow-billed Egret	*Egretta intermedia*			
Grey Heron	*Ardea cinerea*			
Black-headed Heron	*Ardea melanocephala*			
Cattle Egret	*Bubulcus ibis*			
Little Bittern	*Ixobrychus minutus*			
Bokmakierie	Bokmakierie *Telophorus zeylonus*			
Pririt Batis	Pririt Batis *Batis pririt*			
Cape Crow	*Corvus capensis*			
Pied crow	*Corvus albus*			
Red-backed Shrike	*Lanius collurio*		NBM	
Lesser Grey Shrike	*Lanius minor*		NBM	
Common Fiscal	*Lanius collaris*			
Cape Penduline-Tit	*Anthoscopus minutus*			
Ashy Tit	*Parus cinerascens*			
Grey Tit	*Parus afer*			(*)
Brown-throated Martin	*Riparia paludicola*			
Barn Swallow	*Hirundo rustica*		NBM	
White-throated Swallow	*Hirundo albigularis*		BM	
Greater Striped Swallow	*Cecropis cucullata*		BM	
Rock Martin	*Hirundo fuligula*			
Common House-Martin	*Delichon urbicum*		NBM	
African Red-eyed Bulbul	*Pycnonotus nigricans*			
Fairy Flycatcher	*Stenostira scita*			(*)
Yellow-bellied Eremomela	*Eremomela icteropygialis*			
Karoo Eremomela	*Eremomela gregalis*			(*)
Lesser Swamp-Warbler	*Acrocephalus gracilirostris*			
Layard's Tit-Babbler	*Sylvia layardi*			(*)
Orange River White-eye	*Zosterops pallidus*			
Grey-backed Cisticola	*Cisticola subruficapilla*			
Zitting Cisticola	*Cisticola juncidis*			
Tawny-flanked Prinia	*Prinia subflava*			
Karoo Prinia	*Prinia maculosa*			(*)
Namaqua Warbler	*Phragmacia substriata*			(*)
Rufous-eared Warbler	*Malcorus pectoralis*			
Cinnamon-breasted Warbler	*Euryptila subcinnamomea*			(*)
Cape Clapper Lark	*Mirafra apiata*			(*)
Sabota Lark	*Calendulauda sabota*			
Fawn-coloured Lark	*Calendulauda africanoides*			

COMMON ENGLISH NAME	SCIENTIFIC NAME	STATUS CODES (SEE BELOW)		
		RD	S	E
Red Lark	*Calendulauda burra*	VUL		
Karoo Lark	*Calendulauda albescens*			(*)
Spike-heeled Lark	*Chersomanes albofasciata*			
Karoo Long-billed Lark	*Certhilauda subcoronata*			
Black-eared Sparrowlark	*Eremopterix australis*			(*)
Grey-backed Sparrowlark	*Eremopterix verticalis*			
Red-capped Lark	*Calandrella cinerea*			
Stark's Lark	*Spizocorys starki*			
Pink-billed Lark	*Spizocorys conirostris*			
Sclater's Lark	*Spizocorys sclateri*	NT		(*)
Large-billed Lark	*Galerida magnirostris*			(*)
Short-toed Rock-Thrush	*Monticola brevipes*			
Karoo Thrush	*Turdus smithi*		NBM	(*)
Chat Flycatcher	*Bradornis infuscatus*			
Spotted flycatcher	*Muscicapa striata*			
Cape Robin-Chat	*Cossypha caffra*			
Karoo Scrub-Robin	*Erythropygia coryphoeus*			
Mountain Wheatear	*Oenanthe monticola*			
Capped Wheatear	*Oenanthe pileata*			
Sickle-winged Chat	*Cercomela sinuata*			(*)
Karoo Chat	*Cercomela schlegelii*			
Tractrac Chat	*Cercomela tractrac*			
Familiar Chat	*Cercomela familiaris*			
Ant-eating Chat	*Myrmecocichla formicivora*			
Pale-winged Starling	*Onychognathus nabouroup*		I	
Cape Glossy Starling	*Lamprotornis nitens*			
Wattled Starling	*Creatophora cinerea*			
Common Starling	*Sturnus vulgaris* I			
Malachite Sunbird	*Nectarinia famosa*			
Southern Double-collared Sunbird	*Cinnyris chalybeus*			(*)
Dusky Sunbird	*Cinnyris fuscus*			
Scaly-feathered Finch	*Sporopipes squamifrons*			
Sociable Weaver	*Philetairus socius*			
Southern Masked-Weaver	*Ploceus velatus*			
Red-billed Quelea	*Quelea quelea*			
Southern Red Bishop	*Euplectes orix*			
Red-headed Finch	*Amadina erythrocephala*			
Common Waxbill	*Estrilda astrild*		I	
Pin-tailed Whydah	*Vidua macroura*			
House Sparrow	*Passer domesticus*			
Cape Sparrow	*Passer melanurus*			
Southern Grey-headed Sparrow	*Passer diffusus*			
African Pied Wagtail	*Motacilla aguimp*			
Cape Wagtail	*Motacilla capensis*			
African Rock Pipit	*Anthus crenatus*			(*)?
African Pipit	*Anthus cinnamomeus*			
Long-billed Pipit	*Anthus similis*			
Black-headed Canary	*Serinus alario*			(*)
Black-throated Canary	*Crithagra atrogularis*			
Yellow Canary	*Crithagra flaviventris*			
White-throated Canary	*Crithagra albogularis*			
Lark-like Bunting	*Emberiza impetuani*			
Cape Bunting	*Emberiza capensis*			

Red Status	Status in south Africa (S)	Endemism in South Africa (E)
T = Threatened	BM = breeding migrant	Endemism in South Africa (E) (not southern Africa as in field guides)
NT = Near-Threatened	NBM = non-breeding migrant	
Vul = Vulnerable	V = vagrant	* = endemic
E = Endangered	I = introduced	
CE = Critically Endangered	R = rare	(*) = near endemic (i.e. ~70% or more of population in RSA)
RE = Regionally Extinct	PRB = probable rare breeder	B* = breeding endemic
§ = Refer to footnote	RB = rare breeder	B(*) = breeding near endemic
	RV = rare visitor	W* = winter endemic
Red Status is from *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland, Barnes (2001).*		

Nine species of international and/or national conservation concern (Red Data species, IUCN/Birdlife International 2011, Barnes 2000), ranging from Near Threatened to Vulnerable, are considered as possible to occur on site. Most of these threatened species fall into a few obvious categories by habitat preference (Table 16) and their likelihood of occurrence on site (

Table 17).

Table 16: List of threatened species that will possibly make use of the habitats on and around the site, showing their preferred habitat types. Note that one species may have more than one habitat preference

THREATENED STATUS	SPECIES	PREFERRED HABITAT TYPE(S)			
		GRASSY PLAINS	RED SAND/DUNES	BARE WASHES	ROCKY MOUNTAINS & GRAVEL
Near Threatened	Chestnut-banded Plover		X	X	
	Black Harrier	X	X		
	Lanner Falcon	X	X	X	X
	Sclater's Lark				X
Vulnerable	Ludwig's Bustard	X	X	X	
	Kori Bustard	X	X	X	
	Martial Eagle	X	X	X	
	Secretarybird	X	X	X	
	Red Lark	X	X	X	
TOTALS	**9**	**7**	**8**	**7**	**2**

Table 17: The expected frequency of occurrence of threatened bird species on and around the site

THREATENED STATUS	SPECIES	PROBABILITY OF OCCURRENCE ON SITE			
		REGULAR RESIDENT	FREQUENT VISITOR	ERRATIC VISITOR	INFREQUENT VAGRANT
Near Threatened	Chestnut-banded Plover			X	
	Black Harrier			X	
	Lanner Falcon		X		
	Sclater's Lark			X	
Vulnerable	Ludwig's Bustard	X			
	Kori Bustard			X	
	Martial Eagle		X		
	Secretarybird			X	
	Red Lark				
TOTALS	**9**	**1**	**2**	**5**	**0**

Based on the analysis above, the most important habitats to conserve for threatened bird species are the grassy plains and the red sand/dunes, with the bare washes also important during reproductive periods after rains. However, the grassy plains form part of extensive similar habitat in the area, while the red dunes are more restricted but also much more productive, for livestock and birds alike, including the Red Lark that is a restricted-range endemic to Bushmanland. The bare washes (for Chestnut-banded Plover) and gravel fields (for Scalter's Lark) are only really productive after good rains, while the mountains have nest sites for the Lanner Falcon when good rains attract large numbers of nomadic insect- and seed-eating birds.

Two Vulnerable species are expected to be regular breeding residents (Ludwig's Bustard and Red Lark). The Vulnerable Martial Eagle and Secretary Bird, and the Near Threatened Lanner Falcon are expected to be regular visitors to the area, when their prey animals are abundant, but while no sufficiently large trees were seen as likely nest sites for the Eagle or Secretary bird, the large south-facing cliffs could well support nesting ledges for the falcon, as they apparently do for Verreaux's Eagle.

The remaining four threatened species are expected to be erratic visitors when high rainfall creates productive conditions (plant cover, seeds, insects, small vertebrates). Some are resident species in the general area of the Northern Cape whose ephemeral habitats on the property are also only likely to become suitable after good rains, the Chestnut-banded Plover visiting and possibly feeding and breeding in/around the more saline pans and Scalter's Lark using large grass seeds on the few chalky gravel patches. The Kori Bustard generally prefers higher rainfall areas with more ground cover and productivity, so although they do sometimes visit the area it seems unlikely that they breed there. Finally, the Black Harrier is expected only as an erratic, non-breeding winter visitor to the area from the Northern Cape, again most likely when good rains have produced abundant small animals.

As indicated previously, the proposed mining activity is temporary in nature and will result in the disturbance of a relatively small surface area, and disturbed areas will be rehabilitated. The proposed mining permit activities will therefore not result in a progressive loss of ecological sensitive and important habitat units, ecosystem function e.g. reduction in water quality, loss of faunal habitat, and of loss/displacement of threatened or protected fauna. The project will therefore not affect bird species which may utilise the site in a significant manner. Taking cognisance of the above, the main conservation objectives for birds are to avoid the sand dunes, mountains and their gravel skirts, as well as the drainage lines, including the untransformed adjacent grassy plains.

Surface water

The proposed site falls within the Lower Orange Water Management Area (WMA), specifically in the Orange Sub Water Management Area (Boegoeberg Sub Catchment), in the D81G quaternary catchment area. The Lower Orange WMA is the lowest WMA in the Orange River Basin and as such is affected by upstream activities. The area is arid with rainfall varying from 400 mm in the east to 50 mm on the west coast. The topography of the area is flat with large pans or (endoreic areas that do not contribute runoff to the Orange River system. The Orange River, which forms a green strip in an otherwise arid landscape, also forms the border between South Africa and Namibia over about 550 km to the west of the 20-degree longitude. The Vaal River, the main tributary to the Orange River, has its confluence with the Orange River about 13 km west of Douglas. Other tributaries are the Ongers and Hartebeest Rivers from the south, and the Molopo River and Fish River (Namibia) from the north. There are a number of highly intermittent water courses along the coast which drain directly to the ocean. Sheep and goat farming is practised over most of the area. Large parts of the WMA also include conservation areas. Cultivation is restricted to isolated patches where somewhat higher rainfall occurs, and extensive irrigation is practised in the narrow ribbon of fertile alluvial soils along the Orange River valley. This irrigation is supplied by releases from the Vanderkloof Dam. Large mining operations occur in various parts of the water management area. There are no large urban developments or power stations. Groundwater plays a major role in meeting the water requirements of the towns and rural settlements along the tributaries of the Orange. Less than 1% of the Gross Domestic Product (GDP) of South Africa originates from the Lower Orange WMA. The largest economic sectors (in 1997) in the water management, in terms of GGP, were:

- Government 19,4%
- Mining 17,4%
- Agriculture 15,9%
- Trade 15,1%

Economic activity is largely concentrated along the Orange River, with several towns located on the banks of the river, and at mining developments. The two major storage dams Gariep and Vanderkloof, which are both used to supply all the irrigation, urban, mining and environmental requirements along the Lower Orange River are located in the Upper Orange WMA, but are of vital importance to the Lower Orange. There are no large storage dams in the WMA, with only a few smaller dams on some of the main tributaries. These include:

- Smart Syndicate Dam on the Ongers River.
- Van Wyksvlei on the Carnarvonleegte.

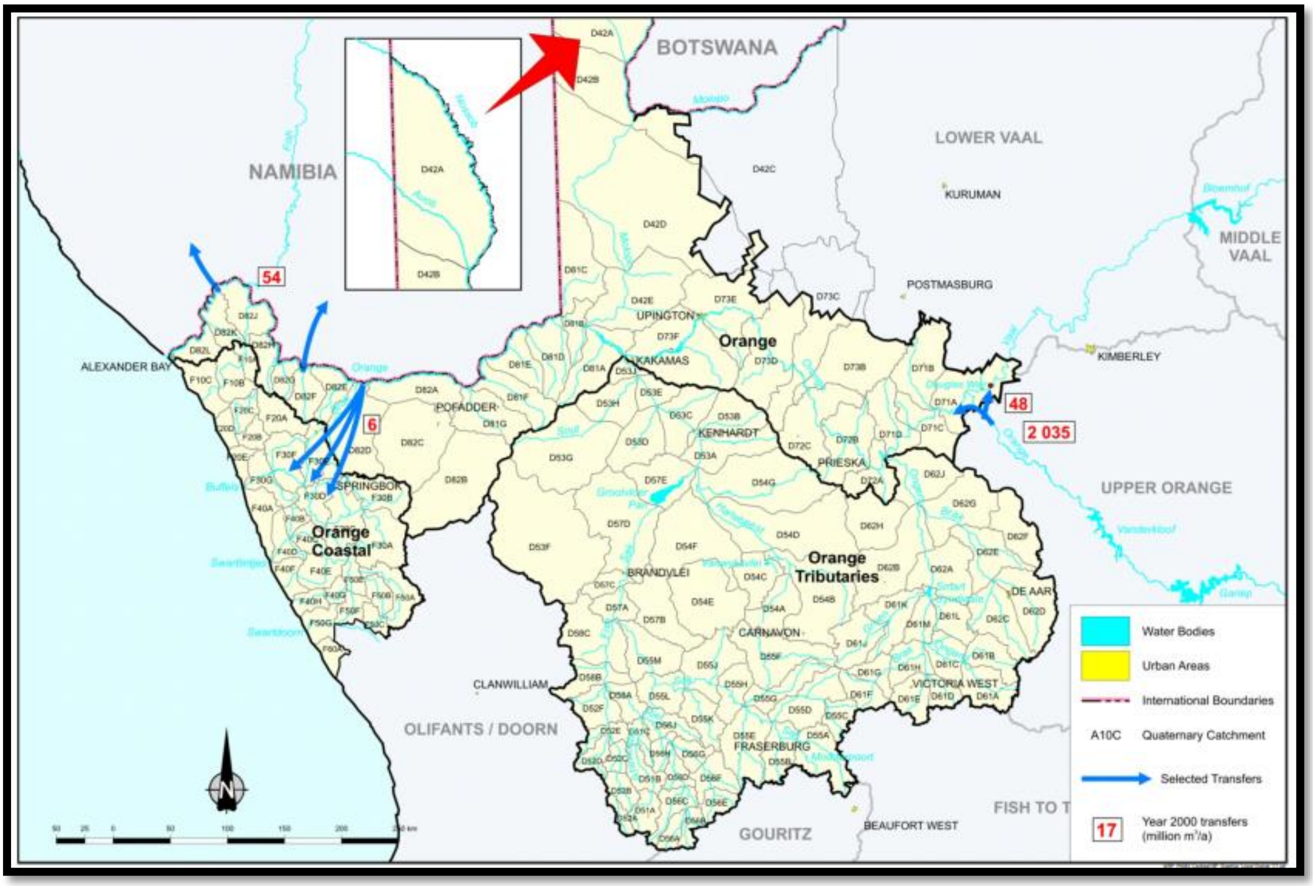

Figure 19: Layout and location of the Lower Orange WMA

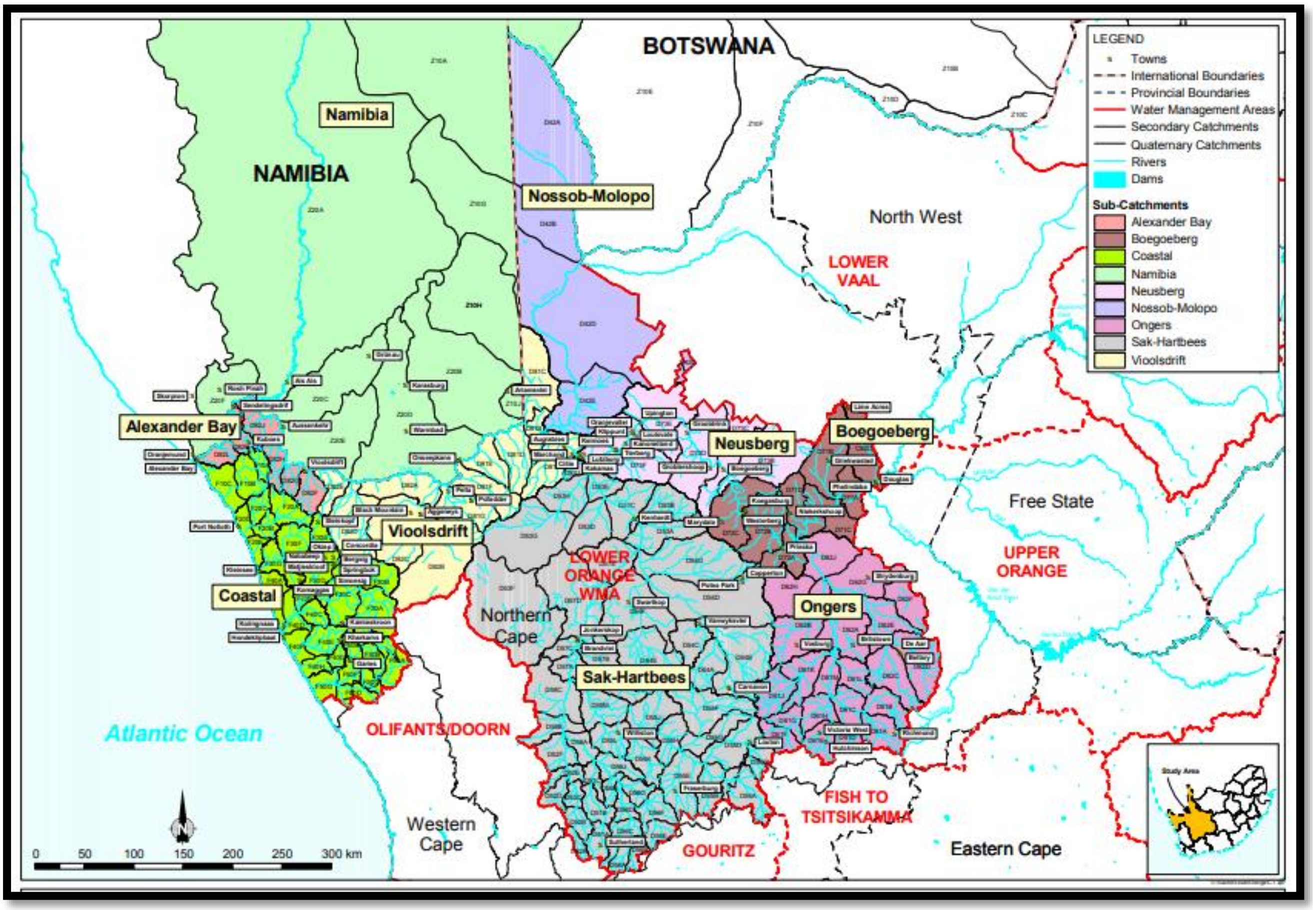

Figure 20: Sub Catchments in the WMA

In its historical natural state, the quality of water in the Orange River was good, although of high turbidity during flood flows. Water from the tributary streams tends to be of high salinity. Both the flow regime and water quality in the Orange River has, however, been severely impacted upon by extensive upstream developments. Salinity in the Orange River has increased due to the transfer of high quality water out of the Orange River (in Lesotho and the Upper Orange WMA) and as a result of high salinity irrigation return flows along the Orange River. Poor quality water from the Vaal River, which contains a high proportion of irrigation return flows as well as treated urban effluent, also enters the Orange River. Salinity is at present still moderate and acceptable along the main stem of the Orange River. Deterioration can be expected with increased upstream irrigation and the situation must be closely monitored. There are algal blooms experienced in the main stem due largely to irrigation return flows, diffuse sources and poor quality water from the upstream Vaal WMAs.

There are algal blooms experienced in the main stem due largely to irrigation return flows, diffuse sources and poor quality water from the upstream Vaal WMAs. The algal blooms are of particular concern as they are potentially toxic. An algal monitoring programme along the Orange River as well as management and communication protocols have been developed by DWS if the algal blooms are identified as toxic. Studies and monitoring programmes are underway to understand the current algae behaviour. (DWAF, ISP Lower Orange WMA, 2004)

Ninety percent of the runoff generated in the two Orange River WMAs is generated in the Upper Orange WMA. The bulk of the runoff generated in the Lower Orange comes from the Fish River in Namibia (approximately 60% of the Lower Orange runoff) but this only enters the main Orange River close to the river mouth. The bulk of the surface water in the Lower Orange Water Management Area is therefore found in the main stem of the Orange River, with virtually all the surface water flowing into the Orange River from the Upper Orange and Lower Vaal WMAs.

There are also several diversion weirs in the Orange River of which Boegoeberg (20 million m³ storage) is the largest. The total water available for use in the Lower Orange water management area during the year 2000 development levels is summarised in Table 18.

Table 18: Available water in year 2000 (million m3/a)

Sub-area	Natural resource		Usable return flow			Total local yield (1)	Transfers in	Grand Total
	Surface water	Ground-water	Irrigation	Urban	Mining and bulk			
Orange	(1 092)	9	96	1	0	**(986)**	2 083	**1 097**
Orange Tributaries	9	13	0	0	0	**22**	0	**22**
Orange Coastal	0	3	0	0	0	**3**	6	**9**
Total	**(1 083)**	**25**	**96**	**1**	**0**	**(961)**	**2 083**	**1 122**

The negative yield for the Orange River within the Lower Orange water management area, as shown in Table 18, is as a result of evaporation losses and evapotranspiration by riparian vegetation along this reach of the river, which by far exceed the run-of-river yield contributed by local inflows. It also includes a component for losses associated with insufficient management of releases from Vanderkloof Dam.

Potential for a dam in the Lower Orange River has been identified for the re-regulation of releases from Vanderkloof Dam as well as the storage of flood flows mainly from the Upper Orange and Vaal Rivers and to a lesser extent also from the flows generated in the Lower Orange. This would contribute to the improved management of the Orange/Vaal River System, and facilitate more water being made available for use.

No meaningful potential for surface water regulation exists in the Orange Coastal sub-area. Factors that could have a significant impact on the available surface water resources include:

- Saving in operational losses with regards to releases from Vanderkloof Dam (See Orange River Overarching ISP; DWAF, 2004a).
- Implementation of the Reserve on the Orange River (See Orange River Overarching ISP; DWAF, 2004a). Indications are that the reserve can vary significantly from the current environmental flows released from Vanderkloof and will therefore significantly impact on the current surplus available in the system.
- Utilising inflows from the Vaal River.
- Irrigation Return Flows. Very little data is available but return flows commonly amount to 10% of irrigation water. Yield analysis assessments for local surface water resources beyond the Orange River main stem can, with the current available hydrology, only be undertaken on a cursory level (using WR90 data).

This should be carried out only when the need exists and will be the responsibility of the specific towns or towns in need. (DWAF, ISP Lower Orange WMA, 2004)

Ground water

The mining permit processes should not have any influence on the quality or quantity of ground water. A negative impact on groundwater usually occurs where subsurface water is pumped out of an excavation pit. This can lower the water table in the immediate surroundings of the excavation, which can negatively impact upon surrounding wetlands (specifically hill slope or seepage wetlands) and boreholes. The proposed method of mining permit will not entail deep excavations from which groundwater will need to be removed and there are no known shallow groundwater on the farm.

Groundwater quality is one of the main factors affecting the development of available groundwater resources. Although there are numerous problems associated with water quality, some of which are easily corrected, total dissolved solids (TDS), nitrates (NO_3 as N) and fluorides (F) are thought to represent the majority of serious water quality problems. The water quality was evaluated in terms of TDS and potability. The information was obtained from DWS Geohydrology. The potability evaluation done was based on the evaluation of chloride, fluoride, magnesium, nitrate, potassium, sodium, sulphate and calcium using the Quality of Domestic Water Supplies, Volume 1 (DWAF, 1998). The portion of the groundwater resources considered to be potable has been calculated as the portion classified as ideal, good and marginal (Class 0 -blue, 1- green and 2 - yellow). Water classified as poor and unacceptable (Class 3 - red and 4 - purple) is considered not to be potable (See Point and diffusive pollution Agricultural activities are a source of diffuse water contamination.)

The contribution of each farm on a local scale is often fairly small but the contribution on a catchment scale needs to be included in assessing any pollution situation. Most findings regarding this issue can only be assessed in a generic way due to the lack of data in the WMA. Nitrates are the contaminant of most concern, since they are very soluble and do not bind to soils, nitrates have a high potential to migrate to groundwater. Because they do not evaporate, nitrates/nitrites are likely to remain in water until consumed by plants or other organisms.

Generally, on a local scale the areas of intense cultivation are the major contributors in terms of inorganic nitrates. The primary inorganic nitrates, which may contaminate drinking water, are potassium nitrate and ammonium nitrate both of which are widely used as fertilizers. Where feedlots are operated the contribution of organic nitrates to groundwater contamination can be far more problematic. For most farming activities organic nitrate is not a severe problem in South Africa. High-density cultivation at surface water irrigation schemes along the Orange River contributes to the nitrate load of localized aquifers in the WMA. Other contaminants of concern are pesticides and herbicides. The contribution of these to groundwater contamination is very difficult to quantify on catchment scale. Site-specific data relating to likely loading/application volumes and history, soil profile and local geohydrology are required. The mineralogical groundwater quality in the Lower Orange Water Management Area is not particularly good in terms of its TDS rating.

In general, the groundwater quality is rated as class 2 to class 4, marginal to completely unacceptable. The southern portion of the inland region, De Aar, Victoria West and Sutherland has a class 2 rating, together with the areas surrounding Prieska, Griekwastad, Upington and Springbok. The rest of the WMA, particularly north of Brandvlei and Carnarvon and the coastal strip are rated as class 3 and 4. The Sutherland, De Aar, Upington belt has a varying range of potable groundwater from a moderate 50% to approximately 90%. The balance of the WMA, has a predominant potable usage of less than 4 30%, with the occasional improvement to 50% (V3, 2002).

See Figure 21 for average TDS values for the area under investigation as mapped by Simonic (1999). Natural occurring radioactivity is found in some of the groundwater resources associated with geological formations such as sillimanite and gneisses. Fortunately, the values are mostly low except at Kotzerus, Kharkams, Bulletrap, Fonteintjie, Kenhardt and Riemvasmaak, which fall into Class 2 according to the potable water classification (Van Dyk, 2003).

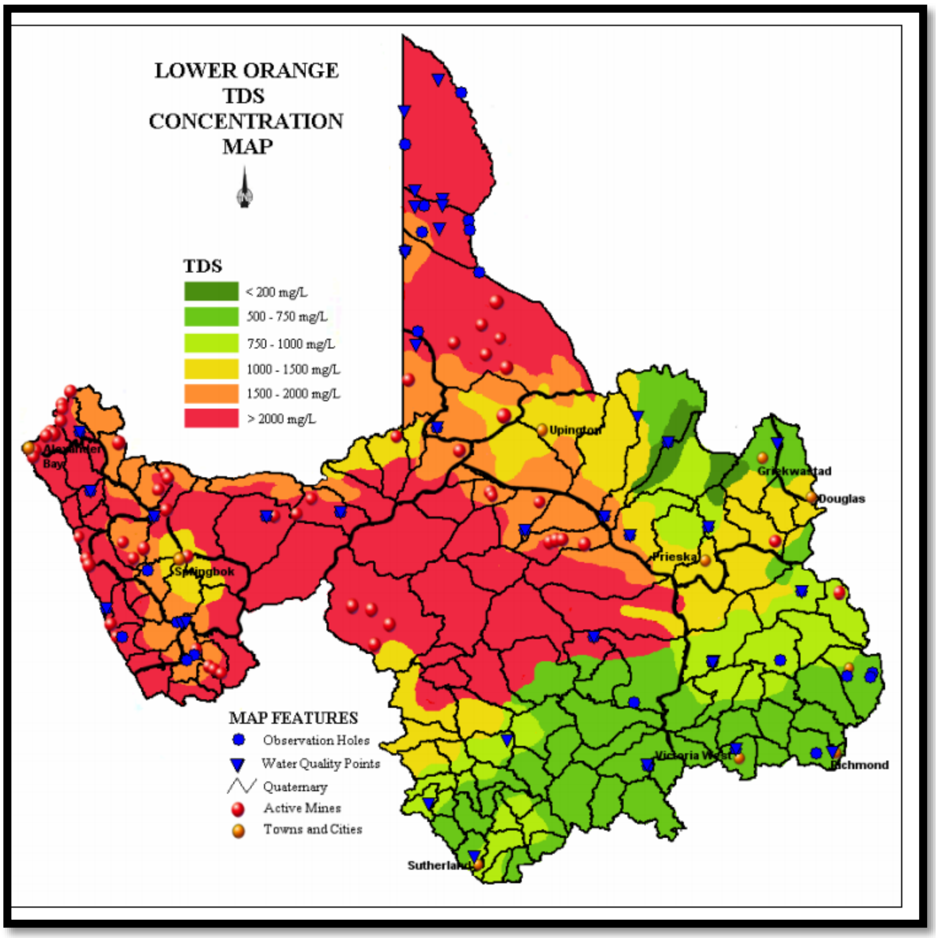

Figure 21: Total dissolved solids for the WMA with main abstraction and water quality monitoring points (DWAF, ISP Lower Orange WMA, 2004).

Activities related to urban areas can also result in localized or even diffuse pollution of groundwater. Poor management of sewage treatment works can contribute to the groundwater pollution as can landfill sites, on-site sanitation (especially in informal settlements) and spills resulting from accidents or leaking underground tanks. Uncontrolled dumping and accidents related to the transport industry also contribute to localized pollution in the WMA. Often goods that contain hazardous substances or perishables are confiscated by authorities and these are then dump at illegal sites. A need for incinerators has been identified. Mining activities that potentially impact on the groundwater quality include the Okiep Copper mine and the Black Mountain lead, zinc, copper and silver mine. Mineralisation in the Okiep area tends to occur in basic rocks intruded in the form of 'steep structures' into granitic terrain of the Namaqualand Metamorphic Complex, and may extend to depths of over 1000 m (www.metorexgroup.com/Ookiep.htm). The major copper minerals are bornite ($Cu_5 FeS_4$) with 62% copper, and chalcopyrite ($CuFeS_2$) with 32.5% copper. Open stopping is employed at the mine, together with backfilling at times at O'okiep. Ore is concentrated by flotation and transported to the nearest available smelter. O'okiep smelts its own concentrates. The Black Mountain Mine is situated in the Northern Cape near Aggeneys. The facility produces zinc concentrate together with lead and copper concentrates, from which silver is also recovered.

Development of the nearby Gamsberg zinc deposit, is currently under consideration (http://www.dwaf.gov.za/orange). There are many impacts on the environment dealing with the water quality and waste disposal from copper mining. These adverse water quality impacts are caused primarily by land disposal practices that fail to contain wastes, by run-on and run-off controls that are inadequate to prevent surface water from flowing through impoundments, or by groundwater infiltrating surface impoundments. These open-pit mining methods also can cause disturbances that can lower the water table in an area, causing water shortages, land subsidence, and fracturing. However due to the low rainfall in area the impacts on the groundwater quality are less than expected and very localized. Acid Mine Drainage, elevated TDS, SO_4, and low pH with associated higher trace metal concentrations have been found at tailings dumps. A radioactive waste disposal site for low- and intermediate level waste generated at the Koeberg Nuclear Power Plant, is located north of Springbok on the flat plains of the Bushmanland plateau. Waste is buried in metal drums and solidified in concrete in the trenches. Up to date no significant contamination of the groundwater has occurred (Van Blerk, 2000). Springbok Hard Chrome is an industry located in Springbok, an incident has occurred where Cr^{+6} was released into the environment but no data is available on the impact the incident had on the groundwater resource. As discussed impacts on groundwater quality from the diamond mining industry in the WMA is negligible.

The Lower Orange WMA, is underlain by very diverse lithologies. Several broad lithostratigraphic units fall within the boundaries. A simplified geological map of the WMA is presented in Figure 15.

From oldest to youngest these units comprise the following (V3, 2002):

- Namaqualand-Natal Basement Complex. Rock of this complex, ranges from homogenous sillimanite through to migmatites and gneisses. The area underlain by the Namaqualand-Natal Complex is situated in the vicinity of the Orange River between Upington and Springbok. The area is an assembly of compact sedimentary, extrusive and intrusive rocks.
- Ventersdorp Supergroup, represented by andesitic lavas and occasional sedimentary rocks related to post extensive erosion, are encountered in very small 2-5 isolated inliers between Prieska and Douglas.
- Dolomitic and related carbonate rocks of the Postmasburg Group, Campbell and Griquatown Sequence, all forming part of the Griqualand West Sequence, occupy the north-eastern lobe of the WMA. Dolomites, limestones and related sedimentary rocks (often iron or manganiferous ore bearing) make up this broad lithostratigraphic unit.
- Abbabis and Kheis Groups are represented by relatively small inliers of diverse sedimentary successions consisting of shales, sandstones, banded iron formations and conglomerates. These rocks are encountered in the vicinity of Upington and are not widespread.
- Damara Sequence encountered in the immediate vicinity of Alexander Bay and Port Nolloth, is represented by the Fish River, Schwarzrand, Kuibis, Malmesbury, Gariep, Swakop, Otavi, Nosib, Rehoboth and Sinclair Groups. Lithologies in these various groups are very diverse, ranging from shales, sandstones, diamictites, banded iron formation through to limestones and calcareous sedimentary formations.
- Karoo Sequence represented by the Ecca Group and Dwyka Formation, and to a lesser extent the Beaufort Group, occupy the southern lobe of the WMA, and comprises thick successions of sedimentary rocks. Sedimentary rocks range from mudrocks through coarser varieties (sandstones, conglomerates) to diamictites and rhythmites (pleistocene deposits). Karoo or Jurassic dolerite is fairly common throughout the sequence and also frequently intrudes older rocks.
- Quaternary and Tertiary dune deposits, consisting of “Kalahari red sands”, occupy the extreme northern part of the WMA bordering on Namibia. These dune deposits are of considerable thickness and comprise fine aeolian sands with occasional coarser gravel deposits.

The geohydrology is just as complex as the geology in the area but can be simplified to four main aquifers namely the Karoo sediments, the weathered sillimanite and gneisses from the Basement complex, dolomites and associated formations and the primary aquifers such as the Kalahari sands and the alluvial deposits along streams and rivers and the coastal plains north of the Buffelsrivier. The first three of these aquifer types are typical dual porosity or secondary aquifers water associated with weathering and fracturing of the matrix. Primary aquifers are found in Kalahari sands and alluvial deposits associated with rivers and coastal plains.

At small scale a number of these aquifers are utilized mostly along dry riverbeds, Buffelsriver, Saaipoort along Carnarvon leegte, along Gamagara River, Driekop Kanhardt. In the drier west almost all abstractions from boreholes associated with a proximate riverbed. Along the Orange River some abstraction along riverbeds is also taking place (Van Dyk, 2003).

General characteristics of riverbed aquifers can be summarized as:

- Coarse gravels and sands are more typical of alluvial deposits. However, flood plains consist mainly of fine silt. Towards the end of a river’s course, the river slows down dumping some of the heavier materials on these flood plains. Boreholes drilled into these types of formations normally have higher yields. It is important to note that borehole design is plays an important role in the yield of boreholes drilled into riverbed aquifers.
- Alluvial deposits grain size varies considerably, fine and coarse materials are intermixed. The hydraulic conductivities vary between 10-3 to 103 m/d and their porosities vary 12 between 25 – 70%. However, flood plain porosities usually range 35 – 50% and the hydraulic conductivities vary between 10-8 – 10-1 m/d.
- In general riverbed aquifers are high recharge areas and often recharge deeper underlying aquifers and are unconfined in nature. The surface-water groundwater interaction is often intermittent (depending on the elevation of the water level, groundwater may recharge the surface water body or the surface water may recharge groundwater). This is normally dependent on the rainfall cycle. Therefore, boreholes drilled into these aquifers are almost always successful.

Groundwater-Surface Water Linkage

Groundwater-surface water interaction has not been studied sufficiently in the Northern Cape due to the limited surface water. According to records documented by Van Tonder and Dennis (2003), under natural conditions there is seldom a connection between surface water and groundwater. However, observed surface water recharge in normally dry riverbeds. Current quality problems experienced in the Vaal and Orange rivers, waterlogging experienced with irrigation along these riverbanks indicate interaction. Therefore, a study is currently motivated by DWS Geohydrology to investigate Groundwater-surface water interaction in the Vaal and Orange rivers (Van Dyk, 2003).

Summarised information on groundwater is given in this section. Groundwater utilisation is of major importance across wide areas in the Lower Orange WMA and often constitutes the only source of water. It is mainly used for rural domestic supplies, stock watering and water supplies to towns off the main stem of the Orange. These resources must be properly managed and developed.

As a result of the low rainfall, recharge of groundwater is limited and only small quantities can be abstracted on a sustainable basis. Artificial recharge of groundwater is practised in some areas where water from small dams is transferred through pipelines into boreholes located in the area of recharge of the main production boreholes. Aquifer characteristics (borehole yields and storage of groundwater) are also typically unfavourable because of the hard geological formation underlying most of the water management area. In the Orange Tributaries sub-area 60% to 70% of the available water is supplied from groundwater sources.

Groundwater also constitutes an important source of water for rural water supplies in the Orange River, although only a small proportion of the total available water. Much of the groundwater abstracted near the river (Orange sub-area), is actually recharged from the river and could also be accounted for as surface water. Groundwater availability in the coastal region is extremely limited as a result of the lack of rainfall. Close to the sea there is a strong risk of seawater intrusion into coastal aquifers.

The interaction between a mining activity and groundwater is managed through the EMPR and the water use licensing process. Some impacts do exist with regard to localized dewatering of aquifers. These impacts are however localized and very little data exist in this regard. The information from the compliance monitoring systems at the mines needs to be integrated into the DWS monitoring systems and regularly reviewed. Mines utilise the groundwater available but are still largely dependent on surface water, which is in most cases supplied from the Orange River. Boreholes and abstraction from boreholes are seldom managed properly and therefore the failure of boreholes is experienced. Borehole siting needs to be based on proper geo-technical work to limit the drilling of unsuccessful boreholes. As result of this some towns have drilled many boreholes without much success.

From the list of towns and related water resources given it is evident that shortages in the supply from groundwater are experienced at Vanwyksvlei, Strydenburg, Carnarvon and Garies. Proper management and monitoring of groundwater sources by municipalities and other users are of vital importance. There is a need to provide groundwater information and to create an improved understanding of groundwater at a local level.

Municipalities should also investigate groundwater potential outside town boundaries as a possible source. Groundwater monitoring and data on the availability of groundwater in general is insufficient (DWAF, ISP Lower Orange WMA, 2004).

No drainage channels occur within the proposed mining area and there is no dendritic system which could be disturbed. Given the variability of semi-arid rainfall, the calculation of the mean annual runoff (MAR) would be of no use. The MAR is very low given the low rainfall (less than 250 mm/year) occurring mainly in the winter months, high evaporation rates, and shallow grade of the slope toward the drainage channels and the permeability of the soils. The surface water quality (when available after severe rainstorms) is suitable for animal consumption but not as potable water. No natural wetlands exist in the area.

- The proposed mining area will be further than 100 m from any natural water source.
- The proposed activities are not expected to have a negative impact on the ground water of the area.

Less than 20 m³ process water will be used per day. Water will be obtained from a borehole of the landowner. The taking and storing of water is covered by a General Authorisation in terms of section 39 of the National Water Act, 1998 (Act No. 36 of 1998). According to the authorisation no “groundwater taking zones” are excluded for “small industrial users”. This mining activity classifies as a “small industrial users” as it qualify as a work creating enterprise that do not use more than 20 cubic metres per day. Mining and quarrying are also a category identified in the Standard Industrial Classification of All Economic Activities (5th edition), published by the Central Statistics Service, 1993, as amended and supplemented as a small industry.

The applicant will however in accordance with the general authorisation adhere to Record-keeping and disclosure of information.

The general authorisation states that the water user must ensure the establishment of monitoring programmes to measure the quantity of water taken and/or stored, as follows -

a) the quantity of groundwater or surface water abstracted must be metered or gauged and the total recorded as at the last day of each month,
b) The quantity of water stored must be recorded as at the last day of each month.

Air quality

The site is situated primarily in a livestock farming area, with no ploughing within close proximity. There are currently no sources of air pollution present on site and the ambient air quality is generally considered as good. The main potential sources of air pollution in the area includes dust generated from gravel roads, domestic fuel burning and veld fires. Neighbouring farmstead (in proximity to mining area) are considered sensitive air quality receptors, but it is not anticipated that the proposed mining activated will introduce excessive pollution, (dust) to the surrounding area.

Emission into the atmosphere is controlled by the National Management: Air Quality Act, 2004. The proposed activity will however not trigger an application in terms of the Air Quality Act as the emissions to be produced will only entail dust generation due to the movement of earthmoving equipment, the loading of material and transporting of material from site.

Dust generation on the access and haul roads as well as mechanical excavation can be managed through the implementation of dust suppression measures via water carts and a sprinkler system. The applicant has to conduct formal dust monitoring on site to provide management with an effective management tool for mitigating the impact of the mining permit activity on the surrounding environment with regard to dust pollution.

Noise

There are currently no sources of noise pollution present on site and the ambient noise levels within the project area is representative of a rural farming district. The only noise sensitive sites are the interspaced farmhouses and associated structure in proximity to proposed mining area.

Due to the nature of the proposed activity, noise will be generated as a result of mechanical excavation. The nuisance value of noise generated by heavy earthmoving equipment for residence in the near vicinity is deemed to be of low-medium significance, as the mine is expected to be operational only during daylight hours, and when necessary on Saturdays. No processing or blasting will be conducted over weekends. All mining related vehicles will also be equipped with silencers and maintained in a road worthy condition in terms of the National Road Traffic Act, 1996 (Act No. 93 of 1996). Noise levels will be compared against those described in *Table 19*.

Table 19: Typical rating levels for ambient noise in districts (extracted from the sans cop 10103:2003)

TYPE OF DISTRICT	EQUIVALENT CONTINUOUS RATING LEVEL, LREQ.T FOR NOISE					
	OUTDOORS			INDOORS, WITH OPEN WINDOWS		
	DAYNIGHT	DAY TIME 06:00 TO 22:00	NIGHT TIME 22:00 TO 06:00	DAYNIGHT	DAY TIME 06:00 TO 22:00	NIGHT TIME 22:00 TO 06:00
Residential Districts/ Rural Districts	45	45	35	35	35	25
Industrial districts	70	70	60	60	60	50

Archaeological and cultural interest

(Information extracted from the Heritage Impact Assessment, HCAC 2019 as well as the Basic Palaeontological Assessment, Pether 2019 see Appendix O2 and O3 respectively)

GENERAL HISTORY OF THE AREA

The Stone Age:

According to the Heritage Impact Assessment (HIA) conducted by HCAC in October 2019 archaeological sites in the area around Aggeneys tend to be focused on three types of landscape features:

1. Places where water can be obtained – generally after rain storms. These include pans and low, flat bedrock outcrops that have hollows and crevices that trap water;
2. The bases of rocky hills and outcrops. These areas frequently reveal low stone-walled structures, either at the base of the hills or, less frequently, on the rocky hills; and
3. On and along sand dunes.

Beaumont et al. (1995) noted that there is a low-density background scatter of artefacts throughout Bushmanland. In the Aggeneys area, however, this scatter tends to be quite ephemeral. Within the Gamsberg inselberg, scatters of Early Stone Age (ESA) artefacts have also been recorded in open, often eroding areas (Morris 2010; Orton 2014). Morris (2010) located bedrock exposures with fissures in them that trap water after rain and sites were reported from the area to the south of Aggeneys (Morris 2013). The rocks bear grinding hollows with associated scatters of stone artefacts, pottery and ostrich eggshell located around them. To the west of Aggeneys, Orton (2016) found a very large bedrock outcrop with a pool of water collected at a low point and many grinding grooves and artefact scatters around it. Pans tend to be rare in the Aggeneys area, but Orton (in prep.) did locate a small LSA scatter alongside a pan to the south of Aggeneys. Just east of Aggeneys, Webley and Halkett (2012) examined an area to the north of the N14 and recorded many isolated artefacts, and a few occurrences of light quartz and quartzite artefact scatters. Orton (2015) worked in the same area and located an isolated heavily used, grooved double-sided lower grindstone. Morris's (2011b) nearby survey found much sand cover and only a small number of isolated quartz artefacts. Morris (2011b) notes the presence of a rock painting on a boulder at Aggeneys. The painting is a finger painting likely associated with the Khoekhoen. A small finger-painted image also lies within the Gamsberg Inselberg (Morris 2010; Orton 2014). Neither of these sites has any associated archaeological deposits, but a small rock shelter high on Gamsberg has been excavated and found to contain a deposit some 30 cm deep (Orton 2014). Sites with deep deposits are incredibly rare in Bushmanland, and sadly excavations at this site were never completed, and the deposit has not been dated.

Historical Information

The northern Bushmanland was colonised quite late with most farms only surveyed and granted in the very late 19th or even early 20th centuries. As a result, very few historical structures and features exist on the landscape. A number of surveys in the Bushmanland area have recorded possible isolated graves represented by unusual rocks (either isolated standing rocks or unnatural clusters). Two examples occur alongside a rocky koppie to the southeast of Aggeneys (Orton, in prep.), while others were seen to the west of Aggeneys (Orton 2016). These could be related to early '*trekboers'* passing through the area. Because they lived a very nomadic lifestyle, the physical traces of these early European stock farmers are extremely ephemeral. The ruins of small stone structures that are occasionally found alongside rock outcrops in Bushmanland are likely to represent huts and small livestock enclosures built either by 19th century '*trekboers*' or by early 20th century shepherds. They may have been covered with sticks and skins or by tarpaulins.

Some of the place names in the region reflect the living heritage of the Khoekhoen. Gamsberg (also Ghaamsberg), for example, derives from the Khoekhoen word meaning 'grassy spring' (Raper n.d.). There are unconfirmed historical reports that a massacre of Bushmen may have occurred in a kloof of the Gamsberg (Robinson 1978) but surveys have failed to yield any evidence of this. Morris (2013) seems confident of this event, however, and suggests that the kloof at the south-eastern edge of the inselberg was the location where the killing occurred.

Cultural Landscape:

Historical land use and the cultural landscape are linked since the cultural landscape shaped to some extent by the history of the area. Although the farm seems to have been fallow in recent years, some sort of agricultural activity no doubt took place and is evident by fences and watering holes. This is largely related to small stock but has not left much trace. The major historic aspect that left the most visible remains on the landscape is the previous Sillimanite mining activities. Historical maps show several mining areas on the farm Wortel to have been present in 1961. No structures or farm werfs are in close proximity to the study area.

Palaeontological Heritage Resources

The bedrock of the area comprises the basement Koeipoort Gneiss, dating from ~1800 Ma (million years ago) and the metamorphosed (cooked up) sediments (metasediments) of the Bushmanland Group, Aggeneys Subgroup, *viz*. the Brulkolk, Wortel, Hotson and Koeris formations, which date to between 1600-1200 Ma (Bailie *et al*., 2007). These rocks were then intruded by molten-rock forming the Gareskop dykes. Between the outcrops of bedrock inselbergs is a buried bedrock topography of ancient drainages that are now filled with a variety of deposits. The fossil finds discovered within these deposits in the wider area enrich the appreciation of the culturally sacred nature of the Bushmanland landscape.

The ancientness of the landscape is evident in the preservation of numerous volcano crater lake deposits in the Kangnas-Gamoep area. Radiometric dating indicates a late Cretaceous to Paleocene age range of ~80 to 56 Ma for these volcanoes (Verwoerd & De Beer, 2006). The crater lake mudstones from the Banke pipe (near Platbakkies) have provided a rich fossil pollen floral assemblage, fossil leaves and wood, insects and frogs. A prominent, broad “fossil” valley, the Koa River, traverses the region, its course marked by red dunes and a series of pans, of which Bosluispan is prominent. At Bosluispan the basal fluvial gravels and sands contain a faunal assemblage that indicates a mid-Miocene age of ~16 Ma for the sediments. To the east in the linked Geelvloer palaeovalley the basal gravels contain bones of Miocene anthracotheres, an extinct hippo-like amphibious herbivore. At Areb the teeth of the extinct three-toed horse *Hipparion namaquense* were found in granitic grits underlying a 15 m thickness of multiple calcretes (Haughton, 1932; Pickford *et al*., 1999).

Also refer to Part A (3)(h)(iv)(1)(c)(iii) Site Specific Archaeological and Cultural Interest.

Visual exposure

The visual character of the surrounding areas comprises of a rural landscape with an agricultural setting, intersected by farming infrastructure, the N14 national road, and the towns of Aggeneys (to the south) and Pella (to the east). The Orange River that also forms the border between South Africa and Namibia passes the study area ±28 km to the north. The aesthetic ambiance of the area is that of a rural area with highly natural landscapes.

Regional socio economic structure

Khâi-Ma Local Municipality falls within the Namakwa District of the Northern Cape Province. Khâi-Ma lies in the central north region of the Namakwa District, which is the furthest north in terms of the provincial boundaries. The Northern Cape is spatially the largest province in the country, but also has the lowest population and some of the least developed areas in terms of its economic and social development. The Khâi-Ma Municipality is classified as a Category B municipality, and was proclaimed as a local municipality with a council combined with a ward participatory system. The Khâi-Ma Municipality is deemed to be a low capacity municipality, and shares executive and legislative authority with the Namakwa District Municipality. The municipal area is demarcated into four wards (Khai-Ma, 2017).

The situational analysis and statistics presented in this chapter indicate the developmental challenges facing Khâi-Ma Municipality, such as poverty, unemployment, and service delivery backlogs. The programmes and projects in this IDP are informed by this scenario (Khai-Ma, 2017).

(a) Demographic Profile

The population for Khâi-Ma is estimated at 11 340 people (2001). The municipality is sparsely populated (+/- 1 person/km^2); most people are settled in its five (5) towns. The municipality is characterized by vast tracts of land, pristine natural environment, unique mountains and its limited cell phone reception, which can be regarded as a unique attraction by some urban dwellers who wish to escape the rush of the cities. This inherent potential for eco-tourism needs to be exploited and managed in a sustainable manner in order to retain this unique setting.

(b) Population Distribution

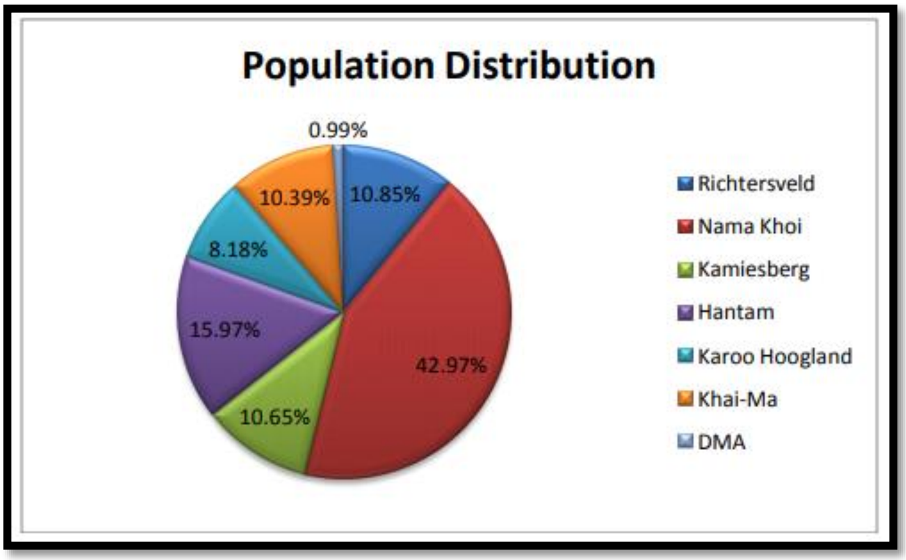

Figure 22: Population Distribution

(c) Households per town

Table 20: Household figures

Household figures per urban area.		
Towns	Population	Current households
Aggeneys	2053	666
Khâi-Ma rural	4035	1404
Onseepkans	912	204
Pella	1425	355
Pofadder	2919	733
TOTALS	**11344**	**3362**

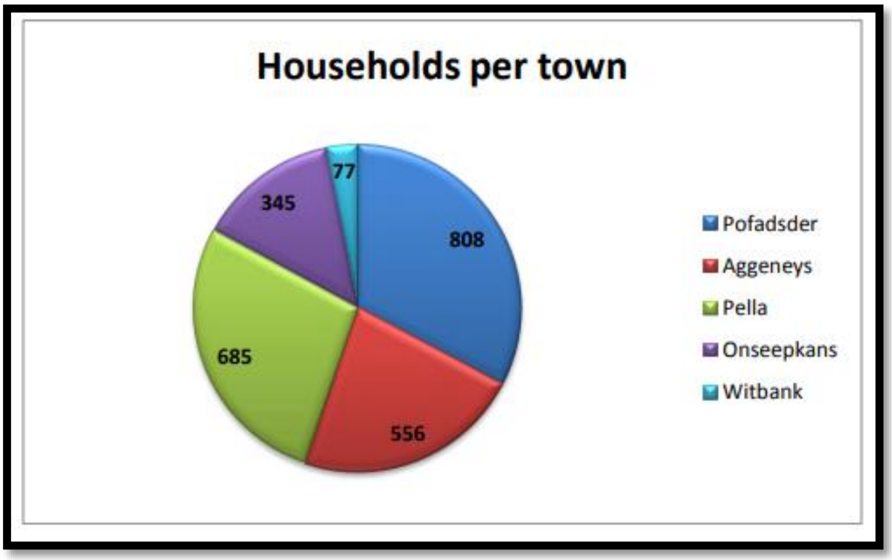

Figure 23: Households per town

Table 21: Population and Household trends.

Population and Household trends						
Khâi-Ma	Population			Households		
	1996	2001	2007	1996	2001	2007
	Statistics SA	Statistics SA	Community Survey	Statistics SA	Statistics SA	Community Survey
	9355	11344	12571	2223	3362	3787
% Increase/Decrease	n/a	21.26%	10.82%	n/a	51.24%	12.64%

CURRENT REALITY: BASIC FACTS & FIGURES

The Municipal Area is divided into 4 wards	
Ward 1	Onseepkans and it includes: Vrugbaar, Raap & Skraap, Pella Brak and Rooiklippe.
Ward 2	Blyvooruitsig and Pofadder.
Ward 3	Pella and it includes: Witbank, Klein Pella.
Ward 4	Aggeneys includes Pofadder town area and Dwaggasoutpan.

The Municipal Council of Khâi-Ma consists of 7 members. 4 represents wards and three (3) are proportional representatives of political parties. The ruling party in all the wards is the ANC.

(d) Age and Gender

Table 22: Age

Age	Male	Female
0 to 4	567	493
5 to 14	1157	1083
15 to 34	2208	1844
35 to 64	1652	1646
Over 65	254	333
Total	5838	5399

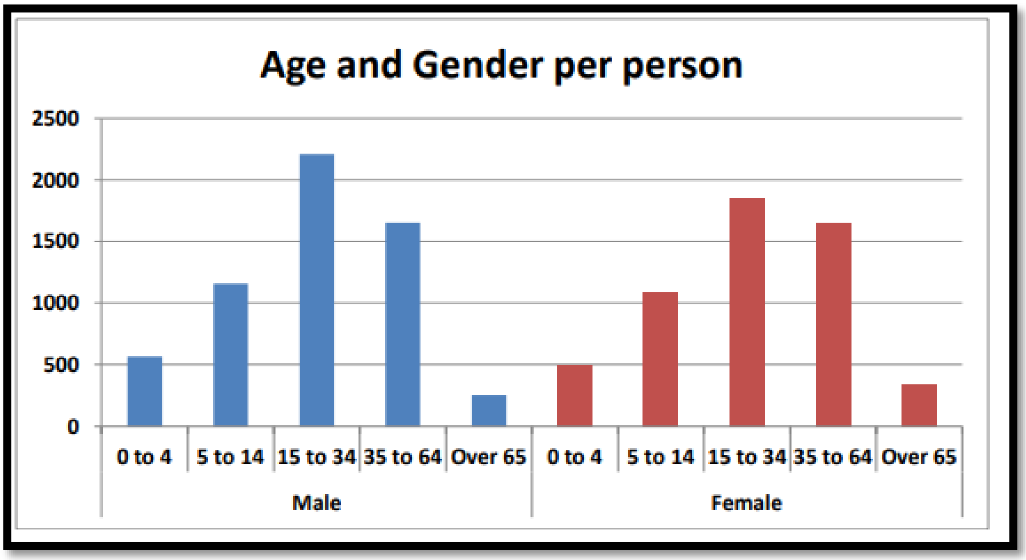

Figure 24: Age and Gender per person

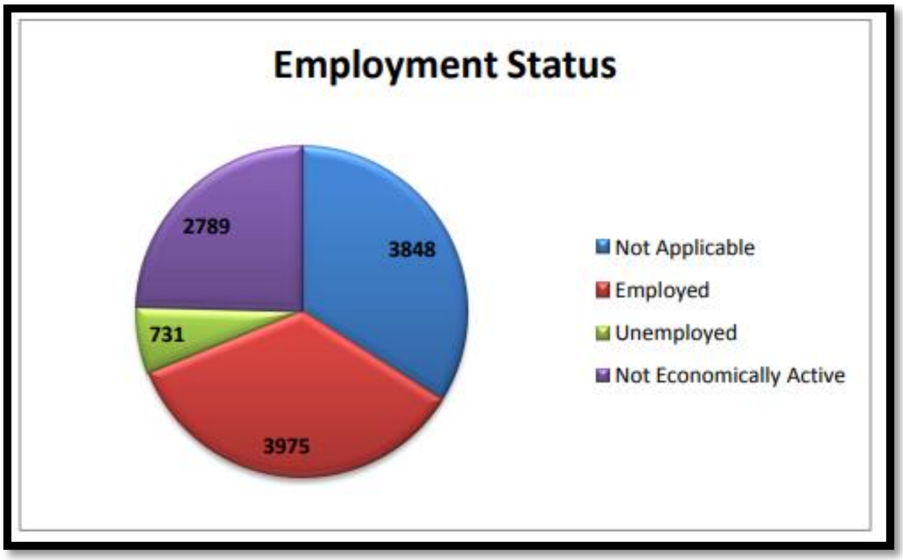

Figure 25: Employment status

(e) Employment status

Table 23: Labour force

Status	Male	Female
Employed	2589	1386
Unemployed	331	400
Not Economically Active	960	1829
Total Labour Force	3880	6315

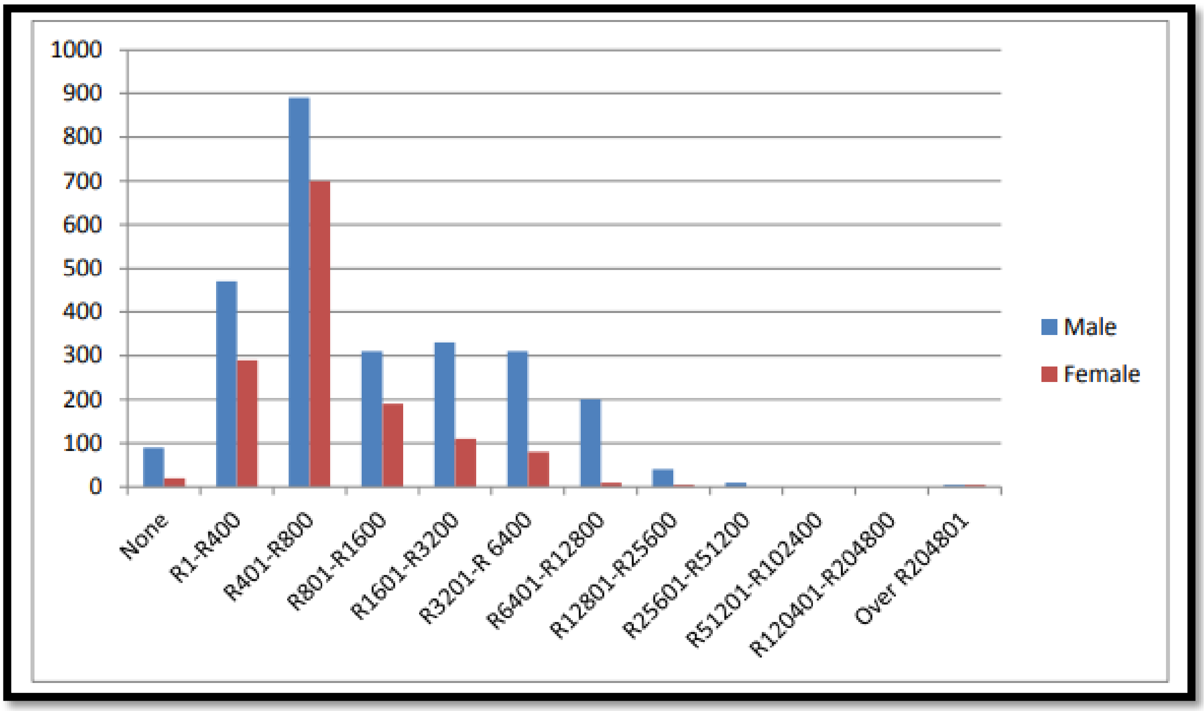

Figure 26: Salary per income.

(f) Education

Table 24: Industry monthly income

Income	Male	Female
None	76	23
R1 – 400	462	285
R401 – 800	882	688
R801 – 1600	301	179
R1601 – 3200	324	116
R3201 – 6400	313	80
R6401 – 12800	188	13
R12801 – 25600	40	3
R25601 – 51200	12	0
R51201 – 102400	0	0
R102401 – 204800	0	0
Over R204801	6	3

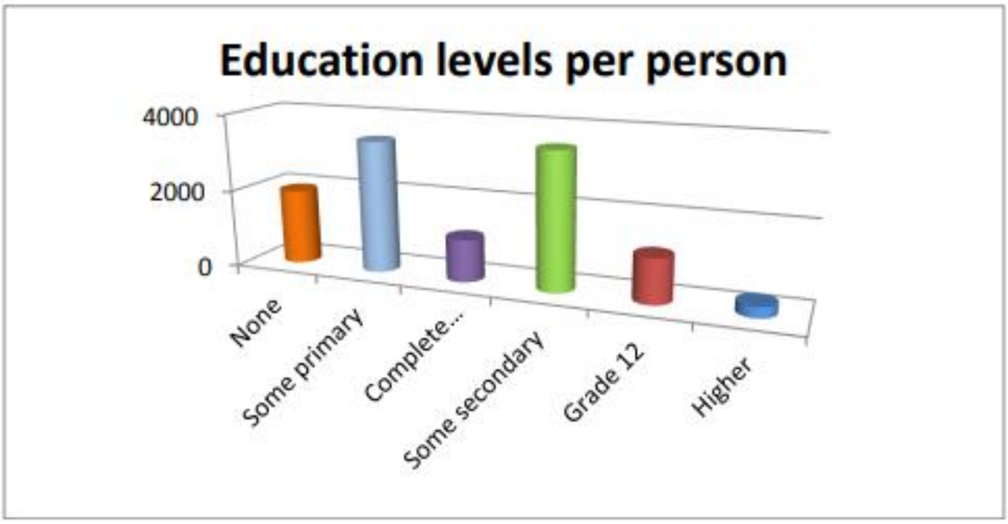

Figure 27: Education levels for person

Table 25: Education

Education Level	Persons
None	1942
Some primary	3399
Complete primary	1091
Some secondary	3497
Grade 12	1141
Higher	274

(g) Employment per industry

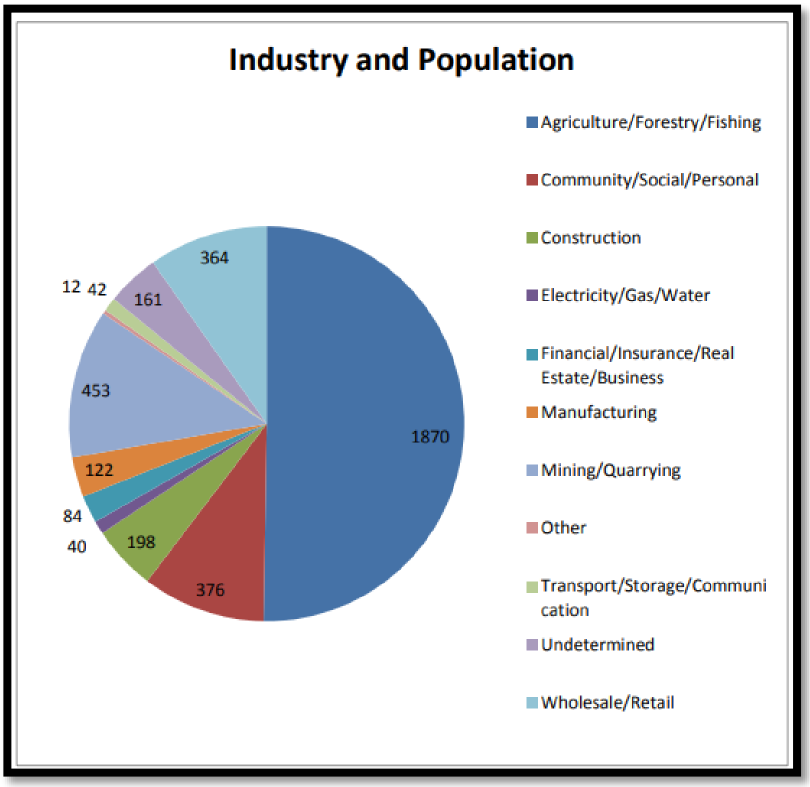

Figure 28: Industry and Population

Table 26: Employment distribution per person

Industry	Population
Agriculture/Forestry/Fishing	1870
Community/Social/Personal	376
Construction	198
Electricity/Gas/Water	40
Financial/Insurance/Real Estate/Business	84
Manufacturing	122
Mining/Quarrying	453
Other	12
Transport/Storage/Communication	42
Undetermined	161
Wholesale/Retail	364

VZS intends to employ up to six (6) workers for the proposed mining activity. The workers will be sourced from the local community as far as practicable depending on skill and expertise. Workers will daily be transported to the site. The establishment of the mining area on the farm will also assist the property owner in the diversification of his income. The material to be sourced from the mining area can be used for the upgrading of the road infrastructure in the vicinity of the site, and can therefore contribute to infrastructure development and indirectly to the economy of the area.

(b) Description of the current land uses.

The farm Wortel 42 is situated in an agricultural setting, intersected by road, rail, telephone lines and electrical infrastructure. The land use of the property comprises of the following:

- Agriculture – Grazing
- Mining – Historic mining.

VZS applied for a mining permit on Portion 1 of farm the farm Wortel 42 (5 ha), over an area that was previously used for sillimanite mining. Mining at the quarry will be temporary where after the land use will revert to grazing.

There are no tourism destinations in the immediate vicinity of the proposed mining area (15 km radius). The main land use of the surrounding properties (>20 km from the mining area) comprises of the following:

- Agriculture - Grazing, and Date Farming
- Mining - Black Mountain, Gamsberg, Aggeneys
- Tourism - Various Campsites (e.g. Klein Pella, Amam Melkbos)
- Conservation - Gamsberg Nature Reserve

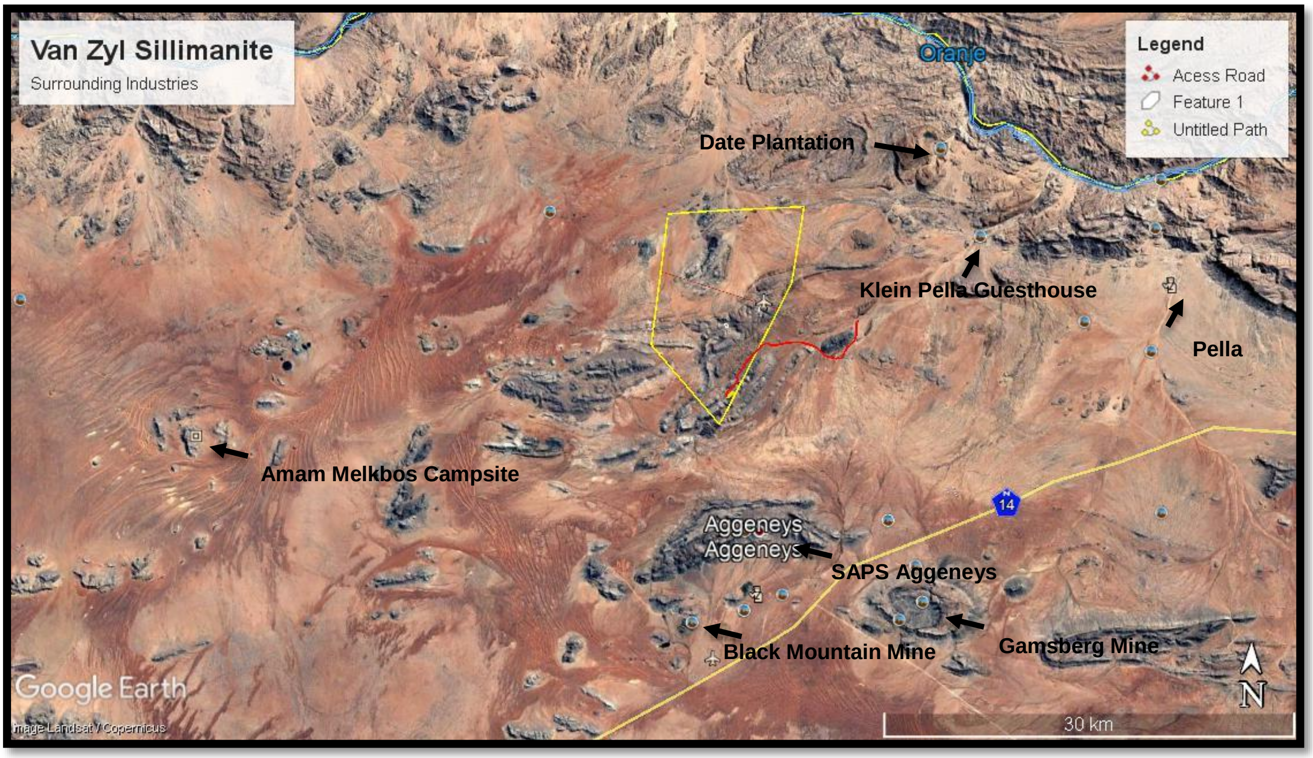

Figure 29: Industries in close proximity to Wortel Quarry

The following table provides a description of the land uses and/or prominent features that currently occur within a 500 m radius of the site:

Table 27: Land uses and/or prominent features that occur within 500 m radius of the site.

LAND USE CHARACTER	YES	NO	DESCRIPTION
Natural area	YES	-	The study area is surrounded by natural areas used some of which are used for agricultural purposes.
Low density residential	-	NO	
Medium density residential	-	NO	
High density residential	-	NO	
Informal residential	-	NO	
Retail commercial & warehousing	-	NO	
Light industrial	-	NO	
Medium industrial	-	NO	
Heavy industrial	-	NO	
Power station	-	NO	
Telecoms Tower	-	NO	
High voltage power line	-	NO	
Office/consulting room	-	NO	
Military or police base / station / compound	-	NO	
Spoil heap or slimes dam	YES	-	Old mines dumps is evident in the area, left by previous prospectors/miners.
Quarry, sand or borrow pit	-	NO	
Dam or reservoir	-	NO	
Hospital/medical centre	-	NO	
School/ crèche	-	NO	
Tertiary education facility	-	NO	

LAND USE CHARACTER	YES	NO	DESCRIPTION
Church	-	NO	
Old age home	-	NO	
Sewage treatment plant	-	NO	
Train station or shunting yard	-	NO	
Railway line	-	NO	
Major road (4 lanes or more)	-	NO	
Airport	-	NO	
Harbour	-	NO	
Sport facilities	-	NO	
Golf course	-	NO	
Polo fields	-	NO	
Filling station	-	NO	
Landfill or waste treatment site	-	NO	
Plantation	-	NO	A date plantation is located approximately 23 km north from the mining area.
Agriculture	YES	-	As mentioned earlier the proposed mining area is situated within an area used for grazing purposes.
River, stream or wetland	-	NO	
Nature conservation area	-	NO	
Mountain, hill or ridge	YES	-	The proposed mining area is situated in undulating ridges.
Museum	-	NO	
Historical building	-	NO	
Protected Area	YES	-	The Gamsberg Nature Reserve borders Portion 1 of the farm Wortel 42 to the east.
Graveyard	-	NO	
Archaeological site	-	NO	
Other land uses (describe)	-	NO	

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

Site Specific Topography

The topography of Portion 1 of the farm Wortel 42 is described as high hills or ridges with rolling or irregular plains and low hills or ridges to the west or the property and plains with open low hills or ridges towards the south of the property. The slope of the area varies from lower than 2% to higher than 20% steep gradients.

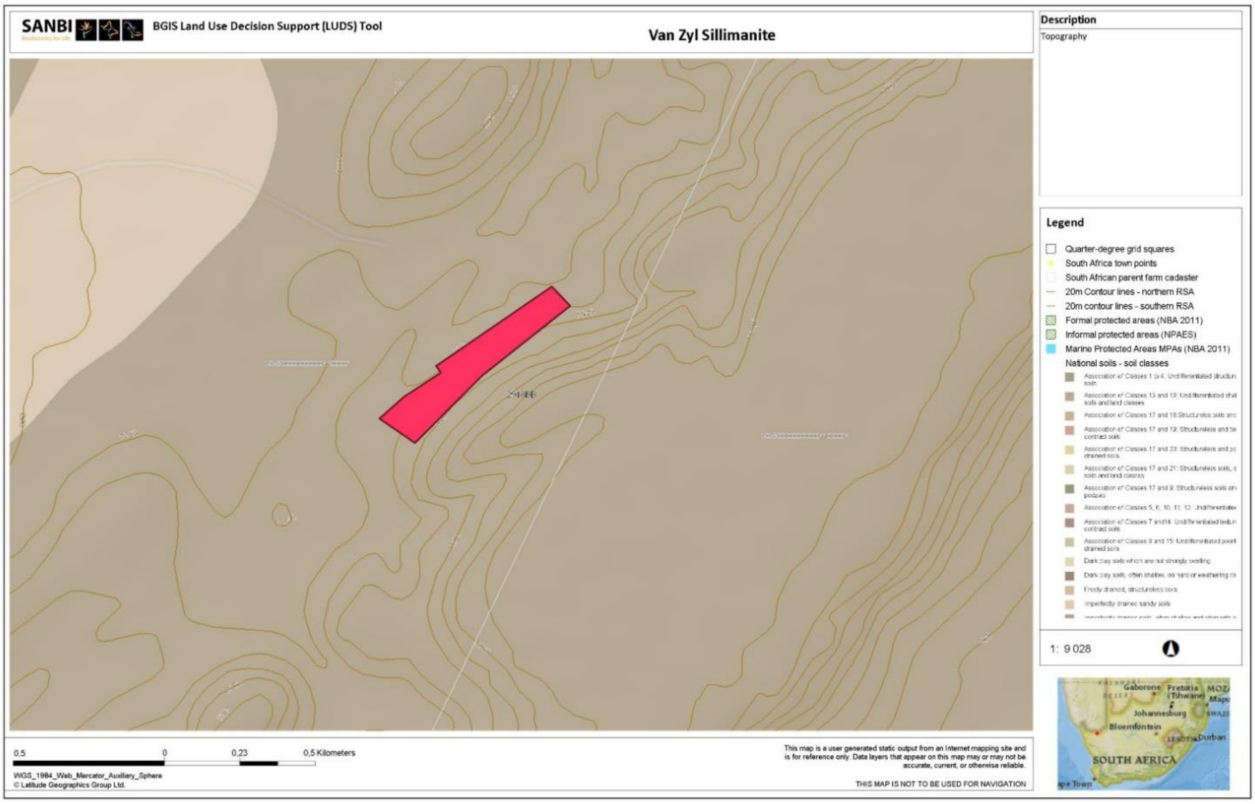

Figure 30: Topography of the mining area.

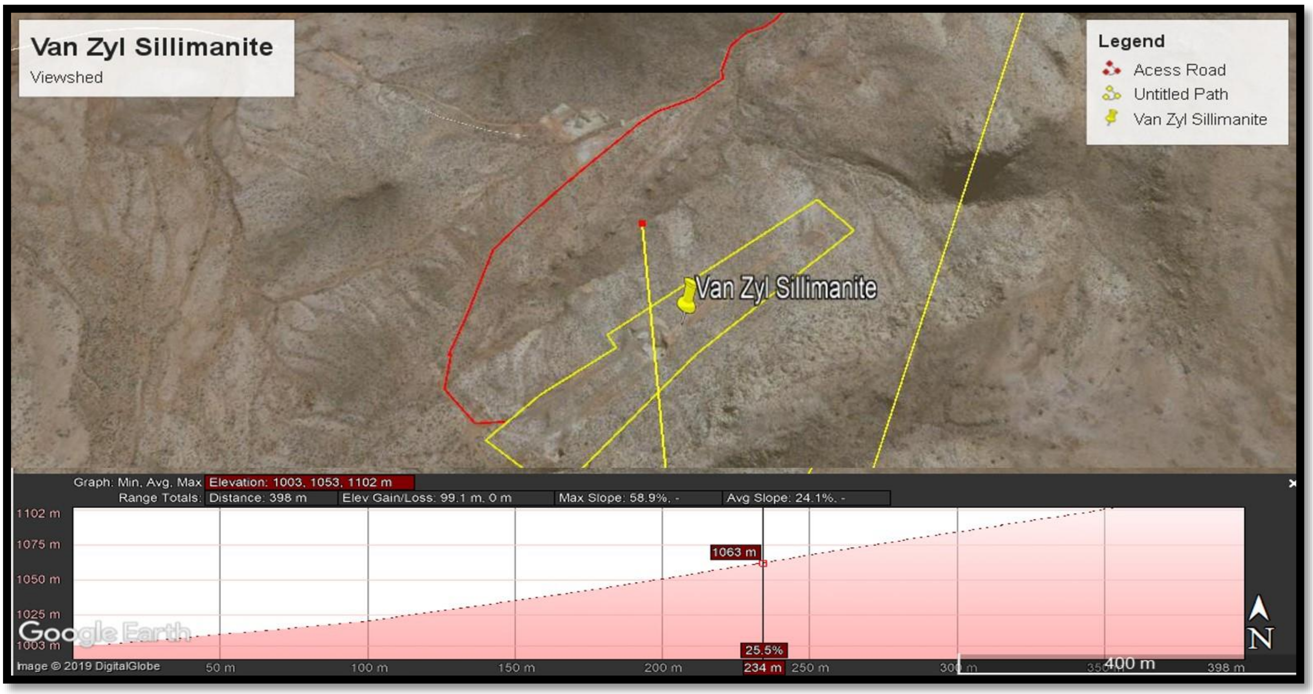

Figure 31: Elevation Profile

The elevation of the proposed Van Zyl Sillimanite mining operations ranges between 1000 m and 1 102 m above sea level. VZS will mine the existing quarry within the footprint and due to the elevation of the site, runoff water (if any) will flow towards the excavation. The quarry pit will alter the topography of the receiving area and the quarry will cause a depression with stepped side walls as mining progress. Due to the impracticality of importing large volumes of fill material to restore the quarry area to its original topography, the rehabilitation option (upon closure) is to render the quarry safe and leave it as a minor landscape feature. The processing infrastructure will be of temporary nature to be removed upon closure, and will therefore not have a permanent impact on the topography of the receiving area.

Site Specific Soil, Land Use and Land Capability

The soils of most of the area are red-yellow apedal soils, with a high base status and <300mm deep, typical of Ag and Ae land types. The soils are typically weakly structured with low organic content. These soils drain freely which results in a soil surface susceptible to erosion, especially wind erosion when the vegetation cover is sparse and gulley erosion in areas where storm-water is allowed to concentrate. The soils in the area are generally not suitable for dry land crop production therefore the pre-mining land capacity is categorized as Class III grazing land. The productivity of the area is very low at 8 – 10 ha/SSU.

Land Use

Current land use conditions are those of farming with small livestock e.g. sheep and goats. More than 50% of the area is mainly used for agriculture and hunting purposes. The grazing capacity of the area can be classified as 81-11 ha/LSU. In the north eastern corner of the farm Wortel, the grazing capacity is classified as 41-80 ha/LSU.

Current activities on the surround farms include livestock grazing at low densities, with sheep, goats and some cattle currently present at some of the surrounding farms. The land is arid and primarily used for grazing. Surrounding farms are either privately owned or owned by the municipality and used for communal purposes.

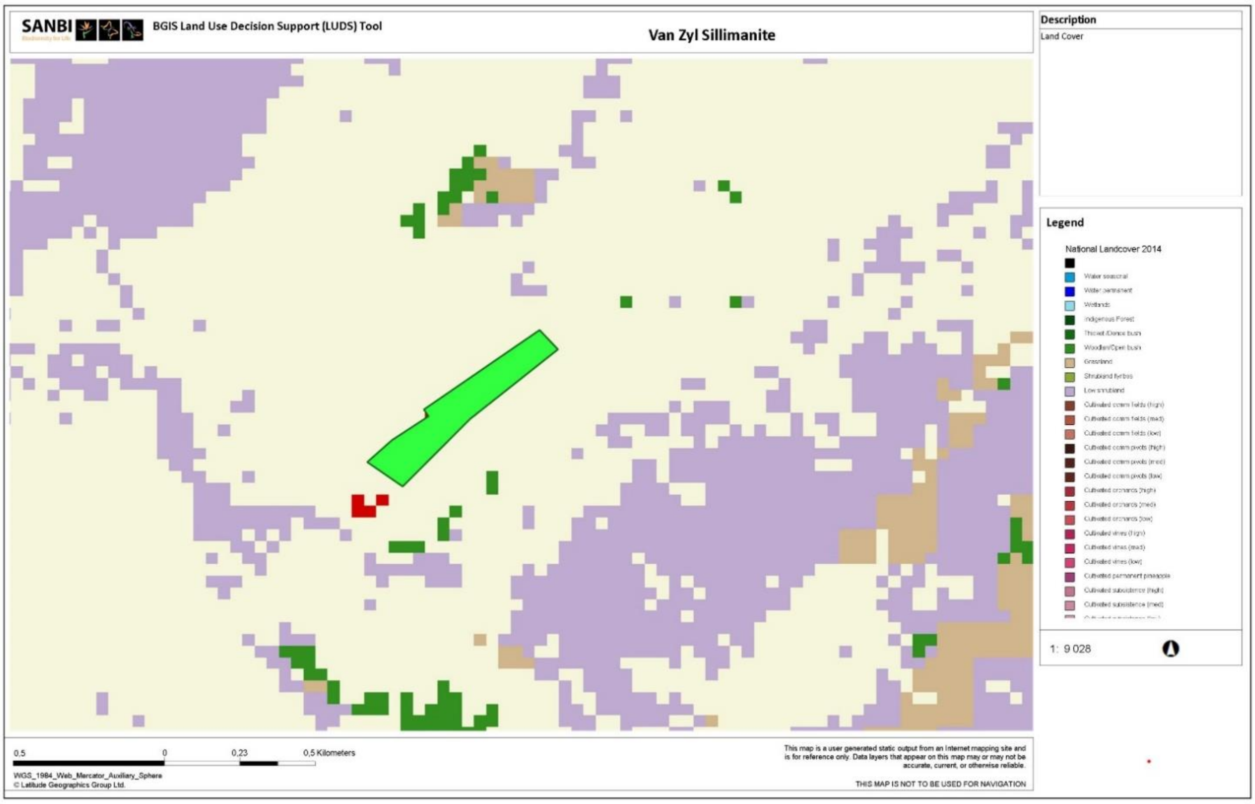

Figure 32: Land Cover

From the figure above the following is evident.

- Red blocks shows mines.
- The beige areas indicate bare none vegetated areas.
- Dark green indicates woodland/open bush.
- Purple indicates low shrubland.

<u>Soil</u>

Soils can be identified to belong to the R and LP2 groups. Soils in the low plains consist of soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime generally present in part or most of the landscape. The landscape areas in the hills are ridges are rock with limited soils. The land type of this area is described as IC, IB, Ae and Ag. The soil in this area has a natural organic carbon content of less than 0.5mm. Soils has a pH of 7.5-8.4 towards the south-west, and towards the north-east, soil has a pH of more the 8.4. The leaching status of these soils is described as non-calcareous and eutrophic soils. These soils have 0.6-10.0 cobalt, 0.6-3.0 copper, low iodine, high in phosphorus, low in selenium, and 0.6 to 6.1 zinc contained within them.

Sands in this area has special management requirements. These requirements include the following:

- Shifting sands are strongly dominant and present in the area.
- Alkaline Saline Sodic soils.

Soils in this area is highly susceptible to erosion caused by rainfall, even though the soil in the area is minimal, due to the rocky outcrops the soil loss in this area will be minimal. Sands in this area is susceptible to wind erosion.

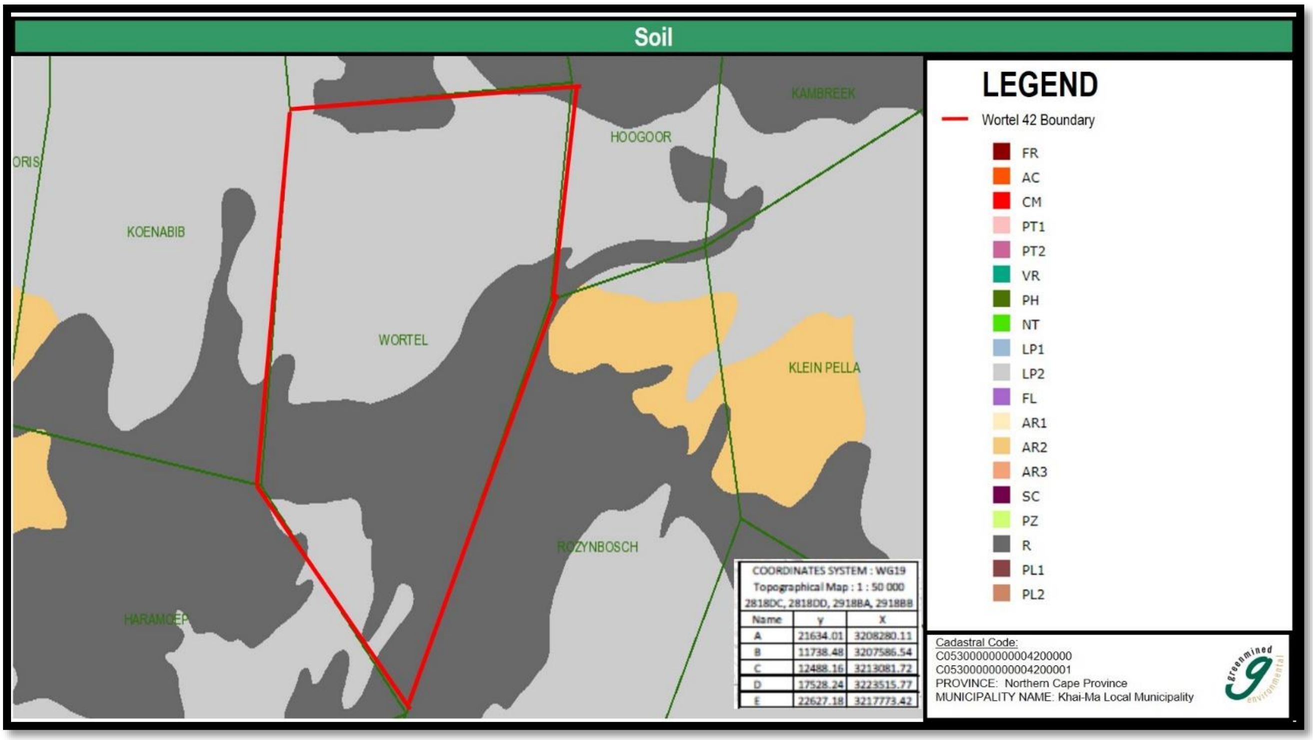

Figure 33: Soil of the proposed mining permit area.

Site Specific Flora

(Information extracted from the Botanical Study and Assessment, Nkurenkuru Ecology & Biodiversity January 2020 attached as Appendix O1)

The vegetation of the study site resembles a severely modified and transformed form of Eastern Gariep Rocky Desert surrounded by mostly natural vegetation. Disturbances and modifications are mainly due to historical mining activities and access roads. There was little variation in the plant communities present on site. The site is situated on the south-western slope of a rocky outcrop characterized by large quartzitic- gneiss- and Schist boulders and rocks with shallow to absent topsoils. Isolated pockets of deeper soils are present along this ridge and may allow for taller shrubs to persist. Most of the site has already been heavily transformed and disturbed as a result of past mining efforts, and vegetation in the disturbed areas specifically is very sparse.

Ground truthing of the site confirmed that the vegetation of the site is relatively uniform overall, with little turnover across the site, which corroborates its classification as a single type.

As mentioned, the disturbed areas (comprising most of the proposed mining footprint) was very sparsely covered by vegetation, comprising of *Brownanthus cf. cilliatus, Acanthopsis disperma, Mesembryanthemum schenkii, Thesium aggregatum* and *Tribulus zeyheri*. Especially *M. schenkii* and *B.cf. cilliatus* were prominent within this disturbed area. The dominant plant species of the natural vegetation growing on the slope is *Euphorbia gregaria*, with scattered individuals of *Aloidendron dichotomum* (previously known as *Aloe dichotoma*), *Boscia albitrunca, B. foetida*. Various species of the family Aizoaceae, subfamily Mesembryanthemoideae, was found growing on the undisturbed slopes, of which *Schantesia ruedebuschii* and *Ruschia spinosa* were the most significant forming fairly large populations along this south-west facing slope. Also, worth mentioning was the observation of single species of the endemic shrub, *Ozoroa dispar* just outside of the highly disturbed area.

Even though, both access road options will traverse existing roads, resulting in a minimal impact on natural vegetation, some sections will have to be addressed in order for these roads to accommodate the movement of vehicles associated with the proposed mine.

- Access Road Option 1: The first 14 km from the mine will traverse a farm road (mostly twin track) that haven't been used for a while and subsequently this road is in a poor state and some maintenance of the road will be necessary in order for this road to accommodate the movement of mining vehicles. Even though no sensitive flora was observed within the tracks/road, some sensitive tree and shrub species such as *Boscia albitrunca, B. foetida, Vachelia erioloba, Ozoroa dispar and Euclea pseudebenus* where recorded within close proximity to the road and may be potentially impacted if this portion of the road is upgraded.
- Access Road Option 2: The first 8 km from the mine will traverse a narrow twin track which will also likely have to be addressed in order to accommodate vehicle movement associated with the proposed mine. Similarly, sensitive trees and shrubs such as *Boscia foetida, B. albitrunca and Aloidendron dichotomum* as well as some protected succulent species occur in close proximity and may potential be affected.

These mentioned species can be successfully avoided and it is recommended that following the final route selection a qualified Botanist should conduct a walkthrough of the mentioned road sections, wherein all conservation important / sensitive flora is mapped. From a floristic perspective both routes are acceptable if the above-mentioned mitigation measures are implemented.

During the site survey no listed Red Data floral species were recorded within the surveyed site. A total of nine (9) species were however recorded which are protected within either National Forest Act or within the Northern Cape Nature Conservation Act (refer to the Botanical Study attached as Appendix O1).

The Botany Study concluded that it is highly unlikely that this development will have an impact on the status of the Ecosystem and Vegetation Types due to the limited extent of the mine as well as the presence of already disturbed areas within the footprint. Furthermore, this mine will not have a significant impact on the services and functions provided by the surrounding natural habitats and development within this area and is regarded as acceptable.

In terms of local-level biodiversity, the site is not exceptional and the site is not highly sensitive in this regard, as there are no unique, threatened of otherwise unique habitats present which are not widely available in the wider landscape. As a result, the majority of impacts associated with the development of the site are likely to be local in nature and not of wider significance. Although there are a number of nationally or provincially protected species at the site, none of these are rare and the loss of the affected individuals from the development footprint would not be of wider significance or compromise the viability of the local populations of these species.

In terms of the likely botanical impacts associated with the mine, impacts on vegetation during the operation phase are likely to be relatively moderate (rated mostly as medium significance prior to mitigation) and are difficult to mitigate as little can be done to avoid the large amounts of disturbance associated with this phase of the development. As the affected vegetation type is relatively widespread and the footprint area is regarded as limited in extent and placed within an already, largely transformed and disturbed area, the impact on vegetation, as already mentioned, is likely to be of locally high intensity but is not considered to be of broader significance. Potential cumulative impacts are also furthermore regarded limited and of low significance due to small footprint sizes of all the proposed borrow pits as well as the location of these borrow pits within largely transformed and disturbed habitats.

Subsequently the proposed development area is largely well located in terms of avoiding sensitive receptors and the development will not compromise the survival of any specific flora or terrestrial vertebrate species on the study area or beyond if mitigation measures are fully implemented.

"From a botanical perspective, no objective or motives (identification of impacts of high significance, etc.) were identified which would hinder the establishment of the proposed mine. Activities and Impacts are regarded as acceptable from a botanical perspective and will not cause detrimental impacts to the local flora, located within the affected area and surroundings. Therefore, it is the opinion of the specialist that the development may be authorised, subject to the implementation of the recommended mitigation measures". (Botha 2020.)

Site Specific Fauna

The site specific fauna of the study area represents the fauna of the surrounding environment, and no protected or red data species were identified to be resident within the proposed footprint area.

The fauna at the site will not be impacted on by the proposed mining activity as they will be able to move away or through the site, without being harmed. Workers must be educated and managed to ensure that no fauna at the site is harmed.

Site Specific Surface Water

As shown in the figure below, according to the BGIS: National Wetlands and NFEPA map the Hartbees River flows from the Orange River towards the proposed mining area ending ±7.5 km to the north. The map further shows an unnamed river to the east (±4.5 km away) of the proposed mining area as well as a river to the south (±3.5 km). Due to the topography of the site and the nature of the proposed activity, these rivers will not be affected by the mining operation.

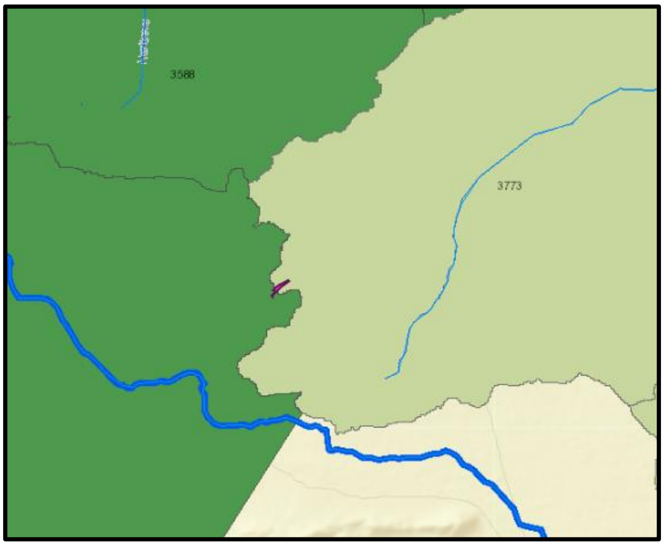

Figure 34: National Wetland and NFEPA map showing the Hartbees River to the north, and the two unnamed rivers to the east and south of the proposed mining area (pink polygon).

The map does not show any wetlands or other drainage lines within close proximity of the site and no areas of concern were noted at the time of the inspection. Due to the topography of the site, drainage channels that flows during rainy periods are present along the sides of the ridges. No drainage line of note passes through the proposed mining footprint, and as discussed the proposed activity does not require the construction of any new roads.

The western side of the mining area extends into a River NFEPA (National Freshwater Ecosystem Priority Area) (dark green in the figure below) while the rest of the mining area falls within an Upstream River NFEPA (light green in the figure below). The River- and Upstream River NFEPA is associated with the Orange River that passes the property to the North along the South African border. This application will not have an impact on the Orange River or the tributaries supporting the river and therefore should the applicant implement the management and mitigation measures proposed in this document no impact on the integrity of the NFEPA's could be identified.

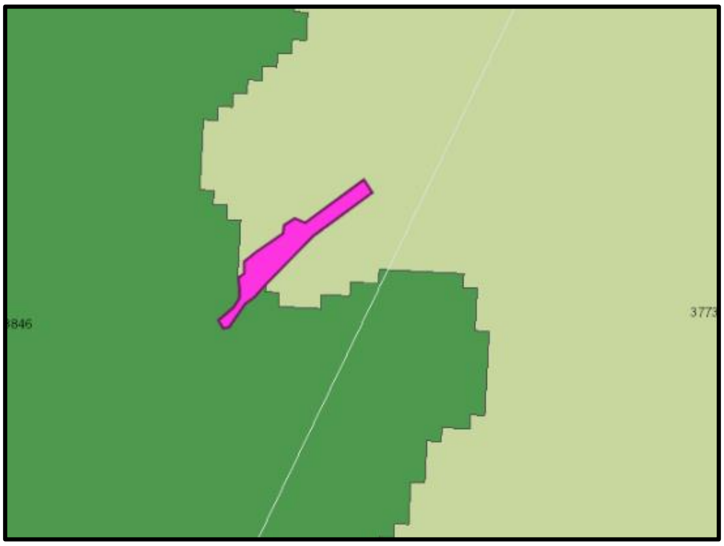

Figure 35: Location of the proposed mining area within a River NFEPA (dark green) and an Upstream River NFEPA (light green) (image obtained from the SANBI BGIS: National Wetlands and NFEPA Map Viewer)

Site Specific Ground water

Water in the area is a scarce commodity. A detailed groundwater study was not compiled for the mining permit, however numerous windmills in the area where observed showing the use and importance of groundwater in the area. However, due to the location, nature and the geology of the site compared with the slope, the potential of the mining operation impact the groundwater of the area is deemed of low possibility.

As mentioned earlier, VZS will take water from a borehole to be drilled on the property that will also be registered with the DWS. A water meter will monitoring the water used from the borehole. Due to the depth of the groundwater in this area, the quarry will not intercept groundwater during its live time and no groundwater seepage is therefore expected.

Site Specific Air quality

Emission into the atmosphere is controlled by the National Environmental Management: Air Quality Act, 2004. The proposed mining activity does not trigger an application in terms of the said act, and emissions to be generated is expected to mainly entail dust due to the displacement of soil and transport of material on gravel roads.

The nearest residential dwelling to the proposed mining area is a farm house of the adjacent landowner approximately 6.2 m north-west of the mining area. As the prevalent wind direction is in a south-south-eastern direction the adjacent hill will screen dust generated at the Wortel quarry from the operations/residents on the opposite side. Should the Applicant however implement the mitigation measures proposed in this document and the EMPr the impact on the air quality of the surrounding environment is deemed to be of low-medium significance.

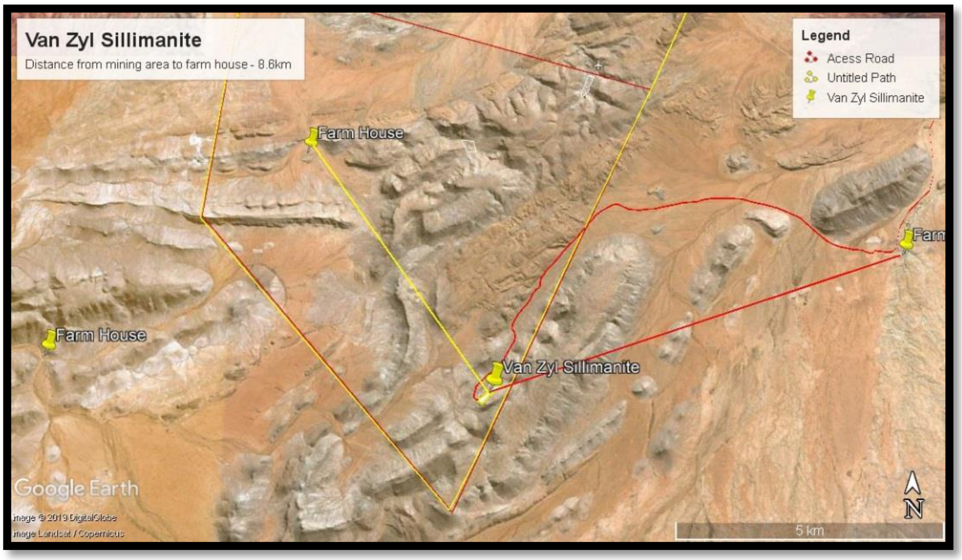

Figure 36: Proximity to neighbours

Site Specific Noise

The noise to be generated at the Wortel quarry will contribute to the daily noise levels of the farm. The proposed activity will contribute noise generated as a result of blasting, as well as loading, and transporting of material. The nuisance value of noise generated by heavy earthmoving equipment, to residence in the near vicinity is deemed to be of low significance, as the surrounding hills will act as a sound barrier to the nearest occupants. The noise caused by blasting will be instantaneous and of short duration. Blasting will only be conducted during day light hours on week days. No processing or blasting will take place over weekends.

Although the proposed activity will have a cumulative impact on the ambient noise levels, the development is not within close proximity to sensitive receptors and, and the impact is therefore deemed of low significance.

Site Specific Archaeology and Cultural Interest

(Information extracted from the Heritage Impact Assessment, HCAC 2019 as well as the Basic Palaeontological Assessment, Pether 2019 see Appendix O2 and O3 respectively).

The HIA concluded that the study area has been impacted on by existing mining and the dumping of topsoil, clearing and levelling as well as previous mining trenches characterise the study area. All of these activities would have impacted on surface indicators of heritage resources if these ever existed in the study area. The likelihood of heritage resources ever occurring in the study area is doubtful as the site is marked by steep slopes of the Witberg Mountain. These slopes of mica-sillimanite schists do not seem to have been conducive to the formation of rock shelters, and no rock art or archaeological sites of significance were recorded. The survey also did not reveal any historical farm steads, colonial era stone-walling (dwellings or kraals), graves or other sites of significance. Human impact (apart from the existing mining and dumps) is limited to isolated farming infrastructure like farm fences, wind pumps and tracks.

In terms of the paleontological component, the general study area is indicated as of low or unknown significance. Rossouw (2013) conducted a study on another portion of the farm Wortel and found that "*Bedrock underlying the study area is not considered to be palaeontologically significant, because of the metavolcanic-metasedimentary nature of the strata. No evidence was found of large vertebrate fossil remains within the Quaternary surface deposits covering the terrain'*. Pether (2012) concurred with the results of this study in an application for exemption for a study to the east of Aggeneys.

The Palaeontological Assessment concluded that mining will involve some shallow disturbance of the surficial deposits. However, such disturbance is of a relatively minor nature and the anticipated impact on palaeontological resources is rated as low, due to the expected, very sparse occurrence of fossil bone material in the thin regolith cover of the bedrock outcrops. No additional palaeontological interventions are required, due to the unfossiliferous nature of the bedrock and the limited palaeontological resource potential of surficial cover on the bedrock outcrops.

Site Specific Visual Exposure

The proposed mining activities will mainly be visible within close proximity (±1 km radius) of the footprint towards the north and north-east as well as some of the higher laying areas to the west. The figure below shows the viewshed analysis for the footprint within a ±10 km radius. The green shaded areas shows the positions from where the mining area will be visible. From this analysis it is proposed that the visual impact of the proposed mining operation will be of low significance, especially as no permanent structures will be constructed. Should the Applicant successfully rehabilitate the mining area (upon closure), the only residual visual impact will be that of the quarry pit to be developed as a landscape feature.

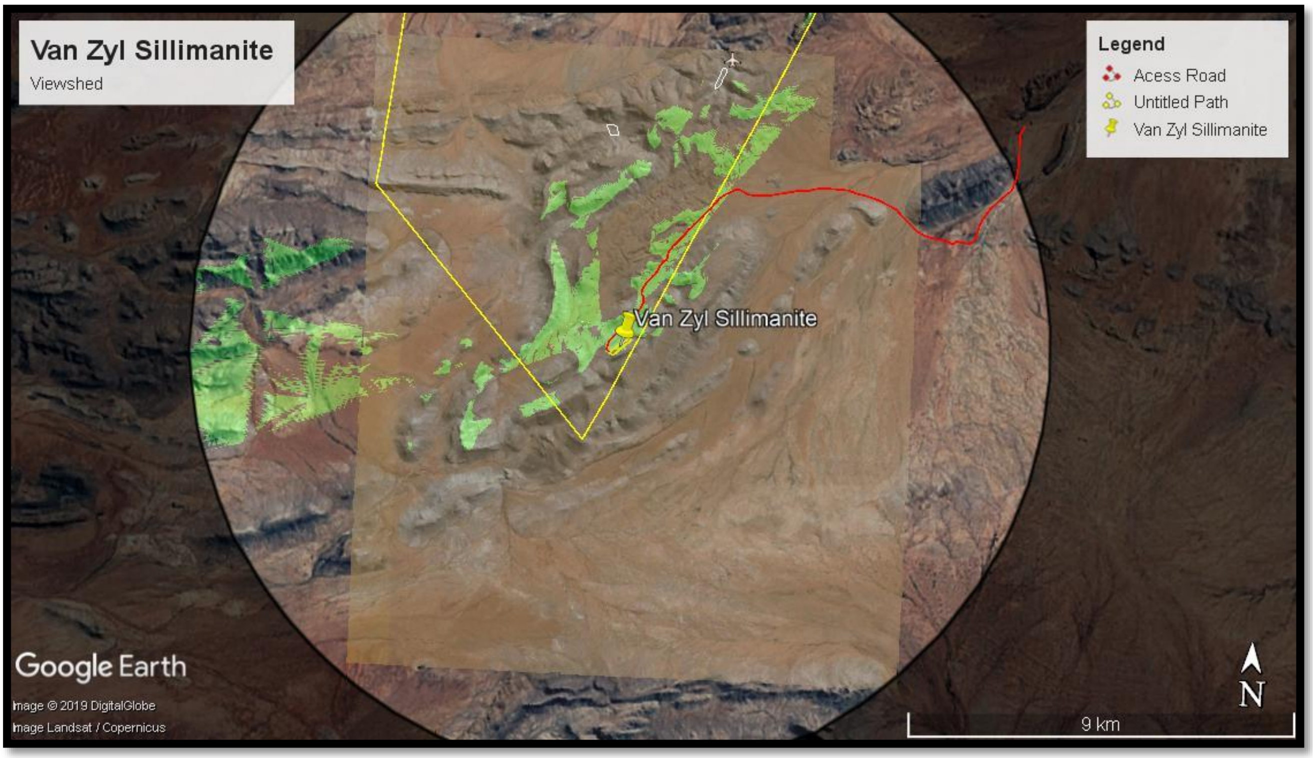

Figure 37: View shed of the proposed mining permit area.

(d) Environmental and current land use map.

(Show all environmental and current land use features)

The environmental and current land use map is attached as Appendix E.

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

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

The following potential impacts were identified of each main activity in each phase. The significance rating was determined using the methodology as explained under *vi) Methodology Used in Determining and Ranking the Significance*. The impact rating listed below was determined for each impact **prior** to bringing the proposed mitigation measures into consideration. The degree of mitigation indicates the possibility of partial, full or no mitigation of the identified impact.

Table 28: Impact Assessment of Van Zyl Sillimanite

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
CONSTRUCTION / SITE ESTABLISHMENT PHASE												
ACTIVITY:	**DEMARCATION OF SITE WITH VISIBLE BEACONS.**											
Site Establishment	No impact could be identified other than the beacons being outside the boundaries of the approved mining area.	Neu										
ACTIVITY:	**ESTABLISHMENT OF TEMPORARY BUILDINGS AND INFRASTRUCTURE WITHIN BOUNDARIES OF SITE.**											
Site Establishment	If the infrastructure is established within the boundaries of the approved mining area, no impact could be identified.	Neu										
Social & Safety	Influx of unsuccessful job seekers which may informally settle in area. Potential danger to surrounding communities	Neg	Reversible	1	1	4	2	3	5	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med- High
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	1	1	3,67	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: ABLUTION FACILITIES												
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Soils	Portable toilets Potential harm through sewage leaks	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
SUB ACTIVITY: ACCESS ROADS												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: SITE OFFICES												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
SUB ACTIVITY: VEHICLE SERVICE AREA												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: WASH BAY												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
SUB ACTIVITY: WORKSHOP												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
SUB ACTIVITY: SALVAGE YARD												

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
SUB ACTIVITY: BUNDED DIESEL AND OIL STORAGE FACILITIES												
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
SUB ACTIVITY: WEIGH BRIDGE												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: PARKING AREA												
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: WASTE AREA												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
ACTIVITY:	**STRIPPING AND STOCKPILING OF TOPSOIL**											
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med- High
Hazardous Waste	Contamination of area with hydrocarbons or hazardous waste materials	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	5	3	11	Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
OPERATIONAL PHASE												
ACTIVITY:	**DRILLING AND BLASTING**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Hazardous Waste	Contamination of area with hydrocarbons or hazardous waste materials	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med- High
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	5	3	11	Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Social & Safety	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Neg	Reversible	1	4	4	3	3	3	3	9	Low-Med
ACTIVITY:	**EXCAVATION**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med- High
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med
Hazardous Waste	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	5	3	11	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Social & Safety	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Neg	Reversible	1	4	4	3	3	3	3	9	Low-Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
ACTIVITY:	**CRUSHING AND SCREENING OF SILLIMANITE S**											
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
ACTIVITY:	**TRANSPORTATION OF SILLIMANITE S FROM STOCKPILE AREA TO CLIENTS**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Traffic and Safety	Road degradation. Increased potential for road incidences Potential distraction to road users	Neg	Reversible	2	2	4	3	3	2	3	6,67	Low-Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
DECOMMISSIONING PHASE												
ACTIVITY:	**SLOPING, LANDSCAPING AND REPLACEMENT OF TOPSOIL OVER DISTURBED AREA (FINAL REHABILITATION)**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med
Soils	Soils replaced and ameliorated	Pos	Reversible	1	3	4	3	3	5	4	10,7	Med
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med
Topography	Eradication of trenches and berms. Re-contouring of area for free surface water drainage. Eradication of stockpiles	Pos	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Visual aspect	Improved aesthetics through rehabilitation	Pos	Reversible	2	1	3	2	2	5	4	7	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med
Fauna	Reintroduction of fauna attracted to flora to the area	Pos	Reversible	2	2	4	3	3	5	4	10,7	Med
Fauna	Reintroduction of fauna attracted to flora to the area	Pos	Reversible	2	1	3	2	1	5	3	6	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Social & Safety	Health and safety risk posed by un-sloped areas	Neg	Reversible	1	4	4	3	3	3	3	9	Low-Med
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Surface water	Containment of dirty water. Improve response to issues relating to deterioration of surface water quality or quantity. Free drainage resorted to area. Revegetation of disturbed areas reduces risk of silt loading on downstream water bodies. Large area of surface water runoff return to catchment	Pos	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Pos	Reversible	2	3	5	3	4	2	3	10	Med
ACTIVITY: Application for Closure Certificate												

(1) Cumulative Impacts

Table 29: Cumulative Impact Assessment of Van Zyl Sillimanite –Wortel Quarry

Nature of Impact	Impact	Positive/Negative / Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Mitigation
CONSTRUCTION, OPERATIONAL AND DECOMMISSIONING PHASES													
Traffic & Safety	Increased potential for road incidences	Neg	Reversible	2	3	1	2	3	1	2	4	Low	• All intersections with main tarred roads will be clearly signposted. Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.
Traffic & Safety	Road degradation	Neg	Reversible	1	3	1	1,6	2	1	1,5	2,5	Low	• Storm water must be diverted around the access roads to prevent erosion. • Erosion of access road: Vehicular movement must be restricted to existing access routes to prevent crisscrossing of tracks through undisturbed areas. Rutting and erosion of the access road caused as a result of the mining activity must be repaired by the applicant.
Noise	The noise impact must be contained within the boundaries of the property, and will represent the current noise levels of the farm.	Neg	Reversible	1	1	2	1,3	1	5	3	4	Low	**Noise Handling:** • The applicant must ensure that employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours. • No loud music may be permitted at the mining area. • All mining vehicles must be equipped with silencers and maintained in a road worthy condition in terms of the Road Transport Act.

Nature of Impact	Impact	Positive/Negative / Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Mitigation
Air quality	Increased dust generation will impact on the air quality of the receiving environment.	Neg	Reversible	2	2	4	2,6	4	5	4,5	12	Med	**Dust Handling:** - The liberation of dust into the surrounding environment must be effectively controlled by the use of, inter alia, water spraying and/or other dust-allaying agents. - The site manager must ensure continuous assessment of all dust suppression equipment to confirm its effectiveness in addressing dust suppression. - Speed on the access roads must be limited to 40km/h to prevent the generation of excess dust. - All roads will be sprayed with water or an environmental friendly dust-allaying agent that contained PCB's (e.g. DAS products/ Pro/base) at regular intervals to ensure that dust is adequately suppressed in the mining roads. - All disturbed or exposed areas will be re-vegetated as soon as possible during the operational phase to prevent any dust source from being created. - A fall out and nuisance dust monitoring programme could be submitted to the principle inspector of mines (DMR-Northern Cape) on an annual basis if required. If any complaint is received form the public or state department regarding dust levels, the fall-out and nuisance dust levels will again be monitored at prescribed monitoring points. The result will then be compiled into monthly reports and forwarded to the Director-Occupational Hygiene. - Fallout dust will be monitored via a fallout dust bucket system on the boundaries of the mining area.
Air quality	Emissions will be contained within the property boundaries and will therefore affect only the landowner.	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	**Emission Handling:** - All vehicles will be regularly services to ensure they are in proper working condition and to reduce risk of excessive emissions.

Cumulative effects are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of ecosystems. Of particular concern is the knowledge that ecological system sometimes changes abruptly and unexpectedly in response to apparently small incremental stresses. For purposes of this report, cumulative impacts have been defined as **"the changes to the environment caused by an activity in combination with other past, present, and reasonably foreseeable human activities".**

Generally, as the sites are in non-existence and no major additional environmental impacts are expected, the cumulative impacts will generally be of medium significance.

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

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

A “significant impact” is defined as it is defined in the EIA Regulations (2014): “an impact that may have a notable effect on one or more aspects of the environment or may result non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as by its duration, magnitude, intensity or probability of occurrence”. The objective of this EIA methodology is to serve as framework for accurately evaluating impacts associated with current or proposed activities in the biophysical, social and socio-economical spheres. It aims to ensure that all legal requirements and environmental considerations are met in order to have a complete and integrated environmental framework for impact evaluations.

The process of determining impacts to be assessed is one of the most important parts of the environmental impact assessment process. It is of such high importance because the environmental impacts identified can and are often linked to the same impact stream.

In this method all impacts on the biophysical environment are assessed in terms of the overall integrity of ecosystems, habitats, populations and individuals affected. The Environmental Impact Assessment (EIA) 2014 Regulations promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) [as amended] requires that all identified potential impacts associated with the proposed project be assessed in terms of their overall potential significance on the natural, social and economic environments.

The criteria identified in the EIA Regulations (2014) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact;
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

Greenmined Environmental has developed an impact assessment methodology (as defined below) whereby the significance of a potential impact is determined through the assessment of the relevant temporal and spatial scales determined of the extent, magnitude and duration criteria associated with a particular impact.

This method does not explicitly define each of the criteria but rather combines them and results in an indication of the overall significance.

DEFINITIONS AND CONCEPTS:

Environmental significance:

The concept of significance is at the core of impact identification, evaluation and decision-making. The concept remains largely undefined and there is no international consensus on a single definition. The following common elements are recognised from the various interpretations:

- Environmental significance is a value judgement;
- The degree of environmental significance depends on the nature of the impact;
- The importance is rated in terms of both biophysical and socio-economic values; and
- Determining significance involves the amount of change to the environment perceived to be acceptable to affected communities.

Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of acceptability) (DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5).

The concept of risk has two dimensions, namely the consequence of an event or set of circumstances, and the likelihood of particular consequences being realised (Environment Australia (1999) Environmental Risk Management).

(1) Methodology that will be used

(a) Nature of the impact

The nature of an impact can be defined as "a brief description of the impact being assessed, in terms of the proposed activity or project, including the socio-economic or environmental aspect affected by this impact".

(b) Extent of the impact

The extent of an impact can be defined as "a brief description of the spatial influence of the impact or the area that will be affected by the impact".

Table 30: Determining the extent of an impact

EXTENT Extent or spatial influence of impact	**Footprint**	Only as far as the activity, such as footprint occurring within the total site area
	Site	Only the site and/or 500m radius from the site will be affected
	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
	Region	Entire region / province is affected
	National	Country is affected

(c) Severity of the impact

Severity relates to the nature of the event, aspect or impact to the environment and describes how severe the aspects impact on the biophysical and socio-economic environment.

Table 31: Rating of Severity

TYPE OF CRITERIA	**RATING**				
	1	**2**	**3**	**4**	**5**
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant/ Harmful	Great/ Very harmful	Disastrous Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance/ Easily reversible	Low cost to mitigate	Substantial cost to mitigate/ Potential to mitigate impacts/ Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate/ Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

(d) Duration of the impact

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Table 32: Rating of Duration

RATING		DESCRIPTION
1	Very Short Term	Up to three months (quarter) after construction
2	Short Term	Three months to one year after construction
3	Medium Term	One year to six years after construction
4	Long Term	Six to ten years after construction
5	Permanent	Beyond ten years after construction

(e) Probability of the impact occurring

The probability of an impact can be defined as "the estimated chance of the impact happening". Probability refers to how often the activity or aspect has an impact on the environment.

Table 33: Determining the probability of an impact

PROBABILITY	1	Almost never / almost impossible	Impossible to occur (0 – 20% probability of occurring)
	2	Very seldom / highly unlikely	Unlikely to occur (20 -40% probability of occurring)
	3	Infrequent / unlikely / seldom	May occur (40-60% chance of occurring)
	4	Often / regularly / likely / possible	Likely to occur (60-80% chance of occurring)
	5	Daily / highly likely / definitely	Will certainly occur (80-100% chance of occurring)

(f) Degree to which impact can be reversed

The reversibility of an impact can be defined as "the ability of an impact to be changed from a state of affecting aspects to a state of not affecting aspects".

Table 34: Determining the reversibility of an impact

REVERSIBILITY	Reversible	Impacts can be reversed through the implementation of mitigation measures
	Irreversible	Impacts are permanent and can't be reversed by the implementation of mitigation measures

(g) Determination of Likelihood

The irreplaceability (likelihood) of an impact can be defined as "the amount of resources that can/can't be replaced". The determination of likelihood is a combination of Duration and Probability. Each factor is assigned a rating of 1 to 5, as described below and in tables 6 and 7.

(h) Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarised below, and then dividing the sum by 2.

Table 35: Calculation of overall likelihood

CONSEQUENCE	RATING
Duration	Example 4
Probability	Example 2
SUBTOTAL	**6**
TOTAL LIKELIHOOD (Subtotal divided by 2)	**3**

(i) Determination of Overall Environmental Significance:

The environmental significance assessment methodology is based on the following determination:

Environmental Significance = Overall Consequence X Overall Likelihood

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of **LOW**, **LOW-MEDIUM**, **MEDIUM**, **MEDIUM-HIGH** or **HIGH**, as shown in the table below.

Table 36: Overall Environmental Significance

SIGNIFICANCE OR RISK	LOW	LOW-MEDIUM	MEDIUM	MEDIUM-HIGH	HIGH
Overall Consequence X Overall Likelihood	1 - 4.9	5 - 9.9	10 - 14.9	15 – 19.9	20 - 25

Based on the above, the significance rating scale has been determined as follows:

High	Of the highest order possible within the bounds of impacts which could occur. In the case of negative impacts, there would be no possible mitigation and / or remedial activity to offset the impact at the spatial or time scale for which it was predicted. In the case of positive impacts, there is no real alternative to achieving the benefit.
Medium-High	Impacts of a substantial order. In the case of negative impacts, mitigation and / or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these. In the case of positive impacts, other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these.
Medium	Impact would be real but not substantial within the bounds of those, which could occur. In the case of negative impacts, mitigation and / or remedial activity would be both feasible and fairly easily possible, in case of positive impacts; other means of achieving these benefits would be about equal in time, cost and effort.

Low-Medium	Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and / or remedial activity would be either easily achieved of little would be required, or both. In case of positive impacts alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time-consuming, or some combination of these.
Low	Impact would be negligible. In the case of negative impacts, almost no mitigation and or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap and simple. In the case of positive impacts, alternative means would almost all likely be better, in one or a number of ways, than this means of achieving the benefit
Insignificant	There would be a no impact at all – not even a very low impact on the system or any of its parts.

(j) Determination of Overall Consequence

Consequence analysis is a mixture of quantitative and qualitative information and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: ***Severity/Intensity, and Extent/Spatial Scale***. Each factor is assigned a rating of 1 to 5, as described in the tables above.

(k) Degree to which the impact can be mitigated

The degree to which an impact can be mitigated can be defined as "the effect of mitigation measures on the impact and its degree of effectiveness".

Table 37: Determining the mitigation rating of an impact

MITIGATION RATING	**MITIGATED Degree impact can be mitigated**	High	Impact 100% mitigated
		Medium	Impact >50% mitigated
		Low	Impact <50% mitigated

(l) Cumulative Impacts

The effect of cumulative impacts can be described as "the effect the combination of past, present and "reasonably foreseeable" future actions have on aspects".

Table 38: Determining the confidence rating of an impact

CUMULATIVE RATING	**CUMULATIVE EFFECTS**	Low	Minor cumulative effects
		Medium	Moderate cumulative effects
		High	Significant cumulative effects

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

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

Layout Alternative 1 (A1) (Non-Preferred Alternative):

Layout Alternative 1 was considered by the applicant and project team during the assessment phase of the environmental impact assessment, but were **not deemed** to be **the preferred option** due to the following:

- Although the proposed footprint offers the mineral sought after (positive impact), the geologist identified an additional area, to the south-west, that should be included in the application. To add this area to the mining permit footprint without crossing the allowable 5 ha limit of a mining permit (negative impact), an alteration of the site layout was proposed.

Layout Alternative 2 (A2) (Preferred Alternative):

Layout Alternative 2 was identified by the project team as the **preferred option** due to the following:

- The natural vegetation of the earmarked footprint was previously altered by sillimanite mining, and although vegetation did re-establish through succession it is still in a transformed state (positive impact).
- The layout of A2 was defined to include the maximum available mining area with the least possible area of recovering vegetation (positive impact).
- This layout includes the stockpiled sillimanite source to the south-west identified by the geologist, while still allowing the application to apply for a mining permit (within 5 ha limit) (positive impact).
- The remote location of the proposed footprint (>20 km from Aggeneys) highly reduces the potential of the operations impacting the air and noise quality of surrounding residents (positive impact).
- The mining area can be reached by an existing road that connects to a provincial gravel road. No new road infrastructure need to be constructed (positive impact).

Site Alternative 3 (Non-Preferred Alternative):

Site Alternative 3 was **not** deemed a **preferred option** due to the following:

- Although the site was previous mined and is therefore a brown field site (positive impact), accessibility is problematic. The site is situated in a very mountainous area with limited road access. This will necessitate the construction/intensive upgrade of access roads (negative impact).
- The geologist found only low grade sillimanite in this area (negative impact).
- The biodiversity related impacts associated with this alternative were deemed too high without the need or motivation to justify it (negative impact).

No-go Alternative:

The no-go alternative was not deemed to be the preferred alternative as:

- The applicant will not be able to supply in the demand of the cement and refactory industries of the area (negative impact),
- The application, if approved, would allow the applicant to utilize the available Sillimanite as well as provide employment opportunities to local employees. Should the no-go alternative be followed these opportunities will be lost to the applicant, potential employees and clients (negative impact),
- The applicant will not be able to diversify the income of the property (negative impact).

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

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

Visual Mitigation:

The risk of the proposed mining activity having a negative impact on the aesthetic quality of the surrounding environment can be reduced to a low – medium risk through the implementation of the mitigation measures listed below:

- The site needs to have a neat appearance and be kept in good condition at all times.
- Upon closure the site needs to be rehabilitated to insure that the visual impact on the aesthetic value of the area is kept to a minimum.

Dust Handling:

The risk of dust, generated from the proposed mining activity, having a negative impact on the surrounding environment can be reduced to being low through the implementation of the mitigation measures listed below:

- The liberation of dust into the surrounding environment must be effectively controlled by the use of, inter alia, water spraying and/or other dust-allaying agents.
- The site manager must ensure continuous assessment of all dust suppression equipment to confirm its effectiveness in addressing dust suppression.
- Speed on the access roads must be limited to 40km/h to prevent the generation of excess dust.
- All roads will be sprayed with water or an environmental friendly dust-allaying agent that contained PCB's (e.g. DAS products/ Pro/base) at regular intervals to ensure that dust is adequately suppressed in the mining roads.
- All disturbed or exposed areas will be re-vegetated as soon as possible during the operational phase to prevent any dust source from being created.
- A fall out and nuisance dust monitoring programme could be submitted to the principle inspector of mines (DMR-Northern Cape) on an annual basis if required. If any complaint is received form the public or state department regarding dust levels, the fall-out and nuisance dust levels will again be monitored at prescribed monitoring points. The result will then be compiled into monthly reports and forwarded to the Director-Occupational Hygiene.
- Fallout dust will be monitored via a fallout dust bucket system on the boundaries of the mining area.

<u>Noise Handling:</u>

The risk of noise, generated from the proposed mining activity, having a negative impact on the surrounding environment can be reduced to being low-medium through the implementation of the mitigation measures listed below:

- The applicant must ensure that employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours.
- No loud music may be permitted at the mining area.
- All mining vehicles must be equipped with silencers and maintained in a road worthy condition in terms of the Road Transport Act, 1996 (Act No 93 of 1996).
- The type, duration and timing of the blasting procedures must be planned with due cognizance of other land users and structures in the vicinity. Surrounding land owners must be notified in writing prior to each blasting occasion.
- Best practice measures shall be implemented in order to minimize potential noise impacts.
- A qualified occupational hygienist must be contracted to quarterly monitor and report on the personal noise exposure of the employees working at the mine. The monitoring must be done in accordance with the SANS 10083:2004 (Edition 5) sampling method as well as NEM:AQA, 2004, SANS 10103:2008.

Management of weed or invader plants:

The risk of weeds or invader plants invading the disturbed area can be reduced to being low through the implementation of the mitigation measures listed below:

- A weed and invader plant control management plan must be implemented at the site to ensure eradication of all listed invader plants in terms of the National Environmental Biodiversity Act [NEMBA] (Act No. 10 of 2004) Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure.
- Management must take responsibility to control declared invader or exotic species on the rehabilitated areas. The following control methods can be used:
  - "The plants can be uprooted, felled or cut off and can be destroyed completely."
  - "The plants can be treated with an herbicide that is registered for use in connection therewith and in accordance with the directions for the use of such an herbicide."
  - The temporary topsoil stockpiles need to be kept free of weeds.
- Regular monitoring for alien plants at the site must occur and could be conducted simultaneously with erosion monitoring.
- When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels.
- No planting or importing of any alien species to the site for landscaping, rehabilitation or any other purpose may be allowed.

Storm water Handling:

The risk of contamination through dirty storm water escaping from work areas, or erosion or loss of stockpiled topsoil caused due to uncontrolled storm water flowing through the mining area can be reduced to being low through the implementation of the mitigation measures listed below:

- Storm water must be diverted around the topsoil heaps, and access roads to prevent erosion and loss of material.
- Mining must be conducted only in accordance with the Best Practice Guideline for small scale mining that relates to storm water management, erosion and sediment control and waste management, developed by the Department of Water and Sanitation (DWS), and any other conditions which that Department may impose:
- Runoff water must be diverted around the site areas with trenches and contour structures to prevent erosion of the work areas.
- Clean water (e.g. rainwater) must be kept clean and be routed to a natural watercourse by a system separate from the dirty water system. You must prevent clean water from running or spilling into dirty water systems.

- Dirty water must be collected and contained in a system separate from the clean water system.
- Dirty water must be prevented from spilling or seeping into clean water systems.
- The storm water management plan must apply for the entire life cycle of the mining activity and over different hydrological cycles (rainfall patterns).
- The statutory requirements of various regulatory agencies and the interests of stakeholders must be considered and incorporated into the management plan.
- Any erosion problems within the borrow pit area as a result of the mining activities observed must be rectified immediately and monitored thereafter to ensure that they do not re-occur.
- Mining within steep slopes will need to ensure that adequate slope protection is provided.
- All bare areas resulting from the development must be re-vegetated, post-operation, with locally occurring species, to bind the soil and limit erosion potential.
- Roads and other disturbed areas within the project area must regularly be monitored for erosion problems and problem areas must receive follow-up monitoring to assess the success of the remediation.
- Silt/sediment traps/barriers must be used where there is a danger of topsoil or material stockpiles eroding and entering downstream drainage lines and other sensitive areas.
- These sediment/silt barriers must regularly be maintained and cleared so as to ensure effective drainage of the areas
- Any erosion points created during construction must be filled and stabilized immediately.
- Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.
- Construction of gabions and other stabilisation features must be undertaken to prevent erosion, where deemed necessary.

<u>Handling of Hazardous Materials and Substances:</u>

- All hazardous materials or substances must be stored in a closed storage facility with an impermeable floor.
- The storage area must meet the following conditions:
  - The storage area must be constructed on a level area to prevent offsite migration of any spilled product.
  - The floor of the storage area must be impermeable to prevent seepage of spilled products into the ground or ground water.
  - The storage area must be out of the 1:100-year flood line or further than 100m from the edge of a watercourse, whichever is greatest.
  - The facility must be such that access to the materials/substances can only take place with the prior notification of an appropriate staff member.

- All fuel storage tanks must have secondary containment in the form of an impermeable bund wall and base within which the tanks sits, raised above the floor, on plinths. This bund capacity must be sufficient to contain 110% of the tank's maximum capacity.
- The distance and height of the bund wall relative to that of the tank must also be taken into consideration to ensure that any spillage does not result in oil spouting beyond the confines of the bund.
- The site manager must establish a formal inspection routine to check all equipment in the bund area, as well as the bund area itself for malfunctions or leakages. The bund area must be inspected at least weekly and any accumulated rainwater removed. All valves and outlets must be checked to ensure that they are intact and closed securely.
- The bund base must slope towards a rainwater sump of sufficient size.
- Contaminated water may not be allowed to mix with clean water, and contained until it can be collected by a registered hazardous waste handling contractor or be disposed of at a registered hazardous waste handling facility.
- Drip trays must be available to be place underneath all stationary equipment or vehicles.
- The layer of material at the vehicle service area must be removed and if contaminated with hazardous substances such as hydrocarbons must be disposed of as hazardous waste by an appropriately qualified waste handling contractor. The compacted areas must be ripped and the topsoil returned over the area.
- The site must be cleared of all hazardous substances once decommissioning has been completed and must be disposed of by an appropriately qualified waste handling contractor.

<u>Waste Management:</u>

The risk of waste generation having a negative impact on the surrounding environment can be reduced to being low through the implementation of the mitigation measures listed below:

- No waste stockpile area may be established outside the boundaries of the mining area.
- Vehicle maintenance may only take place within the service bay area of the off-site workshop.
- The diesel bowser needs to be equipped with a drip tray at all times. Drip trays have to be used during each and every refuelling event.
- The nozzle of the bowser needs to rest in a sleeve to prevent dripping after refuelling.
- Site management must ensure drip trays are cleaned after each use. No dirty drip trays may be used on site.
- Any effluents containing oil, grease or other industrial substances must be collected in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility.
- Spills must be cleaned up immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing it at a recognised facility. Proof must be filed.

- Suitable covered receptacles must be available at all times and conveniently placed for the disposal of waste.
- Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., must be stored in a container with a closable lid at a collecting point and collected on a regular basis and disposed of at a recognised landfill site. Specific precautions must be taken to prevent refuse from being dumped on or in the vicinity of the mine area.
- Biodegradable refuse generated must be handled as indicated above.
- Water from the wash bay must drain into the oil sump from where it must be removed by an approved contractor.
- Drip trays must be available to be place underneath all stationary equipment or vehicles.
- Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognized landfill facility once decommissioning has been completed. It will not be permitted to be buried or burned on the site.

<u>Management of Health and Safety Risks:</u>

The health and safety risk, posed by the proposed mining activity can be reduced to being low through the implementation of the mitigation measures listed below:

- Workers must have access to the correct personal protection equipment (PPE) as required by law.
- All operations must comply with the Mine Health and Safety Act, 1996 (Act No 29 of 1996).
- The type, duration and timing of the blasting procedures must be planned with due cognizance of other land users and structures in the vicinity.
- The surrounding landowners and communities must be informed in writing ahead of any blasting event.
- The compliance of ground vibration and airblast levels must be monitored to USBM standards with each blasting event.
- A vibro recorder must be used to record all blasts.
- Audible warning of a pending blast must be given at least 3 minutes in advance of the blast.
- Measures to limit flyrock must be taken. All flyrock (of diameter 150 mm and larger) which falls beyond the working area, together with the rock spill must be collected and removed.

<u>Protection of fauna and flora:</u>

The risk on the fauna and flora of the footprint area as well as the surrounding environment, as a result of the proposed mining activity, can be reduced to being low through the implementation of the mitigation measures listed below:

- The site manager must ensure that no fauna is caught, killed, harmed, sold or played with.

- Workers must be instructed to report any animals that may be trapped in the working area.
- No snares may be set or nests raided for eggs or young.
- Pre-construction walk-through of the final mining footprint, by a suitably qualified botanist, for species of conservation concern that would be affected (also to comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions).
- Pre-construction walk-through must also be conducted of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded.
- Permits must be kept on-site and in the possession of the flora search and rescue team at all times.
- Pre-construction environmental induction for all staff on site must be provided to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas, etc.
- Contractor's EO must provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place.
- Blanket clearing of vegetation must be limited to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place.
- Topsoil must be stripped and stockpiled separately during site preparation and replaced over disturbed areas on completion.
- Ensure that laydown areas, construction camps, and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible.
- All vehicles to remain on demarcated roads and no unnecessary driving in the veld outside these areas must be allowed.
- No plants may be translocated or otherwise uprooted or disturbed for rehabilitation or other purposes without express permission from the Contractor's EO and without the relevant permits.
- No fires must be allowed on-site.
- After the operation, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations as provided within a site-specific Rehabilitation Plan compiled by a suitably qualified botanist.
- Rehabilitation progress, erosion and I&AP monitoring must occur simultaneously post-operational phase and must occur biannual for a minimum of two years.

Management of Access Roads:

The risk on the condition of the roads, as a result of the proposed mining activities, can be reduced to being low-medium through the implementation of the mitigation measures listed below:

- Pre-construction walk-through must be conducted of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded.
- Storm water must be diverted around the access roads to prevent erosion.
- Erosion of access road: Vehicular movement must be restricted to existing access routes to prevent crisscrossing of tracks through undisturbed areas. Rutting and erosion of the access road caused as a result of the mining activity must be repaired by the applicant.
- On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, must be scarified to a depth of at least 300 mm and graded to an even surface condition and the previously stored topsoil must be returned to its original depth over the area.

Topsoil Handling:

The risk of loss of topsoil can be reduced to being low through the implementation of the mitigation measures listed below:

- Where applicable the first 300 mm of topsoil must be removed in strips and stored along the boundary of the mining area. Stockpiling of topsoil must be done to protect it from erosion, mixing with overburden or other material. The topsoil must be used to cover the rehabilitated area and improve the establishment of natural vegetation.
- The temporary topsoil stockpiles must be kept free of weeds.
- Topsoil stockpiles must be placed on a levelled area and measures must be implemented to safeguard the piles from being washed away in the event of heavy rains/storm water.
- Topsoil heaps must not exceed 1.5 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.
- Should natural vegetation not establish on the heaps within 6 months of stockpiling it must be planted with an indigenous grass species.
- Storm- and runoff water must be diverted around the topsoil stockpiles and access roads to prevent erosion.

Archaeology/Palaeontological/Cultural Aspects:

The impact on archaeological, heritage and palaeontological aspects, as a result of the proposed mining activities, can be reduced to being negligible through the implementation of the mitigation measures listed below:

- All mining must be confined to the development footprint area.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.
- The senior on-site Manager must inform the ECO of the chance find and its immediate impact on operations. The ECO must then contact a professional archaeologist for an assessment of the finds who must notify the South African Heritage Resources Agency (SAHRA) and/or the McGregor Museum (Kimberley). The following information must be supplied:
  - A description of the nature of the find.
  - Detailed images of the finds (with scale included).
  - Position of the find (GPS) and depth.
  - Digital images of the context. *I.e*. the excavation (with scales).
- Work may only continue once the go-ahead was issued by SAHRA.

ix) Motivation where no alternative sites were considered.

N/A

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

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

Van Zyl Sillimanite identified the need for Sillimanite in the area. The mining permit application area of (5 (Ha)) within the boundaries of the farm Wortel 42, portion 1, which falls in the Khâi-Ma Local Municipality, Namakwa District Municipality, Namakwaland Magisterial District, Northern Cape Province, for Sillimanite. As mentioned earlier the quarry pit on the property of the applicant has previously been used for mining purposes. In this light the applicant identified the proposed (Layout Alternative 2) area as preferred and only viable alternative to allow for the proposed development.

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

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

During the impact assessment process the following potential impacts were identified of each main activity in each phase. An initial significance rating (listed under *v) Impacts and Risks Identified*) was determined for each potential impact should the mitigation measures proposed in this document not be implemented on-site. The impact assessment process then continued in identifying mitigation measures to address the impact that the proposed mining activity may have on the surrounding environment.

The significance rating was again determined for each impact using the methodology as explained under *vi) Methodology Used in Determining and Ranking the Significance*. The impact ratings listed below was determined for each impact **after** bringing the proposed mitigation measures into consideration and therefore represents the final layout/activity proposal.

Table 39: Impact Assessment of Van Zyl Sillimanite

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
CONSTRUCTION / SITE ESTABLISHMENT PHASE												
ACTIVITY:	**DEMARCATION OF SITE WITH VISIBLE BEACONS.**											
Site Establishment	No impact could be identified other than the beacons being outside the boundaries of the approved mining area.	Neu										
ACTIVITY:	**ESTABLISHMENT OF TEMPORARY BUILDINGS AND INFRASTRUCTURE WITHIN BOUNDARIES OF SITE.**											
Site Establishment	If the infrastructure is established within the boundaries of the approved mining area, no impact could be identified.	Neu										
Social & Safety	Influx of unsuccessful job seekers which may informally settle in area. Potential danger to surrounding communities	Neg	Reversible	1	1	4	2	2	5	3	6	Low-Med
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Geology	Disturbance of geological strata	Neg	Irreversible	1	2	5	3	5	5	5	13,3	Med-High

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	1	5	2	1	5	3	7	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	1	1	3,67	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: ABLUTION FACILITIES												
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Soils	Portable Toilets Potential harm through sewage leaks	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: ACCESS ROADS												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: SITE OFFICES												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: VEHICLE SERVICE AREA												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: WASH BAY												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: WORKSHOP												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	4	2	2	2	3	3	5,83	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
SUB ACTIVITY: SALVAGE YARD												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: BUNDED DIESEL AND OIL STORAGE FACILITIES												
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: WEIGH BRIDGE												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: PARKING AREA												
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
SUB ACTIVITY: WASTE AREA												
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
ACTIVITY:	**STRIPPING AND STOCKPILING OF TOPSOIL**											
Geology	Disturbance of geological strata	Neg	Irreversible	1	2	5	3	5	5	5	13,3	Med-High
Hazardous Waste	Contamination of area with hydrocarbons or hazardous waste materials	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	1	5	2	1	5	3	7	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	3	2	7,33	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
OPERATIONAL PHASE												
ACTIVITY:	**DRILLING AND BLASTING**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Hazardous Waste	Contamination of area with hydrocarbons or hazardous waste materials	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	1	5	2	1	5	3	7	Low-Med
Geology	Disturbance of geological strata	Neg	Irreversible	1	2	5	3	5	5	5	13,3	Med-High
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	3	2	7,33	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Social & Safety	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Neg	Reversible	1	4	1	2	2	1	2	3	Low
ACTIVITY:	**EXCAVATION**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	4	2	2	2	3	3	5,83	Low-Med
Geology	Disturbance of geological strata	Neg	Irreversible	1	2	5	3	5	5	5	13,3	Med-High
Topography	Alteration of topography	Neg	Irreversible	1	1	5	2	1	5	3	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	3	2	7,33	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	2	1	2	4	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Social & Safety	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Neg	Reversible	1	4	1	2	2	1	2	3	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
ACTIVITY:	**CRUSHING AND SCREENING OF SILLIMANITE S**											
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Air quality	Dust generation	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
ACTIVITY:	**TRANSPORTATION OF SILLIMANITE S FROM STOCKPILE AREA TO CLIENTS**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Traffic and Safety	Road degradation. Increased potential for road incidences Potential distraction to road users	Neg	Reversible	2	1	4	2	2	2	2	4,67	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
DECOMMISSIONING PHASE												
ACTIVITY:	**SLOPING, LANDSCAPING AND REPLACEMENT OF TOPSOIL OVER DISTURBED AREA (FINAL REHABILITATION)**											
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	2	1	2	4,5	Low
Soils	Soils replaced and ameliorated	Pos	Reversible	1	3	4	3	2	3	3	6,67	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	1	5	2	1	5	3	7	Low-Med
Topography	Eradication of trenches and berms. Re-contouring of area for free surface water drainage. Eradication of stockpiles	Pos	Irreversible	1	2	5	3	2	3	3	6,67	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Improved aesthetics through rehabilitation	Pos	Reversible	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Reintroduction of fauna attracted to flora to the area	Pos	Reversible	2	2	4	3	2	5	4	9,33	Low-Med
Fauna	Reintroduction of fauna attracted to flora to the area	Pos	Reversible	2	1	3	2	1	3	2	4	Low
Social & Safety	Health and safety risk posed by un-sloped areas	Neg	Reversible	1	4	1	2	2	1	2	3	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Surface water	Containment of dirty water. Improve response to issues relating to deterioration of surface water quality or quantity. Free drainage resorted to area. Revegetation of disturbed areas reduces risk of silt loading on downstream water bodies. Large area of surface water runoff return to catchment	Pos	Reversible	1	3	1	2	2	2	2	3,33	Low
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Pos	Reversible	1	3	1	2	2	2	2	3,33	Low
ACTIVITY: Application for Closure Certificate												

j) Assessment of each identified potentially significant impact and risk

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

Table 40: Assessment of each identified potentially significant impact and risk

NAME OF ACTIVITY 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, mining plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc. Etc.)	**POTENTIAL IMPACT** (Including the potential impacts for cumulative impacts) (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc...etc..)	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure))	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE** (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc...etc.) E.g. Modify through alternative method. Control through noise control. Control through management and monitoring. Remedy through rehabilitation.	**SIGNIFICANCE** if mitigated
Demarcation of site with visible beacons.	No impact could be identified other than the beacons being outside the boundaries of the approved mining area.	N/A	Construction / Site Establishment phase	N/A	N/A	N/A

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of temporary buildings and infrastructure within boundaries of site.	If the infrastructure is established within the boundaries of the approved mining area, no impact could be identified.	N/A	Construction / Site Establishment phase	N/A	N/A	N/A
Establishment of temporary buildings and infrastructure within boundaries of site. & Stripping and stockpiling of topsoil & Drilling and blasting & Excavation & Crushing and screening of sillimanite s & Transportation of sillimanite s from stockpile area to clients & Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Groundwater pollution Surface water Bodies	Construction / Site Establishment phase	Med	<u>Control:</u> Proper site management. Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Low

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of temporary buildings and infrastructure within boundaries of site.	Portable Toilets Potential harm through sewage leaks	Loss of topsoil will affect the rehabilitation of the mining area and the future agricultural potential of the site.	Construction / Site Establishment phase	Low-Med	<u>Control:</u> Storm water management Site Management Soil Management	Low
	Portable Toilets Potential harm through sewage leaks	Social	Construction / Site Establishment phase	Low-Med	Control through proper site management	Low-Med
Establishment of buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite s Transportation of sillimanite s from stockpile area to clients Sloping, reshaping and replacement of topsoil over disturbed area (final rehabilitation)	Deterioration in visual aesthetics of the area	The visual impact may affect the aesthetics of the landscape.	Operational phase	Low-Med	<u>Control:</u> Implementation of proper housekeeping	Low-Med

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite s Transportation of sillimanite s from stockpile area to clients Sloping, reshaping and replacement of topsoil over disturbed area (final rehabilitation)	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Increased dust generation will impact on the air quality of the receiving environment.	Operational phase	Med	Control: Dust suppression methods Proper housekeeping	Low
Establishment of buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite s Transportation of sillimanite s from stockpile area to clients Sloping, reshaping and replacement of topsoil over disturbed area (final rehabilitation)	Emissions caused by vehicles and equipment	Emissions will be contained within the property boundaries and will therefore affect only the landowner.	Operational phase & Decommissioning Phase	Low-Med	Control: Emissions	Low

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite s Transportation of sillimanite s from stockpile area to clients Sloping, reshaping and replacement of topsoil over disturbed area (final rehabilitation)	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	The noise impact must be contained within the boundaries of the property, and will represent the current noise levels of the farm.	Operational & Decommissioning Phase	Low	Control: Noise control measures Proper housekeeping methods	Low
Establishment of temporary buildings and infrastructure within boundaries of site. & Stripping and stockpiling of topsoil & Drilling and blasting & Excavation & Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	This will impact on the biodiversity of the receiving environment	Site Establishment & Operational phase	Low-Med	Control & Remedy: Implementation of weed control and weed/invader plant management plan Implement good housekeeping practices. Adhere to the recommendations made by the botanist.	Low-Med

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of temporary buildings and infrastructure within boundaries of site. & Drilling and blasting & Excavation & Crushing and screening of sillimanite s & Transportation of sillimanite s from stockpile area to clients & Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Loss of topsoil will affect the rehabilitation of the mining area and the future agricultural potential of the site.	Operational phase	Low-Med	**Control:** Storm water management Site Management Soil Management	Low – Medium
Establishment of temporary buildings and infrastructure within boundaries of site. & Drilling and blasting & Excavation & Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Alteration of topography	Topography	Operational phase	Med- High	No mitigation applicable.	Med- High

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of temporary buildings and infrastructure within boundaries of site. & Stripping and stockpiling of topsoil & Drilling and blasting & Excavation	Loss of and disturbance to surface archaeological sites	Artefacts or graves	Operational phase	Low	Control: Survey area before site clearance.	Low
Establishment of temporary buildings and infrastructure within boundaries of site. & Stripping and stockpiling of topsoil & Drilling and blasting & Excavation & Crushing and screening of sillimanite s	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	The impact of the fauna of the area will not be significant as vibration and noise will drive the fauna away	Operational phase	Med	Control: Implementation of fauna protection measures	Low

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Establishment of temporary buildings and infrastructure within boundaries of site. & Stripping and stockpiling of topsoil & Drilling and blasting & Excavation & Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Land use	Operational phase	Low-Med	<u>Fire Control</u>	Low
Establishment of temporary buildings and infrastructure within boundaries of site.	Influx of unsuccessful job seekers which may informally settle in area. Potential danger to surrounding communities	Social	Construction / Site Establishment phase	Low-Med	Control through proper site management	Low-Med
Stripping and stockpiling of topsoil	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Loss of topsoil will affect the rehabilitation of the mining area and the future agricultural potential of the site.	Operational phase	Low-Med	<u>Control:</u> Storm water management Site Management Soil Management	Low – Medium

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Stripping and stockpiling of topsoil & Excavation	Disturbance of geological strata	Geology	Operational phase	Med- High	N/A	Med- High
Drilling and blasting & Excavation	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities Unsafe working environment for the employees. Safety risk posed by unsloped areas.	The Unsafe working conditions should only impact the applicant. Safety measures will be implemented	Operational phase	Low-Med	Control: Implementation of safety control measures	Low
Transportation of sillimanite s from stockpile area to clients	Road degradation. Increased potential for road incidences Potential distraction to road users	All road users will be affected	Operational phase	Low-Med	Control & Remedy: Road management	Low
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Soils replaced and ameliorated	Loss of topsoil will affect the rehabilitation of the mining area and the future agricultural potential of the site.	Decommissioning phase	Med	Control: Storm water management Site Management Soil Management	Low-Med

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Groundwater improvement	Decommissioning phase	Med	<u>Control:</u> Proper site management. Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Low

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Containment of dirty water. Improve response to issues relating to deterioration of surface water quality or quantity. Free drainage resorted to area. Revegetation of disturbed areas reduces risk of silt loading on downstream water bodies. Large area of surface water runoff return to catchment	Groundwater pollution Surface water Bodies	Decommissioning phase	Med	Control: Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Low
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Health and safety risk posed by un-sloped areas	The impact on health and safety due to un-sloped areas will be contained within the site boundary.	Decommissioning phase	Medium	Control: Sloping of areas upon decommission	0
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Reintroduction of fauna attracted to flora to the area	Fauna returning to area	Decommissioning phase	Low-Med	Control: Implementation of fauna protection measures	Low
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Eradication of trenches and berms. Re-contouring of area for free surface water drainage. Eradication of stockpiles	Topography	Decommissioning phase	Low-Med	N/A	Low-Med
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Improved aesthetics through rehabilitation	The visual impact may affect the aesthetics of the landscape.	Decommissioning phase	Low-Med	Control: Implementation of proper housekeeping	Low-Med

The supporting impact assessment conducted by the EAP must be attached as an appendix, marked Appendix J

k) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

Table 41: Summary of specialist reports.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
Heritage Impact Assessment Assessment for the proposed Van Zyl Sillimanite mining permit on the farm Wortel, Aggeneys Area, Northern Cape Province. (See Appendix O2 for a full copy of the document)	**Recommendations:** The cultural landscape (marked by mining and farming activities) is generally modern without significant cultural landscape elements of concern and impacts are deemed to be of low significance. The impact of the proposed project on heritage resources is considered to be low, and it is recommended that the proposed project can commence on the condition that the following recommendations are implemented and based on approval from SAHRA. Implementation of a chance finds procedure as outlined below. Chance Find Procedure: This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.	All the recommendations proposed by the specialist were included in the BA report.	Please refer to: Part A h) iv) (1) (a); and Part A t) i)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
	• If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. • It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. • The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
Palaeontological Assessment: Basic palaeontological assessment proposed mining of sillimanite on the farm Wortel 42, Van Zyl Sillimanite. Letter of Recommendation for Exemption from Palaeontological Studies. (See Appendix O3 for a full copy of the document)	**Recommendations:** No additional palaeontological interventions are required, due to the unfossiliferous nature of the bedrock and the limited palaeontological resource potential of surficial cover on the bedrock outcrops. Notwithstanding, although improbable, a chance occurrence of archaeological or fossil material cannot be entirely dismissed. It is recommended that a requirement to be alert for possible fossil materials and buried archaeological material be included in the Environmental Management Plan (EMP) for the proposed mining operations. As part of Environmental and Health & Safety awareness training, personnel must be instructed to be alert for the occurrence of fossil bones, archaeological material and of unrecorded burials.	All the recommendations proposed by the specialist were included in the BA report.	Please refer to: Part A h) iv) (1) (a); and Part A t) i)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
	Fossil Finds Procedure: Should Stone Age artefacts and fossil bone and teeth fragments be encountered in the surficial deposits, work must cease at the site and the works foreman and the Environmental Control Officer (ECO) for the project must be informed immediately. Scattered, unearthed parts/fragments of the find must be retrieved and returned to the main find site which must be protected from further disturbance. SAHRA and/or the McGregor Museum, Kimberley, must be informed and supplied with contextual information: - A description of the nature of the find. - Detailed images of the finds (with scale included). - Position of the find (GPS) and depth. - Digital images of the context. I.e. the excavation (with scales). SAHRA and an appropriate specialist palaeontologist will assess the information and liaise with the mine owner, the environmental consultants and the ECO and a suitable response will be established.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
Botanical Study Botanical Study and Assessment - Wortel mine near Aggeneys, Northern Cape Province. (See Appendix O1 for a full copy of the document)	**Recommendations:** Potential impacts on vegetation and listed and protected plant species: - Pre-construction walk-through of the final mining footprint, by a suitably qualified botanist, for species of conservation concern that would be affected (also to comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions). - Pre-construction walk-through must also be conducted of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded. - Permits must be kept on-site and in the possession of the flora search and rescue team at all times. - Pre-construction environmental induction for all staff on site must be provided to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas, etc. - Contractor's EO must provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place.	All the recommendations proposed by the specialist were included in the BA report.	Please refer to: Part A h) iv) (1) (a); and Part A t) i)

	- Blanket clearing of vegetation must be limited to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place. - Topsoil must be stripped and stockpiled separately during site preparation and replaced over disturbed areas on completion - Ensure that laydown areas, construction camps, and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible. - All vehicles to remain on demarcated roads and no unnecessary driving in the veld outside these areas may be allowed. - Regular dust suppression during operation. - No plants may be translocated or otherwise uprooted or disturbed for rehabilitation or other purposes without express permission from the Contractor's EO and without the relevant permits. - No fires must be allowed on-site. - After the operation, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations as provided within a site-specific Rehabilitation Plan compiled by a suitably qualified botanist. - Revegetation must occur naturally where topsoils were not severely altered. <u>Potential increased erosion risk during and post-operational phase:</u> - Any erosion problems within the borrow pit area as a result of the mining activities observed must be rectified immediately and monitored thereafter to ensure that they do not re-occur. - Mining within steep slopes will need to ensure that adequate slope protection is provided. - All bare areas resulting from the development must be re-vegetated, post-operation, with locally occurring species, to bind the soil and limit erosion potential. - Roads and other disturbed areas within the project area must be regularly monitored for erosion problems and problem areas		

	must receive follow-up monitoring to assess the success of the remediation. - Silt/sediment traps/barriers must be used where there is a danger of topsoil or material stockpiles eroding and entering downstream drainage lines and other sensitive areas. - These sediment/silt barriers must be regularly maintained and cleared so as to ensure effective drainage of the areas - Topsoil must be removed and stored separately from subsoil. Topsoil must be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas. - Stockpiles must be protected from erosion, stored on flat areas where possible, and be surrounded by appropriate berms. - Any erosion points created during construction must be filled and stabilized immediately. - Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time. - Construction of gabions and other stabilisation features must be undertaken to prevent erosion, where deemed necessary. <u>Increased alien plant invasion during the operational phase:</u> - Alien species must be removed from the site as per NEM:BA requirements. - A suitable weed management strategy to be implemented in the construction and operation phases. - Regular monitoring for alien plants at the site must occur and could be conducted simultaneously with erosion monitoring. - When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels. - Clearing methods must aim to keep disturbance to a minimum and must be undertaken in accordance with relevant guidelines. - No planting or importing of any alien species to the site for landscaping, rehabilitation or any other purpose must be allowed.		

	Cumulative Impacts: • The activity footprints of various proposed mining locations in the area must be kept to a minimum and natural vegetation must be encouraged to return during the post-operational phase. • Reduce the footprint of mining areas within sensitive habitat types as much as possible.		

l) Environmental impact statement

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

The key findings of the environmental impact assessment entail the following:

Project Proposal:

- The project entails the mining of sillimanite from an area previously used for the same purpose on a portion of Portion 1 of the farm Wortel 42, Registration Division of Namaqualand, Northern Cape Province. The mining application area is 5 ha and the sillimanite to be generated through conventional opencast mining methods will be sold to the construction, building and road maintenance industry.
- The mining procedure entail the blasting, excavation, processing and transporting of the sillimanite by from the mining site to the clients.
- The existing roads to the mine area can be used to gain access to the site. No new roads are needed.
- Mining activities will be contained within the boundaries of the permitted site. Proper storm water and waste management will be implemented on the site to minimise the potential of pollution.

Flora Assessment:

- The vegetation of the study site resembles a severely modified and transformed form of Eastern Gariep Rocky Desert surrounded by mostly natural vegetation. Ground truthing of the site confirmed that the vegetation of the site is relatively uniform overall, with little turnover across the site, which corroborates its classification as a single type.
- The species observed along the access roads can be successfully avoided and it is recommended that following the final route selection a qualified Botanist should conduct a walkthrough of the mentioned road sections, wherein all conservation important / sensitive flora is mapped. From a floristic perspective both routes are acceptable if the above-mentioned mitigation measures are implemented.
- During the site survey no listed Red Data floral species were recorded within the surveyed site. A total of nine (9) species were however recorded which are protected within either National Forest Act or within the Northern Cape Nature Conservation Act (refer to the Botanical Study attached as Appendix O1).

- The Botany Study concluded that is highly unlikely that this development will have an impact on the status of the Ecosystem and Vegetation Types due to the limited extent of the mine as well as the presence of already disturbed areas within the footprint. Furthermore, this mine will not have a significant impact on the services and functions provided by the surrounding natural habitats and development within this area is regarded as acceptable. Subsequently the proposed development area is largely well located in terms of avoiding sensitive receptors and the development will not compromise the survival of any specific flora or terrestrial vertebrate species on the study area or beyond if mitigation measures are fully implemented.

Other Site Specific Environmental Aspects:

- No sites of archaeological or cultural importance were identified during the site inspection located in the mining footprint area.
- The fauna at the site will not be impacts on by the proposed mining activity as they will be able to move away or through the site, without being harmed.
- There are no rivers, streams or wetlands within close proximity of the mining area.
- Although the proposed activity will have a cumulative impact on the ambient noise levels, the impact is deemed compatible with the current operations and of low significance.
- The nearest residential dwelling to the proposed mining area is a farm house of the adjacent landowner approximately 6.2 m north-west of the mining area. As the prevalent wind direction is in a south-south-eastern direction the adjacent hill will screen dust generated at the Wortel quarry from the operations/residents on the opposite side. Should the Applicant however implement the mitigation measures proposed in this document and the EMPr the impact on the air quality of the surrounding environment is deemed to be of low-medium significance.
- The viewshed analysis showed that the visual impact of the proposed mining operation will be of low significance, especially as no permanent structures will be constructed. Should the Applicant successfully rehabilitate the mining area (upon closure), the only residual visual impact will be that of the quarry pit to be developed as a landscape feature.
- The topography of the site will be altered in that a depression will be created with stepped side walls as mining progress.
- Upon closure the site will be rehabilitated and sloped to insure that the visual impact on the aesthetic value of the area is kept to a minimum. The site will have a neat appearance and be kept in good condition at all times.

ii) Final Site Map

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

See the map indicating site activities attached as Appendix C.

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

Associated Positive Impacts – Temporary Infrastructure:

- Low intensity site establishment;
- Easy movement of infrastructure as mining progress;
- Containment of dirty water. Improve reposes to issues relating to deterioration of surface water quality or quantity.
- Reintroduction of fauna and flora to the area in the decommissioning phase;
- Improved aesthetics through rehabilitation;
- Re-contouring of area for free surface water drainage;
- Soils replaced and ameliorated; and
- Complete removal of infrastructure at closure of the mine.

The negative impacts associated with the project that was deemed to have a Low- Medium to High significance includes:

Disturbance of the geological strata	**Med-High**
Loss of and disturbance of surface archaeological sites	**Low-Med**
Contamination of area with hydrocarbons or hazardous waste materials	**Low-Med**
Potential for loss of soil and damage to soil characteristics	**Low -Med**
Loss of biodiversity	**Low-Med**
Alteration of topography	**Low-Med**
Visual intrusion due to the proposed project	**Low-Med**
Potential disruption to graves (if found)	**Low-Med**
Influx of unsuccessful job seekers which may informally settle in the area	**Low-Med**

m) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPR;

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

Table 42: Impact management objectives and the impact management outcomes for inclusion in the EMPR

MANAGEMENT OBJECTIVES	ROLE	MANAGEMENT OUTCOMES
Visual Aspect	Site Manager to ensure compliance with the guidelines as stipulated in the EMPr. Compliance to be monitored by the Environmental Control Officer.	• Ensure that the site have a neat appearance and is kept in good condition at all times. • Remove all infrastructure upon rehabilitation of the mining area and return the area to its prior status.
Dust Handling	Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer. Dust monitoring consultant to check dust results and provide guidelines.	• Control the liberation of dust into the surrounding environment by the use of; inter alia, water spraying and/or other dust-allaying agents. • Limit speed on the access roads to 40km/h to prevent the generation of excess dust. • Spray roads with water or an environmentally friendly dust-allaying agent that contains no PCB's (e.g. DAS products) if dust is generated above acceptable limits. • Assess effectiveness of dust suppression equipment. • Re-vegetate all disturbed or exposed areas as soon as possible to prevent any dust source from being created. • Thoroughly soak all stockpiles to ensure dust suppression on the site. • Conduct formal dust monitoring on a monthly basis.
Noise Handling	Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer. Compliance to be monitored by the Noise Monitoring Specialist.	• Ensure that employees and staff conduct themselves in an acceptable manner while on site. • No loud music may be permitted at the mining area. • Ensure that all mining vehicles are equipped with silencers and maintained in a road worthy condition in terms of the Road Transport Act, 1996. • Plan the type, duration and timing of the blasting procedures with due cognizance of other land users and structures in the vicinity. Notify surrounding land owners in writing prior to each blasting occasion. • Implement best practice measures in order to minimize potential noise impacts. • Contract a qualified occupational hygienist to quarterly monitor and report on the personal noise exposure of the employees working at the mine. The monitoring must be done in accordance with the SANS 10083:2004 (Edition 5) sampling method as well as NEM:AQA, 2004, SANS 10103:2008.
Management of weed/invader plants	Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer.	• Implement a weed and invader plant control management plan. • Control declared invader or exotic species on the rehabilitated areas. • Keep the temporary topsoil stockpiles free of weeds. • Do regular monitoring for alien plants at the site simultaneously with erosion monitoring. • When alien plants are detected, control and clear the plants using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels. • Do not allow the planting or importing of any alien species to the site for landscaping, rehabilitation or any other purposes.

MANAGEMENT OBJECTIVES	ROLE	MANAGEMENT OUTCOMES
Surface and Storm water Handling	Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer.	• Divert storm water around the topsoil heaps and access roads to prevent erosion and loss of material. • Divert runoff water around the stockpile areas with trenches and contour structures to prevent erosion of the work areas. • Conduct mining in accordance with the Best Practice Guideline for small scale mining that relates to storm water management, erosion and sediment control and waste management, developed by the Department of Water and Sanitation. • Rectify any erosion problems within the borrow pit area as a result of the mining activities immediately and monitor it thereafter to ensure that it do not re-occur. • Ensure adequate slope protection is provided when mining within steep slopes. • Re-vegetate all bare areas resulting from the development, post-operation, with locally occurring species, to bind the soil and limit erosion potential. • Regularly monitor roads and other disturbed areas within the project area for erosion problems and ensure problem areas receive follow-up monitoring to assess the success of the remediation. • Use silt/sediment traps/barriers where there is a danger of topsoil or material stockpiles eroding and entering downstream drainage lines and other sensitive areas. • Regularly maintain and clean these sediment/silt barriers so as to ensure effective drainage of the areas. • Fill and stabilize any erosion points created during construction. • Practice practical phased development and vegetation clearing so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time. • Undertake the construction of gabions and other stabilisation features to prevent erosion, where necessary.
Topsoil management	Site Manager to ensure compliance with the guidelines as stipulated in the EMPr. Compliance to be monitored by the Environmental Control Officer.	• Strip and stockpile the upper 300 mm of the soil and protect as topsoil. • Remove topsoil at right angles to the slope to slow down surface runoff and prevent erosion. • Conduct topsoil stripping, stockpiling and re-spreading in a systematic way. Ensure topsoil is stockpiled for the minimum possible time. • Protect topsoil stockpiles against losses by water and wind erosion through the establishment of plants on the stockpiles. • Place topsoil stockpiles along the northern and western boundaries of the site. Topsoil heaps may not exceed 1.5m in order to preserve microorganism within the topsoil.

MANAGEMENT OBJECTIVES	ROLE	MANAGEMENT OUTCOMES
Protection of fauna and flora.	Site Manager to ensure compliance with the guidelines as stipulated in the EMPr. Compliance to be monitored by the Environmental Control Officer.	• Ensure no fauna is caught, killed, harmed, sold or played with. • Instruct workers to report any animals that may be trapped in the working area. • Prevent the setting of snares, raiding of nests, eggs or young. • Arrange a pre-construction walk-through of the final mining footprint, by a suitably qualified botanist, for species of conservation concern that would be affected. • Arrange a pre-construction walk-through of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded. • Keep permits on-site and in the possession of the flora search and rescue team at all times. • Arrange pre-construction environmental induction for all staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas, etc. • Arrange that the contractor's EO provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place. • Limit blanket clearing of vegetation to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place. • Strip and stockpile topsoil separately during site preparation and replaced over disturbed areas on completion. • Ensure that laydown areas, construction camps, and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible. • Ensure all vehicles remain on demarcated roads and prevent unnecessary driving in the veld outside these areas. • Do not translocate or otherwise uprooted or disturbed plants for rehabilitation or other purposes without express permission from the Contractor's EO and without the relevant permits. • Prevent fires on-site. • After the operation, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations as provided within a site-specific Rehabilitation Plan compiled by a suitably qualified botanist. • Ensure rehabilitation progress, erosion and I&AP monitoring occur simultaneously post-operational phase and biannual for a minimum of two years.

MANAGEMENT OBJECTIVES	ROLE	MANAGEMENT OUTCOMES
Management of health and safety risks	Site Manager to ensure compliance with the guidelines as stipulated in the EMP. Compliance to be monitored by the Environmental Control Officer.	- Ensure that workers have access to the correct PPE as required by law. - Ensure all operations comply with the Occupational Health and Safety Act, 1996. - Plan the type, duration and timing of the blasting procedures with due cognizance of other land users and structures in the vicinity. - Inform the surrounding landowners and communities in writing ahead of any blasting event. - Monitor the compliance of ground vibration and airblast levels to USBM standards with each blasting event. - Use a vibro recorder to record all blasts. - Give audible warning of a pending blast at least 3 minutes in advance of the blast. - Take measures to limit flyrock. Collect and remove all flyrock (of diameter 150 mm and larger) which falls beyond the working area, together with the rock spill.
Handling of Hazardous Materials and Substance	Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer	- Store all hazardous materials or substances in a closed storage facility with an impermeable floor. - Storage area to meet the following conditions: - Construct storage area on a level area. - Floor of the storage area must be impermeable. - Storage area must be outside the 1:100-year flood line or further than 100m from the edge of a watercourse, whichever is greatest. - Access to the materials/substances may only take place with the prior notification of the site manager. - Fuel storage tanks must have an impermeable bund wall and base within which the tanks sits, raised above the floor, on plinths. The bund capacity must be sufficient to contain 110% of the tank's maximum capacity. - Consider the distance and height of the bund wall relative to that of the tank to ensure that oil does not spout beyond the confines of the bund. - Establish a formal inspection routine to check all equipment in the bund area, as well as the bund area itself for malfunctions or leakages. Inspection must be at least weekly and any accumulated rainwater must be removed. - All valves and outlets must be checked to ensure that they are intact and closed securely. - Slope the bund base towards a rainwater sump of sufficient size. - Contain contaminated water until it can be collected by a registered hazardous waste handling contractor or be disposed of at a registered hazardous waste handling facility. - Ensure availability of drip trays underneath all stationary equipment or vehicles.

MANAGEMENT OBJECTIVES	ROLE	MANAGEMENT OUTCOMES
Waste management	Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer.	- Ensure no waste storage area is established outside the boundaries of the mining area. - Ensure vehicle maintenance only take place within the service bay area of the off-site workshop. If emergency repairs are needed on site, ensure drip trays is present. Ensure all waste products are disposed of in a 200 litre closed container/bin inside the emergency service area. - Ensure diesel bowser is equipped with a drip tray at all times. - Use drip trays during each and every refuelling event. - Ensure the nozzle of the bowser rests in a sleeve to prevent dripping after refuelling. - Keep drip trays clean. No dirty drip trays may be used on site. - Collect any effluents containing oil, grease or other industrial substances in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility. - Clean spills immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognised facility. File proof on site. - Ensure the availability of suitable covered receptacles at all times and conveniently placed for the disposal of waste. - Place all used oils, grease or hydraulic fluids therein and remove these receptacles from the site on a regular basis for disposal at a registered or licensed hazardous disposal facility. - Store non-biodegradable refuse such as glass bottles, plastic bags etc., in a container with a closable lid at a collecting point. Collection must take place on a regular basis and disposed of at the recognised landfill site. Prevent refuse from being dumped on or in the vicinity of the mining area. - Biodegradable refuse to be handled as indicated above.
Management of access roads	Site Manager to ensure compliance with the guidelines as stipulated in the EMP. Compliance to be monitored by the Environmental Control Officer.	- Arrange a pre-construction walk-through of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded. - Maintain newly constructed access roads so as to minimise dust, erosion or undue surface damage. - Divert storm water around the access roads to prevent erosion. - Erosion of access road: Restrict vehicular movement to existing access routes to prevent crisscrossing of tracks through undisturbed areas. - Repair rutting and erosion of the access roads caused by the proposed activities.
Protection of Cultural or Heritage Artefacts	Site Manager to ensure compliance with the guidelines as stipulated in the EMPr. Compliance to be monitored by the Environmental Control Officer.	- Confine all mining to the development footprint area. - Implement the chance find procedure as described in this document when any discoveries are made.

MANAGEMENT OBJECTIVES	ROLE	MANAGEMENT OUTCOMES
After care on rehabilitated areas	Site Manager to ensure compliance with the guidelines as stipulated in the EMPr. Compliance to be monitored by the Environmental Control Officer.	• Control run-off water via temporary banks to ensure that accumulation of run-off does not cause down-slope erosion. • Only do topsoil spreading at a time of year when vegetation cover can be established as quickly as possible afterwards, so that erosion of returned topsoil by both rain and wind is minimized. The best time of year is at the end of the rainy season, when there is moisture in the soil for vegetation establishment and the risk of heavy rainfall events is minimal. • Plant a cover crop immediately after spreading of topsoil, to stabilize the soil and protect it from erosion. Fertilize the cover crop for optimum production. • Ensure rehabilitation be taken up to the point of cover crop stabilization. Rehabilitation must not be considered complete until the first cover crop is well established. • Monitor all rehabilitated areas for erosion, and appropriately stabilized if any erosion occurs.

n) Aspects for inclusion as conditions of Authorisation.

Any aspects which must be made conditions of the Environmental Authorisation

The management objectives listed in this report under Point M above should be considered for inclusion in the environmental authorisation.

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

(Which relate to the assessment and mitigation measures proposed)

The assumptions made in this document which relate to the assessment and mitigation measures proposed, stem from site specific information gathered from the property owner, as well as site inspections, and background information gathering.

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

i) Reasons why the activity should be authorised or not.

Should the mitigation measures and monitoring programmes proposed in this document be implemented on site, no fatal flaws could be identified that were deemed as severe as to prevent the activity continuing.

The proposed mining operations should strongly be considered for authorisation as such development may result in the upliftment of local community economic growth of the surrounding towns, region and possibly the province.

ii) Conditions that must be included in the authorisation

The management objectives listed in this report under Point M should be considered for inclusion in the environmental authorisation.

q) Period for which the Environmental Authorisation is required.

The applicant requests the Environmental Authorisation to be valid for a five (5) year period to correspond with the maximum validity of the mining permit.

r) Undertaking

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

The undertaking required to meet the requirements of this section is provided at the end of the EMPR and is applicable to both the Basic Assessment Report and the Environmental Management Programme report.

s) Financial Provision

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

i) Explain how the aforesaid amount was derived

The annual amount required to manage and rehabilitate the environment was estimated to be R 541 393.35.

Please see the explanation as to how this amount was derived at attached as in Section B, f, i. A Bank Guarantee will be provided for the proposed site should this amount be approved by the DMR.

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

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

The mining operation will be self-funded through income generated Van Zyl Sillimanite. A bank guarantee will be ceded to the DMR for the required amount.

t) Specific Information required by the competent Authority

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

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

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

The following potential impacts were identified that may impact on socio-economic conditions of directly affected persons:

Visual exposure:

The mining area was identified to constitute the lowest possible visual impact on the surrounding environment. The surrounding areas have previously been disturbed by mining activities that was not rehabilitated. The applicant will however ensure that housekeeping is managed to standard, as this will mitigate the visual impacts during the operational phase of the mine.

Upon closure the site will be rehabilitated and sloped to insure that the visual impact on the aesthetic value of the area is kept to a minimum. The site will have a neat appearance and be kept in good condition at all times.

Air Quality:

The background air quality of the surrounding area is relatively good due to low industrial activity. Dust will be generated by the movement of machinery and vehicles. Dust suppression measures will be implemented to prevent excessive dust on site. Due to the remote setting of the proposed mining area the potential impact of dust nuisance on the surrounding environment is deemed to be of low significance.

Noise:

The surrounding areas are characterised by an agricultural setting in which vehicles and farm equipment operate. The noise to be generated at the proposed operation is expected to temporarily increase the noise levels of the area. Loading and transportation of the material will generate noise daily. The significance of noise on the surrounding environment is deemed to be of low significance. Mitigation measures will be implemented to ensure employees conduct them in an acceptable manner while on site to lessen the noise impact of the proposed activity on the surrounding environment.

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

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

The Heritage Impact Assessment did not identify any sites or artefacts classified as national estate as referred to in section 3(2) of the NHRA, 1999 within the footprint of the proposed mining area.

u) Other matters required in terms of section 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)

The site and layout alternatives investigated during the impact assessment process were done at the hand of information obtained during the site investigation, public participation process as well as desktop studies conducted of the study area. As discussed earlier the following alternatives were considered:

1. Layout Alternative 1 – The proposed mining area over a 5 ha footprint area.
2. Layout Alternative 2 – The proposed mining area over a 5 ha footprint area (Preferred Alternative).
3. Site Alternative 3 – The proposed mining area over a 5 ha footprint area at another location.
4. No-go Alternative.

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1) Draft Environmental Management Programme.

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

The details and expertise of Yolandie Coetzee of Greenmined Environmental that acts as EAP on this project has been included in Part A Section 1(a) as well as Appendix L as required.

b) Description of the Aspects of the Activity

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

The aspects of the activity that are covered by the draft environmental management programme has been described and included in Part A, section (1)(h).

c) Composite Map

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

As mentioned under Part A, section (1) (L) (ii) this map has been compiled and is attached as Appendix C to this document.

d) Description of impact management objectives including management statements

i) Determination of closure objectives.

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

Mining activities are to be undertaken in a manner which facilitates site rehabilitation and the restoration of existing land capabilities. The primary objectives for rehabilitation includes:

- The facilitation of the re-establishment of the land use and capability to as close as reasonably to the original conditions;
- Removal of all infrastructure and material introduced to site;
- Removal of all wastes and their and their related disposal; and
- And promotion of the rapid re-establishment of natural vegetation and the restoration of site ecology.

The disturbed areas shall be rehabilitated to ensure that:

- The biodiversity habitat is encouraged by the new land use after the mining;
- Future public health and safety are not compromised;
- The site is reversed to almost its original state;

- Environmental and resources are not subject to physical and chemical deterioration;
- The after-use of the site is beneficial and sustainable in the long term;
- Any adverse socio-economic impacts are minimized; and
- All socio-economic benefits are maximized.

This will be done by complying with the conditions in the environmental management program below, and relevant statuary requirements. The contractor and employee will be made aware of their environmental responsibilities and will be empowered to execute the work program in compliance with the requirements of this EMPR.

The following closure objectives are proposed with regard to rehabilitation of the mining area:

- On completion of operations, all structures or objects shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002):
  - Where sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
- Upon cessation of the mining activities, the area will be fully rehabilitated.
- The perimeter walls of the opencast pit will either be sloped at 1:3 to the pit floor, to prevent soil erosion, or be stepped by creating benches of not more than 3 meters high.
- Prior to replacing the topsoil, the material that was removed from these areas will be replaced in the same order as it originally occurred.
- Fill and topsoil could be placed over the slopes to provide a suitable medium for the establishment of vegetation.
- No waste will be permitted to be deposited in the excavations.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.
- Photographs of the office sites and plant infrastructure before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Regional Manager.
- All temporary infrastructures, equipment, plant, temporary housing and other items used during the mining period will be removed from the site.
- Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the mining area and disposed of at a recognized landfill facility, proof of this removal will be kept on file at the applicant's office. It will not be permitted to be buried or burned on the site.
- Weed / Alien clearing will be done in a sporadic manner during the life of the Mining activities. Species regarded as the National Environmental Biodiversity Act [NEMBA] (Act No. 10 of 2004) Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure. Final rehabilitation shall be completed within a period specified by the Regional Manager.

- Final rehabilitation shall be completed within a period specified by the Regional Manager.
- All slopes and degraded areas must be rehabilitated prior to the onset of the rainy season to prevent surface water run-off and top soil must be utilises as much as possible in these areas. According to Regulation 3, sub regulation 3(1) "except on authority of a written permission by the executive officer, no land user shall cultivate any land if it:
  a) has a slope of more than 20%; or
  b) (B) has a slope more than 12%, is situated in an area specified in Colum 1 of Table 1, consist mainly of soil of o soil form and soil series respective specified in columns 2 and 3 of the said table opposite the area concerned, and if applicable, has such physical properties as may be specified in Colum 4 of the said table opposite the soil series concerned".
- To prevent/minimise soil erosion though the action of water and wind, control measures must be put in place such as protection berms where needed. Procedures must be developed to minimise surface water run-off and soil erosion. As a mitigating measure soil properties could be improved by encouraging re-vegetation in bare areas by planting indigenous cuttings from the surrounding area.
- Monitoring and evaluation procedures must be put in place to determine if there is any improvement and to ascertain if more rehabilitation initiatives area needed or if the area must be left to spontaneously rehabilitated.
- The land owner/user must protect the cultivated land before/during /after cultivation of the proposed sites effectively against excessive soil loss as a result of erosion through the action of water and wind.
- According to Regulation 4, sub regulation 1(a) *"every land user shall by means of as many of the following measures as are necessary in his situation, protect the cultivated land on his farm unit effectively against eth excessive soil loss as a result of erosion through the action of water*"
- A suitable soil conservation work shall be construction and thereafter be marinated in order to divert run-off water from other land or to restrict the run-off speed of run-off water.
- According to Regulation 5, sun-regulation 1 (a) (j) "*every land use shall by means of as many of the following measure as are necessary in his situation, protect the cultivated land on his farm unit effect again excessive soil loss as a result of erosion through the action of wind*"
- The land covered shall be cultivate in accordance in accordance with such methods or be, laid out in such out in such manner that the surface movement of soil particles through the action of wind is restricted.
- Any rehabilitation and remedial action in relation to soil erosion in the event it does occur needs to be in accordance with regulation 14 of the CARA. According to regulation 14(1)
  - If any land user disturbed or denude any land on his farm unit for purposed other than prospecting or mining activities,
  - such land user shall by means of as many of the following measures as are necessary in this situation, effectively restore and reclaim that disturbed or denuded land.

- Topsoil shall be removed and kept separated with a view or replacing it later on the disturbed or denuded land
- Topsoil shall be used to stabilise the sides of a hollow that has been caused by the exploitation or removal of material and, where possible, or reclaim part of the disturbed or denuded land.

- The flow pattern of run-off water, the topography and the slope shall, depending on the volume of material exploited or removed, be restored as closely as possible to the original condition.

Rehabilitation of the excavated area:

Due to the impracticality of importing large volumes of fill to restore the quarry area to its original topography, the rehabilitation option is to develop the quarry into a minor landscape feature. This will entail creating a series of irregular benches along the quarry faces, the top edges of each face being blasted away to form slopes (40º) on the benches below, thereby reducing the overall face angle.

Fill and topsoil must be placed over the benches to provide a suitable medium for the establishment of vegetation, especially bushes which will break up the line of the faces and enhance their appearance. The floor of the quarry must be capped with suitable soil material and re-vegetated.

Rocks and coarse material removed from the excavation must be dumped into the excavation.

No waste will be permitted to be deposited in the excavations. Once rocks and coarse natural materials has been dumped into the excavated area and profiled with acceptable contours and erosion control measures, topsoil shall be returned over the area.

The area shall be fertilized to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally or regionally occurring flora. If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

Rehabilitation of plant, office and service areas:

Coarse natural material used for the construction of ramps must be removed and dumped into the excavations.

Stockpiles will be removed during the decommissioning phase, the area ripped and the topsoil returned to its original depth to provide a growth medium.

On completion of operations, all structures or objects shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002):

- Where sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
- Areas containing French drains shall be compacted and covered with a final layer of topsoil to a height of 10cm above the surrounding ground surface.
- The site shall be seeded with a vegetation seed mix adapted to reflect the local indigenous flora.

Photographs of the office sites and workshop, before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Regional Manager.

On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, shall be scarified and graded to an even surface condition. Where applicable / possible topsoil needs to be returned to its original depth over the area.

Prior to replacing the topsoil, the material that was removed from these areas will be replaced in the same order as it originally occurred. The area shall then be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local, adapted indigenous seed mix.

If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to his or her specification.

Final rehabilitation:

Rehabilitation of the surface area shall entail reshaping, levelling, top dressing, land preparation, seeding and maintenance, and weed / alien clearing.

All infrastructures, equipment, plant, temporary housing and other items used during the mining period will be removed from the site.

Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site.

Weed / Alien clearing will be done in a sporadic manner during the life of the mining activities. Species regarded as the National Environmental Biodiversity Act [NEMBA] (Act No. 10 of 2004) Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure. Site management must implement an invasive plant species management plan (Appendix M) during the 12 months aftercare period to address germination or problem plants in the area.

Final rehabilitation shall be completed within a period specified by the Regional Manager.

Seeding of the area:

Once the pit slopes have been shaped and the soil replaced, the goal is to establish a good cover of a robust grass that will stabilise the soil and start the accumulation of soil organic carbon. This will be done using a combination of seeding and physical planting of runners to apply a mix of commercial and indigenous species that includes both tufted and creeping species.

ii) Volume and rate of water use required for the operation

The water needed for the proposed activity will stem from the need for dust suppression within the excavation and along the haul roads as well as for the processing of the mineral on the plant equipment. Water will be abstracted from a borehole to be located on site, which will be drilled. A water truck will be used to spray access roads to alleviate dust generation. It is proposed that the mining activities will require between 2 000 – 4 000 l of water per day.

iii) Has a water use licence has been applied for?

A borehole will be drilled on the property for the abstraction of process water. This water use will be registered with DWS in accordance with NWA (Act No. 104 of 1998), Section 21 activities.

iv) Impacts to be mitigated in their respective phases

Table 43: Impacts to be mitigated in their respective phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
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...etc. Etc.)	(volumes, tonnages and hectares or m^2)	In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure))			
Demarcation of site with visible beacons.	5 ha	Construction / Site Establishment phase	Demarcation of the site will ensure that all employees are aware of the boundaries of the mining area and that work stay within approved area.	Mining of the sillimanite is only allowed within the boundaries of the approved area: - MHSA, 1996 - OHSA, 1993 - MPRDA, 2008; - NEMA, 1998	Beacons need to be in place throughout the life of the activity.

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site.	1 ha	Construction / Site Establishment phase	Portable toilets will be managed by reputable contractors and inspected daily for potential leaks	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.	Construction / Site Establishment, operational, decommissioning phases.
Establishment of temporary buildings and infrastructure within boundaries of site; Stripping and stockpiling of topsoil; Drilling and blasting; Excavation; Crushing and screening of sillimanite; transportation of sillimanite from stockpile area to clients; Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	5 ha	Operational phase	**Visual Mitigation:** - The site needs to have a neat appearance and be kept in good condition at all times. - Upon closure the site needs to be rehabilitated to insure that the visual impact on the aesthetic value of the area is kept to a minimum.	Management of the mining activities must be in accordance with the: MHSA, 1996 OHSA, 1993 MPRDA, 2008; NEMA, 1998	Throughout the site establishment- and operational phases.

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site; Stripping and stockpiling of topsoil; Drilling and blasting; Excavation; Crushing and screening of sillimanite; transportation of sillimanite from stockpile area to clients; Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	5 ha	Operational phase	**<u>Dust Handling:</u>** - The liberation of dust into the surrounding environment must be effectively controlled by the use of, inter alia, water spraying and/or other dust-allaying agents. - The site manager must ensure continuous assessment of all dust suppression equipment to confirm its effectiveness in addressing dust suppression. - Speed on the access roads must be limited to 40km/h to prevent the generation of excess dust. - All roads will be sprayed with water or an environmental friendly dust-allaying agent that contained PCB's (e.g. DAS products/ Pro/base) at regular intervals to ensure that dust is adequately suppressed in the mining roads. - All disturbed or exposed areas will be re-vegetated as soon as possible during the operational phase to prevent any dust source from being created. - A fall out and nuisance dust monitoring programme could be submitted to the principle inspector of mines (DMR-Northern Cape) on an annual basis if required. If any complaint is received form the public or state department regarding dust levels, the fall-out and nuisance dust levels will again be monitored at prescribed monitoring points. The result will then be compiled into monthly reports and forwarded to the Director-Occupational Hygiene. - Fallout dust will be monitored via a fallout dust bucket system on the boundaries of the mining area.	Dust generation on site must be managed in accordance with the: NEM:AQA, 2004 Regulation 6(1) National Dust Control Regulations, GN No R827 ASTM D1739 (SANS 1137:2012)	Throughout operational and decommissioning phases
	5 ha	Operational phase & Decommissioning Phase	**<u>Emission Handling:</u>** - All vehicles will be regularly services to ensure they are in proper working condition and to reduce risk of excessive emissions.	<u>Emission Control:</u> NEM:AQA, 2004 Regulation 6(1)	Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	5 ha	Operational & Decommissioning Phase	**Noise Handling:** - The applicant must ensure that employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours. - No loud music may be permitted at the mining area. - All mining vehicles must be equipped with silencers and maintained in a road worthy condition in terms of the Road Transport Act.	Noise generation on site must be managed in accordance with the: NEM:AQA, 2004 Regulation 6(1) NRTA, 1996	Throughout operational and decommissioning phases

Establishment of temporary buildings and infrastructure within boundaries of site; Stripping and stockpiling of topsoil; Drilling and blasting; Excavation; Crushing and screening of sillimanite; transportation of sillimanite from stockpile area to clients; Sloping, landscaping and replacement of topsoil over disturbed area (final	5 ha	Site Establishment & Operational phase	**Flora:** - Pre-construction walk-through of the final mining footprint, by a suitably qualified botanist, for species of conservation concern that would be affected (also to comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions). - Pre-construction walk-through must also be conducted of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded. - Permits must be kept on-site and in the possession of the flora search and rescue team at all times. - Pre-construction environmental induction for all staff on site must be provided to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas, etc. - Contractor's EO must provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place. - Blanket clearing of vegetation must be limited to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place. - Topsoil must be stripped and stockpiled separately during site preparation and replaced over disturbed areas on completion. - Ensure that laydown areas, construction camps, and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible. - All vehicles to remain on demarcated roads and no unnecessary driving in the veld outside these areas must be allowed. - No plants may be translocated or otherwise uprooted or disturbed for rehabilitation or other purposes without express permission from the Contractor's EO and without the relevant permits. - No fires must be allowed on-site. - After the operation, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations as provided within a site-specific Rehabilitation Plan compiled by a suitably qualified botanist.	Management of weed- or invader plants: NEMBA (Act No. 10 of 2004). Alien and Invasive Species Regulation GNR 598 and 599 of 2014. Negative impact on biodiversity of the area: NEM:BA, 2004	Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
			- Rehabilitation progress, erosion and I&AP monitoring must occur simultaneously post-operational phase and must occur biannual for a minimum of two years. Management of weed- or invader plants: - A weed and invader plant control management plan must be implemented at the site to ensure eradication of all listed invader plants in terms of the National Environmental Biodiversity Act [NEMBA] (Act No. 10 of 2004) Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure. - Management must take responsibility to control declared invader or exotic species on the rehabilitated areas. - Regular monitoring for alien plants at the site must occur and could be conducted simultaneously with erosion monitoring. - When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels. - No planting or importing of any alien species to the site for landscaping, rehabilitation or any other purpose may be allowed.		

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Stripping and stockpiling of topsoil; Drilling and blasting; Excavation; Sloping, landscaping and replacement of topsoil over disturbed area (final	5 ha	Operational phase	**Soil:** • Where applicable the first 300 mm of topsoil must be removed in strips and stored along the boundary of the mining area. Stockpiling of topsoil must be done to protect it from erosion, mixing with overburden or other material. The topsoil must be used to cover the rehabilitated area and improve the establishment of natural vegetation. • The temporary topsoil stockpiles must be kept free of weeds. • Topsoil stockpiles must be placed on a levelled area and measures must be implemented to safeguard the piles from being washed away in the event of heavy rains/storm water. • Topsoil heaps must not exceed 1.5 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen. • Should natural vegetation not establish on the heaps within 6 months of stockpiling it must be planted with an indigenous grass species. • Storm- and runoff water must be diverted around the topsoil stockpiles and access roads to prevent erosion.	Loss of topsoil due to incorrect storm water management: NEMA, 1998 NWA, 1998 NEMBA, 2004 GNR 598 and 599 of 2014 The replacement of the topsoil is of utmost importance to ensure the effective future use of the area for agricultural purposes. Loss of soil due to un-vegetated areas: NEMBA (Act No. 10 of 2004). NEMA, 1998 Bare areas need to be re-vegetation to prevent soil erosion.	Throughout operational phases

Stripping and stockpiling of topsoil; Drilling and blasting; Excavation; Transportation of sillimanite from stockpile area to clients; Sloping, landscaping and replacement of topsoil over disturbed area (final)	5 ha	Operational phase	**<u>Surface and Groundwater:</u>** Contamination of surface or groundwater due to improper waste handling: - No waste stockpile area may be established outside the boundaries of the mining area. - Vehicle maintenance may only take place within the service bay area of the off-site workshop. - The diesel bowser needs to be equipped with a drip tray at all times. Drip trays have to be used during each and every refuelling event. - The nozzle of the bowser needs to rest in a sleeve to prevent dripping after refuelling. - Site management must ensure drip trays are cleaned after each use. No dirty drip trays may be used on site. - Any effluents containing oil, grease or other industrial substances must be collected in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility. - Spills must be cleaned up immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing it at a recognised facility. Proof must be filed. - Suitable covered receptacles must be available at all times and conveniently placed for the disposal of waste. - Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., must be stored in a container with a closable lid at a collecting point and collected on a regular basis and disposed of at a recognised landfill site. Specific precautions must be taken to prevent refuse from being dumped on or in the vicinity of the mine area. - Biodegradable refuse generated must be handled as indicated above. - Water from the wash bay must drain into the oil sump from where it must be removed by an approved contractor. - Drip trays must be available to be place underneath all stationary equipment or vehicles. - Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognized landfill facility once decommissioning has been completed. It will not be permitted to be buried or burned on the site.	Contamination of surface or groundwater due to hazardous spills not cleaned: NWA, 1998	Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site; Stripping and stockpiling of topsoil; Drilling and blasting;	5 ha	Operational phase	**Archaeological, Heritage and Paleontological Aspects:** - All mining must be confined to the development footprint area. - If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. - It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area. - The senior on-site Manager must inform the ECO of the chance find and its immediate impact on operations. The ECO must then contact a professional archaeologist for an assessment of the finds who must notify the South African Heritage Resources Agency (SAHRA) and/or the McGregor Museum (Kimberley). The following information must be supplied: • A description of the nature of the find. • Detailed images of the finds (with scale included). • Position of the find (GPS) and depth. • Digital images of the context. *I.e*. the excavation (with scales). - Work may only continue once the go-ahead was issued by SAHRA.	Loss of Artefacts and Graves: National Heritage Resources Act No. 25 of 1999	Throughout operational and decommissioning phases

Establishment of temporary buildings and infrastructure within boundaries of site;
Stripping and stockpiling of topsoil;
Drilling and blasting;
Excavation;
Crushing and screening of sillimanite;
transportation of sillimanite from stockpile area to clients;
Sloping, landscaping and replacement of topsoil over disturbed area (final
	5 ha	Operational phase	**Hydrocarbon Management:**
			- All hazardous materials or substances must be stored in a closed storage facility with an impermeable floor.
			- The storage area must meet the following conditions:
			  • The storage area must be constructed on a level area to prevent offsite migration of any spilled product.
			  • The floor of the storage area must be impermeable to prevent seepage of spilled products into the ground or ground water.
			  • The storage area must be out of the 1:100-year flood line or further than 100m from the edge of a watercourse, whichever is greatest.
			  • The facility must be such that access to the materials/substances can only take place with the prior notification of an appropriate staff member.
			- All fuel storage tanks must have secondary containment in the form of an impermeable bund wall and base within which the tanks sits, raised above the floor, on plinths. This bund capacity must be sufficient to contain 110% of the tank's maximum capacity.
			- The distance and height of the bund wall relative to that of the tank must also be taken into consideration to ensure that any spillage does not result in oil spouting beyond the confines of the bund.
			- The site manager must establish a formal inspection routine to check all equipment in the bund area, as well as the bund area itself for malfunctions or leakages. The bund area must be inspected at least weekly and any accumulated rainwater removed. All valves and outlets must be checked to ensure that they are intact and closed securely.
			- The bund base must slope towards a rainwater sump of sufficient size.
			- Contaminated water may not be allowed to mix with clean water, and contained until it can be collected by a registered hazardous waste handling contractor or be disposed of at a registered hazardous waste handling facility.
			- Drip trays must be available to be place underneath all stationary equipment or vehicles.
			- The layer of material at the vehicle service area must be removed and if contaminated with hazardous substances such as hydrocarbons must be disposed of as hazardous waste by an appropriately qualified waste handling contractor. The compacted areas must be ripped and the topsoil returned over the area.
				Contamination of surface or groundwater due to hazardous spills not cleaned:
				NWA, 1998
					Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
			- The site must be cleared of all hazardous substances once decommissioning has been completed and must be disposed of by an appropriately qualified waste handling contractor.		

	5 ha	Operational phase	**Erosion Control and Storm Water Handling:** - Storm water must be diverted around the topsoil heaps, and access roads to prevent erosion and loss of material. - Mining must be conducted only in accordance with the Best Practice Guideline for small scale mining that relates to storm water management, erosion and sediment control and waste management, developed by the Department of Water and Sanitation (DWS), and any other conditions which that Department may impose: - Runoff water must be diverted around the site areas with trenches and contour structures to prevent erosion of the work areas. - Clean water (e.g. rainwater) must be kept clean and be routed to a natural watercourse by a system separate from the dirty water system. You must prevent clean water from running or spilling into dirty water systems. - Dirty water must be collected and contained in a system separate from the clean water system. - Dirty water must be prevented from spilling or seeping into clean water systems. - The storm water management plan must apply for the entire life cycle of the mining activity and over different hydrological cycles (rainfall patterns). - The statutory requirements of various regulatory agencies and the interests of stakeholders must be considered and incorporated into the management plan. - Any erosion problems within the borrow pit area as a result of the mining activities observed must be rectified immediately and monitored thereafter to ensure that they do not re-occur. - Mining within steep slopes will need to ensure that adequate slope protection is provided. - All bare areas resulting from the development must be re-vegetated, post-operation, with locally occurring species, to bind the soil and limit erosion potential. - Roads and other disturbed areas within the project area must regularly be monitored for erosion problems and problem areas must receive follow-up monitoring to assess the success of the remediation. - Silt/sediment traps/barriers must be used where there is a danger of topsoil or material stockpiles eroding and entering downstream drainage lines and other sensitive areas.	Contamination of surface or groundwater due to hazardous spills not cleaned: NWA, 1998	Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
			• These sediment/silt barriers must regularly be maintained and cleared so as to ensure effective drainage of the areas • Any erosion points created during construction must be filled and stabilized immediately. • Practical phased development and vegetation clearing must be practiced so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time. • Construction of gabions and other stabilisation features must be undertaken to prevent erosion, where deemed necessary.		
Stripping and stockpiling of topsoil; Drilling and blasting; Excavation; Sloping, landscaping and replacement of topsoil over disturbed area (final	5 ha	Operational phase	**<u>Protection of Fauna:</u>** • The site manager must ensure that no fauna is caught, killed, harmed, sold or played with. • Workers must be instructed to report any animals that may be trapped in the working area. • No snares may be set or nests raided for eggs or young.	Negative impact on fauna that may enter the area: NEM:BA, 2004 Site management has to strive to eliminate the impact on fauna in the surrounding environment for the duration of the mining activities.	Throughout operational phases
Establishment of temporary buildings and infrastructure within boundaries of site.	5 ha	Construction / Site Establishment phase	Ensure advertising is limited to local and regional areas, and only specifically advertise for Jobs nationally if skills are not available. Ensure that all power-related structures are adequately marked with relevant signs and warnings and fenced off.	N/A	Construction / Site Establishment phase

Stripping and stockpiling of topsoil, Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	5 ha	Operational phase	**Flora:** • Pre-construction walk-through of the final mining footprint, by a suitably qualified botanist, for species of conservation concern that would be affected (also to comply with the Northern Cape Nature Conservation Act and DENC/DAFF permit conditions). • Pre-construction walk-through must also be conducted of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded. • Permits must be kept on-site and in the possession of the flora search and rescue team at all times. • Pre-construction environmental induction for all staff on site must be provided to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas, etc. • Contractor's EO must provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially at the initiation of the project, when the majority of vegetation clearing is taking place. • Blanket clearing of vegetation must be limited to the proposed mining footprint and associated infrastructure. No clearing outside of the minimum required footprint to take place. • Topsoil must be stripped and stockpiled separately during site preparation and replaced over disturbed areas on completion. • Ensure that laydown areas, construction camps, and other temporary use areas are located in areas of low sensitivity and are properly fenced or demarcated as appropriate and practically possible. • All vehicles to remain on demarcated roads and no unnecessary driving in the veld outside these areas must be allowed. • No plants may be translocated or otherwise uprooted or disturbed for rehabilitation or other purposes without express permission from the Contractor's EO and without the relevant permits. • No fires must be allowed on-site. • After the operation, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations as provided within a site-specific Rehabilitation Plan compiled by a suitably qualified botanist.	Management of weed- or invader plants: NEMBA (Act No. 10 of 2004). Alien and Invasive Species Regulation GNR 598 and 599 of 2014. Negative impact on biodiversity of the area: NEM:BA, 2004	Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION

			- Rehabilitation progress, erosion and I&AP monitoring must occur simultaneously post-operational phase and must occur biannual for a minimum of two years.
			
			Weeds/Invader plant control:
			
			- A weed and invader plant control management plan must be implemented at the site to ensure eradication of all listed invader plants in terms of the National Environmental Biodiversity Act [NEMBA] (Act No. 10 of 2004) Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure.
			- Management must take responsibility to control declared invader or exotic species on the rehabilitated areas. The following control methods can be used:
			  • "The plants can be uprooted, felled or cut off and can be destroyed completely."
			  • "The plants can be treated with an herbicide that is registered for use in connection therewith and in accordance with the directions for the use of such an herbicide."
			  • The temporary topsoil stockpiles need to be kept free of weeds.
			- Regular monitoring for alien plants at the site must occur and could be conducted simultaneously with erosion monitoring.
			- When alien plants are detected, these must be controlled and cleared using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels.
			- No planting or importing of any alien species to the site for landscaping, rehabilitation or any other purpose may be allowed.		

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Drilling and blasting	2 ha	Operational phase	**Blasting:** • The type, duration and timing of the blasting procedures must be planned with due cognizance of other land users and structures in the vicinity. • The surrounding landowners and communities must be informed in writing ahead of any blasting event. • The compliance of ground vibration and airblast levels must be monitored to USBM standards with each blasting event. • A vibro recorder must be used to record all blasts. • Audible warning of a pending blast must be given at least 3 minutes in advance of the blast. • Measures to limit flyrock must be taken. All flyrock (of diameter 150 mm and larger) which falls beyond the working area, together with the rock spill must be collected and removed. **Management of health and safety risks:** • Workers must have access to the correct personal protection equipment (PPE) as required by law. • All operations must comply with the Mine Health and Safety Act, 1996 (Act No 29 of 1996).	The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure. MHSA, 1996 OHSA, 1993 OHSAS 18001	Throughout operational and decommissioning phases
Excavation Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	5 ha	Operational phase	**Employee Safety:** • Workers must have access to the correct personal protection equipment (PPE) as required by law. • All operations must comply with the Mine Health and Safety Act, 1996 (Act No 29 of 1996).	The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure. MHSA, 1996 OHSA, 1993	Throughout operational and decommissioning phases

NAME OF ACTIVITY	SIZE AND SCALE OF DISTURBANCE	PHASE	MITIGATION MEASURES	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Transportation of sillimanite from stockpile area to clients	±14 km farm roads	Operational phase	**Access Roads:** • Pre-construction walk-through must be conducted of the final access route with emphasis on the areas of the route that will traverse narrow twin tracks and areas that will have to be upgraded. • Storm water must be diverted around the access roads to prevent erosion. • Erosion of access road: Vehicular movement must be restricted to existing access routes to prevent crisscrossing of tracks through undisturbed areas. Rutting and erosion of the access road caused as a result of the mining activity must be repaired by the applicant. • On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, must be scarified to a depth of at least 300 mm and graded to an even surface condition and the previously stored topsoil must be returned to its original depth over the area.	Degradation of the gravel access road: NRTA, 1996 The gravel access road needs to be monitored for signs of degradation. Should any signs become apparent immediate rectification actions must be implemented.	Throughout operational and decommissioning phases

e) Impact Management Outcomes

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

Table 44: Impact Management Outcomes

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
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...Etc. Etc.)	(Including the potential impacts for cumulative impacts) (E.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc...Etc.)		In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure))	(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc...Etc.) E.g. Modify through alternative method. Control through noise control. Control through management and monitoring. Remedy through rehabilitation.	
Demarcation of site with visible beacons.	No impact could be identified other than the beacons being outside the boundaries of the approved mining area.	N/A	Construction / Site Establishment phase	N/A	Mining of the sillimanite is only allowed within the boundaries of the approved area: MHSA, 1996 OHSA, 1993 MPRDA, 2008; NEMA, 1998

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Establishment of temporary buildings and infrastructure within boundaries of site.	If the infrastructure is established within the boundaries of the approved mining area, no impact could be identified.	N/A	Construction / Site Establishment phase	N/A	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping and stockpiling of topsoil, Drilling and blasting, Excavation, Crushing and screening of sillimanite, Transportation of sillimanite from stockpile area to clients, Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Groundwater pollution Surface water Bodies	Construction / Site Establishment phase	Control: Proper site management. Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.
Establishment of temporary buildings and infrastructure within boundaries of site.	Portable Toilets Potential harm through sewage leaks	Social	Construction / Site Establishment phase	Control through proper site management	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite, Transportation of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Deterioration in visual aesthetics of the area	The visual impact may affect the aesthetics of the landscape.	Operational phase	Control: Implementation of proper housekeeping	Management of the mining activities must be in accordance with the: MHSA, 1996 OHSA, 1993 MPRDA, 2008; NEMA, 1998
	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Increased dust generation will impact on the air quality of the receiving environment.	Operational phase	Control: Dust suppression methods Proper housekeeping	Dust generation on site must be managed in accordance with the: NEM:AQA, 2004 Regulation 6(1) National Dust Control Regulations, GN No R827 ASTM D1739 (SANS 1137:2012)
	Emissions caused by vehicles and equipment	Emissions will be contained within the property boundaries and will therefore affect only the landowner.	Operational phase & Decommissioning Phase	Control: Emissions	Dust Handling: NEM:AQA, 2004 Regulation 6(1)
	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	The noise impact must be contained within the boundaries of the property, and will represent the current noise levels of the farm.	Operational & Decommissioning Phase	Control: Noise control measures Proper housekeeping methods	Noise generation on site must be managed in accordance with the: NEM:AQA, 2004 Regulation 6(1) NRTA, 1996

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping and stockpiling of topsoil, Drilling and blasting, Excavation, crushing and screening of sillimanite, Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	This will impact on the biodiversity of the receiving environment	Site Establishment & Operational phase	<u>Control & Remedy:</u> Implementation of weed control and weed/invader plant management plan Implement good housekeeping practices. Adhere to the recommendations made by the botanist. <u>Modify:</u> Consider use of a less sensitive area	Management of weed- or invader plants: NEMBA (Act No. 10 of 2004). Alien and Invasive Species Regulation GNR 598 and 599 of 2014. Negative impact on biodiversity of the area: NEM:BA, 2004
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping and stockpiling of topsoil, Drilling and blasting, Excavation, crushing and screening of sillimanite, Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Loss of topsoil will affect the rehabilitation of the mining area and the future agricultural potential of the site.	Operational phase	<u>Control:</u> Storm water management Site Management Soil Management	Loss of topsoil due to incorrect storm water management: NEMA, 1998 NWA, 1998 NEMBA, 2004 GNR 598 and 599 of 2014 The replacement of the topsoil is of utmost importance to ensure the effective future use of the area for agricultural purposes. Loss of soil due to un- vegetated areas: NEMBA (Act No. 10 of 2004). NEMA, 1998 Bare areas need to be re-vegetation to prevent soil erosion.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Alteration of topography	Topography	Operational phase	N/A	N/A
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation	Loss of and disturbance to surface archaeological sites	Artefacts or graves	Operational phase	Control: Survey area before site clearance	Loss of Artefacts and Graves: National Heritage Resources Act No. 25 of 1999
	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	The impact of the fauna of the area will not be significant as vibration and noise will drive the fauna away	Operational phase	Control: Implementation of fauna protection measures	Negative impact on fauna that may enter the area: NEM:BA, 2004 Site management has to strive to eliminate the impact on fauna in the surrounding environment for the duration of the mining activities.

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite, Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Land use	Operational phase	<u>Fire Control</u>	Every precaution must be taken to prevent contamination. The precautionary principal must apply.
Establishment of temporary buildings and infrastructure within boundaries of site.	Influx of unsuccessful job seekers which may informally settle in area. Potential danger to surrounding communities	Social	Construction / Site Establishment phase	Control through proper site management	N/A
Stripping and stockpiling of topsoil Drilling and blasting Excavation	Disturbance of geological strata	Geology	Operational phase	N/A	N/A
Drilling and blasting Excavation	Health and Safety Risk by Blasting Activities. Potential danger to surrounding community's Unsafe working environment for the employees. Safety risk posed by unsloped areas.	The Unsafe working conditions should only impact the applicant. Safety measures will be implemented	Operational phase	Control: Implementation of safety control measures	<u>The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure.</u> MHSA, 1996 OHSA, 1993 OHSAS 18001

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Soils replaced and ameliorated	Loss of topsoil will affect the rehabilitation of the mining area and the future agricultural potential of the site.	Decommissioning phase	Control: Storm water management Site Management Soil Management	Loss of topsoil due to incorrect storm water management: NEMA, 1998 NWA, 1998 NEMBA, 2004 GNR 598 and 599 of 2014 The replacement of the topsoil is of utmost importance to ensure the effective future use of the area for agricultural purposes. Loss of soil due to un- vegetated areas: NEMBA (Act No. 10 of 2004). NEMA, 1998 Bare areas need to be re-vegetation to prevent soil erosion.
	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Groundwater improvement	Decommissioning phase	Control: Proper site management. Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Contamination of surface or groundwater due to hazardous spills not cleaned: NWA, 1998

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Containment of dirty water. Improve response to issues relating to deterioration of surface water quality or quantity. Free drainage resorted to area. Revegetation of disturbed areas reduces risk of silt loading on downstream water bodies. Large area of surface water runoff return to catchment	Groundwater pollution Surface water Bodies	Decommissioning phase	Control: Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Contamination of surface or groundwater due to hazardous spills not cleaned: NWA, 1998
	Health and safety risk posed by un-sloped areas	The impact on health and safety due to un-sloped areas will be contained within the site boundary.	Decommissioning phase	Control: Sloping of areas upon decommission	The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure. MHSA, 1996 OHSA, 1993
	Reintroduction of fauna attracted to flora to the area.	Fauna returning to area	Decommissioning phase	Control: Implementation of fauna protection measures	Negative impact on fauna that may enter the area: NEM:BA, 2004 Site management has to strive to eliminate the impact on fauna in the surrounding environment for the duration of the mining activities.
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Eradication of trenches and berms. Re-contouring of area for free surface water drainage. Eradication of stockpiles	Topography	Decommissioning phase	N/A	N/A

f) Impact Management Actions

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

Table 45: Impact Management Actions

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
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, mining plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...Etc. Etc.)	(Including the potential impacts for cumulative impacts) (E.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc...Etc.)	(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc...Etc...) E.g. Modify through alternative method. Control through noise control. Control through management and monitoring. Remedy through rehabilitation.		
Demarcation of site with visible beacons.	No impact could be identified other than the beacons being outside the boundaries of the approved mining area.	N/A	Mining of the sillimanite is only allowed within the boundaries of the approved area: MHSA, 1996 OHSA, 1993 MPRDA, 2008; NEMA, 1998	Beacons need to be in place throughout the life of the activity.

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site.	If the infrastructure is established within the boundaries of the approved mining area, no impact could be identified.	N/A	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.	Construction / Site Establishment phase
	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Control: Proper site management. Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.	Construction / Site Establishment phase
Establishment of temporary buildings and infrastructure within boundaries of site.	Portable Toilets Potential harm through sewage leaks	Control: Storm water management Site Management Soil Management	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.	Construction / Site Establishment phase
	Portable Toilets Potential harm through sewage leaks	Control through proper site management	Not applicable as these are mobile and will be removed during rehabilitation and closure of the site.	Construction / Site Establishment phase
	Deterioration in visual aesthetics of the area	Control: Implementation of proper housekeeping	Management of the mining activities must be in accordance with the: MHSA, 1996 OHSA, 1993 MPRDA, 2008; NEMA, 1998	Throughout the site establishment- and operational phases.

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite Transportation of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Control: Dust suppression methods Proper housekeeping	Dust generation on site must be managed in accordance with the: NEM:AQA, 2004 Regulation 6(1) National Dust Control Regulations, GN No R827 ASTM D1739 (SANS 1137:2012)	Throughout operational and decommissioning phases
	Emissions caused by vehicles and equipment	Control: Emissions	Dust Handling: NEM:AQA, 2004 Regulation 6(1)	Throughout operational and decommissioning phases
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite Transportation of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Control: Noise control measures Proper housekeeping methods	Noise generation on site must be managed in accordance with the: NEM:AQA, 2004 Regulation 6(1) NRTA, 1996	Throughout operational and decommissioning phases

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Control & Remedy: Implementation of weed control and weed/invader plant management plan Implement good housekeeping practices. Adhere to the recommendations made by the botanist. Modify: Consider use of a less sensitive area	Management of weed- or invader plants: NEM:BA (Act No. 10 of 2004). Alien and Invasive Species Regulation GNR 598 and 599 of 2014. Negative impact on biodiversity of the area: NEM:BA, 2004	Throughout operational and decommissioning phases
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite Transportation of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Control: Storm water management Site Management Soil Management	Loss of topsoil due to incorrect storm water management: NEMA, 1998 NWA, 1998 NEMBA, 2004 GNR 598 and 599 of 2014 The replacement of the topsoil is of utmost importance to ensure the effective future use of the area for agricultural purposes. Loss of soil due to un- vegetated areas: NEMBA (Act No. 10 of 2004). NEMA, 1998 Bare areas need to be re-vegetation to prevent soil erosion.	Throughout operational phases

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil drilling and blasting excavation crushing and screening of sillimanite transportation of sillimanite from stockpile area to clients sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Control: Proper site management. Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Contamination of surface or groundwater due to hazardous spills not cleaned: NWA, 1998	Throughout operational and decommissioning phases
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil drilling and blasting excavation transportation of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Alteration of topography	N/A	N/A	Throughout operational and decommissioning phases
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation	Loss of and disturbance to surface archaeological sites	**Control:** Survey area before site clearance	Loss of Artefacts and Graves: National Heritage Resources Act No. 25 of 1999	Throughout operational and decommissioning phases

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Establishment of temporary buildings and infrastructure within boundaries of site. Stripping and stockpiling of topsoil Drilling and blasting Excavation Crushing and screening of sillimanite	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Control: Implementation of fauna protection measures	Negative impact on fauna that may enter the area: NEM:BA, 2004 Site management has to strive to eliminate the impact on fauna in the surrounding environment for the duration of the mining activities.	Throughout operational phases
Establishment of temporary buildings and infrastructure within boundaries of site.	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Fire Control	Every precaution must be taken to prevent contamination. The precautionary principal must apply.	Throughout operational and decommissioning phases
Establishment of temporary buildings and infrastructure within boundaries of site.	Influx of unsuccessful job seekers which may informally settle in area. Potential danger to surrounding communities	Control through proper site management	N/A	Construction / Site Establishment phase
Stripping and stockpiling of topsoil Excavation Drilling and blasting	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Fire Control	Every precaution must be taken to prevent contamination. The precautionary principal must apply.	Throughout operational and decommissioning phases
Stripping and stockpiling of topsoil Excavation Drilling and blasting	Disturbance of geological strata	N/A		Throughout operational and decommissioning phases

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
Drilling and blasting	Health and Safety Risk by Blasting Activities. Potential danger to surrounding community's Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Control: Implementation of safety control measures	The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure. MHSA, 1996 OHSA, 1993 OHSAS 18001	Throughout operational and decommissioning phases
Excavation	Health and Safety Risk by Blasting Activities. Potential danger to surrounding community's Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Control: Implementation of safety control measures	The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure. MHSA, 1996 OHSA, 1993	Throughout operational and decommissioning phases
Transportation of sillimanite from stockpile area to clients	Road degradation. Increased potential for road incidences Potential distraction to road users	Control & Remedy: Road management	Degradation of the gravel access road: NRTA, 1996 The gravel access road needs to be monitored for signs of degradation. Should any signs become apparent immediate rectification actions must be implemented?	Throughout operational and decommissioning phases
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Soils replaced and ameliorated	Control: Storm water management Site Management Soil Management	Loss of topsoil due to incorrect storm water management: NEMA, 1998 NWA, 1998 NEM:BA, 2004 GNR 598 and 599 of 2014 The replacement of the topsoil is of utmost importance to ensure the effective future use of the area for agricultural purposes. Loss of soil due to un- vegetated areas: NEM:BA (Act No. 10 of 2004). NEMA, 1998 Bare areas need to be re-vegetation to prevent soil erosion.	Throughout operational phases

NAME OF ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	COMPLIANCE WITH STANDARD / STANDARD TO BE ACHIEVED	TIME PERIOD FOR IMPLEMENTATION
	Containment of dirty water. Improve response to issues relating to deterioration of surface water quality or quantity. Free drainage resorted to area. Revegetation of disturbed areas reduces risk of silt loading on downstream water bodies. Large area of surface water runoff return to catchment	Control: Surface water Management Implement storm water control measures. Measures will be implemented as subscribed by DWS.	Contamination of surface or groundwater due to hazardous spills not cleaned: NWA, 1998	Throughout operational and decommissioning phases
	Health and safety risk posed by un-sloped areas	Control: Sloping of areas upon decommission	The Occupational Health and safety act in conjunction with the Mine Health and Safety act as mitigation measure. MHSA, 1996 OHSA, 1993	Throughout operational and decommissioning phases
	Reintroduction of fauna attracted to flora to the area	Control: Implementation of fauna protection measures	Negative impact on fauna that may enter the area: NEM:BA, 2004 Site management has to strive to eliminate the impact on fauna in the surrounding environment for the duration of the mining activities.	Throughout operational phases
	Eradication of trenches and berms. Re-contouring of area for free surface water drainage. Eradication of stockpiles	N/A	N/A	Throughout operational and decommissioning phases
Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation)	Improved aesthetics through rehabilitation	Control: Implementation of proper housekeeping	Management of the mining activities must be in accordance with the: MPRDA, 2008 NEMA, 1998	Throughout the site establishment- and operational phases.
	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Fire Control	Every precaution must be taken to prevent contamination. The precautionary principal must apply.	Throughout operational and decommissioning phases

i) Financial Provision

(1) Determination of the amount of Financial Provision.

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

The primary objective is to obtain a closure certificate at the end of the life of the mining permit at minimum cost and in as short a time period as possible whilst still complying with the requirements of the Minerals and Petroleum Resources Development Act, 2002. To realise this, the following objectives must be achieved:

- Remove all temporary infrastructure and waste from the site as per the requirements of this EMPR and of the Provincial Department of Mineral Regulation;
- Demolish / rehabilitate all roads with no post-mining use potential;
- Clear all stockpiled sillimanite material from site;
- Clear boulders form site;
- Remove all waste from site;
- The perimeter walls of the opencast pit to be sloped at 1:3 to the pit floor, to prevent soil erosion, or to be stepped by creating benches of not more than 3 meters high.
- Ensure future public health and safety are not compromised;
- Ensure that no threat to surface and underground water quality remains;
- Ensure that all permanent changes in topography are sustainable and do not cause erosion or the damming up of runoff;
- Shape and contour all disturbed areas in compliance with the EMPR;
- Spread the stockpiled topsoil (that is available) over the disturbed area to a depth of at least 300 mm;
- Control of weeds and alien invasive plant species is an important aspect after topsoil replacement and seeding has been done in an area;
- Any adverse socio-economic impacts are minimised; and
- All socio-economic benefits are maximised.

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

This report, the Draft Basic Assessment Report, includes all the environmental objectives in relation to closure and will be made available for perusal of I&AP's and stakeholders. Any additional comments received during the commenting period will be added to the Final Basic Assessment Report to be submitted to DMR for approval.

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

The requested rehabilitation plan is attached in Appendix G. Upon closure of the mining activity all infrastructure will be removed. The compacted areas will be ripped and levelled upon which the topsoil will be replaced. No permanent structures will remain upon closure of the site. The rehabilitation plan shall entail removal of all generated waste, infrastructures and materials, re-vegetation of disturbed and cleared areas, rehabilitation of access roads, ensuring the growth of the existing grasses and plants species and cleaning of spillages etc.

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

The rehabilitation of the mining area as indicated on the rehabilitation plan attached as Appendix G will comply with the minimum closure objectives as prescribed by DMR and detailed below, and therefore is deemed to be compatible:

Rehabilitation of the excavated area:

- Due to the impracticality of importing large volumes of fill to restore the quarry area to its original topography, the rehabilitation option is to develop the quarry into a minor landscape feature.
- This will entail creating a series of irregular benches along the quarry faces, the top edges of each face being blasted away to form slopes on the benches below, thereby reducing the overall face angle. Oversized rocks and overburden will be used to make the quarry safe.

- Fill and topsoil could be placed over the benches to provide a suitable medium for the establishment of vegetation, especially trees which will break up the line of the faces and enhance their appearance. The floor of the quarry must be capped with suitable soil material and re-vegetated.
- Rocks and coarse material removed from the excavation must be dumped into the excavation.
- No waste will be permitted to be deposited in the excavations.
- The area shall be fertilized to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally or regionally occurring flora.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

Rehabilitation of plant, office and service areas:

- Coarse natural material used for the construction of ramps must be removed and dumped into the excavations.
- Stockpiles will be removed during the decommissioning phase, the area ripped and the topsoil returned to its original depth to provide a growth medium.
- On completion of operations, all structures or objects shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act [MPRDA], 2002 (Act No. 28 of 2002):
  - Where sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
  - Areas containing French drains shall be compacted and covered with a final layer of topsoil to a height of 10cm above the surrounding ground surface.
  - The site shall be seeded with a vegetation seed mix adapted to reflect the local indigenous flora.
- Photographs of the workshop and office sites, before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the Regional Manager.
- On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, shall be scarified and graded to an even surface condition. Where applicable / possible topsoil needs to be returned to its original depth over the area.
- Prior to replacing the topsoil, the material that was removed from these areas will be replaced in the same order as it originally occurred.
- The area shall then be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local, adapted indigenous seed mix.

- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to his or her specification.

Final rehabilitation:

- Rehabilitation of the surface area shall entail reshaping, levelling, top dressing, land preparation, seeding and maintenance, and weed / alien clearing.
- All Infrastructures, equipment, plant, and other items used during the mining permit period will be removed from the site.
- Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the mining permit area and disposed of at a recognized landfill facility; proof of this removal will be kept on file at the applicant's office. It will not be permitted to be buried or burned on the site.
- Weed / Alien clearing will be done in a sporadic manner during the life of the Mining activities. Species regarded as the National Environmental Biodiversity Act [NEMBA] (Act No. 10 of 2004) Alien and Invasive Species Regulation GNR 598 and 599 of 2014 Species regarded as need to be eradicated from the site on final closure. Final rehabilitation shall be completed within a period specified by the Regional Manager.
- Final rehabilitation shall be completed within a period specified by the Regional Manager.
- Seeding of the area:
  - Once the pit slopes (40º) have been shaped and the soil replaced, the initial goal is to establish a good cover of a robust grass that will stabilise the soil and start the accumulation of soil organic carbon. This will be done using a combination of hydro seeding and physical planting of runners to apply a mix of commercial and indigenous species that includes both tufted and creeping species. The plants that were collected during the establishment and operational phases and kept in the designated area will be replanted.

The closure plan will be reviewed annually and updated every two years or as significant changes to the mine plan occur, as nearing closure. Please refer to the closure plan as attached in Appendix G.

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

The calculation of the quantum for financial provision was according to Section B of the working manual.

Mine type and saleable mineral by-product

According to Tables B.12, B.13 and B.14

Mine type	Sillimanite
Saleable mineral by-product	N/A

Primary Risk Class

According to Tables B.12 or B.13

Primary risk ranking	Class C – No additional Impact
Revised risk ranking	N/A

Environmental sensitivity of the mine area

According to Table B.4

Environmental sensitivity of the mine	Low

Level of information

According to Step 4.1

Level of information available	Extensive

Identification of closure components

According to Table B.5 and site-specific conditions.

COMPONENT NO.	MAIN DESCRIPTION	APPLICABILITY OF CLOSURE COMPONENTS (CIRCLE YES OR NO)	
1	Dismantling of processing plant and related structures (including overland conveyors and power lines)	**-**	**NO**
2(A)	Demolition of steel buildings and structures	**-**	**NO**
2(B)	Demolition of reinforced concrete buildings and structures	**-**	**NO**
3	Rehabilitation of access roads	**-**	**NO**
4(A)	Demolition and rehabilitation of electrified railway lines	**-**	**NO**
4(B)	Demolition and rehabilitation of non-electrified railway lines	**-**	**NO**
5	Demolition of housing and facilities	**-**	**NO**
6	Opencast rehabilitation including final voids and ramps	**YES**	**-**
7	Sealing of shafts, adits and inclines	**-**	**NO**
8(A)	Rehabilitation of overburden and spoils	**-**	**NO**

COMPONENT NO.	MAIN DESCRIPTION	APPLICABILITY OF CLOSURE COMPONENTS (CIRCLE YES OR NO)	
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing)	-	NO
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich)	-	NO
9	Rehabilitation of subsided areas	-	NO
10	General surface rehabilitation, including grassing of all denuded areas	YES	-
11	River diversions	-	NO
12	Fencing	-	NO
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater)	-	NO
14	2 to 3 years of maintenance and aftercare	YES	-

Unit rates for closure components

According to Table B.6 master rates and multiplication factors for applicable closure components. The master rate from the DMR Master Rates table for financial provision of 2020 has been used.

COMPONENT NO.	MAIN DESCRIPTION	MASTER RATE	MULTIPLICATION FACTOR
1	Dismantling of processing plant and related structures (including overland conveyors and power lines)	-	-
2(A)	Demolition of steel buildings and structures	-	-
2(B)	Demolition of reinforced concrete buildings and structures	-	-
3	Rehabilitation of access roads	-	-
4(A)	Demolition and rehabilitation of electrified railway lines	-	-
4(B)	Demolition and rehabilitation of non-electrified railway lines	-	-
5	Demolition of housing and facilities	-	-
6	Opencast rehabilitation including final voids and ramps	R 253 019	0.04
7	Sealing of shafts, adits and inclines	-	-
8(A)	Rehabilitation of overburden and spoils	-	-
8(B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing)	-	-
8(C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich)	-	-
9	Rehabilitation of subsided areas	-	-
10	General surface rehabilitation, including grassing of all denuded areas	R 133 622	1.00
11	River diversions	-	-
12	Fencing	-	-
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater)	-	-
14	2 to 3 years of maintenance and aftercare	R 17 782	1.00

Determine weighting factors

According to Tables B.7 and B.8

Weighting factor 1: Nature of terrain/accessibility	1.00 (Flat)
Weighting factor 2: Proximity to urban area where goods and services are to be supplied	1.05 (Peri-Urban)

Table B.10 Template for Level 2: "Rules-based" assessment of the quantum for financial provision							
CALCULATION OF THE QUANTUM							
Mine:	Van Zyl Sillimanite -Wortel			**Location:**	Pella		
Evaluator:	Yolandie Coetzee			**Date:**	13 January 2020		
No	**Description**	**Unit**	**A Quantity**	**B Master rate**	**C Multiplication factor**	**D Weighting factor 1**	**E=A *B*C*D Amount (rands)**
			Step 4.5	**Step 4.3**	**Step 4.3**	**Step 4.4**	
1	Dismantling of processing plant and related structures (including overland conveyors and power lines)	m^3	0	17	1	1	R 0,00
2a	Demolition of steel buildings and structures	m^2	0	241	1	1	R 0,00
2b	Demolition of reinforced concrete buildings and structures	m^2	0	356	1	1	R 0,00
3	Rehabilitation of access roads	m^2	0	43	1	1	R 0,00
4a	Demolition and rehabilitation of electrified railway lines	m	0	419	1	1	R 0,00
4b	Demolition and rehabilitations of non-electrified railway lines	m	0	229	1	1	R 0,00
5	Demolition of housing and/or administration facilities	m^2	0	483	1	1	R 0,00
6	Opencast rehabilitation including final voids and ramps	ha	3	253 019	0.04	1	R 30 362.28
7	Sealing of shaft, audits and inclines	m^3	0	130	1	1	R 0,00
8a	Rehabilitation of overburden and spoils	ha	0	168 679	1	1	R 0,00
8b	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	ha	0	210 087	1	1	R 0,00
8c	Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	ha	0	610 192	0.51	1	R 0,00
9	Rehabilitation of subsided areas	ha	0	141 244	1	1	R 0,00
10	General surface rehabilitation	ha	2	133 622	1	1	R 267 244,00
11	River diversions	ha	0	133 622	1	1	R 0,00
12	Fencing	m	0	152	1	1	R 0,00
13	Water Management	ha	0	50 807	0.17	1	R 0,00
14	2 to 3 years of maintenance and aftercare	ha	5	17 782	1	1	R 88 910,00
15a	Specialists study	Sum			1	1	R 0,00
15b	Specialists study	Sum			1	1	R 0,00
							R 386 516.28
	Multiply Sum of 1-15 by Weighting factor 2 (Step 4.4)			1,05	R 386 516.28	**Sub Total 1**	R 405 842.09
	General and preliminary			6% of subtotal 1			R 24 350.53
	Contingency			10.0% of Subtotal 1			R 40 584.21

	(Subtotal 1 plus management and contingency)					**Sub Total 2**	R 470 776.83
	Vat (15%)					**Sub Total 3**	R 70 616.53
	(Subtotal 3 plus VAT)					**GRAND TOTAL**	R 541 393.35

Calculation of closure costs

The amount that will be necessary for the rehabilitation of damages caused by the operation, both sudden closures during the normal operation of the project and at final, planned closure gives a sum total of R 541 393.35.

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

Herewith I, the person, whose name is stated below confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application. I herewith confirm that the company will provide the amount that will be determined by the Regional Manager in accordance with the prescribed guidelines.

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

- **(g) Monitoring of Impact Management Actions**
- **(h) Monitoring and reporting frequency**
- **(i) Responsible persons**
- **(j) Time period for implementing impact management actions**
- **(k) Mechanisms for monitoring compliance**

Table 46: Mechanism for monitoring compliance

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
whether listed or not listed			(FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	
Demarcation of site with visible beacons	Maintenance of beacons	• Visible beacons need to be placed at the corners of the mining area.	Responsibility: • Site Manager to ensure day-to-day compliance with the guidelines as stipulated in the EMPR. • Compliance to be monitored by the independent Environmental Control Officer during the annual environmental audit. Role: Ensure beacons are in place throughout the life of the mine.	Applicable throughout site establishment-, operational-, and decommissioning phases. Daily compliance monitoring by site management. Annual compliance monitoring of site by an Environmental Control Officer.

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil	Geology and Soil	Storm water management structures such as berms to direct storm- and runoff water around the stockpiled topsoil area.	Responsibility: • Site Manager to ensure day-to-day compliance with the guidelines as stipulated in the EMPR. • Compliance to be monitored by the independent Environmental Control Officer during the annual environmental audit. Role: • Strip and stockpile the upper 300 mm of the soil and protect as topsoil. • Remove topsoil at right angles to the slope to slow down surface runoff and prevent erosion. • Conduct topsoil stripping, stockpiling and re-spreading in a systematic way. Ensure topsoil is stockpiled for the minimum possible time. • Protect topsoil stockpiles against losses by water and wind erosion through the establishment of plants on the stockpiles. • Place topsoil stockpiles along the northern and western boundaries of the site. Topsoil heaps may not exceed 1.5m in order to preserve microorganism within the topsoil.	Applicable throughout site establishment-, operational-, and decommissioning phases. Daily compliance monitoring by site management. Annual compliance monitoring of site by an Environmental Control Officer.

	Soils	Soil contamination	Responsibility: • Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. • Compliance to be monitored by the Environmental Control Officer. Role: • Strip and stockpile the upper 500 mm of the soil before mining. • Carefully manage and conserve the topsoil throughout the stockpiling and rehabilitation process. • Ensure topsoil stripping, stockpiling and re-spreading is done in a systematic way. Plan mining in such a way that topsoil is stockpiled for the minimum possible time. • Consider stockpiling the topsoil at the existing topsoil storage area (Existing stockpile area), alternatively place topsoil heaps on a levelled area within the mining footprint area and implement measures to safeguard the piles from being washed away. Do not stockpile topsoil in undisturbed areas. • Ensure that topsoil heaps do not exceed 1.5 m in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen. • Divert storm- and runoff water around the stockpile area to prevent erosion. • Vegetate the topsoil heaps to be stored longer than 6 months with an indigenous grass seed mix if vegetation does not naturally germinate within the first growth season. • Spread the topsoil evenly over the rehabilitated area upon closure of the site. • Strive to re-instate topsoil at a time of the year when vegetation cover can be established as quickly as possible afterwards, to that erosion of returned topsoil is minimized. The best time of year is at the end of the rainy season.	

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
			• Plant a cover crop immediately after spreading topsoil to stabilise the soil and protect it from erosion. Fertilise the cover crop for optimum production. Rehabilitation extends until the first cover crop is well established. • Control run-off water with temporary banks, where necessary, to prevent accumulation of run-off causing down-slope erosion. • Monitor the rehabilitated area for erosion, and appropriately stabilize if erosion do occur, for at least 12 months after reinstatement. • Remove topsoil at right angles to the slope to slow down surface runoff and prevent erosion. • Conduct topsoil stripping, stockpiling and re-spreading in a systematic way. Ensure topsoil is stockpiled for the minimum possible time. • Protect topsoil stockpiles against losses by water and wind erosion through the establishment of plants on the stockpiles. • Conduct the activity in accordance with the Best Practice Guideline for small-scale mining as stipulated by DWS.	

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Visual intrusion as a result of site establishment. Visual intrusion associated with the excavation activities. Monitoring of visual impacts. Inspect area for illegal littering and dumping	Minimize the visual impact of the activity on the surrounding environment through proper site management and implementing good housekeeping practices.	Responsibility: - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. Role: - Ensure that the site have a neat appearance and is kept in good condition at all times. - Remove all infrastructure upon rehabilitation of the mining area and return the area to its prior status.	

Establishment of temporary buildings and infrastructure within boundaries of site.	Inspect area for illegal littering and dumping	Oil spill kit. Sealed drip trays. Formal waste disposal system with waste registers, or access to the waste registers of Queenstown Quarry.	<u>Responsibility:</u> • Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. Compliance to be monitored by the Environmental Control Officer. <u>Role:</u> • Ensure no waste storage area is established outside the boundaries of the mining area. • Ensure vehicle maintenance only take place within the service bay area of the off-site workshop. If emergency repairs are needed on site, ensure drip trays is present. Ensure all waste products are disposed of in a 200 litre closed container/bin inside the emergency service area. • Ensure diesel bowser is equipped with a drip tray at all times. • Use drip trays during each and every refuelling event. • Ensure the nozzle of the bowser rests in a sleeve to prevent dripping after refuelling. • Keep drip trays clean. No dirty drip trays may be used on site. • Collect any effluents containing oil, grease or other industrial substances in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility. • Clean spills immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognised facility. File proof on site. • Ensure the availability of suitable covered receptacles at all times and conveniently placed for the disposal of waste. • Place all used oils, grease or hydraulic fluids therein and remove these receptacles from the site on a regular basis for disposal at a registered or licensed hazardous disposal facility.	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Monthly compliance monitoring of site by fallout dust monitoring consultant. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
			• Store non-biodegradable refuse such as glass bottles, plastic bags etc., in a container with a closable lid at a collecting point. Collection must take place on a regular basis and disposed of at the recognised landfill site. Prevent refuse from being dumped on or in the vicinity of the mining area. • Biodegradable refuse to be handled as indicated above.	

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Noise Monitoring The noise impact must be contained within the boundaries of the property, as it will represent the current activities.	Personal noise exposure monitoring equipment. Signage indicating noise zones. Silencers fitted to all project related vehicles, and the use of vehicles that are in road worthy condition in terms of the National Road Traffic Act, 1996.	Responsibility: - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. Role: - Ensure that employees and staff conduct themselves in an acceptable manner while on site. - No loud music may be permitted at the mining area. - Ensure that all mining vehicles are equipped with silencers and maintained in a road worthy condition in terms of the Road Transport Act, 1996. - Plan the type, duration and timing of the blasting procedures with due cognizance of other land users and structures in the vicinity. Notify surrounding land owners in writing prior to each blasting occasion. - Implement best practice measures in order to minimize potential noise impacts. - Contract a qualified occupational hygienist to quarterly monitor and report on the personal noise exposure of the employees working at the mine. The monitoring must be done in accordance with the SANS 10083:2004 (Edition 5) sampling method as well as NEM:AQA, 2004, SANS 10103:2008.	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control Officer.

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Management of weed or invader plants The presence of weed and/or invader plants must be continuously monitored, and any unwanted plants must be removed. Loss of natural vegetation. Groundcover: Potential loss of protected or red data plant species.	Designated team to cut or pull out invasive plant species that germinated on site. Herbicide application equipment.	<u>Responsibility:</u> • Site Manager to ensure day-to-day compliance with the guidelines as stipulated in the EMPr. • Compliance to be monitored by the independent Environmental Control Officer during the annual environmental audit. • Botanist to identify plants of importance. <u>Role:</u> • Implement a weed and invader plant control management plan. • Control declared invader or exotic species on the rehabilitated areas. • Keep the temporary topsoil stockpiles free of weeds. • Do regular monitoring for alien plants at the site simultaneously with erosion monitoring. • When alien plants are detected, control and clear the plants using the recommended control measures for each species to ensure that the problem is not exacerbated or does not re-occur and increase to problematic levels. • Do not allow the planting or importing of any alien species to the site for landscaping, rehabilitation or any other purposes.	Throughout Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Soil Management Topsoil Management <u>Soil erosion:</u> Loss of reinstated topsoil after rehabilitation.	Storm water management structures such as berms to direct storm- and runoff water around the stockpiled topsoil area.	<u>Responsibility:</u> - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. <u>Role:</u> - Strip and stockpile the upper 300 mm of the soil and protect as topsoil. - Remove topsoil at right angles to the slope to slow down surface runoff and prevent erosion. - Conduct topsoil stripping, stockpiling and re-spreading in a systematic way. Ensure topsoil is stockpiled for the minimum possible time. - Protect topsoil stockpiles against losses by water and wind erosion through the establishment of plants on the stockpiles. - Place topsoil stockpiles along the northern and western boundaries of the site. Topsoil heaps may not exceed 1.5m in order to preserve microorganism within the topsoil.	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control Officer

	<u>Waste Management:</u> Management of waste must be a daily monitoring activity. Hydrocarbon spills need to be cleaned immediately and the site manager must check compliance daily. Contamination of area with hydrocarbon or hazardous waste material. Potential contamination of environment as a result of improper waste disposal	Oil spill kit. Sealed drip trays. Formal waste disposal system with waste registers, or access to the waste registers of Queenstown Quarry.	<u>Responsibility:</u> - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. <u>Role:</u> - Ensure no waste storage area is established outside the boundaries of the mining area. - Ensure vehicle maintenance only take place within the service bay area of the off-site workshop. If emergency repairs are needed on site, ensure drip trays is present. Ensure all waste products are disposed of in a 200 litre closed container/bin inside the emergency service area. - Ensure diesel bowser is equipped with a drip tray at all times. - Use drip trays during each and every refuelling event. - Ensure the nozzle of the bowser rests in a sleeve to prevent dripping after refuelling. - Keep drip trays clean. No dirty drip trays may be used on site. - Collect any effluents containing oil, grease or other industrial substances in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility. - Clean spills immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognised facility. File proof on site. - Ensure the availability of suitable covered receptacles at all times and conveniently placed for the disposal of waste. - Place all used oils, grease or hydraulic fluids therein and remove these receptacles from the site on a regular basis for disposal at a registered or licensed hazardous disposal facility.	

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
			• Store non-biodegradable refuse such as glass bottles, plastic bags etc., in a container with a closable lid at a collecting point. Collection must take place on a regular basis and disposed of at the recognised landfill site. Prevent refuse from being dumped on or in the vicinity of the mining area. • Biodegradable refuse to be handled as indicated above.	

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Protection of Cultural and Heritage Artefacts	Number of an archaeologist that can be called once a discovery is made.	<u>Responsibility:</u> • Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. • Compliance to be monitored by the Environmental Control Officer. <u>Role:</u> • Confine all mining to the development footprint area. • Implement the chance find procedure as described in this document when any discoveries are made.	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control Officer.

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Protection of fauna	Toolbox talks to educate employees how to handle fauna that enter the work areas.	Responsibility: • Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. • Compliance to be monitored by the Environmental Control Officer. Role: • Ensure no fauna is caught, killed, harmed, sold or played with. • Instruct workers to report any animals that may be trapped in the working area. • Prevent the setting of snares, raiding of nests, eggs or young.	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control
	Fire Management	Firefighting equipment	Responsibility: • Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. • Compliance to be monitored by the Environmental Control Officer. Role: • No fires allowed on site • All employees to know the location of the fire extinguishers. • Only smoke in designated smoking areas.	

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	Social	Complaints register	Responsibility: - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. Role: - Inspect all complaints received and compare against photographic evidence. Inspect areas and ensue fences haven't been tampered with and no illegal connections have been added to lines	Throughout Operational Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control Officer.

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Establishment of temporary buildings and infrastructure within boundaries of site, Stripping of topsoil Drilling and blasting Excavation Crushing and screening, Transporting of sillimanite from stockpile area to clients Sloping, landscaping and replacement of topsoil over disturbed area (final rehabilitation	<u>Air Quality</u>: The dust generated by the mining activities must be continuously monitored, and addressed by the implementation of dust suppression methods. Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Fallout dust monitoring equipment. Gravimetric dust monitoring equipment. Dust suppression equipment such as a water car, water dispenser and sprayers on the crusher plant. Signage that clearly reduce the speed on the access roads.	<u>Responsibility:</u> - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. <u>Role:</u> - Control the liberation of dust into the surrounding environment by the use of; inter alia, water spraying and/or other dust-allaying agents. - Limit speed on the access roads to 40km/h to prevent the generation of excess dust. - Spray roads with water or an environmentally friendly dust-allaying agent that contains no PCB's (e.g. DAS products) if dust is generated above acceptable limits. - Assess effectiveness of dust suppression equipment. - Re-vegetate all disturbed or exposed areas as soon as possible to prevent any dust source from being created. - Thoroughly soak all stockpiles to ensure dust suppression on the site. - Conduct formal dust monitoring on a monthly basis	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control Officer.

NAME OF ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMME	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Drilling and blasting	Social Health and Safety Risk	Stocked first aid box. Level 1 certified first aider. All appointments in terms of the Mine Health and Safety Act, 1996. Vibro recorder.	Responsibility: - Site Manager to ensure compliance with the guidelines as stipulated in the EMPR. - Compliance to be monitored by the Environmental Control Officer. Role: - Ensure that workers have access to the correct PPE as required by law. - Ensure all operations comply with the Occupational Health and Safety Act, 1996. - Plan the type, duration and timing of the blasting procedures with due cognizance of other land users and structures in the vicinity. - Inform the surrounding landowners and communities in writing ahead of any blasting event. - Monitor the compliance of ground vibration and airblast levels to USBM standards with each blasting event. - Use a vibro recorder to record all blasts. - Give audible warning of a pending blast at least 3 minutes in advance of the blast. - Take measures to limit flyrock. Collect and remove all flyrock (of diameter 150 mm and larger) which falls beyond the working area, together with the rock spill.	Throughout Construction, Operational and Decommissioning Phase Daily compliance monitoring by site management. Quarterly compliance monitoring of site by an Environmental Control Officer. Annual compliance monitoring of site by an Independent Environmental Control

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

The Environmental Audit Report in accordance with Appendix 7 as prescribed in Regulation 34 of the EIA Regulation, 2014 (as amended) will annually be submitted to the DMR for compliance monitoring purposes or in accordance with the time period stipulated by the Environmental Authorisation.

(m) Environmental Awareness Plan

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

The purpose of this section is to outline the methodology that will be used to educate the mine's employees and contractors of any environmental risks associated with their work and the manner in which these risks must be dealt with so as to avoid pollution and minimize the degradation of the environment.

Once mining of the proposed area starts a copy of the Basic Assessment Report and Environmental Management Programme report will be handed to the site manager during the site establishment meeting. Issues such as topsoil handling, site clearance, fire principals and hazardous waste handling will be discussed. An induction meeting will be held with all the site workers to inform them of the Basic Rules of Conduct with regard to the environment.

The operations manager must ensure that he/she understands the EMPR document and its requirement and commitments. An Environmental Control Officer needs to check compliance of the mining activities to the management programmes described in the EMPR.

<u>Training Needs</u>

A training needs analysis will be performed through all levels of the organization including those within the administration, plant and mining worker sectors. Each of the categories / levels of the organization have different responsibilities and roles, accordingly different knowledge requirements are applicable.

After the training needs have been identified, it is the responsibility of the SHE Office to ensure that personnel attend the relevant identified training.

Training will also address the specific measures and actions as listed in the EMPR. This Environmental Awareness Plan (EAP) is intended to supplement the Safety, Health and Environmental (SHE) training and awareness requirements. Issues such as topsoil handling, site clearance, fire principals and waste handling will be discussed with the manager to ensure that he understands the goals as set out in the EMPR. An induction meeting will also be held with all the site workers to inform them of the basic steps towards environmental awareness with regard to the environment.

Table 47: Environmental Awareness Plan

OCCUPATION CATEGORY	ENVIRONMENTAL MANAGEMENT RESPONSIBILITY / ROLE	REQUIRED KNOWLEDGE AND INPUT	TRAINING REQUIRED	INTERVAL
Senior Management including Process Managers and Head of Department	Managing the Social & Environmental Assessment & Management System (SEAMS), and the Safety, Health & Environmental (SHE) Management System	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	Once off
		Knowledge of the significant impacts as described in the EIA/EMP during the various phases		
		Knowledge of the commitments made in the EMP relevant to the various phases		
		Setting and reviewing the mine's Environmental objectives		
		Directing the SEAMS and SHE management system, and monitoring their progress		
		Accessing the legal register and searching for details	Training on the legal register	

OCCUPATION CATEGORY	ENVIRONMENTAL MANAGEMENT RESPONSIBILITY / ROLE	REQUIRED KNOWLEDGE AND INPUT	TRAINING REQUIRED	INTERVAL
Environmental Management Representative, SHE Officer & Internal Auditor	Managing the SEAMS and the SHE Management System Monitoring and auditing	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	
		Knowledge of the significant impacts as described in the EIA/EMP during the various phases		
		Knowledge of the commitments made in the EMP relevant to the various phases		
		Directing the SEAMS and SHE management system, and monitoring their progress		
		Current knowledge of South African regulatory requirements, best practice guidelines and applicable legislation	Training on the legal register	On going
		Emergency preparedness and response		
		Knowledge in spill management, stockpile management, discard management, water management and waste management	Meetings and Talk Topics	Continuous
		Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting		
		Knowledge of the SABS standards and other relevant legislation regarding the correct storage of chemicals	Training on the SABS standards and other legislation	Annual
		Knowledge of auditing techniques and report writing	Auditor training	Annual
Section Managers & Section Engineers	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	Once off
		Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases		
		Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.	Meetings and talk topics	Continuous
		Knowledge in stockpile management, discard management, water management and waste management		
		Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting		
		Knowledge in the correct storage of chemicals		
Engine		Understanding the purpose of the SEAMS and SHE Management System		

OCCUPATION CATEGORY	ENVIRONMENTAL MANAGEMENT RESPONSIBILITY / ROLE	REQUIRED KNOWLEDGE AND INPUT	TRAINING REQUIRED	INTERVAL
	Implementation and daily management of the SEAMS and the SHE Management System	Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases	General in-house, management training	Once off
		Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.		
		Knowledge in spill management and waste management	Meetings and talk topics	Continuous
		Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting		
		Knowledge in the correct storage of chemicals		
Mine Captain & General Engineering Supervisors	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.	General in-house, management training	Once off
		Knowledge in spill management and waste management Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting Knowledge in the correct storage and handling of chemicals Understanding the requirements for not polluting the environment	Meetings and talk topics	Continuous
Supervisors, Shift Boss & Forman	General Environmental Awareness and job specific impacts	Understanding the purpose of the SEAMS and SHE Management System Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting Knowledge in spill management and waste management Understanding the requirements for not polluting the environment	General in-house, management training	Once off

OCCUPATION CATEGORY	ENVIRONMENTAL MANAGEMENT RESPONSIBILITY / ROLE	REQUIRED KNOWLEDGE AND INPUT	TRAINING REQUIRED	INTERVAL
Operators, tradespersons & Floor Employees	General Environmental Awareness and job specific impacts	General Awareness of aim and purpose of the SEAMS and SHE Management System Understanding the SEAMS Management Plan relevant to their operations Understanding the requirements for not polluting the environment General understanding of the relevant Operational procedures, Emergency Response Plans and Incident reporting	Environmental Awareness Training	Annual
General Administration Staff	General Environmental Awareness and job specific impacts	General Awareness of aim and purpose of the SEAMS and SHE Management System Understanding the SEAMS Management Plan relevant to their operations Understanding the requirements for not polluting the environment General understanding of the relevant Operational procedures, Emergency Response Plans and Incident reporting	Environmental Awareness Training	Annual
Security	General Environmental Awareness and job specific impacts	General Awareness of aim and purpose of the SEAMS and SHE Management System Understanding the requirements for not polluting the environment General understanding of the relevant Operational procedures, Emergency Response Plans and Incident reporting	Environmental Awareness Training	Annual
Senior Management including Process Managers and Head of Department	Managing the Social & Environmental Assessment & Management System (SEAMS), and the Safety, Health & Environmental (SHE) Management System	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	Once off
		Knowledge of the significant impacts as described in the BAR/EMP during the various phases		
		Knowledge of the commitments made in the EMP relevant to the various phases		
		Setting and reviewing the mine's Environmental objectives		
		Directing the SEAMS and SHE management system, and monitoring their progress		
		Accessing the legal register and searching for details	Training on the legal register	Once off
		Emergency preparedness and response		
Environmental Management	Managing the SEAMS and the SHE Management System Monitoring and auditing	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	Once off
		Knowledge of the significant impacts as described in the EIA/EMP during the various phases		

OCCUPATION CATEGORY	ENVIRONMENTAL MANAGEMENT RESPONSIBILITY / ROLE	REQUIRED KNOWLEDGE AND INPUT	TRAINING REQUIRED	INTERVAL
		Knowledge of the commitments made in the EMP relevant to the various phases		
		Directing the SEAMS and SHE management system, and monitoring their progress		
		Current knowledge of South African regulatory requirements, best practice guidelines and applicable legislation	Training on the legal register	On going
		Emergency preparedness and response		
		Knowledge in spill management, stockpile management, discard management, water management and waste management	Meetings and Talk Topics	Continuous
		Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting		
		Knowledge of the SABS standards and other relevant legislation regarding the correct storage of chemicals	Training on the SABS standards and other legislation	Annual
		Knowledge of auditing techniques and report writing	Auditor training	Annual
Section Managers & Section Engineers	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	Once off
		Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases		
		Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.	Meetings and talk topics	Continuous
		Knowledge in stockpile management, discard management, water management and waste management		
		Knowledge of the relevant Operational procedures, Emergency Response Plans and Incident reporting		
		Knowledge in the correct storage of chemicals		
Engineering HOD & General Engineering Supervisor	Implementation and daily management of the SEAMS and the SHE Management System	Understanding the purpose of the SEAMS and SHE Management System	General in-house, management training	Once off
		Knowledge of the relevant department's significant impacts as described in the EIA/EMP during the construction and operational phases		
		Actively implementing actions to achieve SEAMS Management Plans and Environmental Objectives.		

<table>
<tr><th>OCCUPATION CATEGORY</th><th>ENVIRONMENTAL MANAGEMENT RESPONSIBILITY / ROLE</th><th>REQUIRED KNOWLEDGE AND INPUT</th><th>TRAINING REQUIRED</th><th>INTERVAL</th></tr>
<tr><td rowspan="3"></td><td rowspan="3"></td><td>Knowledge in spill management and waste management</td><td rowspan="3">Meetings and talk topics</td><td rowspan="3">Continuous</td></tr>
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Understanding the SEAMS Management Plan relevant to their operations
Understanding the requirements for not polluting the environment</td><td rowspan="3">Environmental Awareness Training</td><td rowspan="3">Annual</td></tr>
<tr><td>General Administration Staff</td></tr>
<tr><td>Security</td></tr>
</table>

Specialized Skills

The Training Department in conjunction with the SHE Officer are responsible for ensuring job specific training for personnel performing tasks, which can cause significant environmental and social impacts (e.g. receipt of bulk hazardous chemicals/fuel, hazardous materials handling, responding to emergency situations etc.). The Mining permit Manager with the assistance of the SHE Officer must identify relevant personnel and training courses.

On the job training is an essential tool in environmental awareness. Employees must be given details of the expected environmental issues and concerns specifically related to their occupation. Employees must be trained on how to respond if an environmental problem or source of environmental pollution arises. The training will be on-going, and all new employees will be provided with the same standard of training as existing employees.

Review of Training Material

Effectiveness of the environmental management training will be done by the management through task observations and during internal and external audits.

All training material for presentation to personnel and contractors will be reviewed annually to ensure consistency with organizational requirements and best practice guidelines. In addition to this, annual monitoring reports, audit results and all incident reports will be reviewed, any short comings and non-compliancy will be highlighted and management measures incorporated or improved upon within the training material.

Records

Records from the implementation of this EAP will be kept and controlled in accordance with the SHE Management System Control of Records Procedure, which is required to be implemented so as to provide evidence of conformity and effective operation of the relevant requirements of the SHE management system.

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

The operations manager must ensure that he/she understands the EMPR document and its requirement and commitments before any mining takes place. An Environmental Control Officer needs to check compliance of the mining activity to the management programmes described in the EMPR.

EMERGENCY RESPONSE PLAN AND PROCEDURES

As part of its management tools, a mine must have an Emergency Response Plan. These plans will be disseminated to all employees and contractors in the event of an emergency. In the case of a medical accident or problem, the mine has first aid kits available at various points and an emergency room. A First Aid officer will be on duty at all times. In the event of an emergency the checklist of emergency response units must be consulted and the relevant units notified.

Communication is vital in an emergency and thus communication devices, such as mobile phones, two-way radios, pagers or telephones, must be placed around the mine. Should the emergency have the potential to affect the surrounding communities, they will be alerted via alarm signals or contacted in person.

Emergency services will be sourced from the nearest main town, Pofadder wherever possible. Contact details for the emergency services and local authorities are listed below; these will be displayed on site and made available to all employees and contractors.

Police Station (Aggeneys):	054 983 2437
Police Department (Pofadder):	054 933 1100
Ambulance:	082 749 7412
Fire Department:	054 332 4254
Hospital:	053 712 8100
Department of Water and Sanitation:	056 811 5834
Department of Mineral Resources:	053 807 1700
Department of Environment and Nature Conservation:	053 807 7300
Department of Roads and Public Works:	053 839 2100
Department of Economic Development and Tourism:	053839 4000
Department of Agriculture, land reform and rural development:	053 838 9100

The following list represents the basic steps towards environmental awareness, which all participants in this project must consider whilst carrying out their tasks.

Site Management

- Stay within boundaries of site – do not enter adjacent properties;
- Keep tools and material properly stored;
- Smoke only in designated areas; and
- Use toilets provided – report full or leaking toilets.

Water Management and Erosion

- Check that rainwater flows around work areas and are not contaminated;
- Report any erosion;
- Check that dirty water is kept from clean water;
- Do not drink from streams;
- After a heavy rainstorm or at least every 3 months, all water pollution control structures like storm water berms and trenches will be checked for signs of damage or change in its capacity;
- Any damage to any water pollution structures will be repaired immediately; and
- Any of the above actions will be included in the performance assessment report to the Department of Mineral Resources (DMR).
- Maintenance activities shall not lead to undue damage, blockages or disruption of the drainage lines or storm water channels on site or concentrate storm water sheet flow into erosive channels.
- Sediment to be removed on a need basis from all drainage channels, culverts and pipes under roads to prevent blocked pipes and erosion damage to road sides due to disrupted flow.
- Significant erosion in the drainage lines or storm water channels or swales shall be addressed by implementing water slowing measures e.g. temporary straw bales or sand bags or permanent gabion weirs and stabilised overflows and crossings to prevent recurrence.
- All erosion channels anywhere on site shall be repaired immediately through backfilling with appropriate material and stabilising to prevent recurrence.
- Where vegetation has been washed away or damaged as a result of the erosion this shall be reinstated once the area has been stabilised.
- Stabilisation measures e.g. grass blocks shall be maintained in good repair.
- No materials or wastes shall be dumped into storm water channels, in the drainage lines or their buffer zones. Any litter or foreign material blown or washed into these areas inadvertently is to be removed regularly (minimum monthly) without undue disturbance to the vegetation and stability of the area.

- Fuel or oil or other chemical spills anywhere on site must be treated immediately with an appropriate mop-up or bio-remedial product as directed by manufacturers to prevent contamination of runoff.

Flooding

There is potential for flooding during the rainy season. This could result in a large volume of water flowing downstream or accumulating in a water containment facility and could cause major damage to equipment and endanger the lives of employees on site. Procedures must be put in place to ensure that there is a quick response to flood events and damage is kept to a minimum.

The procedure for flooding is as follows:

- DWS's flood warning system will be reviewed annually;
- Mine management will be made aware of any such event so they can take appropriate action to ensure production losses are kept to a minimum;
- All contaminated water will be contained on site, as far as possible and discharges to the environment will only occur if absolutely necessary in an extreme flood event.
- Check that rainwater flows around work areas and are not contaminated;
- Report any erosion;
- Check that dirty water is kept from clean water; and
- Do not swim in or drink from streams or the quarry.

Waste Management

- Take care of your own waste;
- Keep waste separate into labelled containers – report full bins;
- Place waste in containers and always close lid;
- Don't burn waste; and
- Pick-up any litter laying around.

Hazardous Waste Management (Petrol, Oil, Diesel, Grease)

Hydrocarbons such as diesel, petrol, and oil which are used as fuel for mine machinery which is kept on site, increases the possibility that spillage may occur. As this is a product mine there is also the possibility of a product spillage occurring. In the event of a spillage, procedures must be put into place to ensure that there are minimal impacts to the surrounding environment.

Diesel, engine oil and hydraulic oil are the most likely hydrocarbons identified during impact assessments that can result in an emergency situation.

The following procedure applies to a hydrocarbon spill:

- If any spills take place the contaminant together with the soil will be removed and placed in acceptable container to be removed with industrial waste to a recognised licence facility or licenced company.
- Bioremediation will be done on site to the satisfaction of DEA
- A spill clean-up kit is available at the storage yard
- All personnel will be trained n spill clean-up methodologies.
- Every precaution will be taken to prevent the spill from entering the surface water environment;
- 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 made available and if required, a specialised clean-up crew will be called in to decontaminate the area. The soil will be removed and treated at a special soil rehabilitation facility;
- If the spill is larger than 100 litres the Department of Environmental Affairs and Tourism (DEAT) will be notified by fax and or phone within 24-hour of the event.
- Reasonable measures must be taken to stop the spread of hydrocarbons and secure the area to limit access;
- Dispatch necessary services;
- The incident must be reported to the Environmental coordinator immediately;
- The Environmental Coordinator will assess the situation from the information provided, and set up an investigation team or relevant personnel. Included in this team could be the Mine Manager, Chief Safety Officer, the employee who reported the incident and any individual responsible for the incident;
- When investigating the incident, priority must be given to safety;
- Once the situation has been assessed, the Environmental Coordinator must report back to the Mine Manager;
- The Mine Manager and the investigation team must make a decision on what measures can be taken to limit the damage caused by the incident, and if possible any remediation measures that can be taken;
- The source / reason of the spill or leak will be addressed immediately;
- Never mix general waste with hazardous waste;
- Use only sealed, non-leaking containers;
- Keep all containers closed and store only in approved areas;
- Always put drip trays under vehicles and machinery;
- Empty drip trays after rain;
- Stop leaks and spills, if safe;
- Keep spilled liquids moving away;
- Immediately report the spill to the site manager/supervision;
- Locate spill kit/supplies and use to clean-up, if safe;

- Place spill clean-up wastes in proper containers; and
- Label containers and move to approved storage area.

Breakdown of vehicles or equipment outside vehicle maintenance yard:

If any equipment of vehicles breaks down inside the pit or outside the storage yard the following emergency procedure will be followed:

- Drip pans will be placed at all point s where diesel, oil or any hydraulic fluid can rip and contaminate the oil;
- All efforts will be made to remove the vehicle or equipment to the storage area;
- If the vehicle or equipment cannot be removed the broken part will be drained of all fluid and the specific part remove to the service area;
- No repairs will be allowed to take place outside the maintenance yard or service area; and
- Any spills will be managed as described in the hydrocarbon section above.

Explosions

Explosions can occur in the plant and workshop areas when working with gas cylinders and chemicals. These could result in large numbers of employees being injured and requiring medical assistance.

The procedure to be followed is:

- Alternative evacuation routes will be devised, should a rock fall occur as a result of the explosion; and
- All relevant emergency response units must be notified and hospitals informed of incoming patients.

Discoveries:

- Stop work immediately;
- Notify site manager/supervisor; and
- Includes – Archaeological finds, Cultural artefacts, contaminated water, Pipes, Containers, Tanks and drums, any buried structures.

Air Quality:

- Wear protection when working in very dusty areas;
- Implement dust control measures:
- Sweep paved roads;
- Water all roads and work areas;
- Minimize handling of material; and
- Obey speed limit and cover trucks.

Driving and Noise

- Use only approved access roads;
- Respect speed limits;
- Only use turn-around areas – no crisscrossing through undisturbed areas;
- Avoid unnecessary loud noises; and
- Report or repair noisy vehicles.

Flora and Fauna

- Do not remove any plants or trees without approval of the site manager;
- Do not collect fire wood;
- Do not catch, kill, harm, sell or play with any animal, reptile, bird or amphibian on site;
- Report any animal trapped in the work area; and
- Do not set snares or raid nests for eggs or young.

Fire Management

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

The following procedures apply to fires:

- In the event of a fire an alarm will be activated to alert all employees and contractors;
- Identify the type of fire and the appropriate extinguishing material. For example, water for a grass fire, and mono ammonium phosphate based fire extinguisher for chemical and electrical fires;
- In the event of a small fire the fire extinguishers placed around the mine will be used to contain and extinguish the fire;
- In the event of a large fire, the fire department will be notified and must react timeously;
- All staff will receive training in response to a fire emergency on site;
- A Fire Protection Association will be set up with the mine and surrounding land owners to facilitate communication during fire events and assist in fighting fires, where necessary;
- Fire breaks has been established and will be maintained around the mining area for the duration of the project;
- If possible all surrounding drains, such as storm water drains need to be covered and or protected to prevent any contaminated water from entering the drains
- In case of a chemical or petroleum fire, run-off from the area will be contained as far as possible using the most appropriate measures e.g. spill absorbent cushions, sand or a physical barrier;
- Contaminated run-off must be diverted into an oil sump, or cleaned up;

- All firefighting equipment will be inspected at least monthly to ensure that these are functioning;
- Do not light any fires on site, unless contained in a drum at demarcated area;
- Put cigarette butts in a rubbish bin;
- Do not smoke near gas, paints or petrol;
- Know the position of firefighting equipment;
- Report all fires; and
- Don't burn waste or vegetation.

In addition to the induction meeting to be held with the site employees to inform them of the basic steps towards environmental awareness, the operators of earth moving equipment should be informed of the following requirements:

- Mine within demarcated areas;
- No-go areas;
- Establishment of access roads;
- Handling of hazardous waste and their storage facilities;
- Handling of biodegradable and non-degradable waste;
- Vehicle maintenance;
- Mining methods to be followed;
- Handling and storing of topsoil;
- Capping of drill holes;
- Speed control in order to reduce dust;
- Emergency procedure awareness;
- Labourers must be informed of the following during "toolbox talks":
- Reporting of unusual observations to management (e.g. fossils, graves, etc.);
- Reporting of spills to management;
- Felling or damaging trees for firewood not allowed;
- Making fires not allowed;
- Hunting and killing of animals not allowed;
- Demarcated areas for mining;
- Establishing of access roads and erection of gates in fence lines;
- Toilet facilities and hygiene measures;
- Handling of waste;
- Vehicle maintenance and vehicle maintenance yard;
- Handling of topsoil; and
- Emergency procedures awareness.

Flora and Fauna including alien invasive species

- Do not remove any plants or trees without approval of the site manager;
- Do not collect fire wood;

- Do not catch, kill, harm, sell or play with any animal, reptile, bird or amphibian on site;
- Report any animal trapped in the work area; and
- Do not set snares or raid nests for eggs or young.

<u>Maintenance and Infrastructure Management</u>

- Infrastructure visibly in good repair and operational areas kept tidy.
- The footprint of the operations and vehicular circulation is clearly defined with no "spill over" into other areas of the site.
- Roads are stable and in good repair and
- Fences and gates are in good repair.

g) Specific information required by the Competent Authority

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

The applicant undertakes to annually review and update the financial provision calculation, upon which it will be submitted to DMR for review and approved as being sufficient to cover the environmental liability at the time and for closure of the mine at that time.

Effectiveness of the environmental management training will be done by the management through task observations and during internal and external audits. All training material for presentation to personnel and contractors will be reviewed annually to ensure consistency with organizational requirements and best practice guidelines. In addition to this, annual monitoring reports, audit results and all incident reports will be reviewed, any short comings and non-compliancy will be highlighted and management measures incorporated or improved upon within the training material.

2) Undertaking

The EAP herewith confirms

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

b) the inclusion of comments and inputs from stakeholders and I&AP's X

c) the inclusion of inputs and recommendations from the specialist reports where relevant, and X

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

Signature of the Environmental Assessment Practitioner:

Greenmined Environmental

Name of Company:

10 January 2020

Date:

-END-

APPENDIX A

REGULATION 2(2) MINE PLAN

APPENDIX B

LOCALITY MAP

APPENDIX C

SITE ACTIVITIES PLAN

APPENDIX D

ROADS AND ADJACENT PROPERTIES MAP

APPENDIX E

LAND USE PLAN

APPENDIX F

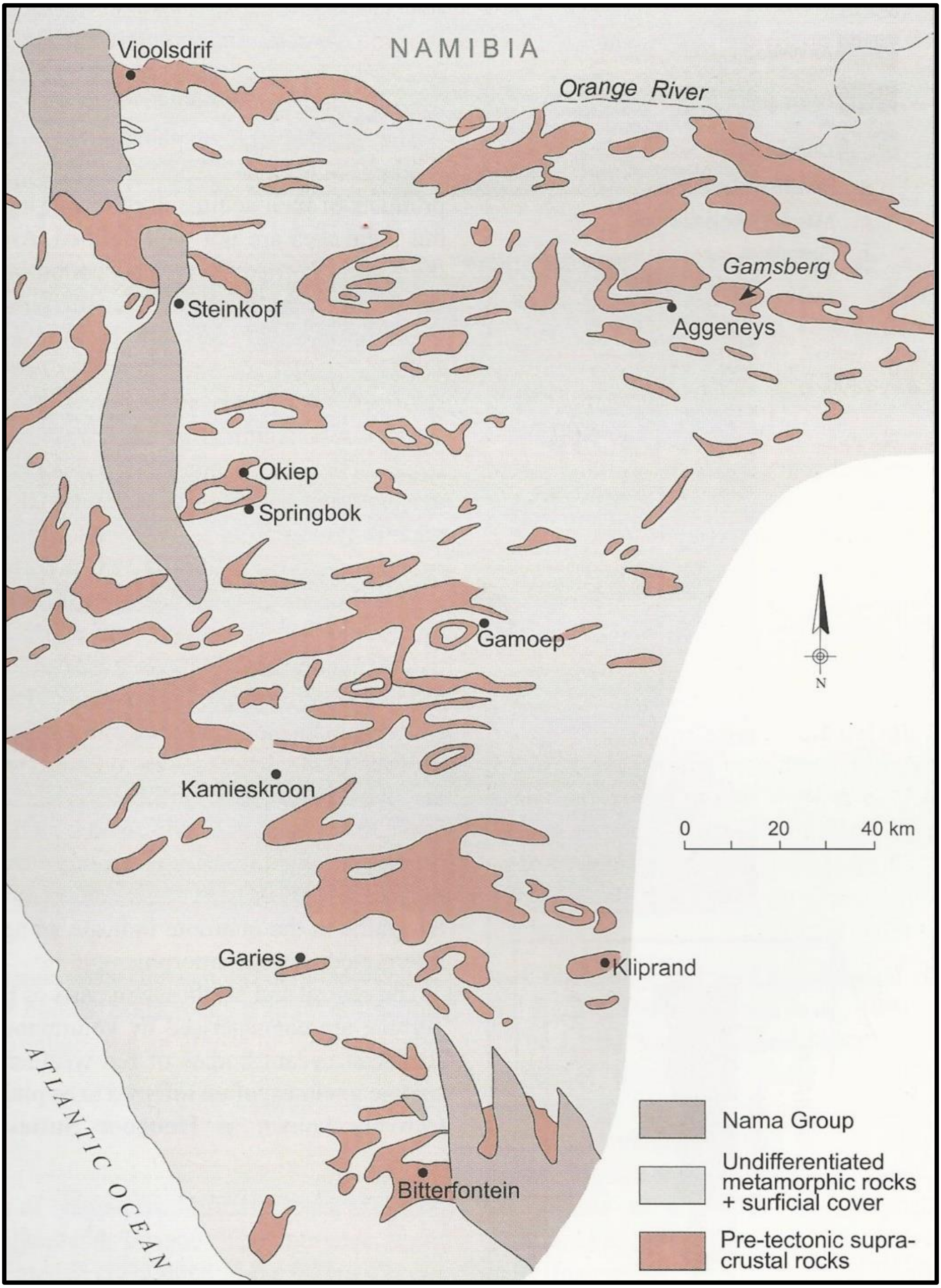
SITE ALTERNATIVES MAP

APPENDIX G

REHABILITATION MAP

APPENDIX H

GEOLOGY PLAN


NAMIBIA
Orange River
Vioolsdrif
Steinkopf
Gamsberg
Aggeneys
Okiep
Springbok
Gamoep
Kamieskroon
Garies
Kliprand
Bitterfontein
ATLANTIC OCEAN
N
0
20
40 km
Nama Group
Undifferentiated metamorphic rocks + surficial cover
Pre-tectonic supra-crustal rocks

APPENDIX I

PROOF OF PUBLIC PARTICIPATION

APPENDIX J

SUPPORTING IMPACT ASSESSMENT

SUPPORTING IMPACT ASSESSMENT

A “significant impact” is defined as it is defined in the EIA Regulations (2014): “an impact that may have a notable effect on one or more aspects of the environment or may result non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as by its duration, magnitude, intensity or probability of occurrence”. The objective of this EIA methodology is to serve as framework for accurately evaluating impacts associated with current or proposed activities in the biophysical, social and socio-economical spheres. It aims to ensure that all legal requirements and environmental considerations are met in order to have a complete and integrated environmental framework for impact evaluations.

1. IMPACT ASSESSMENT METHODOLOGY

The process of determining impacts to be assessed is one of the most important parts of the environmental impact assessment process. It is of such high importance because the environmental impacts identified can and are often linked to the same impact stream.

In this method all impacts on the biophysical environment are assessed in terms of the overall integrity of ecosystems, habitats, populations and individuals affected. The Environmental Impact Assessment (EIA) 2014 Regulations promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) [as amended] requires that all identified potential impacts associated with the proposed project be assessed in terms of their overall potential significance on the natural, social and economic environments.

The criteria identified in the EIA Regulations (2014) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact;
- Frequency of the Impact;
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

Greenmined Environmental has developed an impact assessment methodology (as defined below) whereby the significance of a potential impact is determined through the assessment of the relevant temporal and spatial scales determined of the extent, magnitude and duration criteria associated with a particular impact.

This method does not explicitly define each of the criteria but rather combines them and results in an indication of the overall significance.

DEFINITIONS AND CONCEPTS:

Environmental significance:

The concept of significance is at the core of impact identification, evaluation and decision-making. The concept remains largely undefined and there is no international consensus on a single definition. The following common elements are recognised from the various interpretations:

- Environmental significance is a value judgement;
- The degree of environmental significance depends on the nature of the impact;
- The importance is rated in terms of both biophysical and socio-economic values; and
- Determining significance involves the amount of change to the environment perceived to be acceptable to affected communities.

Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of acceptability) (DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5).

The concept of risk has two dimensions, namely the consequence of an event or set of circumstances, and the likelihood of particular consequences being realised (Environment Australia (1999) Environmental Risk Management).

1.1. Nature of the impact

The nature of an impact can be defined as “a brief description of the impact being assessed, in terms of the proposed activity or project, including the socio-economic or environmental aspect affected by this impact”.

1.2. Extent of the impact

The extent of an impact can be defined as “a brief description of the spatial influence of the impact or the area that will be affected by the impact”.

Table 48: Determining the extent of an impact

EXTENT Extent or spatial influence of impact	**Footprint**	Only as far as the activity, such as footprint occurring within the total site area
	Site	Only the site and/or 500m radius from the site will be affected
	Local	Local area / district (neighbouring properties, transport routes and adjacent towns) is affected
	Region	Entire region / province is affected
	National	Country is affected

1.3. Severity of the impact

Severity relates to the nature of the event, aspect or impact to the environment and describes how severe the aspects impact on the biophysical and socio-economic environment.

Table 49: Rating of Severity

Type of criteria	**Rating**				
	1	**2**	**3**	**4**	**5**
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small / Potentially harmful	Significant/ Harmful	Great/ Very harmful	Disastrous Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance/ Easily reversible	Low cost to mitigate	Substantial cost to mitigate/ Potential to mitigate impacts/ Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate/ Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

1.4. Duration of the impact

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Table 50: Rating of Duration

Rating		**Description**
1	Very Short Term	Up to three months (quarter) after construction
2	Short Term	Three months to one year after construction
3	Medium Term	One year to six years after construction
4	Long Term	Six to ten years after construction
5	Permanent	Beyond ten years after construction

1.5. Probability of the impact occurring

The probability of an impact can be defined as “the estimated chance of the impact happening”. Probability refers to how often the activity or aspect has an impact on the environment.

Table 51: Determining the probability of an impact

PROBABILITY	**1**	Almost never / almost impossible	*Impossible* to occur (0 – 20% probability of occurring)
	2	Very seldom / highly unlikely	*Unlikely* to occur (20 -40% probability of occurring)
	3	Infrequent / unlikely / seldom	*May* occur (40-60% chance of occurring)
	4	Often / regularly / likely / possible	*Likely* to occur (60-80% chance of occurring)
	5	Daily / highly likely / definitely	Will *certainly* occur (80-100% chance of occurring)

1.6. Degree to which impact can be reversed

The reversibility of an impact can be defined as "the ability of an impact to be changed from a state of affecting aspects to a state of not affecting aspects".

Table 52: Determining the reversibility of an impact

REVERSIBILITY	**Reversible**	Impacts can be reversed through the implementation of mitigation measures
	Irreversible	Impacts are permanent and can't be reversed by the implementation of mitigation measures

1.7. Determination of Likelihood:

The irreplaceability (likelihood) of an impact can be defined as "the amount of resources that can/can't be replaced". The determination of likelihood is a combination of Frequency and Probability. Each factor is assigned a rating of 1 to 5, as described below and in tables 6 and 7.

1.8. Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarised below, and then dividing the sum by 2.

Example of calculating Overall Likelihood

Consequence	**Rating**
Duration	Example 4
Probability	Example 2
SUBTOTAL	**6**
TOTAL LIKELIHOOD **(**Subtotal divided by 2)	**3**

1.9. Determination of Likelihood:

The irreplaceability (likelihood) of an impact can be defined as "the amount of resources that can/can't be replaced". The determination of likelihood is a combination of Frequency and Probability. Each factor is assigned a rating of 1 to 5, as described below and in tables 6 and 7.

1.10. Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarised below, and then dividing the sum by 2.

Example of calculating Overall Likelihood

Consequence	Rating
Duration	Example 4
Probability	Example 2
SUBTOTAL	**6**
TOTAL LIKELIHOOD (Subtotal divided by 2)	**3**

Determination of Frequency

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

Rating of Frequency:

Rating	Description
1	Once a year or once/more during operation
2	Once/more in 6 Months
3	Once/more a Month
4	Once/more a Week
5	Daily

1.11. Determination of Overall Environmental Significance:

The environmental significance assessment methodology is based on the following determination:

Environmental Significance = Overall Consequence X Overall Likelihood

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of **LOW**, **LOW-MEDIUM**, **MEDIUM**, **MEDIUM-HIGH** or **HIGH**, as shown in the table below.

Significance or Risk	Low	Low-Medium	Medium	Medium-High	High
Overall Consequence X Overall Likelihood	1 - 4.9	5 - 9.9	10 - 14.9	15 – 19.9	20 - 25

Based on the above, the significance rating scale has been determined as follows:

High — Of the highest order possible within the bounds of impacts which could occur. In the case of negative impacts, there would be no possible mitigation and / or remedial activity to offset the impact at the spatial or time scale for which it was predicted. In the case of positive impacts, there is no real alternative to achieving the benefit.

Medium-High — Impacts of a substantial order. In the case of negative impacts, mitigation and / or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these. In the case of positive impacts, other means of achieving this benefit would be feasible, but these would be more difficult, expensive, time-consuming or some combination of these.

Medium	Impact would be real but not substantial within the bounds of those, which could occur. In the case of negative impacts, mitigation and / or remedial activity would be both feasible and fairly easily possible, in case of positive impacts; other means of achieving these benefits would be about equal in time, cost and effort.
Low-Medium	Impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and / or remedial activity would be either easily achieved of little would be required, or both. In case of positive impacts alternative means for achieving this benefit would likely be easier, cheaper, more effective, less time-consuming, or some combination of these.
Low	Impact would be negligible. In the case of negative impacts, almost no mitigation and or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap and simple. In the case of positive impacts, alternative means would almost all likely be better, in one or a number of ways, than this means of achieving the benefit
Insignificant	There would be a no impact at all – not even a very low impact on the system or any of its parts.

1.12. Determination of Overall Consequence

Consequence analysis is a mixture of quantitative and qualitative information and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: ***Severity/Intensity, Duration and Extent/Spatial Scale***. Each factor is assigned a rating of 1 to 5, as described in the tables above.

1.13. Degree to which the impact can be mitigated

The degree to which an impact can be mitigated can be defined as "the effect of mitigation measures on the impact and its degree of effectiveness".

Table 53: Determining the mitigation rating of an impact

MITIGATION RATING	**MITIGATED Degree impact can be mitigated**	High	*Impact 100% mitigated*
		Medium	*Impact >50% mitigated*
		Low	*Impact <50% mitigated*

1.14. Cumulative Impacts

The effect of cumulative impacts can be described as "the effect the combination of past, present and "reasonably foreseeable" future actions have on aspects".

Table 54: Determining the confidence rating of an impact

CUMULATIVE RATING	**CUMULATIVE EFFECTS**	Low	*Minor* cumulative effects
		Medium	*Moderate* cumulative effects
		High	*Significant* cumulative effects

2. The positive and negative impacts that the proposed activity will have on the environment and the community that may be affected.

Layout Alternative 1 (A1) (Non-Preferred Alternative):

Layout Alternative 1 was considered by the applicant and project team during the assessment phase of the environmental impact assessment, but were **not deemed** to be **the preferred option** due to the following:

- Although the proposed footprint offers the mineral sought after (positive impact), the geologist identified an additional area, to the south-west, that should be included in the application. To add this area to the mining permit footprint without crossing the allowable 5 ha limit of a mining permit (negative impact), an alteration of the site layout was proposed.

Layout Alternative 2 (A2) (Preferred Alternative):

Layout Alternative 2 was identified by the project team as the **preferred option** due to the following:

- The natural vegetation of the earmarked footprint was previously altered by sillimanite mining, and although vegetation did re-establish through succession it is still in a transformed state (positive impact).
- The layout of A2 was defined to include the maximum available mining area with the least possible area of recovering vegetation (positive impact).
- This layout includes the stockpiled sillimanite source to the south-west identified by the geologist, while still allowing the application to apply for a mining permit (within 5 ha limit) (positive impact).
- The remote location of the proposed footprint (>20 km from Aggeneys) highly reduces the potential of the operations impacting the air and noise quality of surrounding residents (positive impact).
- The mining area can be reached by an existing road that connects to a provincial gravel road. No new road infrastructure need to be constructed (positive impact).

Site Alternative 3 (Non-Preferred Alternative):

Site Alternative 3 was **not** deemed a **preferred option** due to the following:

- Although the site was previous mined and is therefore a brown field site (positive impact), accessibility is problematic. The site is situated in a very mountainous area with limited road access. This will necessitate the construction/intensive upgrade of access roads (negative impact).
- The geologist found only low grade sillimanite in this area (negative impact).
- The biodiversity related impacts associated with this alternative were deemed too high without the need or motivation to justify it (negative impact).

No-go Alternative:

The no-go alternative was not deemed to be the preferred alternative as:

- The applicant will not be able to supply in the demand of the cement and refactory industries of the area (negative impact),
- The application, if approved, would allow the applicant to utilize the available Sillimanite as well as provide employment opportunities to local employees. Should the no-go alternative be followed these opportunities will be lost to the applicant, potential employees and clients (negative impact),
- The applicant will not be able to diversify the income of the property (negative impact).

Table 55: Impact Assessment of Van Zyl Sillimanite Wortel Quarry MP

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
CONSTRUCTION / SITE ESTABLISHMENT PHASE																					
ACTIVITY:	**DEMARCATION OF SITE WITH VISIBLE BEACONS.**																				
	No impact could be identified other than the beacons being outside the boundaries of the approved mining area.	Neu																			
ACTIVITY:	**ESTABLISHMENT OF TEMPORARY BUILDINGS AND INFRASTRUCTURE WITHIN BOUNDARIES OF SITE.**																				
	If the infrastructure is established within the boundaries of the approved mining area, no impact could be identified.	Neu																			
Social & Safety	Influx of unsuccessful job seekers which may informally settle in area. Potential danger to surrounding communities	Neg	Reversible	1	1	4	2	3	5	3	6	Low-Med	1	1	4	2	2	5	3	6	Low-Med
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med-High	1	2	5	3	5	5	5	13,3	Med-High
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med	1	1	5	2	1	5	3	7	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	1	1	3,67	Low	1	5	5	4	1	1	1	3,67	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: ABLUTION FACILITIES																					
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Soils	Portable Toilets Potential harm through sewage leaks	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
SUB ACTIVITY: ACCESS ROADS																					

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Surface water		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: SITE OFFICES																					
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: VEHICLE SERVICE AREA																					
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: WASH BAY																					

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Surface water		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: WORKSHOP																					
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med	1	4	2	2	2	3	3	5,83	Low-Med
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: SALVAGE YARD																					

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Surface water		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: BUNDED DIESEL AND OIL STORAGE FACILITIES																					
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Surface water		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: WEIGH BRIDGE																					
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
SUB ACTIVITY: PARKING AREA																					
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
SUB ACTIVITY: WASTE AREA																					
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater	leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
ACTIVITY:	**STRIPPING AND STOCKPILING OF TOPSOIL**																				
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med-High	1	2	5	3	5	5	5	13,3	Med-High
Hazardous Waste	Contamination of area with hydrocarbons or hazardous waste materials	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med	1	1	5	2	1	5	3	7	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	5	3	11	Med	1	5	5	4	1	3	2	7,33	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med	2	2	4	3	2	1	2	4	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
OPERATIONAL PHASE																					
ACTIVITY:	**DRILLING AND BLASTING**																				
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Hazardous Waste	Contamination of area with hydrocarbons or hazardous waste materials	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med	1	4	2	2	2	3	3	5,83	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med	1	1	5	2	1	5	3	7	Low-Med
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med-High	1	2	5	3	5	5	5	13,3	Med-High
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	5	3	11	Med	1	5	5	4	1	3	2	7,33	Low-Med
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Social & Safety	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities' Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Neg	Reversible	1	4	4	3	3	3	3	9	Low-Med	1	4	1	2	2	1	2	3	Low
ACTIVITY:	**EXCAVATION**																				
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med	1	4	2	2	2	3	3	5,83	Low-Med
Geology	Disturbance of geological strata	Neg	Irreversible	1	3	5	3	5	5	5	15	Med-High	1	2	5	3	5	5	5	13,3	Med-High
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med	1	1	5	2	1	5	3	7	Low-Med
Hazardous Waste	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Archaeological & cultural sites	Loss of and disturbance to surface archaeological sites	Neg	Irreversible	1	5	5	4	1	5	3	11	Med	1	5	5	4	1	3	2	7,33	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	Emissions caused by vehicles and equipment	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med	2	2	4	3	2	1	2	4	Low
Social & Safety	Health and Safety Risk by Blasting Activities. Potential danger to surrounding communities' Unsafe working environment for the employees. Safety risk posed by unsloped areas.	Neg	Reversible	1	4	4	3	3	3	3	9	Low-Med	1	4	1	2	2	1	2	3	Low
Surface water		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
ACTIVITY:	**CRUSHING AND SCREENING OF SILLIMANITE S**																				
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	2	2	1	2	2	3	3	4,17	Low
Fauna	Alienation of animals from the area. Potential risk to avifauna. Potential harm through littering. Loss of food, nest sites and refugia Hindrance to nocturnal animals and change in behaviour of nocturnal prey and predators. New habitat available to fauna in the area and reduced activity should result in influx of animals to the area. Impact to nocturnal insects and their predators and other nocturnal animals.	Neg	Reversible	2	2	4	3	3	5	4	10,7	Med	2	2	4	3	2	1	2	4	Low
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
ACTIVITY:	**TRANSPORTATION OF SILLIMANITE S FROM STOCKPILE AREA TO CLIENTS**																				
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Visual aspect	Deterioration in visual aesthetics of the area	Neg	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Dust generation	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	Dust nuisance caused by the disturbance of soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Traffic and Safety	Road degradation. Increased potential for road incidences Potential distraction to road users	Neg	Reversible	2	2	4	3	3	2	3	6,67	Low-Med	2	1	4	2	2	2	2	4,67	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
DECOMMISSIONING PHASE																					
ACTIVITY:	**SLOPING, LANDSCAPING AND REPLACEMENT OF TOPSOIL OVER DISTURBED AREA (FINAL REHABILITATION)**																				
Soils	Potential compaction of soils in neighbouring areas. Potential contamination through littering. Potential for loss of soil & damage to soil characteristics. Initial increased potential for loss of soils and soil erosion. Potential hydrocarbon contamination to soils.	Neg	Reversible	1	3	5	3	4	2	3	9	Low-Med	1	3	5	3	2	1	2	4,5	Low
Soils	Soils replaced and ameliorated	Pos	Reversible	1	3	4	3	3	5	4	10,7	Med	1	3	4	3	2	3	3	6,67	Low-Med
Flora	Loss of biodiversity. Potential damage to vegetation in neighbouring areas. Alien invasive encroachment Potential loss of protected or red data plant species.	Neg	Reversible	1	2	4	2	3	5	4	9,33	Low-Med	1	4	2	2	2	3	3	5,83	Low-Med
Topography	Alteration of topography	Neg	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med	1	1	5	2	1	5	3	7	Low-Med

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Topography	Eradication of trenches and berms. Re-contouring of area for free surface water drainage. Eradication of stockpiles	Pos	Irreversible	1	2	5	3	2	5	4	9,33	Low-Med	1	2	5	3	2	3	3	6,67	Low-Med
Land Use	Veldt fire might seriously impact on surrounding land-use (livestock/irrigation of neighbouring farmers). Degrading of grazing potential for livestock farming	Neg	Reversible	1	2	2	2	3	3	3	5	Low-Med	1	1	2	1	2	3	3	3,33	Low
Visual aspect	Improved aesthetics through rehabilitation	Pos	Reversible	2	1	3	2	2	5	4	7	Low-Med	2	1	3	2	2	3	3	5	Low-Med
Noise	Noise nuisance caused by machinery stripping and stockpiling the topsoil. Noise nuisance generated by earthmoving machinery. Noise nuisance as a result of blasting. Noise nuisance generated by excavation equipment and earthmoving machinery. Noise nuisance generated during the landscaping phase.	Neg	Reversible	1	1	2	1	1	5	3	4	Low	1	1	2	1	1	5	3	4	Low
Air quality	Dust nuisance caused by the disturbance of	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Air quality	soil. Dust nuisance caused by blasting activities. Dust nuisance due to excavation and from loading and vehicles transporting the material. Dust nuisance due to landscaping activities.	Neg	Reversible	2	2	4	3	4	5	5	12	Med	2	2	1	2	2	3	3	4,17	Low
Fauna	Reintroduction of fauna attracted to flora to the area	Pos	Reversible	2	1	3	2	1	5	3	6	Low-Med	2	1	3	2	1	3	2	4	Low
Social & Safety	Health and safety risk posed by un-sloped areas	Neg	Reversible	1	4	4	3	3	3	3	9	Low-Med	1	4	1	2	2	1	2	3	Low

Nature of Impact	Impact	Positive/Negative/ Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating
Surface water	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Surface water	Containment of dirty water. Improve response to issues relating to deterioration of surface water quality or quantity. Free drainage resorted to area. Revegetation of disturbed areas reduces risk of silt loading on downstream water bodies. Large area of surface water runoff return to catchment	Pos	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Hazardous Waste	Potential hydrocarbon contamination leeching into the water table. Reduction of local groundwater. Potential contamination through littering leeching into the groundwater table Potential silt-loading of drainage lines, downstream and surrounding water bodies. Potential hydrocarbon contamination which may reach downstream surface water bodies. Potential surface water contamination if leaks escape into the environment. Potential impact of mining activities on the runoff and infiltration of storm water.	Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Neg	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
Groundwater		Pos	Reversible	2	3	5	3	4	2	3	10	Med	1	3	1	2	2	2	2	3,33	Low
ACTIVITY: Application for Closure Certificate																					

h) Cumulative Impacts

Table 56: Cumulative Impact Assessment of Van Zyl Sillimanite Wortel Quarry

Nature of Impact	Impact	Positive/Negative / Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Mitigation
CONSTRUCTION, OPERATIONAL AND DECOMMISSIONING PHASES													
Traffic & Safety	Increased potential for road incidences	Neg	Reversible	2	3	1	2	3	1	2	4	Low	All intersections with main tarred roads will be clearly signposted. Drivers will be enforced to keep to set speed limits. Trucks will be in road-worthy condition with reflective strips.
Traffic & Safety	Road degradation	Neg	Reversible	1	3	1	1,6	2	1	1,5	2,5	Low	Storm water must be diverted around the access roads to prevent erosion. Erosion of access road: Vehicular movement must be restricted to existing access routes to prevent crisscrossing of tracks through undisturbed areas. Rutting and erosion of the access road caused as a result of the mining activity must be repaired by the applicant.
Noise	The noise impact must be contained within the boundaries of the property, and will represent the current noise levels of the farm.	Neg	Reversible	1	1	2	1,3	1	5	3	4	Low	**Noise Handling:** The applicant must ensure that employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours. No loud music may be permitted at the mining area. All mining vehicles must be equipped with silencers and maintained in a road worthy condition in terms of the Road Transport Act.

Nature of Impact	Impact	Positive/Negative / Neutral Impact	Reversibility	Extent	Severity	Duration	Consequence	Probability	Frequency	Likelihood	Significance	Mitigation Rating	Mitigation
Air quality	Increased dust generation will impact on the air quality of the receiving environment.	Neg	Reversible	2	2	4	2,6	4	5	4,5	12	Med	**Dust Handling:** • The liberation of dust into the surrounding environment must be effectively controlled by the use of, inter alia, water spraying and/or other dust-allaying agents. • The site manager must ensure continuous assessment of all dust suppression equipment to confirm its effectiveness in addressing dust suppression. • Speed on the access roads must be limited to 40km/h to prevent the generation of excess dust. • All roads will be sprayed with water or an environmental friendly dust-allaying agent that contained PCB's (e.g. DAS products/ Pro/base) at regular intervals to ensure that dust is adequately suppressed in the mining roads. • All disturbed or exposed areas will be re-vegetated as soon as possible during the operational phase to prevent any dust source from being created. • A fall out and nuisance dust monitoring programme could be submitted to the principle inspector of mines (DMR-Northern Cape) on an annual basis if required. If any complaint is received form the public or state department regarding dust levels, the fall-out and nuisance dust levels will again be monitored at prescribed monitoring points. The result will then be compiled into monthly reports and forwarded to the Director-Occupational Hygiene. • Fallout dust will be monitored via a fallout dust bucket system on the boundaries of the mining area.
Air quality	Emissions will be contained within the property boundaries and will therefore affect only the landowner.	Neg	Reversible	2	2	2	2	4	2	3	6	Low-Med	**Emission Handling:** • All vehicles will be regularly services to ensure they are in proper working condition and to reduce risk of excessive emissions.

APPENDIX K

PHOTOGRAPHS OF THE SITE

VAN ZYL SILLIMANITE –MINING PERMIT APPLICATION

ADJACENT LANDOWNERS AND I&AP'S	
	
	

ROADS

SITE PHOTOGRAPHS	
	
	
	











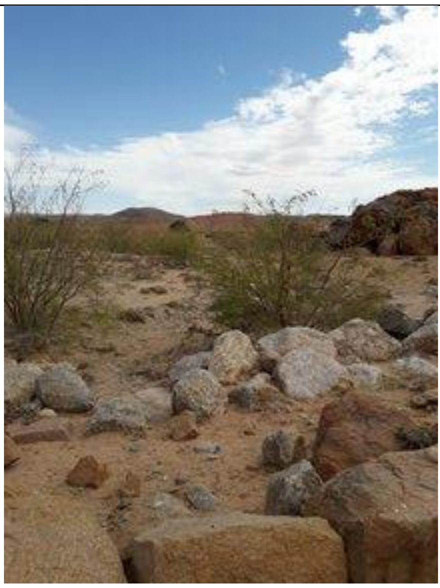




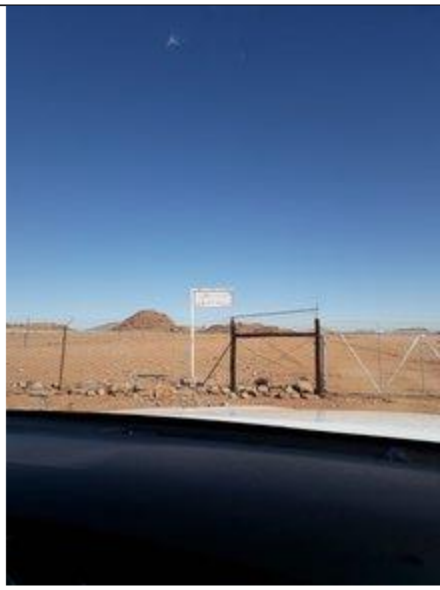































OLD MINING AREA






PLANTS IN THE AREA	
	
	
	






	
	
	
Euphorbia Sp.	*Prosopis glandulosa*

	
	
Prosopis glandulosa	*Oscularia spp.*
	

Boscia albitrunca	
	 *Oscularia spp.*
	 *Euphorbia Sp.*

APPENDIX L

CV AND EXPERTISE OF THE EAP

YOLANDIE COETZEE

OCCUPATION	Environmental Consultant
TOTAL YEARS WORK EXPERIENCE	10
AGE	31

PERSONAL DETAILS

GENDER	Female
NATIONALITY	South African
SOUTH AFRICAN ID NO	8709020094080
LANGUAGE	English, Afrikaans (read, write, speak)
MARITAL STATUS	Married

PROFILE

Yolandie Coetzee is an Environmental Consultant with 10 years' experience in the environmental sector. She specialized the last 5 years in the rehabilitation of mines where she conducted the conceptual rehabilitation and management designs and the closure plans and programs. She has also been involved in a number of other environmental projects including railway sidings, filling stations, abattoir's, logistics hub and mining sites where she compiled environmental management plans, environmental impact assessments, environmental audits, due diligences, IWULA's/IWWMP's and alien invasive encroachment programs. She studied at the University of Potchefstroom where she has successfully completed her undergraduate degree in microbiology and biochemistry and her Honours degree in environmental sciences.

I am an administrative person who is adaptive to change confident in what I do and try to be creative as I can in what I do. I am enthusiastic about environmental issues and try to implement my people skills where I can and motivate those around me about the issues in South Africa. I am results driven, a quick learner and can work as a team with others. My passions are to campaign for causes that I belief in and working with people solving environmental issues.
My interest is creating things, reading about history and spending time with friends and family and travelling.

EDUCATION

2010 North-West University, Potchefstroom **BSc. Honours (Ecological Remediation and Rehabilitation)** *Honours Project: Du Preez Y, Claasens S (2009)*
2005-2008 North-West University, Potchefstroom **BSc. (Environmental Sciences) Majors: Microbiology and Biochemistry**

PROFESSIONAL COURSES / TRAINING

2003	Secretarial Training Course	Waterberg FET college
2008	Soil Classification and Morphology	Agriculture Resource Council (ARC)
2009	Polymerase chain reaction (PCR)	North-West University
2009	Freeze Drying (Genetics)	North-West University
2010	Model Maker Introduction and Advanced Course	Model maker (Centurion)
2012	Road Maker Advanced Course	Model maker (Centurion)
2013	Lead Auditor Course (ISO14001)	WTH
2017	Fallout Dust Monitoring Course	Dustwatch
2017	SAGIC Invasive Species Training	SAGIC
2019	Mine Closure and Recent Case Law Workshop	IMBEWU

PROFESSIONAL AFFILIATIONS

SACNASP	South African Council for Natural Scientific Professions	400324/13
SASM	South African Society for Microbiology	2011

SKILLS & EXPERIENCE

Proficient in Microsoft Office.

Competent with 3D spatial modelling programme, Model maker, Global Mapper.and Google Earth, BGIS and DAFF:AGIS

Experience in Project Management.

Worked in laboratories at North-West University – Potchefstroom

Good working knowledge of NEMA, MRPDA, NWA, CARA, NEMAQA, NEMWA, NEM:BA etc.

AWARDS & ACHIEVEMENTS

- Achieved distinctions at Northwest University for Microbiology

AREAS OF EXPERTISE

- Conceptual rehabilitation and management designs
- Rehabilitation closure plans and programs and associated mine closure costing assessments
- Alien invasive encroachment programs
- Rehabilitation programs
- Waste Management Plans
- Financial closure cost assessments (Financial provisions)
- Mine Closure Applications
- 24G Rectification Applications
- Basic Assessment Applications
- Environmental Impact Assessments Applications
- Environmental Management Plans
- Environmental Auditing
- Mining Permit/Right and Mining permit Applications
- Integrated water use licenses and applications (IWWMP and IWULA)
- Due diligence
- Plant Permit Removal Applications

CAREER HISTORY

1.	**MAY 2017 - CURRENT**
Greenmined Environmental	

ENVIRONMENTAL CONSULTANT
Responsibilities

- Compilation Environmental Impact Assessments and Environmental Management Plans;
- Compilation of Basic Assessments;
- Conduct Water Use Licence Applications (IWULA) and Integrated Waste Water Management Plans (IWWMP);
- Compilation of Waste Management Plans;
- Liaise with client and the suitable government departments; and
- Compilation of Environmental Performance Assessment Programs (EMP PAR)

Major Projects

ENVIRONMENTAL REPORT	PROJECT	CLIENT
Environmental Control Officer (ECO)	• Hendrina Quarry, • Roodekranz Quarry, • Balmoral Quarry, • Middelburg Quarry, • Bloemhof Quarry, • Bambi, • Pomona, and • Witkloof Quarry	B&E International (Pty) Ltd
	Zwartkop	Baitumetse (Pty) Ltd
	Aroams Quarry, Brandvlei Quarry, and Barrage Bulk Sand Mine (Tja Naledi Beafase Investment Holdings).	SPH Kundalila (Pty) Ltd
	Thembisa	Raubex Construction (Pty) Ltd
Environmental Performance Assessment (EPA)	• Bloemhof Quarry • Witkloof Quarry • Balmoral Quarry • Middelburg Quarry • Hendrina Quarry • De Roodepoort Quarry • Roodekrans Quarry	B&E International (Pty) Ltd
	• Aroams Quarry • Kersfontein Sand • Bridgetown Dolomite Quarry • Barrage Bulk Sand Mine	SPH Kundalila (Pty) Ltd
	Stilfontein	OMV
	• Alfa Sand • Crushco Quarry • Donkerhoek Quarry • Rosslyn Quarry • Rossway Quarry • SPH Sand • Willows Quarry • Butterworth Quarry • Mthatha Quarry	Raumix Aggregates (Pty) Ltd
Dust Monitoring	Balmoral Quarry	B&E International (Pty) Ltd
	Zwartkop	Baitumetse (Pty) Ltd
	Stilfontein	OMV
	Potchefstroom	
	Aroams Quarry	SPH Kundalila
	Witkloof Quarry	B&E International (Pty) Ltd

	Bloemhof Quarry	B&E International (Pty) Ltd
BAR & EMPr	Witkloof Mining Permit	B&E International (Pty) Ltd
	Piet Retief Prospecting Right	Lomeza Mining Services (Pty) Ltd
	Geluk Prospecting Right	
	Barrage Bulk Sand Mine Section 102 EMP Ammendment	SPH Kundalila
	Rugron Exploration Co (Pty) Ltd	
	Middelwater Exploration (Pty) Ltd	
	Aroams 3 Mining Permit	
	Van Zyl Sillimanite	Van Zyl Sillimanite
	Sillimanite Prospecting	Van Zyl Sillimanite
EIA & EMPr	Middelburg Quarry Mining Right	Inzalo Crushing and Aggreates (Pty) Ltd
	Bloemhof Quarry Mining Right	
	Sileco Lime Mining Right	Lomeza Mining Services (Pty) Ltd
	Yomba Umgodi Mining Right	Raumix Aggregates
	Aroams Quarry Mining Right	SPH Kundalila (Pty) Ltd
Closure Application	• Witkloof Quarry • Roodekrans Quarry • Dwaalfontein Quarry • Hendrina Quarry • Bloemhof Quarry (Review) • De Roodepoort Quarry (Review)	B&E International (Pty) ltd
	Howards Quarry	Howards Crushers (Pty) Ltd
	SPH Sands	Raumix Aggregates (Pty) Ltd
	Brandvlei Quarry	SPH Kundalila (Pty) Ltd
IWULA/ IWWMP	• Umfolozi Quarry • Hluhluwe Quarry • Rietfontein Quarry • Denver Quarry • Dundee Quarry • Vryheid Quarry • Qwa Quarry • Bethlehem Quarry	Afrimat (Pty) Ltd
	Alfa Sand Quarry	Raumix Aggregates (Pty) Ltd
	Crushco Quarry	
	Lichtenburg Plant	Lafarge Cement
	Tlkowe Local Municipality	Tlkowe Local Municipality
Waste Management Plan	Wouterspan Boerdery (Pty) Ltd	Wouterspan Boerdery (Pty) Ltd
	Dukathole Brickworks CC	Dukathole Brickworks CC
Rehabilitation Plan	• Witkloof Quarry • Middelburg Quarry • Roodekrans Quarry • Balmoral Quarry	B&E International (Pty) ltd
	• Alfa Sand • Butterworth Quarry • Crushco Quarry • Donkerhoek Quarry • Mthatha Quarry • Rosslyn Quarry	Raumix Aggregates

	• Rossway Quarry • SPH Sands Quarry • Willows Quarry	
Asbestos Management Plan	Dukathole Brickworks CC	Dukathole Brickworks CC
COP for Hydrocarbons	Dukathole Brickworks CC	Dukathole Brickworks CC
Financial Provision in terms of NEMA 2015	Letama Quarry	Letama Quarry
	• Alfa Sand • Crushcho • Donkerhoek Quarry • Rosslyn Quarry • Rossway Quarry • SPH Sand • Willows Quarry	Raumix Aggregates
EMPr	• Vryheid Quarry • Pietermaritsburg Quarry	Afrimat (Pty) Ltd
Sec 30 Spillage Incident	Tosas	Tosas
Sec 102	Barrage Bulk Sand Mine	SPH Kundalila
Mine Works Programme (MWP)	Aliwal Quarry	Raumix Aggregates
	Barrage Bulk Sand Mine	SPH Kundalila
24G Rectification Application	Golden Valley Poultry Farm Welkom	Golden Valley Poultry Farm Welkom

Achievements

- Assisted in client' understanding of relevant environmental regulations thus improving customer relations.
- Achieved project goals through consistent engagement with the client.
- Received authorisations for the projects applied for.

2.	**APRIL 2015–APRIL 2017**

Genis Consultants CC

Contract Work

ENVIRONMENTAL CONSULTANT, PROJECT MANAGER

Responsibilities

- Compilation Environmental Impact Assessments and Environmental Management Plans
- Compilation of Basic Assessments
- Conduct Water Use Licence Applications (IWULA) and Integrated Waste Water Management Plans (IWWMP)
- Liaise with client and the suitable government departments
- Compilation of Mine Closure Liability Assessments (MCL)
- Compilation of Rehabilitation Strategic Implementation Plans (RSIP)
- Compilation of Environmental Performance Assessment Programs (EMP PAR)
- Compilation of Legal Compliance and GN704 Audits
- Compilation of Soil, Alien Invasive and Biodiversity Management Plans

Major Projects

- Bosveldsrus Abattoir

Achievements

- Assisted in client' understanding of relevant environmental regulations thus improving customer relations.
- Achieved project goals through consistent engagement with the client.

3.	JUNE 2014 – APRIL 2015
Environmental Assurance (ENVASS)	

SPECIALIST ENVIRONMENTAL CONSULTANT

Responsibilities

- Reporting to Directors
- Compilation Environmental Impact Assessments and Environmental Management Plans
- Compilation of Basic Assessments
- Conduct Water Use Licence Applications (IWULA) and Integrated Waste Water Management Plans (IWWMP)
- Liaise with client and the suitable government departments
- Compilation of Mine Closure Liability Assessments (MCL)
- Compilation of Rehabilitation Strategic Implementation Plans (RSIP)
- Compilation of Environmental Performance Assessment Programs (EMP PAR)
- Compilation of Legal Compliance and GN704 Audits
- Compilation of Soil, Alien Invasive and Biodiversity Management Plans

Major Projects

- Coal of Africa – Mooiplaats Colliery: IWWMP Update, RSIP and MCL
- Coal of Africa – Woestalleen Colliery: MCL, Legal Compliance Audit, EMP PAR
- Coal of Africa – Vele Colliery: MCL
- Samancor – Western Chrome Mine: MCL
- Eastplats Western and Eastern Limb (Rhodium Reefs Limited) – MCL, EMP PAR, Total Compliance Project: Environmental Awareness Campaign, GN704 Audit, Sol Management Plan, Biodiversity Management Plan, Alien Invasive Management Plan
- Various sand and clay brick mine MCL – Sterkfontein Bricks, Victoria Bricks, Roosema (Olifantsfontein & Delmas), SA Brix (Boekenhout and Zandfontein), and Kilo Sand.
- Mamatwan Manganese Land Capability Study, Visual Impact Assessment (VIA)
- Kongoni EMP PAR, MCL
- Assmang Technical Training College – Tree Removal Licence
- Umlabu: MCL
- LE Vervoer (Sandtoria): Rehabilitation and Terrestrial Ecology Plan, Stormwater Management Plan, EMP
- HJG Vervoer - EMP
- Stuart Coal: MCL
- Yoctolux EMP

Achievements

- Assisted in client' understanding of relevant environmental regulations thus improving customer relations.
- Achieved success in the closing of mine sites.
- Achieved project goals through consistent engagement with the client.

Reason for Leaving

Pregnancy. I wanted to be a stay at home mom.

4.	NOV 2013 –MAY 2014

African Innovative Solutions and Projects CC

SENIOR ENVIRONMENTAL CONSULTANT/ PROJECT MANAGER

Responsibilities

- Business Development and Marketing
- Financial Administration Duties
- Office management
- Reporting to Directors
- Managing Junior Environmental Consultants
- Compilation Environmental Impact Assessments and Environmental Management Plans
- Compilation of Basic Assessments
- Conduct Water use licence applications
- Liaise with client and the suitable government departments
- Compilation of Rehabilitation Models and the relevant reports
- Compilation of Alien invasive encroachment programs
- Compilation of Rehabilitation programs
- Conducting of pre-mining assessments (Biodiversity and Basic Soil Studies)
- Compiling operational procedure documents

Major Projects

- Thabazimbi Local Municipality (TLM) – upgrading and construction of a bulk water pipeline – BA, EMPR and IWULA
- Dr. Ruth Segamotsedi Municipality – EIA/EMP for waste water treatment works and for the bulk water pipeline
- Various prospecting rights applications in Limpopo

Achievements

- Assisted in client' understanding of relevant environmental regulations thus improving customer relations.
- Achieved success in the rehabilitation of mine sites and closing the sites.
- Achieved project goals through consistent engagement with the client.

Reason for Leaving

Company has been liquidated.

5.	JAN 2013 – OCT 2013

Kai Batla Minerals Industry Consultants

SENIOR ENVIRONMENTAL CONSULTANT

Responsibilities

- Reporting to Directors
- Managing Junior Environmental Consultants
- Compilation Environmental Impact Assessments and Environmental Management Plans
- Compilation of Basic Assessments
- Conduct Water use licence applications
- Liaise with client and the suitable government departments
- Compilation of Rehabilitation Models and the relevant reports
- Compilation of Alien invasive encroachment programs
- Compilation of Rehabilitation programs
- Conducting of pre-mining assessments (Biodiversity)
- Compiling operational procedure documents

Major Projects

- Imaforce (Pty) Ltd - Prospecting Rights Application and associated Environmental Management Plans for various properties in Kwa Zulu Natal and Mpumalanga
- AEMFC - Environmental and Social prefeasibility report
- PMG- IWULA / IWWMP for Koedoeskloof and Paling Pan; Rehabilitation Program and Report for Bishop Mine
- Barleda 625cc - EMP and associated PPP
- Mogale City Municipality - Environmental Impact Assessment (EIA) Guideline Report for a Logistics Hub in the West Rand

Achievements

- Assisted in client' understanding of relevant environmental regulations thus improving customer relations.
- Achieved success in the rehabilitation of mine sites and closing the sites.
- Achieved project goals through consistent engagement with the client.

Reason for Leaving

No growth opportunities.

6.	JAN 2010 – NOV 2012

Cabanga Concepts

JNR ENVIRONMENTAL CONSULTANT

Responsibilities

- Reporting to Senior Environmental Consultant
- Compilation entire Environmental Impact Assessments and Environmental Management Plans
- Compilation of Basic Assessments
- Conduct Water use licence applications
- Liaise with client and the suitable government departments
- Compilation of Rehabilitation Models and the relevant reports
- Compilation of Alien invasive encroachment programs
- Compilation of Rehabilitation programs
- Conducting of pre-mining assessments (Biodiversity)
- Compiling operational procedure documents

Major Projects

- Sakoa Coal Madagascar – Prefeasibility Study
- Pembani Coal Carolina – New Areas EIA and 24G EIA
- Pembani Coal Carolina – Alien Encroachment Program
- Pembani Coal Carolina – Rehabilitation Models and Program
- Pembani Coal Carolina – Pre-mining assessments (Biodiversity)
- Pembani Coal Carolina – Creating a wetland to treat AMD water
- Pembani Coal Carolina – Audits and IWULA audits
- Coal of Africa – 24G EIA/EMP
- Shanduka Resources – Rehabilitation Models and Reports
- Homelands Kendal Colliery – Alien Encroachment Program
- Homelands Kendal Colliery – Rehabilitation Models and Reports
- Sekoko Resources – Scoping report for the Railway siding

Achievements

- Assisted in client' understanding of relevant environmental regulations thus improving customer relations.
- Achieved success in the rehabilitation of mine sites and closing the sites.
- Achieved project goals through consistent engagement with the client.

Reason for Leaving

Retrenched.

Volunteer Experience

- Involved in the Climate Change Community Forum – Centurion
- Involved in the feeding of the animals at the game reserve in Mokopane
- Involved in the feeding of the animals at the Cheetah project in Limpopo
- Involved with the annual Santa shoe box Christmas presents for the under privileged in South Africa.

Professional Strengths

- Creative thinker
- Versatile and able to learn new tasks/skills quickly
- Good interpersonal skills - works well with others
- Focused, self-motivated and target driven; determined to succeed.
- Willing to learn and adapt to changing environments
- Focus on accuracy and attention to detail
- Strong planning, organising and monitoring abilities and an efficient time-manager

References

Name Emile van Druten	Environmental Assurance	082 554 8051
Name Hennie Du Preez	Genis Consultants	083 407 4522
Name Chris Weideman	Greenmined Environmental	082 602 6133

APPENDIX M

ALIEN INVASIVE PLANT SPECIES PLAN

APPENDIX N

FINANCIAL PROVISION

APPENDIX O1

BOTANICAL STUDY AND ASSESSMENT

APPENDIX O2

HERITAGE IMPACT ASSESSMENT

APPENDIX O3

BASIC PALAEONTOLOGICAL ASSESSMENT

APPENDIX P

ENVIRONMENTAL AWARNESS PLAN