DRAFT EIA/EMPR REPORT FOR THE PROPOSED AMENDMENT OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND SECTION 102 APPLICATION

PROPOSED ADDITIONAL INFRASTRUCTURE: OPENCAST PITS CRUSHING AND SCREENING PLANT; WASTE ROCK DUMP; ACCESS ROAD; WATER STORAGE RESERVOIR; STATIC PLANT; WORKSHOP AREA; TOPSOIL DUMP; SUB-STATION; OFFICE; ONBOARDING FACILITY AND STORM WATER MANAGEMENT INFRASTRUCTURE.

for

Salene Manganese (Pty) Ltd - Macarthy Mining Operations

Located on:

Portions 2, 3, 4, and 5 of the Farm Macarthy 559 within the Kuruman Magisterial District of Kuruman, Northern Cape Province

MINING RIGHT REF: NC/30/5/1/2/2/10013 MR

Report Compiled by:

Prescali
Environmental Consultants (Pty) Ltd

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Title:

Draft EIA/EMPR Report for the proposed amendment of the Environmental Management Programme and Section 102 application. The proposed additional infrastructure: 3 opencast pits (1 iron ore and 2 manganese ore); crushing and screening plant; waste rock dump; access road; water storage reservoir; manganese static plant; new workshop area; topsoil dump; sub-station; container office; container onboarding facility; and storm water infrastructure. Salene Manganese (Pty) Ltd: Macarthy Mining Operations, Mining Right Reference Number: NC/30/5/1/2/2/10013 MR

Client:

Salene Manganese (Pty) Ltd

Postal Address:

P.O Box 50917

Randburg

2125

Physical Address:

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Kathu,

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Report no:

Salene/EIAR/EMPR/2021/v1

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DOCUMENT CONTROL

	Name	Signature	Date
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Checked:	Dr Petro Erasmus(EAPASA Registered)(Pri.Sci.Nat)		31 August 2021
Final quality Check	Elaine van der Linde (EAPASA Registered)(Pri.Sci.Nat)		7 September 2021

Applicant Approval

I, _____, duly authorised by Salene Manganese (Pty) Ltd, hereby confirm that the report has been reviewed and approved for distribution (Public Participation Process).

_____ _____
Signature Date

REVISION AND AMENDMENTS

Description of Revision / Amendment	No	Date
Salene Environmental Impact Assessment Report/ Environmental Management Programme (Draft)	0	31 August 2021

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
And
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

DRAFT EIA/EMPR REPORT FOR THE PROPOSED AMENDMENT OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND SECTION 102 APPLICATION. THE PROPOSED ADDITIONAL INFRASTRUCTURE: 3 OPENCAST PITS (1 IRON ORE AND 2 MANGANESE ORE);CRUSHING AND SCREENING PLANT; WASTE ROCK DUMP; ACCESS ROAD; WATER STORAGE RESERVOIR; MANGANESE STATIC PLANT; NEW WORKSHOP AREA; TOPSOIL DUMP; SUB-STATION; CONTAINER OFFICE; CONTAINER ONBOARDING FACILITY; AND STORM WATER INFRASTRUCTURE.

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

NAME OF APPLICANT: Salene Manganese (Pty) Ltd: Macarthy Mining Operations
TEL NO: 011 463 7100
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POSTAL ADDRESS:
P.O Box 50917
Randburg
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PHYSICAL ADDRESS:
Farm Macarthy 559,
Kathu,
Northern Cape

FILE REFERENCE NUMBER SAMRAD: NC/30/5/1/2/2/10013 MR

IMPORTANT NOTICE

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

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

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

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

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

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
(d) Determine the—-
    (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    (ii) degree to which these impacts—
        (aa) can be reversed;
        (bb) may cause irreplaceable loss of resources, and
        (cc) can be avoided, managed or mitigated;
(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
(g) identify suitable measures to manage, avoid or mitigate identified impacts; and
(h) identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Thari Resources (Pty) Ltd (Thari Resources) applied for a mining right to the DMR in 2012. The mining right was approved in June 2018 on Portions 2, 3, 4 and 5 of the Farm Macarthy 559, situated between Postmasburg and Sishen in the Northern Cape Province of South Africa. The Mining Right has been transferred to Salene Manganese (Pty) Ltd (Salene).

Due to the time that has lapsed between applying for the mining right and the mining right finally being granted, the approved mine layout has undergone numerous updates and subsequent revisions. Salene has proposed an amendment to its mine plan and therefore its mine layout. Some of the proposed changes include the addition of waste rock dumps and the construction of clean and dirty water storage facilities within its mining right area. The addition of these facilities triggers the requirements for an application for an Environmental Authorisation (EA), a Waste Management Licence (WML) and a Water Use Licence (WUL).

The proposed new infrastructure are:

- New opencast pits: Three different opencast pits will be developed. Two of these will be manganese pits and one will be an iron ore pit.
- New topsoil dump: Topsoil will be removed and dumped on the topsoil dump. The position is in such an area that it would not impact on any future mining activity.
- Waste rock dumps (WRDs): Waste rock dump will be used for waste generated from the two manganese pits and the iron ore pit, the two new WRDs will extend for about approximately 38 ha. In addition, the existing WRD will be expanded to a total of approximately 13 ha.
- New manganese static plant: A 100 kt static plant will be put in place to crush and screen manganese ore. The static plant will consist of a jaw crusher, screen, and a cone crusher. Attached to the static plant will be two Magnetic Separation (MagSep) units. Permanent magnets of approximately 18-gauss will be used to separate ore and waste. Three different products will be produced:
    - -75 mm + 10 mm;
    - -30 mm + 6 mm; and
    - -10 mm + 6 mm.
- New access road: A new access road was established between the Salene offices and the contractor offices. This was done to avoid driving through the red permit area.
- Increased groundwater abstraction – will be based on available yield. Originally planned to be within the quantity that can be abstracted under a general authorisation in terms of the National Water Act, 1998 (Act No. 36 of 1998), it was decided to base abstraction requirements on the daily need for half a day at 150 m^3/day.
- New water storage reservoir: Salene has applied for a 150 NB connection to the Sedibeng pipeline which will connect to the existing Gamagara line that goes through Salene Manganese mine entrance. Two 533 m^3 dams will be erected to supply water to the manganese static plant. The new water storage reservoir will cater for 2 weeks storage based on 300 kl/day requirement.
- New workshop area: A workshop area will be put in place next to the contractor's offices. Mining and plant equipment will be maintained in this area. Area will be dressed with fines.

Activities in this area:	General equipment maintenance Tyre inflation and repair Diesel refuelling Boilermaker activities
Equipment to be maintained in this area:	Articulated dump trucks Excavators Light delivery vehicles Grader Mobile crusher and Screens

- New container onboarding facility: A three-classroom prefabricated building will be used as a training and onboarding facility. This facility will be placed next to the current Almar offices.
- Storm water infrastructure: Storm water infrastructure will consist mainly of berms constructed with competent waste material. On addition pollution control facilites in the form of 3 smaller dams (sump) and a main pollution control dam will be developed.
- Section 102 application: Salene has applied for the following additional minerals to be included in their mining right: Aluminium (Al). Silver (Ag), Arsenic (As), Barium (Ba), Bismuth (Bi), Cobalt (Co), Copper (Cu), Potassium (K), Lithium (Li), Nickel (Ni), Phosphorus (P), Lead (Pb), Sulphur (S), Silicon (Si), Strontium (Sr), Titanium (Ti), Vanadium (V), Zinc (Zn); and Rare Earths Elements (Re): Scandium (Sc) (Rare Earths) Rubidium (Rb) (Rare Earths) Neodymium (Nd) (Rare Earths) Cerium (Ce) (Rare Earths) Lanthanum (La) (Rare Earths).

Specialist Studies

The following specialist studies were conducted for the EMPr amendment based on the findings of the Screening tool report:

- Air Quality Assessment;
- Visual Impact Assessment;
- Fauna and Flora Impact Assessment;
- Surface Water Assessement;
- Blasting and Vibration Impact Assessment;
- Noise Impact Assessment;
- Geohydrological Assessment;
- Waste Management Classification;
- Soil and Land Capability Assessment;
- Heritage Impact Assessment (Archaeological);
- Palaeontological Assessment; and
- Socio-economic Impact Assessment.

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ABBREVIATIONS

(Pty)	Proprietary
(RE)	Remaining extend
BC	Bushveld Complex
BID	Background information document
Cm	Centimetre
Fe^{2+}	Iron
DAFF	Department of Agriculture, Fisheries and Forestry
DEAT	Department of Environmental Affairs and Tourism
DM	District Municipality
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
ENPAT	Environmental Potential Atlas for South Africa
Fax	Facsimile
TLM	Tsantsabane Local Municipality
FIDP	Final integrated Development Plan
GDP	Gross Domestic Product
GNR	Government Notice Regulation
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
Km	kilometer
Km^2	Square kilometer
L	litre
LM	Local Municipality
LoM	Life of Mine
Ltd	Limited
mamsl	meters above mean sea level
ME	Mitigation efficiency
MG	Middle Group
Mm	millimeter
MPRDA	Mineral and Petroleum Resources Development Act
NEMA	National Environmental Management Act
NEMAQA	National Environmental Management Air Quality Act
NEMBA	National Environmental Management Biodiversity Act
NEMWA	National Environmental Management Waste Act
NHRA	National Heritage Resources Act
No	Number
NWA	National Water Act
ºC	Degrees Celsius
RoM	Run of Mine
RWD	Return Water Dam
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SLP	Social and Labour Plan
Tel	Telephone
WM	With Mitigation
WOM	Without Mitigation

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1. Details of:

1.1.1. The Environmental Assessment Practitioner (EAP) who prepared the report

Name of The Practitioner: Prescali Environmental Consultants. The report was compiled by Gregory Netshilindi (EAPASA Registered) *(Cand.Nat. Sci)*.
Tel No.: 012 543 3808
Fax No. :086 621 0294
e-mail address: info@prescali.co.za

1.2. Expertise of the EAP

1.2.1. The qualifications of the EAP

(With evidence attached as Error! Reference source not found.).

Mr Gregory Netshilindi has qualifications in Environmental & Geographical Sciences and Geological Sciences. He is a Cand.Nat.Sci. (SACNASP), Natural Professional Scientist for geological sciences and is registered with EAPASA. His qualifications are provided in **Error! Reference source not found.**.

Reviewers:

- Ms. E. van der Linde has qualifications in Geology, Engineering Geology and Environmental Management and experience in Water and Environmental Management. She is registered as a Pri Sci Nat. (SACNASP), Natural Professional Scientist and is also registered with EAPASA. Her qualifications are provided in Appendix 1.
- Dr. P. Erasmus has qualifications in Zoology and Biochemistry and further studied in Zoology and Marine pollution. She is registered as a Pri Sci Nat. (SACNASP), Natural Professional Scientist, for Ecological and Environmental Sciences. She is also registered with EAPASA. Her qualifications are provided in Appendix 1.

1.2.2. Summary of the EAP's past experience.

(Attach the EAP's curriculum vitae as Appendix)

- Mr G. Netshilindi has 4 years applicable experience (a short resume with a list of projects is attached in Appendix 2) and has been employed by:
  - Minmet Services (Pty) Ltd;
  - Tshikovha Green and Climate Change Advocates (Pty) Ltd; and
  - Prescali Environmental Consultants (Pty) Ltd.

Reviewers:

- Ms. E. van der Linde has 21 years of applicable experience (a short resume with a list of projects is attached in Appendix 2and has been employed by:
  - Department: Water Affairs and Forestry (DWAF);
  - Groundwater Consulting Services cc;
  - M2 Environmental Connections cc; and
  - Prescali Environmental Consultants (Pty) Ltd.
- Dr. P. Erasmus has 16 years of applicable experience (a short resume with a list of projects is attached in Appendix 2 and has been employed by:
  - Department: Water Affairs and Forestry (DWAF);
  - M2 Environmental Connections (Pty) Ltd; and

- Prescali Environmental Consultants (Pty) Ltd.

2. DESCRIPTION OF THE PROPERTY

Farm Name:	Portion 2, 3, 4, and 5 of the Farm Macarthy 559
Application area (Ha)	860 Ha
Magisterial district:	Kuruman
Municipal Areas:	Tsantsabane Local Municipality, ZF Mgcawu District Municipality
Distance and direction from nearest town	Approximately 40 km North of Postmasburg Approximately 22 km South of Kathu
Cadastral Codes	C04100000000055900002 C04100000000055900003 C04100000000055900004 C04100000000055900005

2.1. LOCALITY MAP

(show nearest town, scale not smaller than 1:250000 attached as Appendix 3)

Large locality and layout maps will be included in Appendix 3 and Appendix 4.

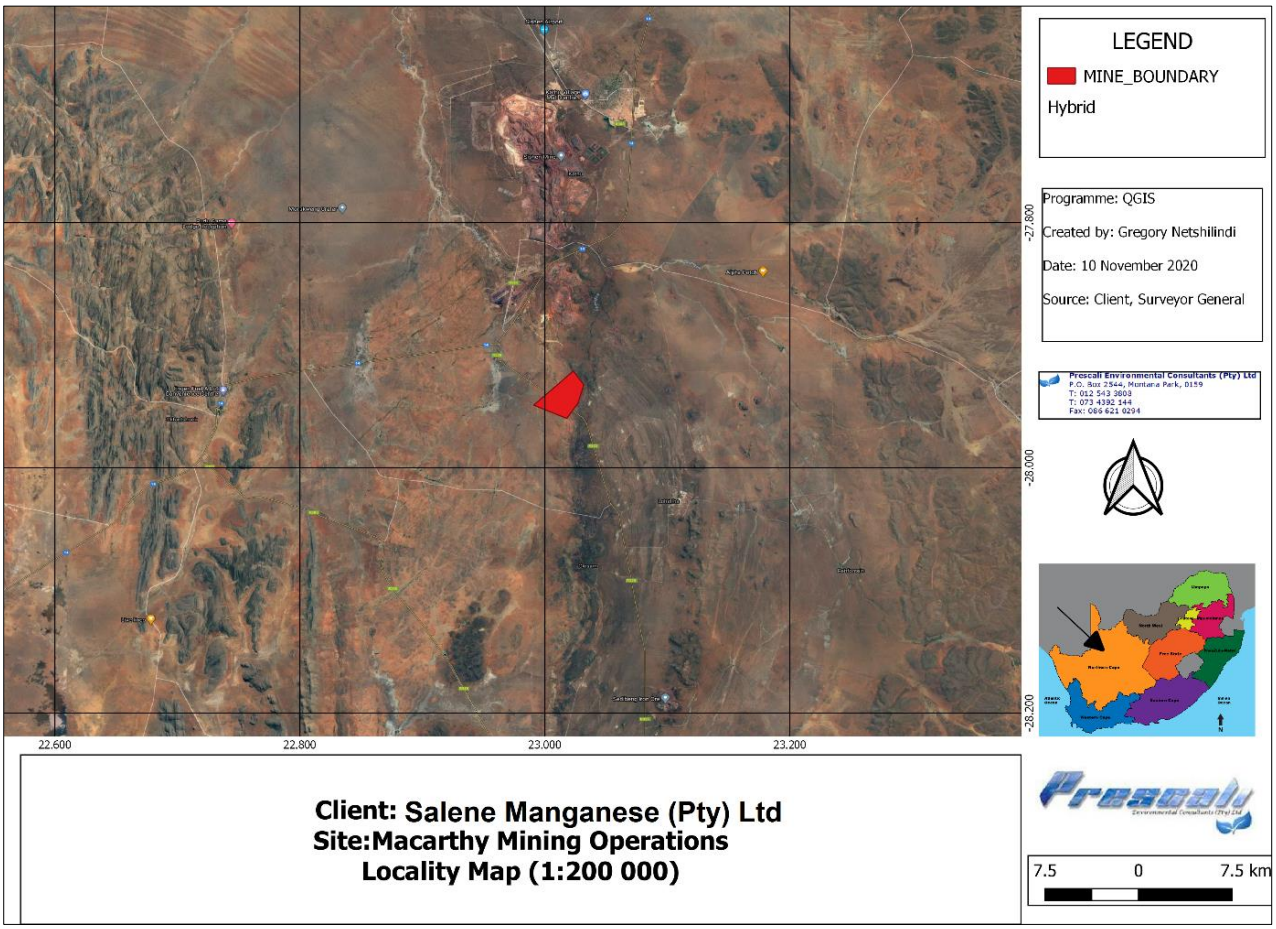


Figure 2-1: Regional Locality Map

3. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

3.1. LISTED AND SPECIFIED ACTIVITIES

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

The site layout plan is provided in Appendix 4.

Table 3-1: Listed and Specified Activities to be authorised

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE	WASTE MANAGEMENT AUTHORIZATION
(E.g. For prospecting – drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route)	*Ha or m^2*	*(Mark with an X where applicable or affected)*	*GNR LN1: 983 / LN2 984 / LN =3: 985 (as amended 07 April 2017)*	*(Indicate whether an authorization is required in terms of the Waste Management Act). (Mark with an X)*
The application is for an amended mining right as a result of the proposed opencast and associated minerals being applied for.	860 Ha	X	LN 2: #17	
Development of a new waste rock dump (WRD) and expansion of the existing WRD	WRD North: 12.9645 Ha (129 645 m^2) WRD South: 29.7045 Ha (297 045 m^2) WRD West: 15.7820 Ha (157 820 m^2) RoM Stockpile area: 35.0315 ha Product Bed: 5.6205 ha	X		X Category B#11
Access roads will be extended between the Salene offices and the contractor offices as well as within the mining area. The road will be wider than 8 meters but less than 13.5. Some of the roads are existing informal internal roads and will be upgraded (widened by more than 4 meters and lengthened by more than 1 km). The mining area is classified as ecological support areas. The road development will be a phased approach.	10 km in phased approach	X	Develop LN 1: #24 Expand LN 1: #56 Expand LN 3: #18	
Two reservoirs will be erected to store water with a capacity of 533 m^3 each. The mining area is classified as ecological support areas	1,066 m^3 (2 x 533 m^3)	X	LN 3: #2	
The proposed opencast activities will require additional storage of dangerous goods, taking into consideration the existing activities at Salene this could exceed the total storage to 80 m^3 but not more than 500 m^3.	100 m^3	X	LN 1: #14	
Vegetation will be cleared for the new open pits, waste rock dump, topsoil dump, and access road.	> 180 Ha	X	LN 2: #15 LN3: #12	

The cleared area will exceed 20 ha in an ecological support area				
Storm water dams will be constructed – detail not available as yet. They could be in excess of 50 000 m^3	45 100 m^3	X	LN 1: #12	
Should any protected plant species require relocation as a result of the proposed opencast activities a permit will be applied for in terms of the NEMBA	1 ha (assumption)	X	LN1: #30	
Phased activities that will take place as per the opencast mining in terms of stormwater development, overburden dumps and backfilling and road development. LN1:24(i), 30, 34, LN2: 5,7,8(ii),11,13,16,27(i)or(ii).	Opencast: ~147 Ha New road: 10 km Waste Rock Dump: ~51 Ha Topsoil Dump: ~3.7 Ha	X	LN1: #67	X
Phased activities that will take place as per the opencast mining in terms of stormwater development, overburden dumps and backfilling and road development. Excluded: LN3: 7,8,11,13,20,21,24.	Opencast: ~147 Ha New road: 10 km Waste Rock Dump: 51 Ha Topsoil Dump: ~3.7 Ha	X	LN3: #26	X

3.2. Description of the activities to be undertaken

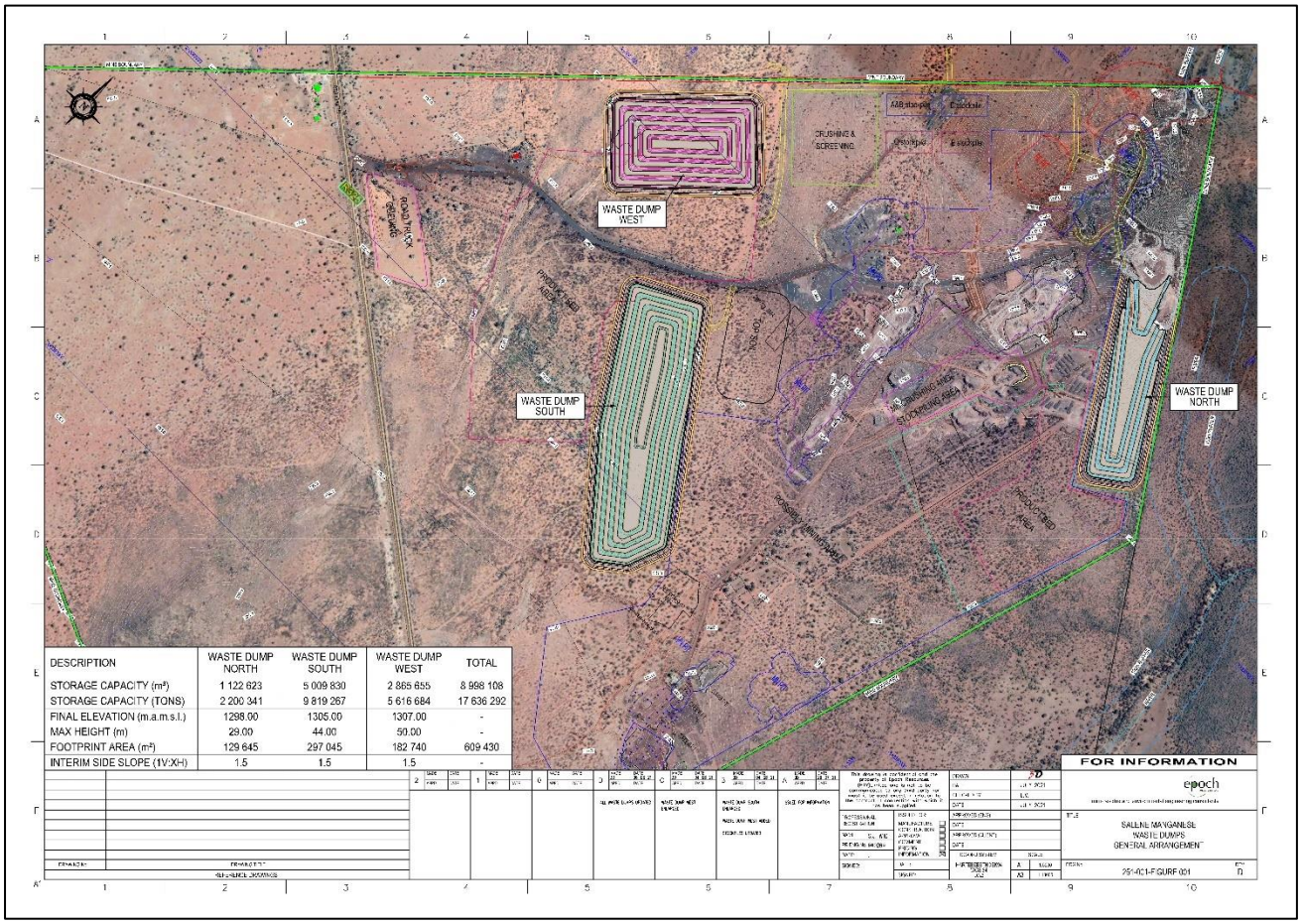
(Describe Methodology or technology to be employed, and for a linear activity, a description of the route of the activity)

3.2.1. Existing Infrastructure

The current operations are taking place in line with the approved EMPr and the Mining Right. There are access roads, offices, security building, opencast pits and an existing waste rock dump on site.

3.2.2. Proposed additional infrastructure

Salene wishes to amend and consolidate its existing EMPr by including additional infrastructures. New infrastructure includes the following as discussed below and indicated in Figure 3-1.



DESCRIPTION	WASTE DUMP NORTH	WASTE DUMP SOUTH	WASTE DUMP WEST	TOTAL
STORAGE CAPACITY (m³)	1 122 623	5 009 830	2 865 655	8 998 108
STORAGE CAPACITY (TONS)	2 200 341	9 819 267	5 616 684	17 636 292
FINAL ELEVATION (m.a.m.s.l.)	1298.00	1305.00	1307.00	-
MAX HEIGHT (m)	29.00	44.00	50.00	-
FOOTPRINT AREA (m²)	129 645	297 045	182 740	609 430
INTERIM SIDE SLOPE (1V:XH)	1.5	1.5	1.5	-

Figure 3-1: Proposed infrastucture Layout map

3.2.2.1. New opencast pits

Three different opencast pits will be developed. Two of these will be manganese pits and one will be an iron ore pit.

3.2.2.2. New Topsoil dump

Topsoil will be removed and dumped on the topsoil dump. The position is in such an area that it would not impact on any future mining activity.

3.2.2.3. Waste Rock dump (WRD)

Waste rock dumps will be used for waste generated from the two manganese pits and the iron ore pit, the two new WRDs will extend for about approximately 18.238 ha. In addition, the existing WRD will be expanded and will extend for about 10.5to a total of approximately 13 ha.

3.2.2.4. New Manganese static plant

A 100 kt static plant will be put in place to crush and screen manganese ore. The static plant will consist of a jaw crusher, screen, and a cone crusher.

Attached to the static plant will be two Magnetic Separation (MagSep) units. Permanent magnets of approximately 18-gauss will be used to separate ore and waste. Three different products will be produced:

- -75 mm + 10 mm;
- -30 mm + 6 mm; and
- -10 mm + 6 mm.

3.2.2.5. New access road

A new access road was established between the Salene offices and the contractor offices. This was done to avoid driving through the red permit area. As part of the mining activities raods will be developed throughout the life of the mine, it is expected that the length will be around 10 km.

3.2.2.6. Increased groundwater abstraction – will be based on available yield

Groundwater abstraction will be based on the quantity that will supply the mine with half day supply of 150 m^3/day, this is still within the yield determined.

3.2.2.7. New water storage reservoir

Salene has applied for a 150 NB connection to the Sedibeng pipeline which will connect to the existing Gamagara line that goes through Salene Manganese mine entrance. Two 533 m^3 dams will be erected to supply water to the manganese static plant. The new water storage reservoir will cater for 2 weeks storage based on 300 m^3/day requirement.

3.2.2.8. New workshop area

A workshop area will be put in place next to the contractor's offices. Mining and plant equipment will be maintained in this area. Area will be dressed with fines.

Activities in this area:	General equipment maintenance Tyre inflation Tyre repair Diesel refuelling Boilermaker activities
Equipment to be maintained in this area:	Articulated dump trucks Excavators Light delivery vehicles Grader Mobile crusher Mobile screens

3.2.2.9. New sub-station

Various options are considered to supply power. An area of 300 m x 300 m is set out as a possible location.

3.2.2.10. New container onboarding facility

A three-classroom prefabricated building will be used as a training and onboarding facility. This facility will be placed next to the current Almar offices.

3.2.2.11. Storm water infrastructure

Storm water infrastructure will consist mainly of berms constructed with competent waste material. To ensure compliance with GN704 regulations all dirty storm water generated on site must be contained in a dam able to capture the 1:50 year rainfall event.

3.2.2.12. Section 102 application

Salene has applied for the following additional minerals to be included in their mining right: Aluminium (Al). Silver (Ag), Arsenic (As), Barium (Ba), Bismuth (Bi), Cobalt (Co), Copper (Cu), Potassium (K), Lithium (Li), Nickel (Ni), Phosphorus (P), Lead (Pb), Sulphur (S), Silicon (Si), Strontium (Sr), Titanium (Ti), Vanadium (V), Zinc (Zn); and Rare Earths Elements (Re): Scandium (Sc) (Rare Earths) Rubidium (Rb) (Rare Earths) Neodymium (Nd) (Rare Earths) Cerium (Ce) (Rare Earths) Lanthanum (La) (Rare Earths)

4. POLICY AND LEGISLATIVE CONTEXT

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
(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);	
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 2 of the Constitution states that: "This Constitution is the supreme law of the Republic; law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled." Section 24 of the CA, states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: • prevent pollution and ecological degradation; • promote conservation; and • secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Section 24 guarantees the protection of the environment through reasonable legislative (and other measures) and such legislation is continuously in the process of being promulgated. Section 33(1) concerns administrative justice which includes the constitutional right to administrative action that is lawful, reasonable and procedurally fair.	The Draft EIA/EMPR Report was accordingly prepared and considered within the constitutional framework set by Section 24 and 33 of the Constitution.
The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Environmental Assessment Regulations, 2014 (as amended) The overarching principle of the NEMA is sustainable development. It defines sustainability as meaning the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure the development serves present and future generations. Section 2 of NEMA provides for National Environmental Management Principles. These principles include: • Environmental management must place people and their needs at the forefront of its concern. • Development must be socially, environmentally and economically sustainable. • Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated. • Environmental justice must be pursued. • Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued. • Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle. • The participation of all Interested and Affected Parties (I&APs) in environmental governance must be promoted. • Decisions must take into account the interests, needs and values of all I&APs.	The draft EIAR/EMPr Report was be distributed for public review for periods stipulated in NEMA as part of the environmental impact assessment process.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment. • Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law. • The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage. • The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment. The EIA process to be undertaken in respect of the authorization process of the proposed mining operations is in compliance with the MPRDA, as well as the NEMA read with the Environmental Impact Assessment Regulations of 2014 (as amended). The proposed development involves 'listed activities', as identified in terms of the NEMA and in terms of section 24(1), the potential consequences for or impacts on the environment of listed activities must be considered, investigated, assessed and reported on to the Minster of Mineral Resources or to the relevant office of the Department responsible for mineral resources, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of the NEMA.	
GNR 1147 (20 November 2015) of the NEMA - Financial Provisioning Regulations In accordance with the above legislation, the holder of a mining right must make the prescribed financial provision for the costs associated with the undertaking of the management, rehabilitation and remediation of the negative environmental impacts due to prospecting, exploration and mining activities and the latent or residual environmental impacts that may become known in future.	The Final Rehabilitation, Decommissioning and Mine Closure plan will be compiled in accordance with GNR 1147.
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) Previously South African mineral rights were owned either by the State or the private sector. This dual ownership system represented an entry barrier to potential new investors. The current Government's objective is for all mineral rights to be vested in the State, with due regard to constitutional ownership rights and security of tenure. The MPRDA was passed in order to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources, and to provide for matters connected therewith. The Preamble to the MPRDA inter alia affirms the State's obligation to: • protect the environment for the benefit of present and future generations; • ensure ecologically sustainable development of mineral and petroleum resources; and • promote economic and social development. The aforesaid preamble affirms the general right to an environment provided for in section 24 of the Constitution (as set out hereinabove).	The EIA/EMPR Report was compiled as per the guidelines and requirements of the DMRE.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
The objects of the MPRDA, as set out in section 2 thereof serve as a guide to the interpretation of the Act. The objects of the MPRDA are as follows: • recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic; • give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources; • promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa; • substantially and meaningfully expand opportunities for historically disadvantaged persons, including women, to enter the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources; • promote economic growth and mineral and petroleum resources development in the Republic; • promote employment and advance the social and economic welfare of all South Africans; • provide for security of tenure in respect of prospecting, exploration, mining and production operations; • give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and • ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating. The national environmental management principles provided for in section 2 of the NEMA apply to all prospecting and mining operations and any matter relating to such operation. These principles apply throughout the Republic to the actions of all organs of state including inter alia the Department of Mineral Resources that may significantly affect the environment. Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations. Section 38 of the MPRDA states that the holder of inter alia, a prospecting right, mining right or mining permit: • Must at all times give effect to the general objectives of integrated environmental management laid down in Chapter 5 of NEMA; • Must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment as contemplated in section 24(7) of NEMA; • Must manage all environmental impacts – ○ In accordance with an environmental management plan or approved environmental management programme, where appropriate, and ○ As an integral part of the prospecting or mining operations, unless the Minister directs otherwise.	

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
• Must as far as reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and • Is responsible for any environmental damage, pollution or ecological degradation as a result of prospecting or mining operations and which may occur inside and outside the boundaries of the area to which such right, permit or permission relates.	
National Water Act, 1998 (Act No. 36 of 1998 (NWA) In terms of the NWA, the National Government, acting through the Minister of Water Affairs, is the public trustee of South Africa's water resources, and must ensure that water is protected, used, development, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons (section 3(1)). In terms of the NWA a person may only use water without a license under certain circumstances. All other use, provided that such use qualifies as a use listed in section 21 of the Act, require a water use license. A person may only use water without a license if such water use is permissible under Schedule 1 (generally domestic type use) if that water use constitutes a continuation of an existing lawful water use (water uses being undertaken prior to the commencement of the NWA, generally in terms of the Water Act of 1956), or if that water use is permissible in terms of a general authorisation issued under section 39 (general authorisations allow for the use of certain section 21 uses provided that the criteria and thresholds described in the general authorisation is met). Permissible water use furthermore includes water use authorised by a license issued in terms of the NWA. Section 21 of the NWA indicates that "water use" includes: • taking water from a water resource (section 21(a)); • storing water (section 21(b)); • impeding or diverting the flow of water in a water course (section 21(c)); • engaging in a stream flow reduction activity contemplated in section 36 (section 21(d)); • engaging in a controlled activity which has either been declared as such or is identified in section 37(1) (section 21(e)); • discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit (section 21(f)); • disposing of waste in a manner which may detrimentally impact on a water resource (section 21(g); • disposing in any manner of water which contains waste from, or which has heated in, any industrial or power generation process (section 21 (h)); • altering the bed, banks, course or characteristics of a water course (section 21(i)); • removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people (section 21(j)); and • using water for recreational purposes (section 21(k)).	A new water use licence will be applied for the Section 21 activities identified as a result of the construction of the new proposed activities.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
In addition to the above and in terms of section 26 of the NWA, Regulations on the Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources were published in GN R. 704 of 4 June 1999 (GN R. 704). The aforesaid GN R. 704 provides for inter alia the capacity requirements of clean and dirty water systems (regulation 6), the protection of water resources by a person in control of a mine (regulation 7), security and addition measures (regulation 8) and temporary or permanent cessation of a mine or activity (regulation 9). According to GN R. 704 “no person in charge of a mine may carry on any underground or opencast mining, prospecting or any other operation or activity under or within the 1:50 year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, whichever is the greatest”. Insofar as the undertaking of section 21 water uses is concerned, it is anticipated that application for registration and water use licensing will be undertaken.	
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA established the South African Heritage Resources Agency (SAHRA) as well as Provincial Heritage Resources Agencies. In terms of the NHRA, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. No person may damage, disfigure, alter, subdivide or in any other way develop any part of a protected area unless, at least 60 days prior to the initiation of such changes, he/she/it has consulted with the relevant heritage resources authority. Section 34 of the NHRA provides for the protection of immovable property by providing for a prohibition on altering or demolishing any structure or part of any structure, which is older than 60 years, without a permit issued by the relevant provincial heritage resources authority. Accordingly, should the proposed activities, prospecting or mining activities or the closure and rehabilitation of mined land involve the altering or demolishing of any structure or part of any structure, which is older than 60 years, a permit issued by the relevant provincial heritage resources authority is required. No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite; destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite; trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. No person may, without a permit issued by SAHRA or a provincial heritage resources authority destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves; destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local	An archaeological assessment was conducted on the site.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
authority; or bring onto or use at the burial ground or grave referred to above any excavation equipment or any equipment which assists in the detection or recovery of metals. Section 38 of the NHRA states that any person who intends to undertake developments categorised in Section 38 of the NHRA must at the very earliest stages of initiating such development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. By way of example, the developments referred to in Section 38 of the NHRA include: • the construction of a road, wall, power-line, pipeline, canal or other similar form of linear development or barrier exceeding 300 metres in length; • the construction of a bridge or similar structure exceeding 50 metres in length; • any development or other activity which will change the character of a site as specified in the regulations; • any other category of development provided for in regulations by SAHRA or the provincial heritage resources authority. However, the abovementioned provisions are subject to the exclusion that section 38 does not apply to a development as described in subsection (1) if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act No. 73 of 1989 (EIA) (now presumably the NEMA in view of the repeal of the listed activities under the ECA: Provided that the consenting authority must ensure that the evaluation fulfils the requirements of the relevant heritage resources authority in terms of subsection (3), and any comments and recommendations of the relevant heritage resources authority with regard to such development have been taken into account prior to the granting of the consent.	
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) The NEMBA aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith. The NEMBA provides for the publishing of various lists of species and ecosystems by the Minister of Environmental Affairs and Tourism (now the Minister of Water and Environmental Affairs) as well as by a Member of the Executive Council responsible for the conservation of biodiversity of a province in relation to which certain activities may not be undertaken without a permit. In terms of Section 57 of the NEMBA, no person may carry out any restricted activity involving any species which has been identified by the Minister as "critically endangered species", "endangered species", "vulnerable species" or "protected species" without a permit. The NEMBA defines "restricted activity" in relation to such identified species so as to include, but not limited to, "hunting, catching, capturing, killing, gathering, collecting, plucking, picking parts of, cutting, chopping off, uprooting, damaging, destroying, having in possession, exercising physical control over, moving or translocating".	The legislation was considered throughout the EIA process and in particular the Ecological Impact Assessment which will comply with the NEMBA.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
The Minister has made regulations in terms of section 97 of the NEMBA with regards to Threatened and Protected Species which came into effect on 1 June 2007. Furthermore, the Minister published lists of critically endangered, endangered, vulnerable and protected species in terms of section 56(1) of the NEMBA.	
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEMAQA) The NEMAQA came into power on the 24th of February 2005. Additionally, the amendment to the Minimum Emission Standards (GN R 893) also came into effect on the 12 June 2015. This Notice provides a list of activities that may cause atmospheric emissions which have or may have a significant detrimental effect on the environment as well as the minimum emission standards ("MES") for these activities as contemplated in section 21 of NEMAQA. The effect of the commencement of the NEMAQA and the listed activities, listed in GN 964 is that an atmospheric emission licence (AEL) is now required for conducting these listed activities.	Currently there are no listed activities that require registration/permitting according to NEMAQA for the proposed activities infrastructures.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEMWA) The NEMWA commenced on 1 July 2009 and as a result of its commencement the relevant provisions in the Environment Conservation Act No. 73 of 1989 (ECA) in respect of waste management, were repealed. The NEMWA sets out to reform the law regulating waste management and deals with waste management and control more comprehensively than was dealt with in the ECA. It also introduces new and distinct concepts never before canvassed within the realm of waste management in South Africa, such as the concept of contaminated land and extended producer responsibility. It also provides for more elaborate definitions to assist in the interpretation of the Act. Section 19 of the NEMWA provides for listed waste management activities and states in terms of section 19(1), the Minister may publish a list of waste management activities that have, or are likely to have a detrimental effect on the environment. Such a list was published in GNR 921 of 29 November 2013. In accordance with section 19(3), the Schedule to GNR 921 provides that a waste management licence is required for those activities listed therein prior to the commencement, undertaking or conducting of same. In addition, GNR 921 differentiates between Category A, B, and Category C waste management activities. Category A waste management activities are those which require the conducting of a basic assessment process as stipulated in the EIA Regulations, 2014 promulgated in terms of the NEMA as part of the waste management licence application and Category B waste management activities are those that require the conducting of a scoping and environmental impact assessment process stipulated in the EIA Regulations, 2014 as part of the waste management licence application. Category C waste management activities do not require a waste management licence, however a person who wished to commence, undertake or conduct a waste management activity listed under this category, must comply with the relevant requirements and standards, Section 20 of the NEMWA pertains to the consequences of listing waste management activities and states that no person my commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards	The proposed activities (construction require a waste management licence (WML) as listed in GNR 921 of 29 November 2013 (Category B (11)).

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required. In terms of the current statutory framework with regards to waste management, a waste management licence is required for those waste management activities identified in the Schedule to GNR 921.	
Tsantsabane Local Municipality- Integrated Development Plan- Revised Draft 2018/19- 2019/20- 2020/21 Tsantsabane Local Municipality (LM) is situated in the ZFM District Municipality and covers geographic area of 5 887 km^2. Tsantsabane Local Municipality is bordered by Siyancuma LM, Khara Hais LM, !Kheis LM, Gamagara LM and Kgatelopele LM. The municipal area falls in the Gamagara Corridor. The Northern Cape Province Spatial Development Framework (NCPSDF) defines the Gamagara Corridor as "comprises the mining belt of the John Taolo Gaetsewe and Siyanda (ZF Mgcawu) districts and runs from Lime Acres and Danielskuil to Hotazel in the north. The corridor focuses on the mining of iron and manganese". The intention of compiling the IDP is to amongst others: • To articulate how the municipality aims to address and align with the national objectives of shared growth, reduction of poverty and social inclusion; • Determine the strategic priorities guiding the actions of the municipality for the next financial year through linking and co-ordination between sectoral strategies; • Set out a strategically informed programmer of action for the medium-term revenue and expenditure framework; • Guide Council's development decision-making; • Enable legislative compliance; and • Provide a monitoring and evaluation framework of the implementation of the IDP.	The mining activities are in line with the Gamagara mining belt corridor.
Integrated Development Plans and Environmental Management Frameworks	
Z.F Mgcawu (formerly known as Siyanda) District Municipality Environmental Management Framework (EMF)- 2008 The purpose of the project is to develop an EMF that will integrate municipal and provincial decision-making and align different government mandates in a way that will put the area on a sustainable development path. The specific objectives of the EMF include: The provision of strategic guidance in the EMF area. • Assisting in the identification of "identified geographical areas" in terms of NEMA. • Assisting in the identification of "specified activities" within "identified geographical areas" in terms of NEMA. • The provision of a decision support system in respect to environmental attributes, issues and priorities in the EMF area.	The requirements of these will be assessed and included in the specialist reports and this EIA/EMP.

5. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

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

5.1. New Activities as Proposed in 2020/2021 Amendment Application

The proposed Macarthy Mining expansion is required to extend the life of the current operations. The expansion will allow for the continuation of the current mining activities beyond the originally planned life, the proposed expansion will include 3 openpits (1 Iron ore and 2 Manganese). Current indications are that the operations will continue in line with projected production until 2040.

The continuation and extension of the Macarthy Mine is need and is desirable for the following reasons:

- It will enable Macarthy Mine to stay operational and earn a profit;
  - Enable Macarthy Mine to continue to supply iron ore and Manganese, to satisfy various requirements of its clients;
- To safeguard the employment of employees;
- Increase future employment of nearby communities from nearby local municipalities; and
- Safeguard and increase local economic development opportunities created by existing Macarthy Mine.

6. MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE

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

The identification of alternatives is a key aspect of the success of the scoping process and reaches its conclusion in the EIA phase. All reasonable and feasible alternatives was identified and screened to determine the most suitable alternative to consider and assess. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include financial, environmental and social issues, which will be discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the No-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process. Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

6.1. Details of the Development Footprint Alternatives Considered

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

6.1.1. The property on which or location where it is proposed to undertake the activity

6.1.1.1. Property

The property on which the proposed opencast and the associated infrastructure will be located are within the Mining Right Area (Table 6-1) as outlined below:

- Portions 2, 3, 4, and 5 of Farm Macarthy 559.

Below is the list of the land owner and lessee of the mining right area.

Table 6-1: Surface Right information

Land owner	Farm Name	Farm Number	Portion	Size (Ha)	Title Deed
Christoffel Johannes Swanepoel	Macarthy	559	2	214.7768	T2803/1996
Hendrik Coenraad Kotze			3	214.7757	T182/2004
Leon Marius Venter			4	214.7751	T2756/1999
Christoffel Johannes Swanepoel			5	214.7741	T2803/1996

The type of minerals mined are Iron (FeO) and Manganese (Mn). A Section 102 application under the MPRDA has been lodged to include the following minerals in the mining right area: Aluminium (Al). Silver (Ag), Arsenic (As), Barium (Ba), Bismuth (Bi), Cobalt (Co), Copper (Cu), Potassium (K), Lithium (Li), Nickel (Ni), Phosphorus (P), Lead (Pb), Sulphur (S), Silicon (Si), Strontium (Sr), Titanium (Ti), Vanadium (V), Zinc (Zn); and Rare Earths Elements (Re): Scandium (Sc) (Rare Earths) Rubidium (Rb) (Rare Earths) Neodymium (Nd) (Rare Earths) Cerium (Ce) (Rare Earths) Lanthanum (La) (Rare Earths).

The land use of the proposed mining area is now considered to be predominantly for mining and mining related activities therefore, there is no practical development alternative for the current Macarthy Mine area. The proposed extension of the open pit of the current mining area has taken into consideration economic viability and practicality as well as the location of the resource to be mined.

6.1.2. Location Alternatives

The Macarthy operations is an existing mine with existing infrastructure that will be utilised during the proposed amendment project. A site selection process was undertaken to consider the possible location of the proposed open pit, WRDs, topsoil area, access road extension, reservoir and various plant areas. However, the open pit site was selected based on the availability of iron, manganese and other minerals that Salene is targeting to extract. Minerals can only be mined where identified and verified, therefore it was not practical to select an alternative mining site.

The location of the mineral resource thus informed which areas were available for other infrastructures. As far as possible existing road and infrastructures (e.g. existing WRD) was and will be used.

6.1.3. The type of activity to be undertaken

Alternatively to the mining land use the Macarthy mining area could be used for dry land agriculture, residential development and / or wilderness activities.

However, the Macarthy mining right area is currently used for mining related activities as an operational mining area since 2018.

The development of additional infrastructure including three openpits and Waste Rock Dumps. The development of the proposed iron and manganese ore is required to allow continued mining operations. Alternatives assessed with regards to the mining activity currently in operation are:

- Waste rock, topsoil dump and access roads.

The development of storm water infrastructure to ensure compliance with GN704 as published in terms of the NWA.

Opencast mining operations will continue as per current method, no althernatives were investigated.

6.1.4. The design or layout of the activity

The final design / layout of the mining activities and support infrastructure are determined by the location of the ore resource and infrastructures to exploit the resource and are placed to ensure maximum exploitation without sterilising the resource.

As Macarthy Mine is an operational mine, any new infrastructures are planned in accordance with the existing infrastructures on site and layout alternatives are investigated as and when needed in a phased approach. Opencast mining areas are identified based on the presence of the mineral ore and thus no alternatives are applicable regarding this aspect.

The final design of the WRD, RoM stockpile and product areas, opencasts and the supporting infrastructure will be prescribed by the final site as selected and will comply with the requirements of the Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 as published in Government Notice R632 in Government Gazette 39020 dated 24 July 2015. The design of the new Return Water Dams (RWDs) will be compliant with the Requirements of GN704.

6.1.5. The technology to be used in the activity

EPOCH was appointed to design the liner system for the proposed residue stockpiles (WRDs, RoM and Product). The material classified as Type 3 waste due to the inherent geology of the material and the leachable concentrations did not exceed the LC0 Values. The decision was thus taken to motivate the use of a Class D liner as the material will be deposited dry and the area is classified as a semi-desert.

The final design report was not available during the public participation process, but will be included as an appendix in Appendix 6: Specialist reports.

6.1.6. The operational aspects of the activity

Macarthy is an operational mine and will remain such until the ore resources are depleted or not financially viable to mine or not possible to mine with current technology.

6.1.7. The option of not implementing the activity

Macarthy Mine is an operational mine and thus provides much needed employment in the area. The no-go alternative is thus not an option.

The no-go option refers to the alternative of the proposed expansion of the opencasts, WRD and other supporting infrastructure not going ahead at all. This alternative will avoid potentially positive and negative impacts on the environmental condition of the area where the residue deposit will be constructed.

As indicated the applicant has almost depleted existing resources and will rely on the three proposed opencasts in order to extend the Life of the mine (LoM).

7. 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. Summary of issues raised by I&APs

The following process was undertaken to facilitate the public participation process for the proposed EMPr amendment project thus far.

7.1. Newspaper Advertisement

An advertisement notifying the public of the environmental authorisation application as well as the process to be followed: and requesting Interested and Affected Parties (I&APs) to register their comments with Prescali was placed within the local newspaper(s) in accordance with Regulation 41 (2) (c) and (d) of the EIA Regulation of 2014. The newspaper advertisements were placed as follows:

- Kathu Gazette- **21 November 2020**; and
- Noordkaap Bulletin- **26 November 2020.**

7.2. Site Notices and Background Information Document distribution

In order to inform the surrounding communities and adjacent landowners of the proposed development, notice boards and Background Information Document (BID) (in accordance with regulation 41 (2) (c) of the EIA Regulations) were provided at key locations surrounding the project site and within the project area on the **21st September 2020**.

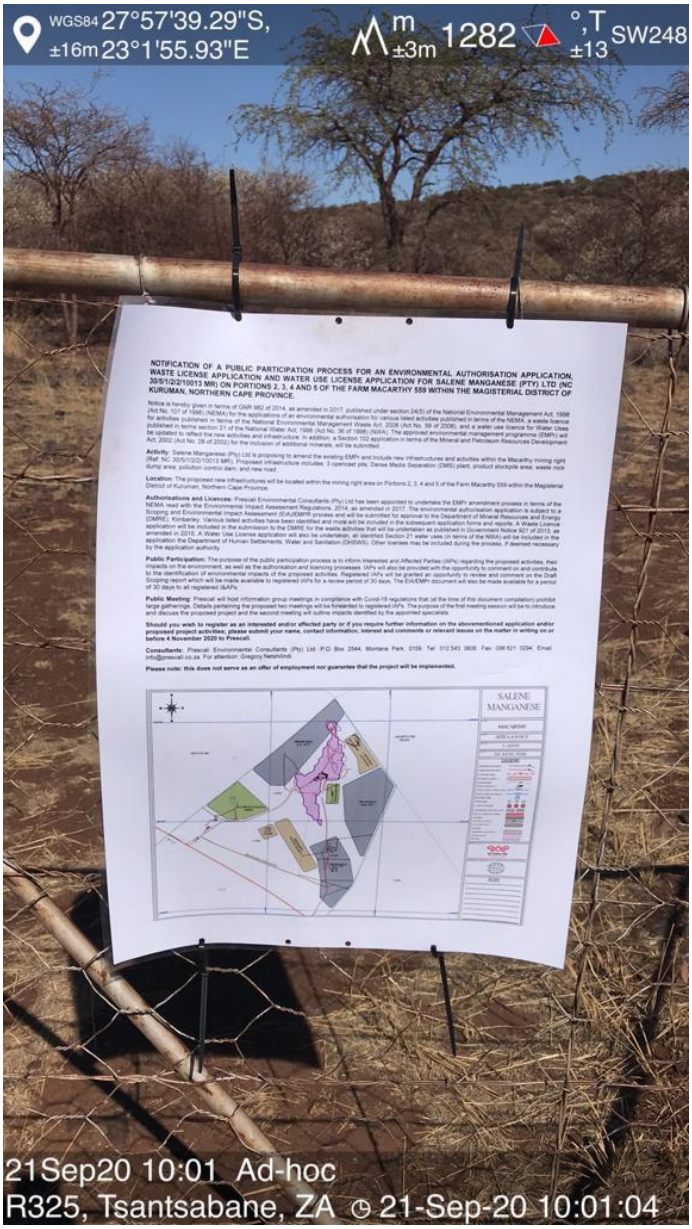


Figure 7-1: Macarthy EMPr Amendment Site Notice

The purpose of a BID was to provide stakeholders with introductory information on the Salene Manganese EMPr amendment project, the Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP) being undertaken and the stakeholder engagement process. The BID also provided stakeholders who are interested in the project with the opportunity to register as interested and affected parties (IAPs) by way of requesting and completing the registration sheet distributed with the BID. Information on the registration sheet has been used to register IAPs on a database to receive all project-related information and invitations to meetings. The registration sheet included a section for comments and issues, which allows IAPs an opportunity to provide the consultants with written comments and feedback.

7.3. Direct Notification of Identified I&APs

Consultation BIDs were distributed at the following sites informing IAPs about the Salene EMPr Amendment Project on 18 January 2021:

- Ward Councillor;
- Land owners; and
- Government Departments.

Government authority consultation was undertaken from **January 2021** as part of the consultation process with I&APs. The following authorities were consulted:

- Northern Cape Department of Agriculture, Environmental Affairs, Land Reform and Rural Development;
- Department of Water and Sanitation (DWS);
- Tsantsabane Local Municipality;
- Department of Agriculture, Forestry and Fisheries (DAFF)
- Northern Cape Department of Mineral Resource;
- Rural Development and Land Reform (RDLR);
- South African Heritage Resource Agency (SAHRA); and
- Northern Cape Heritage Resource Authority.

7.4. Public Meetings

7.4.1. Scoping Phase

A public meeting in the form of an open day for the scoping phase was held on 15 April 2021 at Namakwari Lodge, Kathu. Comments and questions from the meeting are tabled in Table 7-1 . A second meeting will be held during the EIA phase and the dates will be confirmed with registered I&APs.

7.4.2. EIA Phase

This section will be updated in the Final document to reflect meetings held during September 2021 once draft document has been made available for comment. The public meeting is scheduled for 30 September 2021 (10h00 to 12h00) in Kathu.

7.5. Document Review

7.5.1. Draft Scoping Report

The EIA Regulations specify that the Draft Scoping Report (DSR) will be subjected to a public participation process of at least 30 days. A period of 30 days was made available for public comment on the DSR as part of the EIA process between 03 March 2021 and 15 April 2021.

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

- Electronic copies were made available via email and post;
- Hard copies of the report were also made available to DMRE, DWS, Department of Agriculture (Provincial), Department of Environmental Affairs (Provincial), Tsantsabane Local Municipality, District Municipality, Kathu Library and Postmasburg Library.

7.5.2. Draft EIA-EMPr

The draft EMPr will be made available for a period of 30 days (excluding public holidays) from 20 September 2021 to 22 October 2021 as follows:

- Electronic copies will be made available via email and post;
- Hard copies of the report were also made available to DMRE, DWS, DEAFF(Provincial), Tsantsabane Local Municipality, District Municipality, Northern Cape Heritage Agency, Kathu Library and Postmasburg Library.

7.6. Summary of the issues raised by the I&APs

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

Table 7-1: Issues and Responses (note this table will be updated following the EIA phase consultation)

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
	DVD Quality Mining (Pty) Ltd	2021/02/15	Good day Gregory, Please find the comment sheet as requested to register for a public participant with comments to be noted in the public participant proses. I'm an independent consultant for DVD Quality Mining (Pty) Ltd and acting on behalf of DVD and wants to state on behalf of DVD that DVD is strongly opposed to the granting of any rights on the same area where mining already takes place. DVD has gone to great lengths and it was a timeous and costly exercise to get the mining right approved and to start with mining activities. Any other prospecting or mining activities will have a direct impact on the mining approved by the DMR for this area and will ultimately lead to conflict situations. It is very important that entry to the mine should be arranged beforehand, at least one day in advance. Any person who wishes to enter the mine must have proper identification and be accompanied by a DVD mining employee at all times. The only entry that will be granted will be to take the sample and will only be granted for ONE day. This is as discussed during the virtual meeting held by Prescali Consultants on the 9th February with Gregory and myself present. Salene Manganese must take full responsibility for any person who enters the mining area and a letter stating such must be submitted in writing to DVD beforehand when the date of entry to the mine is anticipated. Induction at the mine will be a requisite	Good day Mienie. Please note that the proposed application is for Salene Manganese existing right (NC 30/1/2/2/10013 MR) mining right amendment and not the for the prospecting right consultation. DVD mining has been identified as a neighbouring interested and affected party in this application. I have noted that comments below relate to the prospecting application and will take note of them and include them in the final Basic Assessment Report.	Finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
			to entrance to the mine. Furthermore, any other prospecting methods to be undertaken will not be allowed under this application. Should Salene Manganese progress to other methods of prospecting or mining, they will have to undergo all the environmental and social assessments required by NEMA and MPRDA for a prospecting or mining right application irrespective of the area under question. DVD must be involved in all public participation processes for any further prospecting or mining activities.		
			DVD Quality Mining will strongly oppose the application or granting of any rights for the same area where we have the mining right. Any other mining activities/prospecting activities will have a direct impact on our day to day mining. Interaction with TMMS will take place because of the following: access roads will be shared as will as other access points and ablution facilities, Environmental Impact with border mining will have an effect on our environmental management plan, no fencing will separate the different mine working areas. No fencing will separate the different working areas, water usage will be a problem, if any other boreholes are drilled it will have an effect on our boreholes and water supply, we commit to comply with our SLP we as DVD Quality mining will also be put in bad faith as it would be considered as a joint venture. Who will be responsible for the access control, shared rads and other infrastructure?. Covid-19 protocol is a priority for us as Boskop, it will not be possible to keep different mining companies work force apart and can lead to conflict situations on the mine. Compliances and responsibilities have to be clearly defined.	Good day Jaco Please note that the proposed application is for Salene Manganese existing right (NC 30/1/2/2/10013 MR) mining right amendment and not the for the prospecting right consultation. DVD mining has been identified as a neighbouring interested and affected party in this application. I have noted that comments below relate to the prospecting application and will take note of them and include them in the final Basic Assessment Report. Regards	Finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
			Criminal activities are a possibility and may occur between different work forces. Sample results must be made available to DVD Quality mining for the commodities applied for. DVD Q quality Mining must be involved in all public participation process for any other prospecting or mining activities planned for the future		
Elsaine Costerus Mohr	Morokwa Manganese Mine_ Morokwa 672_ Portion 2	2021/03/09	Morokwa Manganese Mine (Pty) Ltd ("our client") does not object to the Section 102 application submitted by Salene Manganese (Pty) Ltd ("Salene"), for the amendment of its current mining right held under reference number NC 30/5/1/2/2/10013 MR, which mining right area is situated on the farm Macarthy 559. However, our client would like to place on record that it has noted the minerals to be added to the existing mining right is similar to the minerals applied for in the prospecting right application also submitted by Salene under reference number NC 30/5/1/1/2/12630 PR, which application our client objected to. It is therefore clear from this Section 102 application, as our client suspected, that it is indeed the intention of Salene to eventually apply for a mining right over the prospecting right area applied for, which area stretches over 34 properties, including our client's mining right area on the farm Morokwa 672. We are therefore of the opinion that the prospecting right application (without bulk sampling) is a misrepresentation of the intentions of Salene, to which application our client will further object and/or appeal to. Our client's rights remain reserved.	It is correct that the minerals applied for in the Section 102 application are the same as the ones applied for in the prospecting right application. Your comments have been noted, however, this particular application is for the EMPr amendment and S. 102 application and we cannot make any further comments on other applications by Salene Manganese.	Finalised
Rodney Kotze	Macarthy 559 _ Portion_ 03	2021/03/31	As landowner and affected party i will appreciate if Salene will involve my SMME company in these developments. The community of this portion also want to benefit from the activity's on this portion.	The email was forwarded to the applicant for an official response.	Not finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
Alexia Hlengani	Department of Water and Sanitation	2021/03/03		Good day Hlengani As the Department of Water and Sanitation and registered Interested and Affected Party we are mandated to send you all relevant documentation regarding the proposed developments described below. Salene Manganese (Pty) Ltd proposes an amendment of the Environmental Management Programme and Section 102 application on their existing Macarthy mining area. The proposed additional infrastructure: 3 opencast pits (1 iron ore and 2 manganese ore); crushing and screening plant; waste rock dump; access road; water storage reservoir; manganese static plant; new workshop area; topsoil dump; sub- station; container office; container onboarding facility; and storm water infrastructure. Prescali Environmental Consultants has compiled a draft scoping report for the proposed development which has a 30-day commenting period starting from today (03 March 2021- 09 April 2021) excluding public holidays. Please find attached report and send us comments on or before 09 April 2021. https://www.dropbox.com/sh/q4ox9beqzutij7m/AABSDUiQYc2h-onQFtu86h6-a?dl=0 Please also find link above with all appendices to the attached report for further reference. Due to the uncertainty with regards to COVID-19 regulations open days will be proposed in due	Not finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
				course: Please forward all correspondence with regards to this consultation process to: Email: info@prescali.co.za or fax: 0866210294 Attention: Mr Gregory Netshilindi Reference: Salene Manganese (NC 30/5/1/2/2/10013 MR)	
		2021/04/12		Good day Hlengani A. Please note that commenting period for the Draft Scoping Report has been extended to the 15th of April 2021. Regards	
			Kindly resend it again since I have not been in the office for two weeks	Please see attached report and link below with all the appendices. Regards Gregory Netshilindi	
			Good day Gregory Kindly note that Kuruman falls under Lower Vaal not Orange. Ms. Lerato, kindly assist on the attached documents. Regards Alexia		
Dion van Dyk and Jaco Breedt	DVD Quality Mining	2021/04/15	No comments or objections from DVD Quality Mining regarding the proposed mine expansion and Section 102 Application	Mr Gregory Netshilindi gave a brief introductory presentation regarding the proposed project.	Finalised
				Mr Gregory Netshilindi gave a brief introductory presentation regarding the proposed project.	
Rodney Kotze	Macarthy 559_ Portion 3	2021/04/15		Mr Cobus Gouws gave a brief introductory presentation regarding the proposed project.	Not finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
			No comments from the Mr Kotze on the project just a follow up question on the email sent on the 31st March 2021 regarding the involvement of SMMEs in the proposed project	The email was forwarded to the applicant for an official response.	
Zoom Meeting	Izak	2021/04/15	Groundwater abstraction- No mention in the report on the impact that it could have on Kolomela operations and surrounding stakeholders- no possible impacts addressed- what monitoring has been done? What data has been compile	This is a scoping phase and no specific mention of the impacts on groundwater, however in the EIA Phase ground water impact assessment will be conducted and impacts, recommendations including monitoring requirements will be included in the reports.	Finalised
			There needs to be mention of the impacts on groundwater to surrounding mines and other landowners	This will be included in the Final Scoping report	
			Blasting and Vibration impacts	Yes there is a specialist that has been appointed for blasting and vibration	
	Mienie		Conducted any traffic impact assessment since DVD had to conduct an assessment because the entrance was on an incline.	No Traffic Impact study will be conducted for this application	
			Can the mine look into conducting an impact assessment dealing with the increased traffic?	Jan/Applicant: We had a discussion with Deon earlier, there will be no impact on the traffic as the existing entrance will be used.	
			Impact on the water and groundwater to the surrounding mines if the specialist groundwater Impact assessment report can be circulated to all parties	The groundwater impact assessment report will be included in the EIA/EMPr report and will be sent to everyone for comments	
	Izak		Water quality studies be conducted as part of the study	Yes there is a specialist that has been appointed for blasting and vibration	
			Air quality: not much information is given on the scoping report,	The following specialist studies will be conducted: Air Quality, Visual Impact, Fauna and Flora, Aquatic assessment, Blasting and Vibration, Noise Geohydrology, Waste classification, Soil and land capability ,Socio-Economic, Heritage, Palaeontological assessment.	
			Infrastructure on the proposed development- not much detail provided so not much information and as	Appendix 4 shows the proposed layout infrastructure and section 3 of the report details	

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
			an interested and affected party it is difficult to comment	the proposed additional infrastructure. Page 6-8 details the proposed infrastructure.	
			Scope of assessment for the specialist studies	We can send through the scope of the specialist studies	
			Kolomela was only made aware of the application on the 29th of March 2021 to company representatives whereas the report was made available on the 03rd of March 2021, is there any reason Kolomela received this report later?	The report was made available to all registered interested and affected parties on the 03rd of March 2021, all other affected parties where then identified later on and where then sent the report, so if you did register earlier during our call for registration the report would have been sent through. The adjacent land owners were then sent during the commenting phase.	
			The only comment is on the scope of the specialist, Kolomela would like to have a look at that because it does have an impact on our operation	The scope of work for the specialist has been described in pages 55-58 of the scoping report.	
			We are looking for a more detailed scope of work for specific specialist because the scope on the Scoping report is very generic.	The scope of work for the specialist will then be presented in the EIA/EMPR when it becomes available.	
	Mienie		How many people will be employed? Will there be any employees who will be staying on the farm?	Jan: At this point in time this will be a small operation involving about 100-150 people from surrounding municipalities such as Tsantsabane and Gamagara municipality. Most of the people will stay close to Postmasburg, Olifantshoek, Kathu and the Maramane community. They will not stay on site, they will commute from various areas using normal mini-buses and taxis	
			Can you share this presentation together with the minutes for ease of reference	The presentation will be shared with everyone.	
Leon Venter	Macarthy 559_ Portion _4	2021/04/19	Hi Gregory My apologies for only replying now. I don't have any major concerned, had a discussion With Jan regarding the waste dump that are crossing the farms fence lines, in future this will have to be rehabilitated that a new fence can be constructed	Thank you, your comment regarding the waste dump will be considered.	Finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
			and a road next to the fence or alternatively move the dump to fall in one farm or create two separate dump one on each farms. Regards Leon		
DMRE-	Johannes Nematatani	2021/04/19	Upon receiving the presentation and application forms we see the need for a site inspection that will be discussed with you at a later stage	Please let me know the date of the site inspection so that I can communicate with the applicant	Finalised
			Do you know how much was paid as the application fees?	Yes! on the EA application form annexures there is a standard bank proof of payment showing a payment of R 15 000. The EA Form together with the proof of payment will be submitted in the final Scoping Report.	
	Kgaudi Shapo		Please clarify on the final scoping report how the additional minerals will affect the current processing and beneficiation plants on site. Indicate whether all the additional minerals will be processed in the same processing plant or if there will be a need for other special plants to be used for processing	A description will be given on the Final Scoping report regarding the additional minerals and how they will be processed.	Finalised
	Johannes Nematatani		On the EA forms there are some activities that have note specified the areal extent, do you now have the final areal extent of all the activities?	At this stage the areal extent of some of the activities have not been finalised. The EIAR/EMPr report will have all the final aerial extent of all the activities.	Finalised
			On the EIAR/EMPR report please confirm all the sizes and send an addendum on the SAMRAD system as well .	Noted	Finalised
			Please note that on the Section 102 application the department is still confirming all the minerals if they are available or if there are existing rights by other mining companies on those minerals. The department will send a letter confirming if all the minerals applied are available for Salene to mine	Noted we will await the confirmation from the department.	Finalised
	Kgaudi Shapo		In conclusion, we will communicate with you the date of the site visit once we receive the Final Scoping	Thank you we will await for your confirmation on the site visit.	Finalised

Name	Property/ Organisation	Date	Comment	Response	Consultation Status
			report in order to confirm all the proposed activities on the ground		

8. THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES – BASELINE ENVIRONMENT

8.1. Type of Environment Affected by the Proposed Activity.

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

8.2. Regional Location

The Macarthy Mining area is located within the ZF Mgcavu District Municipality and the Tsantsabane Local Municipality (Figure 8-1), Ward 6.

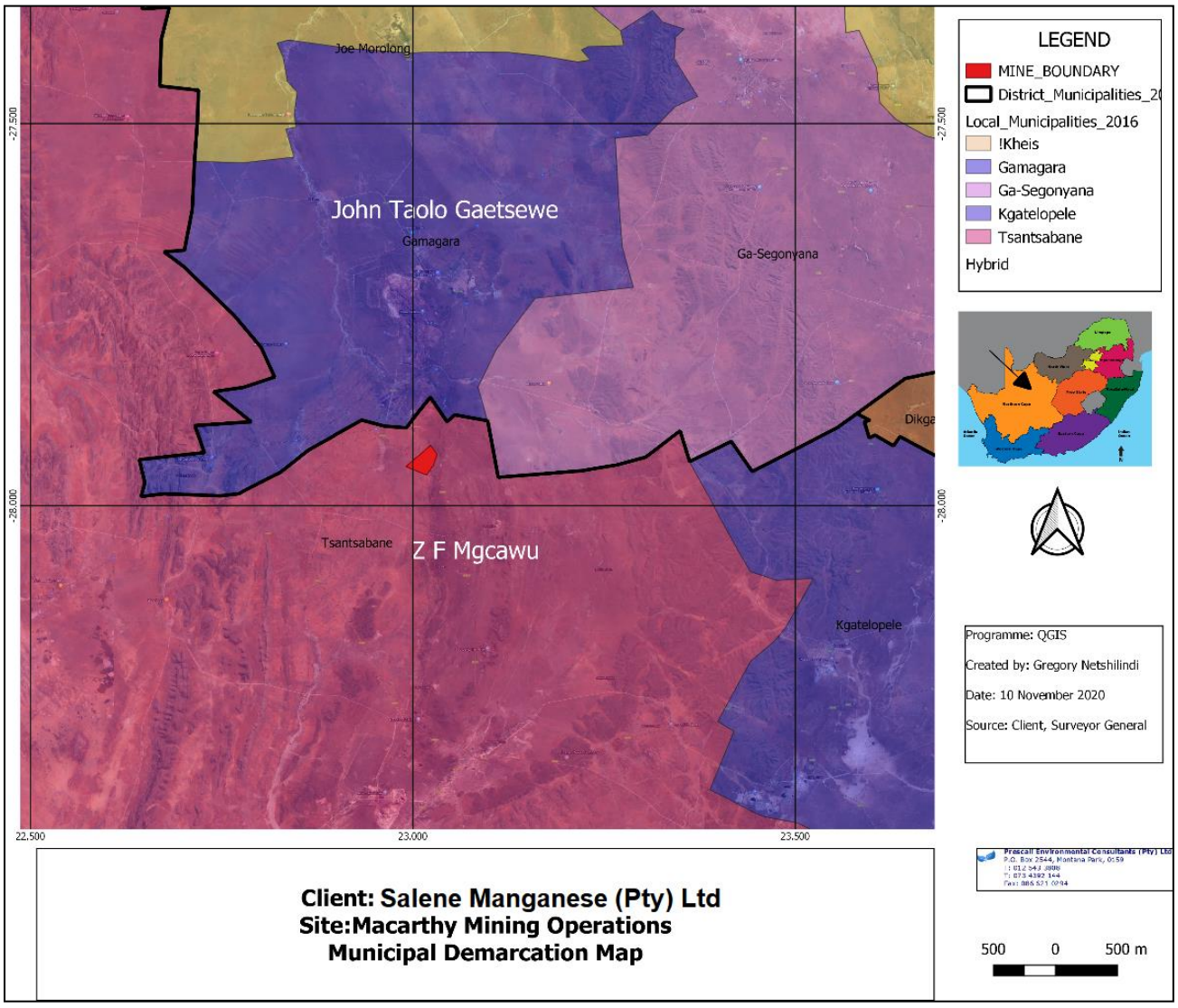


Figure 8-1: Location within District and Local Municipality boundaries

8.3. Climate

8.3.1. Regional climate

The climate in Postmasburg is referred to as a local steppe climate and the Köppen-Geiger climate classification is BSh[1].The climate of the Sishen area is described to be semi-arid with a mean annual precipitation of 349 mm. This tends to fall in summer and early autumn. Temperatures vary between -7.3 °C and +40 °C, with an average of 19.2° C (Thari, 2012). Climate data from 1982 - 2020[1] indicates an averages temperature of 18.6 +°C, minimum, average and maximum temperatures are indicated in Figure 8-2.

[1] https://en.climate-data.org/africa/south-africa/northern-cape/postmasburg-26833/ 27 May 2020

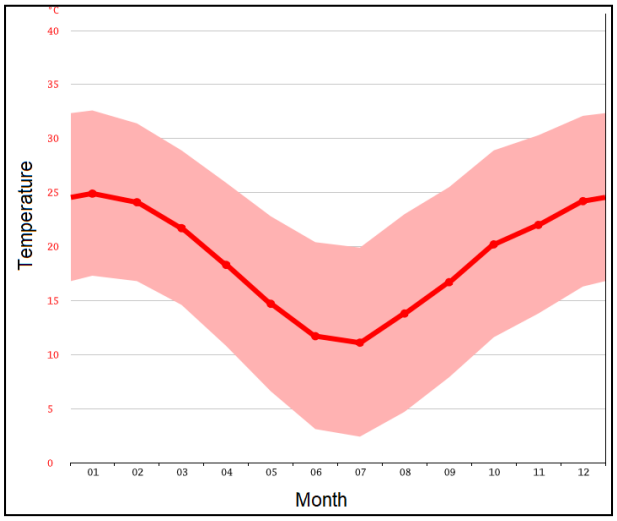


Figure 8-2: Temperature graph[1]

8.3.2. Rainfall

Rainfall records extending a period of 40 years for the Sishen Weather Station (Station No. 0356857AX) show that the mean annual precipitation (MAP) is 349 mm. The majority of rain falls in the late summer months of January, February and March, whilst the lowest rainfall records are recorded for the months of June, July and August. Rainfall tends to vary widely over the years as typical of most arid and semi-arid climates. The mean monthly rainfall figures in mm for Sishen and Postmasburg[1] are presented in Table 8-1. This is similar to the Mean Annual Precipitation as indicated in Figure 8-3.

Table 8-1: Rainfall as recorded

Rainfall	Sishen			Postmasburg
	Average	Minimum	Maximum	Average
Total	349	105	1086	342
January	70	0	418	51
February	56	0	291	60
March	62	0	275	65
April	33	0	130	40
May	12	0	101	12
June	6	0	79	9
July	2	0	18	4
August	3	0	51	5
September	8	0	51	7
October	23	0	91	23
November	31	0	132	26
December	55	0	276	40

8.3.3. Evaporation

The average annual evaporation rate (as reported at the Sishen Weather Station) in the region is 2 026 mm a year, which is more than 5 times greater than the MAP (i.e. 349 mm/year) (Thari, 2012). Annual A-Pan evaporation is recoded as > 2 600 mm (Figure 8-4).

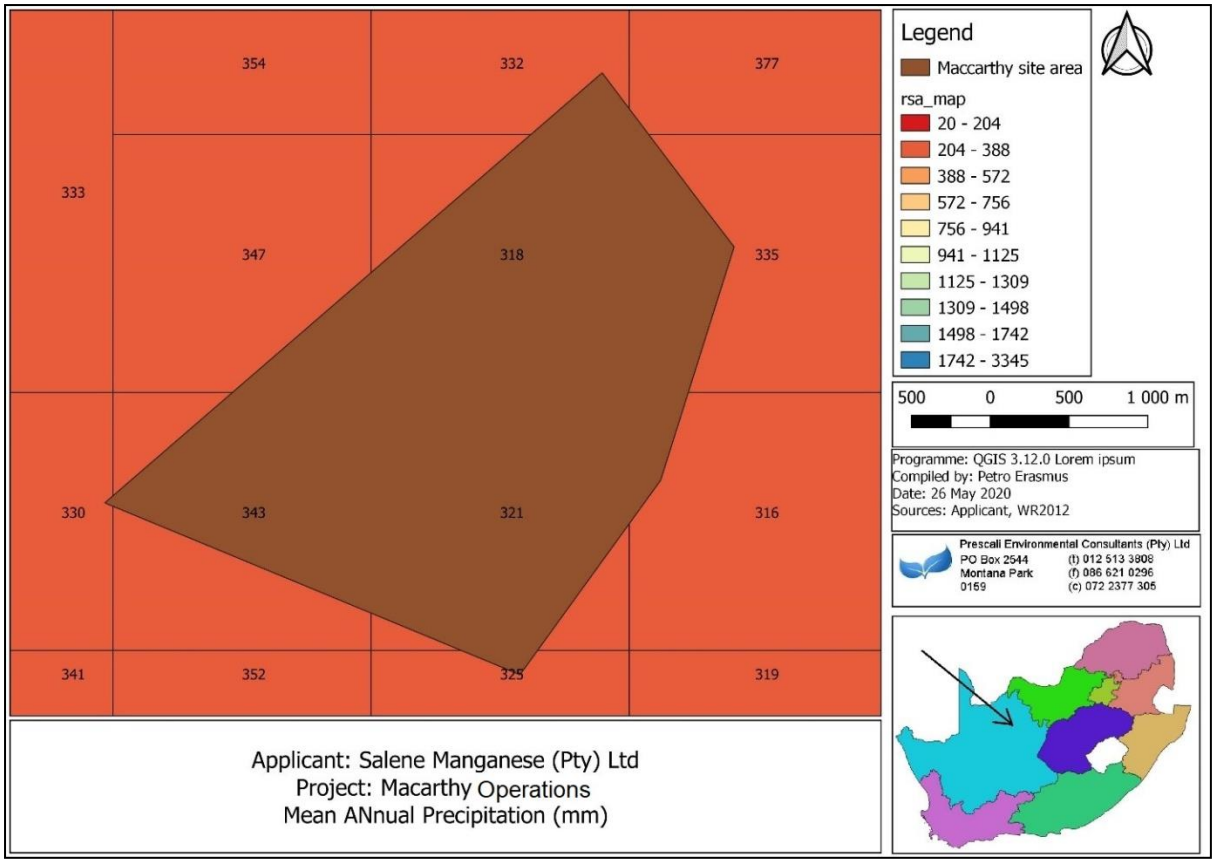


Figure 8-3: Mean annual Precipitation (MAP)

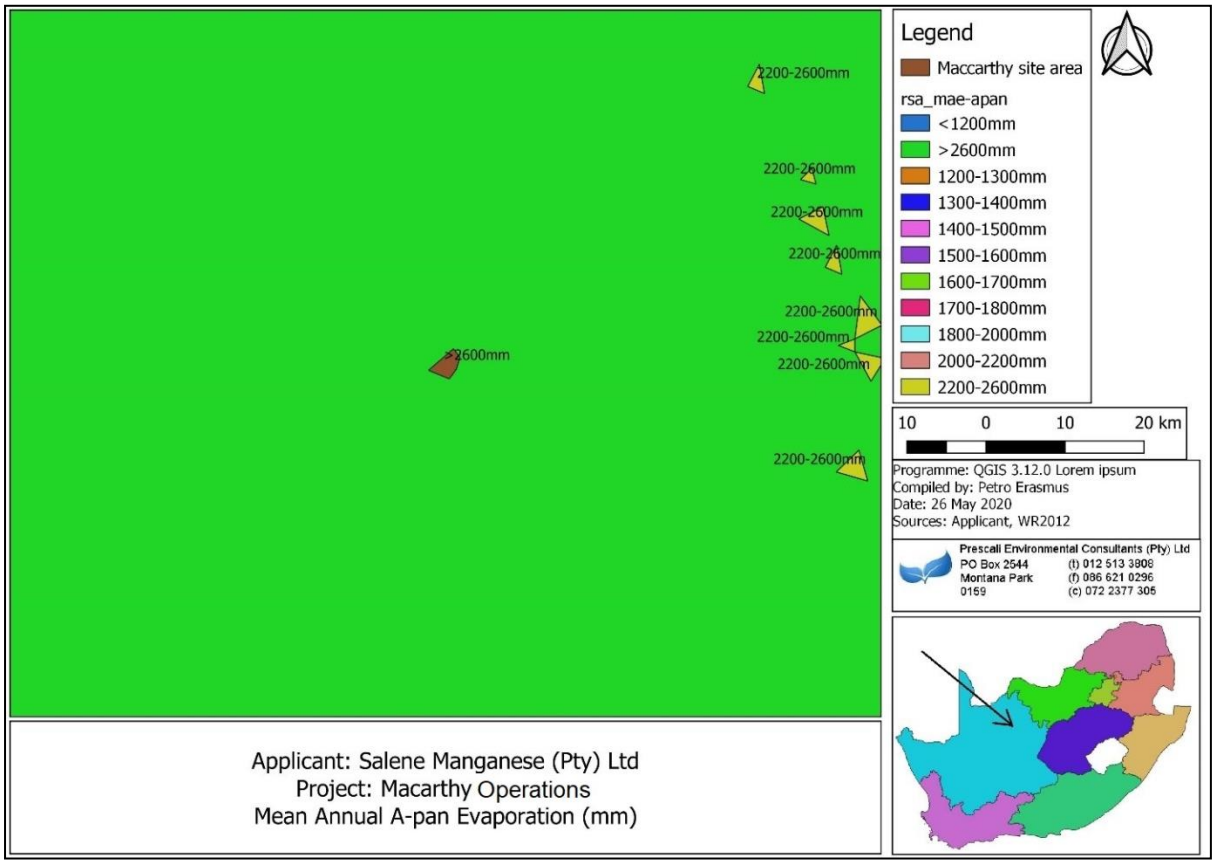


Figure 8-4: Mean annual A-pan evaporation

8.3.4. Wind

The most commonly occurring wind direction for Kathu (period extending 1993 to 2001) is SSE where the wind velocity is 3.0 m/s. Commonly the wind speed fluctuates between 1.6 m/s and 3.5 m/s although speeds in the range 3.6 m/s to 5.5 m/s are regularly recorded (Thari, 2012). A wind rose indicating wind direction and speed is indicated in Figure 8-5[2].

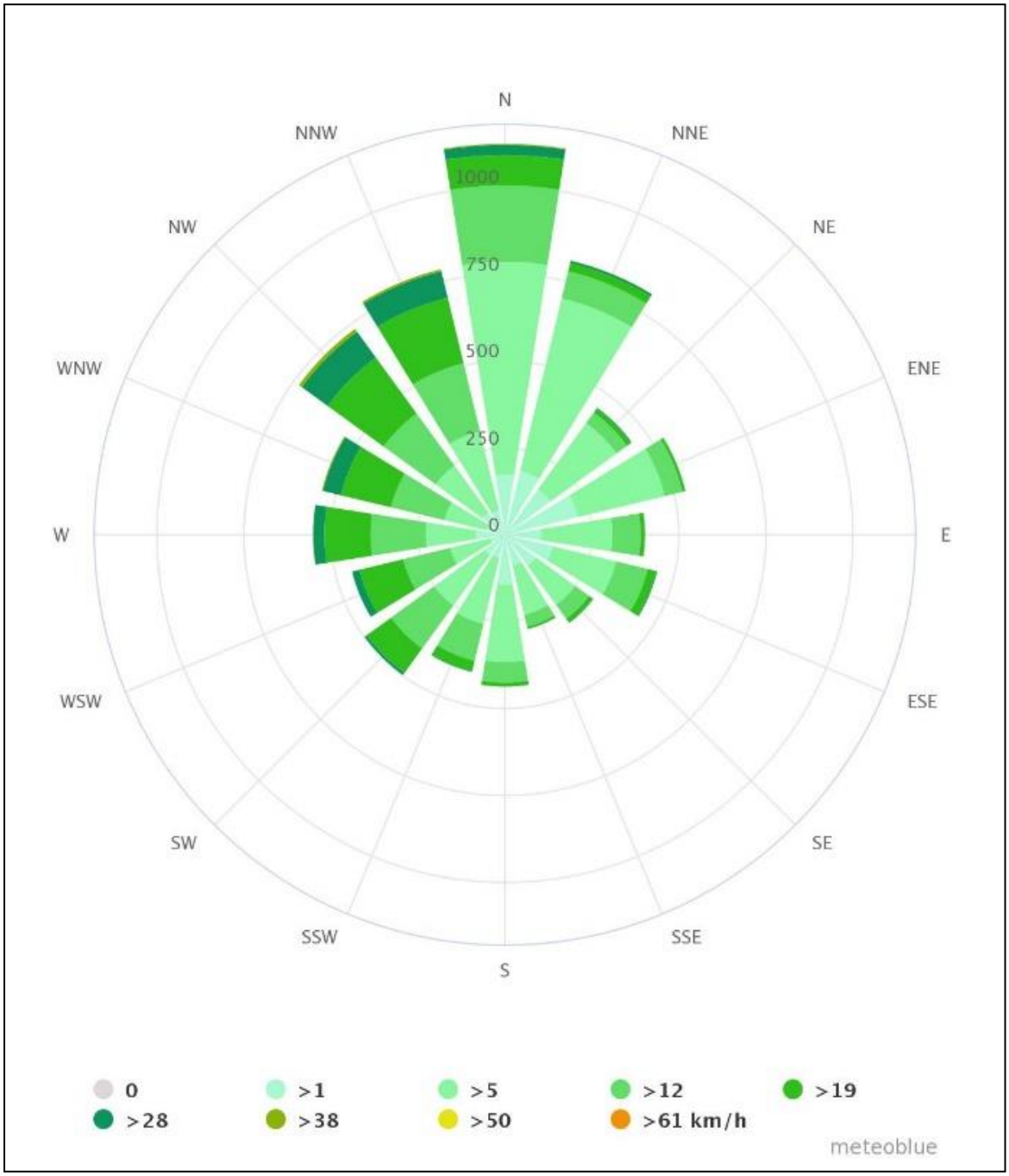


Figure 8-5: Wind rose for Postmasburg

8.4. Topography

Topography applicable to the Macarthy area is indicated in Figure 8-6. From the contour lines it can be seen that the northern and eastern areas are elevated. The northern side contours range from 1 260 meter above mean sea level (mamsl) to1 360 mamsl while from the eastern side they range between 1 260 and 1 280 mamsl.

[2] https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/postmasburg_south-africa_964363 27 May 2020

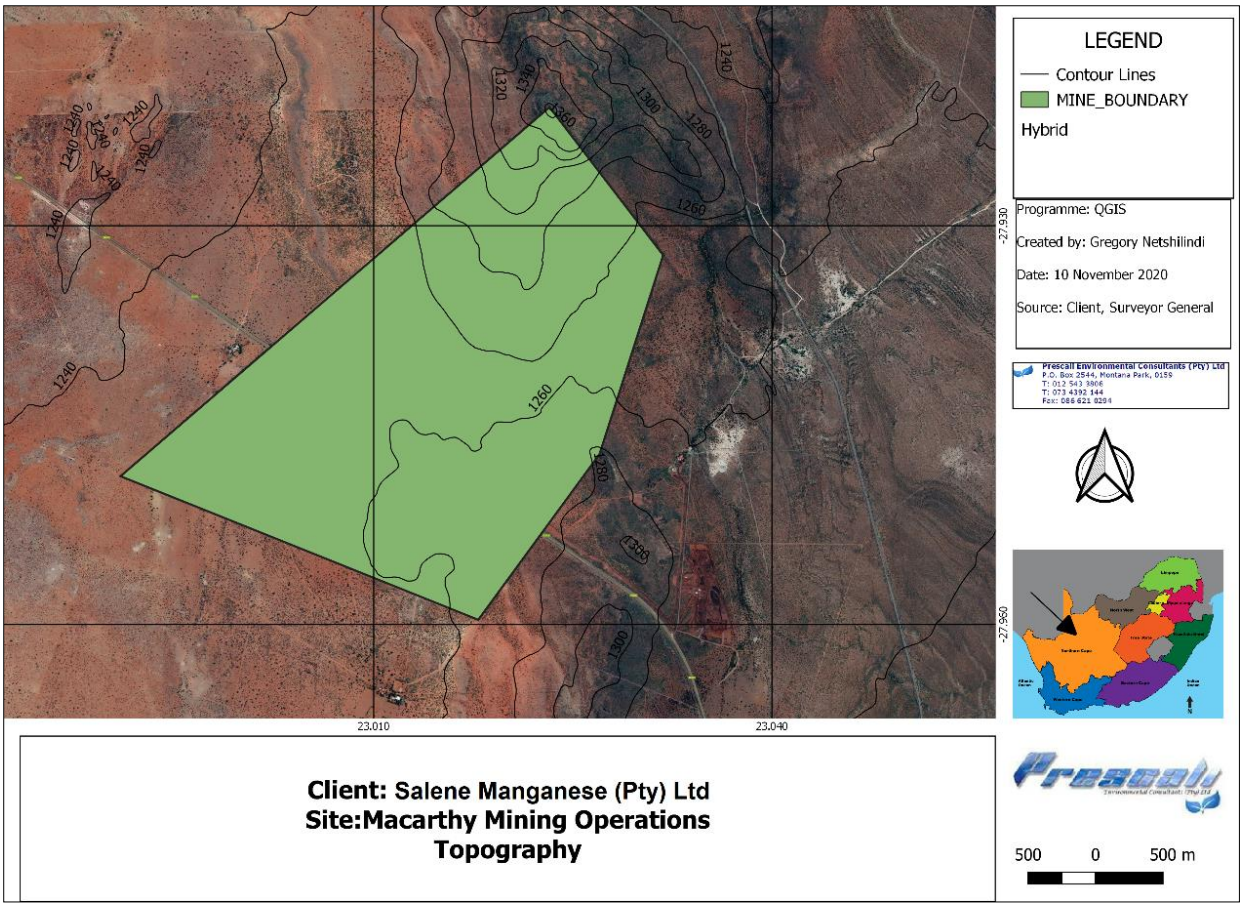


Figure 8-6 : Topography of Macarthy Mining Right Area

8.5. Geology

The regional geology is shown in Figure 8-7 and Figure 8-8 below. Figure 8-9 indicates site specific geology.

8.5.1. Regional Geology

Iron ore in the wider project area is preserved in chemical and clastic sediments of the Proterozoic Transvaal Supergroup. These sediments define the western margin of the Kaapvaal Craton in the Northern Cape Province. The stratigraphy has been deformed by thrusting from the west and has also undergone extensive karstification. The thrusting has produced a series of open, north south plunging, anticlines, synclines and grabens. Karstification has been responsible for the development of deep sinkholes. The iron ore in the project area has been preserved from erosion as low hills due to high hardness. The iron ore deposits that are actively mined in the area are all located on the Maremane anticline structure.

The Transvaal Supergroup lithologies have been deposited on a basement of Archaean granite gneisses and greenstones, and/or lavas of the Ventersdorp Supergroup. In the Jenkins region, the oldest rocks of the Transvaal Supergroup form a carbonate platform sequence (dolomites with minor limestone, chert and shale) known as the Campbell Rand Subgroup. The upper part of the Transvaal Supergroup comprises a banded iron formation unit, the Asbestos Hills Subgroup, which has been conformably deposited on carbonates of the Campbell Rand Subgroup. The upper portion of the banded iron formations has in places been supergene-enriched to ore grade, i.e. Fe ³ 60%. The ores found within this Subgroup comprise the bulk of the higher-grade iron ores in the region. An altered, intrusive sill (originally of gabbroic composition) usually separates the ore bodies from the underlying host iron formation. It intruded into the Transvaal Supergroup in late Proterozoic times. A thick sequence of younger clastic sediments (shale's, quartzite's and conglomerates) belonging to the Gamagara Subgroup unconformably overlies the banded iron formations. Some of the conglomerates consist almost entirely of hematite and are of lower-grade ore quality.

The unconformity separating the iron formations from the overlying clastic sediments represents a period of folding, uplift and erosion. At the time, dissolution and karstification took place in the upper dolomitic units. A

residual dissolution breccia, referred to as the 'Manganese Marker' or 'Wolhaarkop Breccia', developed between the basal dolomites and overlying banded iron formations. This breccia is known to contain/yield vast volumes of groundwater. In places, deep sinkholes developed in the dolomites, into which the overlying iron formation and mineralized iron ore bodies collapsed. The sinkholes are considered to have resulted from a combination of folding and collapse of overlying iron-bearing strata. At Macarthy, however, the iron ore has been preserved through resistance to weathering and occurs as part of a low hill similar to adjacent deposits such as the Mokaning reserves of Assmang's Khumani Mine.

Diamictite of the Makganyene Formation and lava belonging to the Ongeluk Formation have been thrusted over the Gamagara sediments. It is now preserved only within the larger synclinal structures. A considerable portion of the upper parts of the stratigraphy have been eroded during Dwyka glaciation and re-deposited as tillite. The entire, folded sequence was later truncated by Tertiary erosion. A thick (10 to around 60 m) blanket of calcrete, dolocrete, clays and pebble layers belonging to the Kalahari Supergroup was unconformably deposited over the older lithologies.

8.5.2. Site Specific Geology

According to Moen *(Moen HFG, 1977 as cited by Synergistics Environmental Services, 2015)* the farm Macarthy is underlain by rocks of the Gamagara Subgroup (Vg), Asbestos Hills Subgroup as well as rocks of the Lime Acres Member of the Ghaap Plato Formation (Vgl) of the Campbell Rand Subgroup. The rocks of the Gamagara Subgroup underlie the eastern corner of the Jenkins farm. This subgroup consists of quartzites, conglomerates, flagstones and shales and constitutes the base of the Postmasburg Group. Lenticular basal conglomerates contain pebbles of jasper and banded iron stone and are completely ferruginised in places. The shales contain lenses of conglomerate and are also locally ferruginised or manganised. Ferruginous flagstone and white, purple and brown quartzites form the top of the Subgroup. Rocks of the Lime Acres Member of the Ghaap Plato Formation of the Campbell Rand Subgroup consist of dolomitic limestone with subordinate coarsely crystalline dolomite and chert with lenses of limestone. Stromatolitic puckered limestone consisting of alternating dark and light bands can be found. Lenticular bodies of limestone occurring in the dolomite are probably the result of irregular dolomitisation of the original limestone.

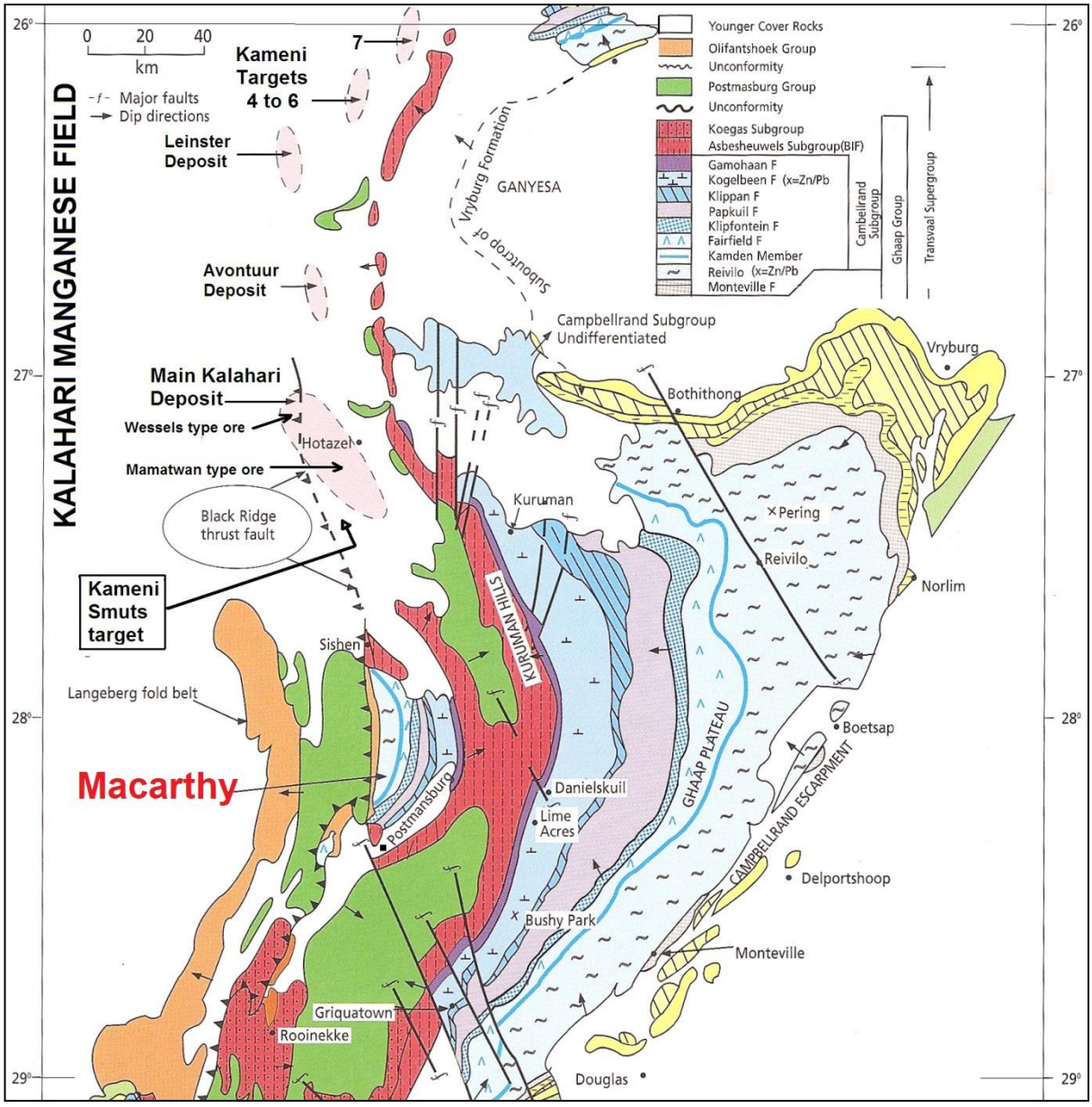


Figure 8-7: Simplified geology map of the Postmasburg and Kalahari manganese fields (Figure adapted from Cairncross *et al*, 1997 as cited in the Mine Works Plan)

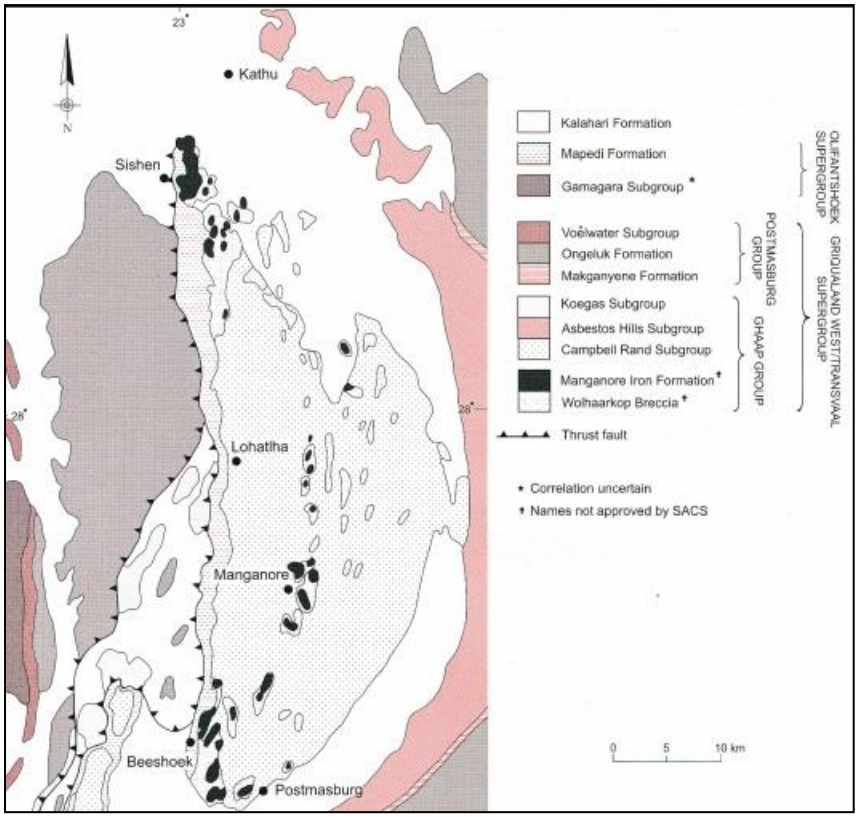


Figure 8-8: Regional geology and Structures of the Postmasburg Manganese Field indicating target zones (Manganore Iron Formation, Wolhaarkop Breccia and western edge of the Campbellrand Subgroup). (after Van Schalkwyk and Beukes 1986 as cited in the Mine Works plan)

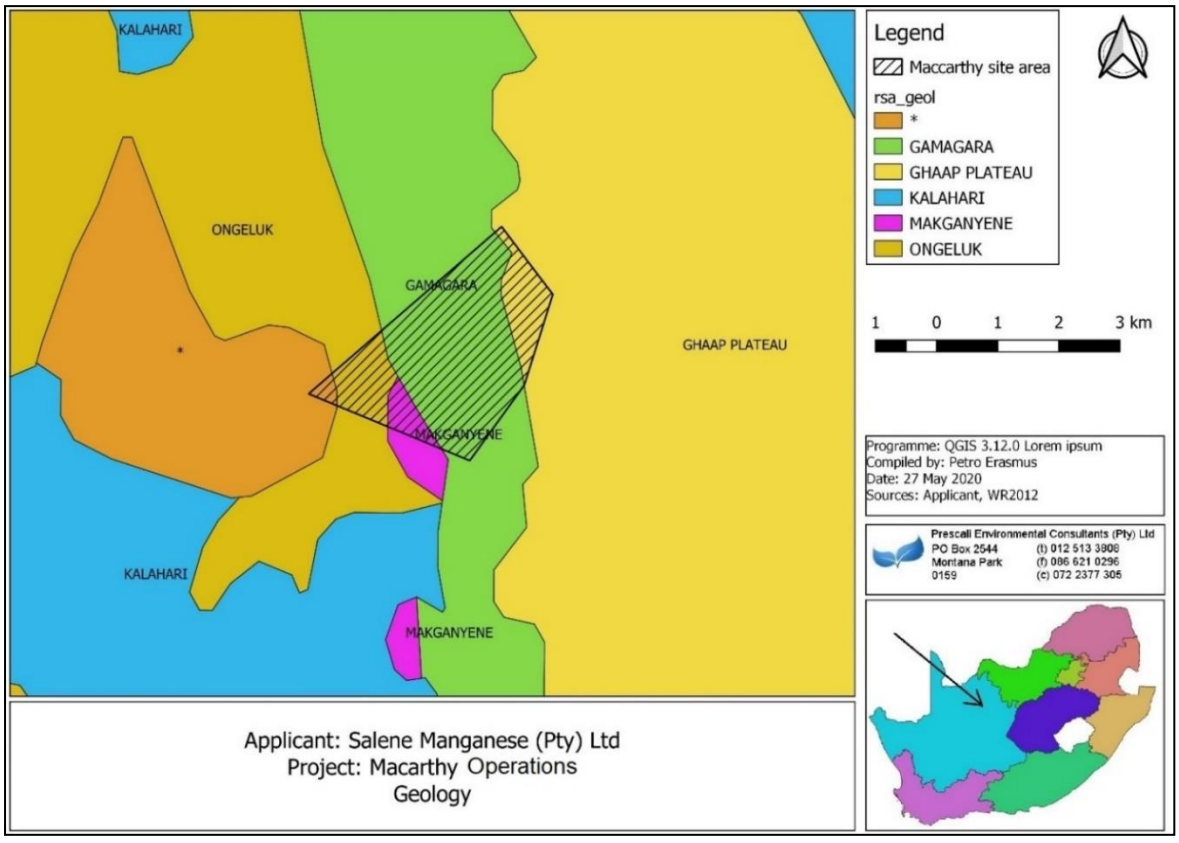


Figure 8-9: Site geology

8.6. Agricultural, Soil and Land Capability

A Soil and Agricultural Assessment was conducted for this project (Terra, 2021), the results of the site assessment are indicated below.

8.6.1. Soil classification

The study area includes ten different soil forms that have been grouped into eight different mapping units. The distribution of the soil forms are shown in Figure 8-10. Each of the soil forms and the approximate area covered by it, is discussed below.

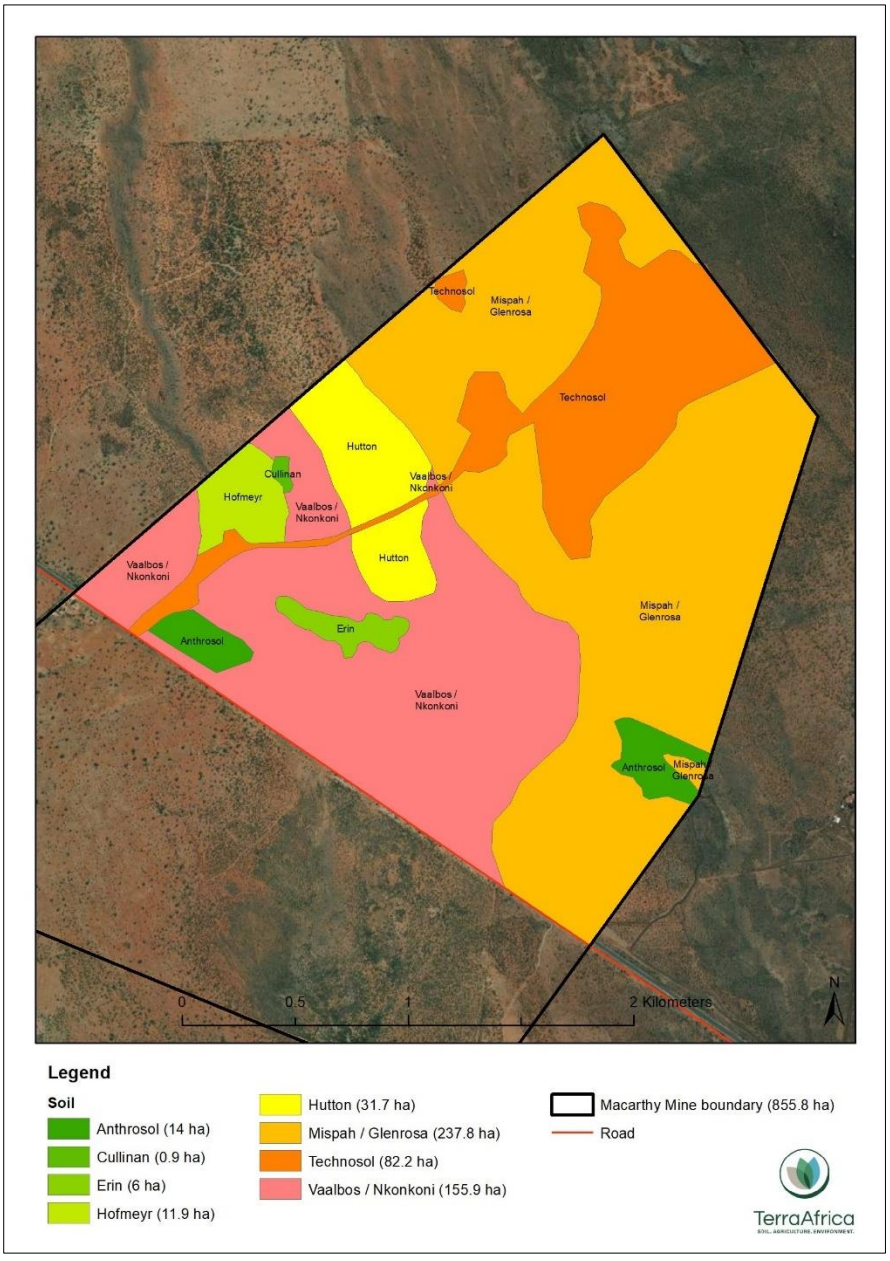


Figure 8-10: Soil classification map of the Macarthy project's study area

8.6.1.1. Anthropogenic soil groups

8.6.1.1.1. Anthrosols

Two areas with Anthrosols is present within the study area – one at the entrance gate where trucks and other vehicles are parking and the other is an area along the southern parts of the eastern study area boundary. The total area of Anthrosols is approximately 14 ha. The Anthrosol areas represent soils that have been compacted

and where surface layers have been removed but no significant excavations are presented and it does include transported materials.

8.6.1.1.2. Cullinan

A small area that seems to be an old quarry near the western boundary of the study area, has been classified as the Cullinan soil class. Areas classified as Cullinan are exposed excavations without backfilling. While eroded soil particles from other areas may move into these excavations through wind and water transport, the imported material has not developed significantly to fill the excavation. Within the study area, slight surface crusting is visible in the middle of the Cullinan area, an indication that water may collect in this area after rainfall (Figure 8-11).

Figure 8-11 Example of the Cullinan soil class within the study area

8.6.1.1.3. Technosol

An area of 82.2 ha has been classified as Technosol. These areas represent a range of anthropogenic disturbances and include excavations, ore stockpiling and crushing as well as imported materials such as the materials used on the road surface of the existing access road. No differentiation was made between the different classes of Technosols as they occur in close proximity and an area represent a combination of disturbances.

Figure 8-12: Evidence of an area with Technosols within the Macarthy study area

8.6.1.2. Natural Soil forms/groups

8.6.1.2.1. Erin

The Erin soil form is identified at 6 ha of land in the middle of the Vaalbos/Nkonkoni soil group. It consists of orthic topsoil that is underlain by two cutanic subsoil horizons. The horizon directly underneath the topsoil consists of a neocutanic horizon that increases in structure strength with soil depth. The pedocutanic horizon underneath the neocutanic horizon is found at 0.6m and deeper.

8.6.1.2.2. Hofmeyr

The Hofmeyr soil form borders on the northwestern boundary of the study area and consist of an orthic topsoil horizon that overlies a neocarbonate subsoil horizon. The neocarbonate horizon is underlain by hard carbonate at depths between 0.35 m and 0.55 m. The Hofmeyr soil form is present in an area of around 11.9 ha.

8.6.1.2.3. Hutton

The Hutton soil form has been identified at 31.7 ha of the study area. It consist of an orthic A horizon on a red apedal B horizon that is 1.5 m or deeper. The texture of the Hutton soils are dominated by the sand fraction. Some of the defining red soil colours identified on the sites are highly bleached (5YR 5/8), thus borderline red (Figure 8-13).

Figure 8-13: Example of the red colour of the apedal subsoil of the Hutton form

8.6.1.2.4. Mispah/Glenrosa

The northern and eastern part of the study area consists largely of the Mispah and Glenrosa soil forms that are grouped together. Both these soil forms have orthic topsoil but the Mispah form is underlain by rock (solid and fractured rock) while the Glenrosa form is underlain by a lithic horizon. The lithic horizon is a mixture of partly weathered and friable parent material to hard rock fragments (Soil Classification Working Group, 2018). The soil depths of this soil group range between very shallow (0.05 m) to shallow (0.35 m).

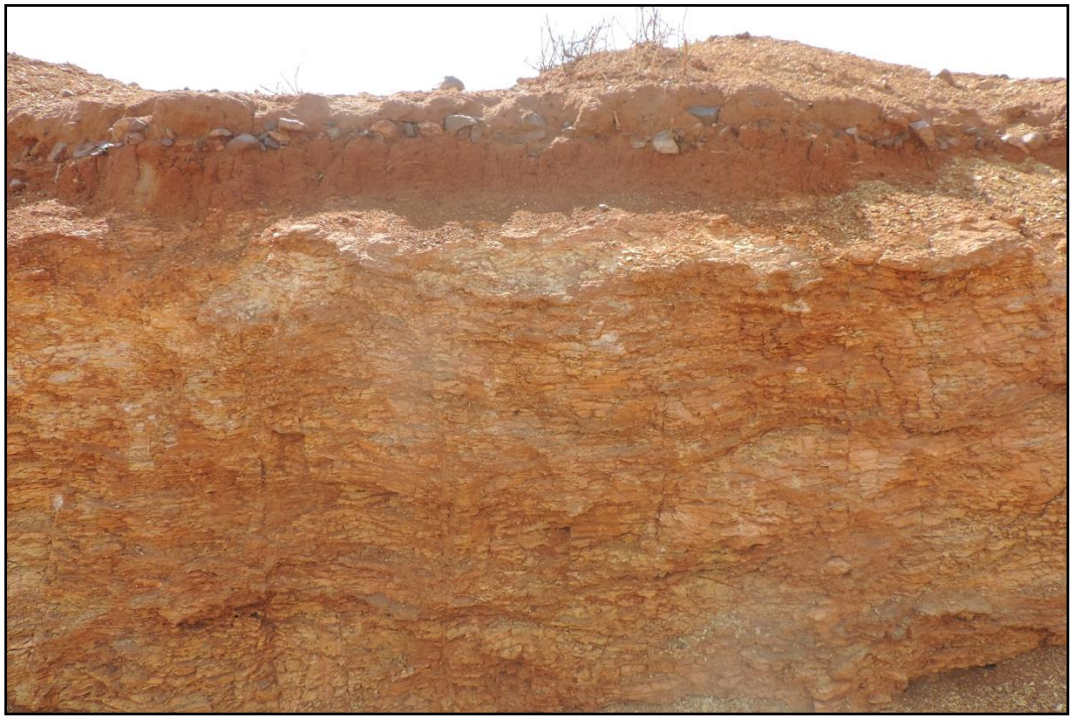


Figure 8-14 Glenrosa profile within the Macarthy study area

8.6.1.3. Soil chemical properties

The purpose of establishing baseline chemical composition of soil on a site before development commences, is to determine whether there is any deterioration in soil fertility and what the nutrient status of the soil is associated with the natural vegetation. The analyses results obtained from (Terra, 2021).

Sample 01 was collected from an Erin soil profile (between 0 m and 0.35 m), Sample 02 from the orthic topsoil and Sample 03 form the red apedal subsoil of the Hutton soil. Samples 04 and 05 were sampled from the Nkonkoni form.

The pH(H_2O) levels of the analysed soil samples reflect slight fluctuation between moderately acidic (5.79 at Sample 05) and neutral (7.04 at Sample 01). The electric conductivity of all the samples are very low, with the highest value (39 mS/m) measured in Sample 01. The plant-available phosphorus levels are low (11.7 mg/kg in Sample 01) to very low (0.6 mg/kg in Sample 06). Calcium is the dominant cation present in the plant-available cation levels determined. The calcium concentrations range between 173.8 mg/kg in Sample 01 to very high concentrations of 3746.7 mg/kg in Sample 01. The second-most dominant cation is potassium, ranging between 206.3 mg/kg in Sample 01 and 48.7 mg/kg in Sample 03.

Organic carbon concentrations are low in all the samples, ranging between 0.16% in Sample 03 to 0.95% in Sample 01. The texture of all the soil samples is dominated by the sand fraction, ranging between 75.0% and 95.8% sand with clay particle fractions ranging between 3.5 and 12.9%.

8.6.2. Land capability classification

Following the results of the soil classification survey as well as other site assessment observations such as the terrain and climate, the entire study area can be divided into two land capability classes i.e. 458.2 ha of grazing land capability and 82.2 ha of wilderness land capability. The current position of these land capability classes are depicted in Figure 8-15. The deeper soils of the Hutton could have had arable land capability and could also be suitable for irrigated crop production. Due to unfavourable climatic conditions and lack of irrigation water the land capability of these parts of the study area is that of extensive grazing.

The wilderness land capability classification has been assigned to the area where the Technosols are present. The soil profiles and vegetation of these areas have already been significantly affected by the existing mining activities and it is currently not suitable for livestock grazing.

8.6.3. Agricultural potential

During the site visit as well as through analysis of desktop data for the infrastructure expansion areas, it was found that the areas to be directly affected by the project infrastructure, is suitable for extensive livestock farming.

Therefore, the spatial data layer of the long-term grazing capacity of the area (DAFF, 2018 as cited by Terra), was used to determine the number of cattle that feed in the study area. The ideal grazing capacity of a specified area is an indication of the long-term production potential of the vegetation layer growing there to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)) with an average feed intake of 10 kg dry mass per day over the period of approximately a year.

Following the metadata layer obtained from DAFF, the grazing capacity of the entire Macarthy mining right area, is 14 ha/LSU (Figure 8-15). When using this grazing capacity, the mining right area of 855.8 ha can provide feed to 61 head of cattle. Within the study area of 540.4 ha, the area with Wilderness land capability (82.2 ha) is no longer considered suitable for livestock grazing. The remaining portion of the study area is 458.2 ha and this area can provide feed to 33 head of cattle.

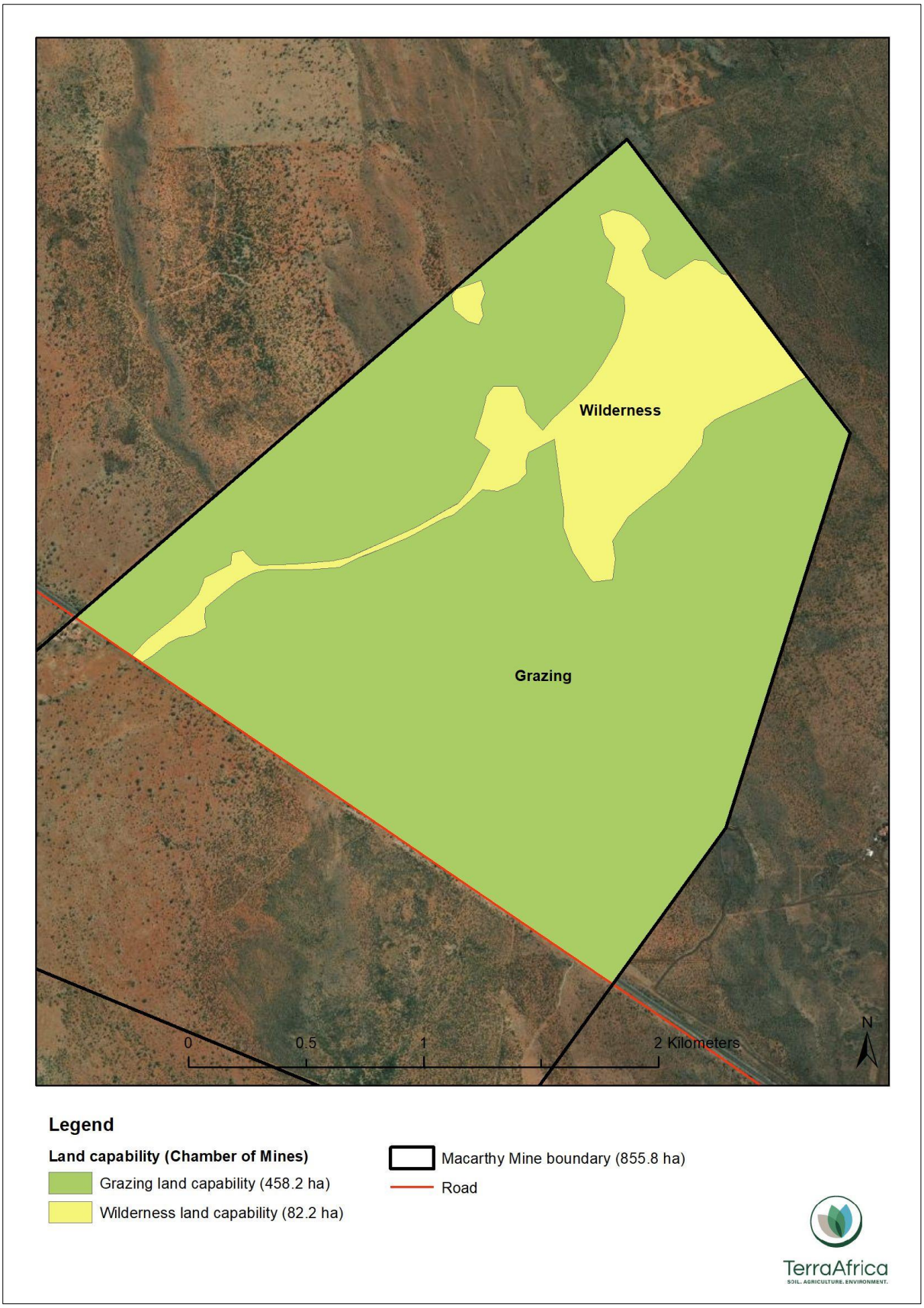


Figure 8-15: Land capability map of the study area according to the Chamber of Mines Classification System

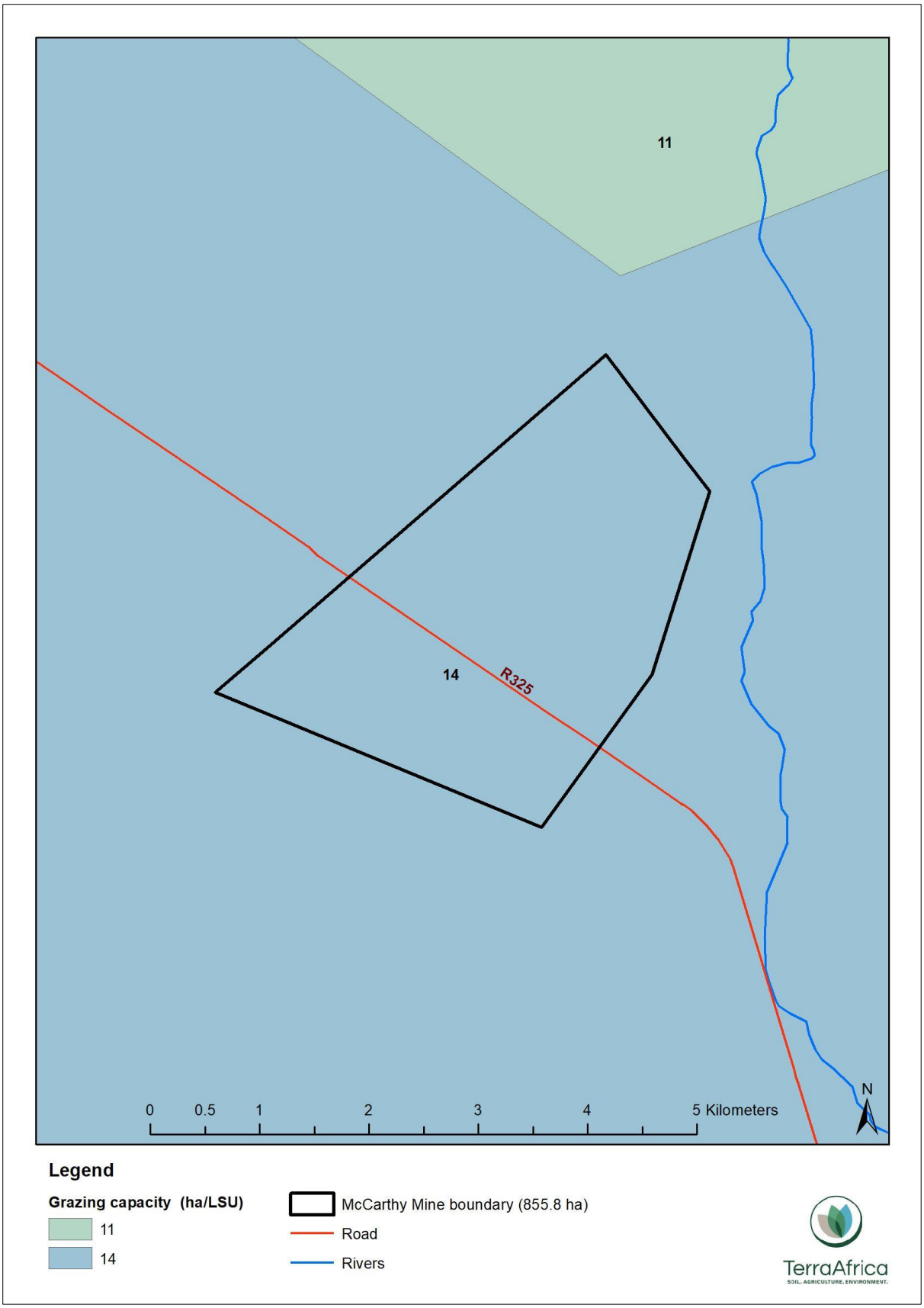


Figure 8-16: Long-term grazing capacity of the Macarthy mining right area (data source: DAFF, 2018 as cited by Terra)

8.6.4. Land use

Apart from the current mining activities within the study area, the Macarthy mining right area is used for livestock grazing. During the site visit, sheep were seen grazing the veld. While wildlife may be present on the property, the study area is not used for game farming and associated activities. The surrounding land uses are limited to livestock farming. Stock and/or game farming will be a viable post mining land use of the study area as long as the field quality is maintained by never exceeding the grazing capacity. The existing access roads on the property are covered by a gravel layer for stability (Figure 8-17). This material was transported onto site from somewhere else.

Figure 8-17: Farm road covered by imported gravel for stability

8.6.5. Consideration of site sensitivities and micro-siting

Following the analysis of all the desktop and baseline data discussed in the sections above, the study area has been classified into three different sensitivity ratings for agricultural sensitivity (refer to Figure 8-18). The deep Hutton soil profiles along the northwestern boundary of the area has medium agricultural sensitivity. Although the soil properties are suitable for crop production, the semi-arid climate and lack of a water source for irrigation, makes this area suitable for livestock grazing and not crop production. The largest part of the site has low sensitivity (426.4 ha) and is suitable for livestock grazing, permitting that the veld quality is maintained through control of livestock density. The areas already converted by mining activities and the associated infrastructure, has very low agricultural sensitivity.

Several options for the surface infrastructure layout were considered prior to deciding on the final layout that was provided for the purpose of this assessment. The positioning of the infrastructure was determined by the locality of manganese and iron ore as well as the mining method. Once the mining method was determined, the associated infrastructure were identified to ensure that the extraction of ore is maximised with the least amount of waste development. All surface infrastructure was then oriented around the mining pits to ensure unhindered flow of men, material and ore. Only one site was selected as a possible Waste Rock Dump area and the decision was made through consideration of the available space on site and proximity to areas from where waste material will be transported.

Although agricultural and soil sensitivities were not used as criteria for decisions on the proposed infrastructure layout, the area's land capabilities and agricultural potential is almost homogeneous and the infrastructure is positioned on land with very low, low and medium agricultural combined sensitivity.

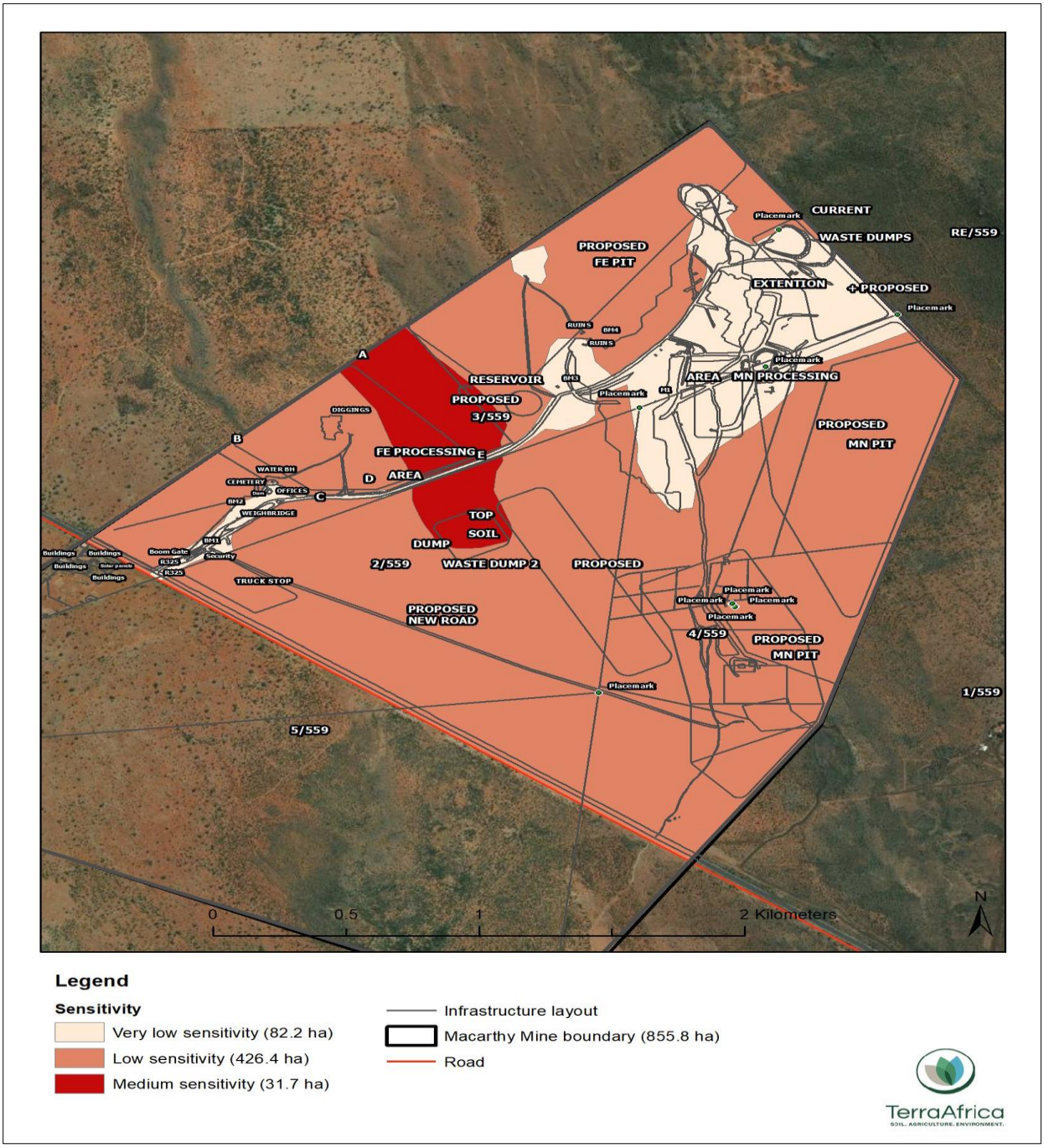


Figure 8-18: Agricultural sensitivity of th estudy area for the proposed development

8.7. Biodiversity

8.7.1. Vegetation

A Terrestrial Ecology Assessment was conducted for this project (Red Kite Environmental Solutions, 2020), the results of the site assessment are indicated below.

Following the latest classification (Red Kite Environmental Solutions, 2020) according to the National Vegetation Map (2018) the project site falls within the Kuruman Thornveld and Kuruman Mountain Bushveld vegetation type. The majority of the project footprint (292 ha) is located in the Kuruman Thornveld vegetation type, with a smaller section (12 ha) in the north-western corner of the project footprint situated in the Kuruman Mountain Bushveld vegetation type.

Neither of the vegetation types are listed in the National List of Threatened Ecosystems, the Government Gazette (2011), No. 34809, General Notice 1002.

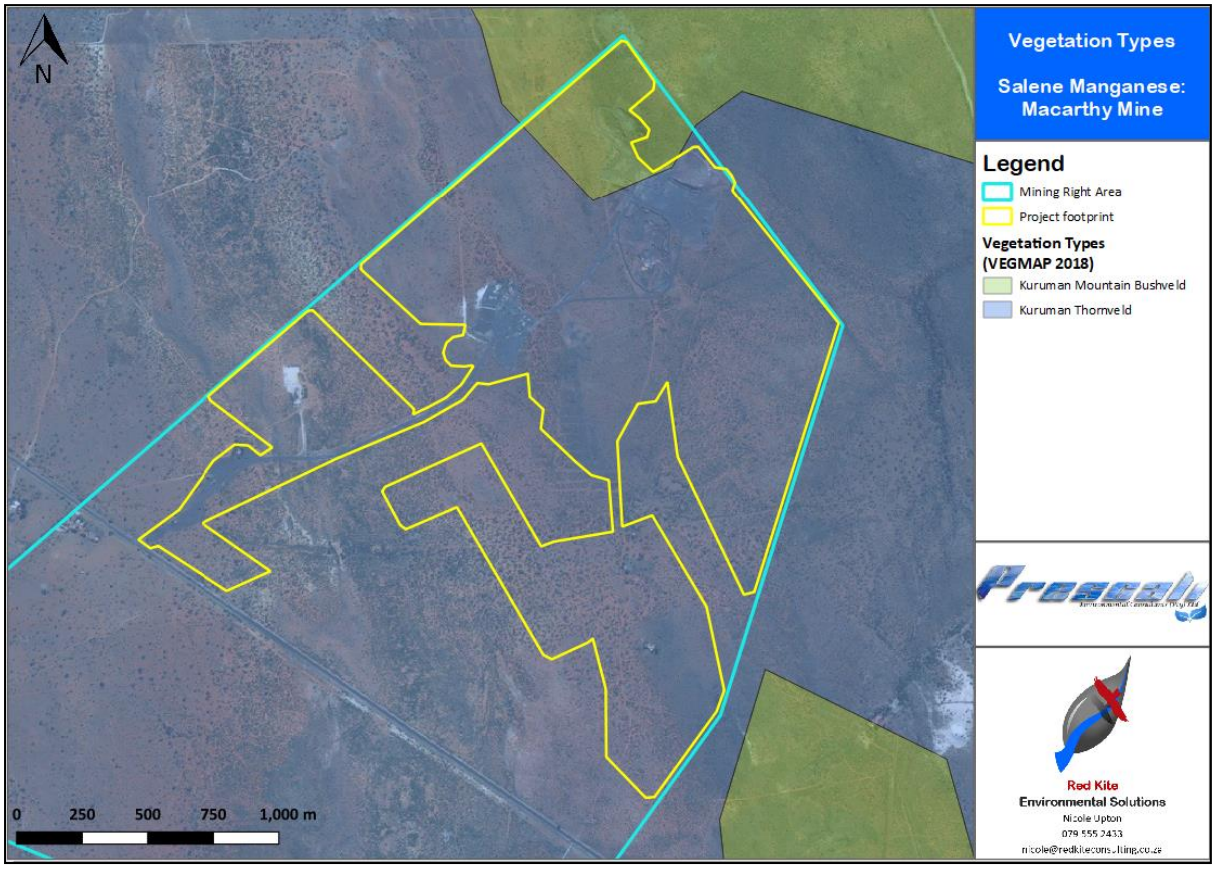


Figure 8-19: Vegetation types of the study site

8.7.1.1. Kuruman Thornveld (SVk 9)

The Kuruman Thornveld ecosystem is located in the North-West and Northern Cape Provinces. It is distributed on flats from the vicinity of Postmasburg and Danielskuil (west of the Kuruman Hills) in the south extending via Kuruman to Tsineng and Dewar in the north.

The vegetation type is characterised by flat rocky plains and some sloping hills with very well-developed, closed shrub layer and well-developed open tree stratum consisting of *Vachellia erioloba*.

A list of expected common and dominant species in undisturbed vegetation includes the following (those with a "d" are considered to be dominant) (Mucina and Rutherford, 2006):

- **Trees**: *Vachellia erioloba* (d), *Senegalia mellifera subsp. detinens* (d), *Boscia albitrunca* (d).
- **Shrubs:** *Grewia flava* (d), *Lycium hirsutum* (d), *Tarchonanthus camphoratus* (d), *Gymnosporia buxifolia, Acacia hebeclada subsp. hebeclada* (d), *Monechma divaricatum* (d), *Gnidia polycephala, Helichrysum zeyheri, Hermannia comosa, Pentzia calcarea, Plinthus sericeus, Elephantorrhiza elephantina.*
- **Graminoids:** *Aristida meridionalis* (d), *A. stipitata subsp. stipitata* (d), *Eragrostis lehmanniana* (d), *E. echinochloidea, Melinis repens.*
- **Herbs:** *Dicoma schinzii, Gisekia africana, Harpagophytum procumbens subsp. procumbens, Indigofera daleoides, Limeum fenestratum, Nolletia ciliaris, Seddera capensis, Tripteris aghillana, Vahlia capensis subsp. vulgaris.*

8.7.1.2. Kuruman Mountain Bushveld (SVk 10)

The Kuruman Mountain Bushveld ecosystem is located in the North-West and Northern Cape Provinces. It is distributed across the Asbestos Mountains south-west and north-west of Griekwastad, along the Kuruman Hills

north of Danielskuil, passing west of Kuruman town and re-emerging as isolated hills, i.e. Makhubung and the hills around Pomfret in the north.

The vegetation type is characterised by rolling hills with generally gentle to moderate slopes and hill pediment areas with an open shrubveld with *Lebeckia macrantha* prominent in places. Grass layer is well developed.

A list of expected common and dominant species in undisturbed vegetation includes the following (those with a "d" are considered to be dominant) (Mucina and Rutherford, 2006):

- **Trees**: *Rhus lancea*.
- **Shrubs**: *Diospyros austro-africana, Euclea crispa subsp. crispa, E. undulata, Olea europaea subsp. africana, Rhus pyroides var. pyroides, R. tridactyla, Tarchonanthus camphoratus, Tephrosia longipes, Rhus ciliata* (d), *Amphiglossa triflora, Anthospermum rigidum subsp. pumilum, Gomphocarpus fruticosus subsp. fruticosus, Helichrysum zeyheri, Lantana rugosa, Wahlenbergia nodosa, Ebracteola wilmaniae, Hertia pallens, Rhynchosia totta*.
- **Graminoids**: *Andropogon chinensis* (d), *A. schirensis* (d), *Anthephora pubescens* (d), *Aristida congesta* (d), *Digitaria eriantha subsp. eriantha* (d), *Themeda triandra* (d), *Triraphis andropogonoides* (d), *Aristida diffusa, Brachiaria nigropedata, Bulbostylis burchellii, Cymbopogon caesius, Diheteropogon amplectens, Elionurus muticus, Eragrostis chloromelas, E. nindensis, Eustachys paspaloides, Heteropogon contortus, Melinis repens, Schizachyrium sanguineum, Trichoneura grandiglumis*.
- **Herbs:** *Dicoma anomala, D. schinzii, Geigeria ornativa, Helichrysum cerastioides, Heliotropium strigosum, Hibiscus marlothianus, Kohautia cynanchica, Kyphocarpa angustifolia. Geophytic Herbs: Boophone disticha, Pellaea calomelanos*.

8.7.1.3. Griqualand West Centre of Endemism

The project site is located in the Griqualand west centre (GWC) of endemism, which is found in the Hay- and part of the Barkley West districts of the Northern Cape Province (Van Wyk & Smith, 2001 as cited by Red Kite). According to Van Wyk & Smith (2001), as cited by Red Kite the GWC is best described in geological terms, with its core area mostly linked to surface outcrops of the Ghaap Group (notably limestone and dolomite) and those of the Olifantshoek Supergroup (notably quartzite). However, in floristic terms, the outer boundaries of the centre are rather diffuse as floristic elements can spill over onto related substrates, especially alkaline substrates rich in calcium. The GWC separates the Kalahari basin from the sediments of the Karoo Supergroup further south and floristically the GWC is sometimes described as a Kalahari-Highveld transition zone (White, 1983, as cited by Red Kite). It is important to note that the nearby Kalahari Desert intrudes into the GWC as pockets and tongues of wind-blown, orange-red Kalahari sand accumulating in valleys between the rocky outcrops and mountains of this region, signified by the presence of the camel thorn tree (*Vachellia erioloba*), which only occurs on deep sandy soils. This is very relevant as the GWC is mainly associated with the rocky outcrops of this region.

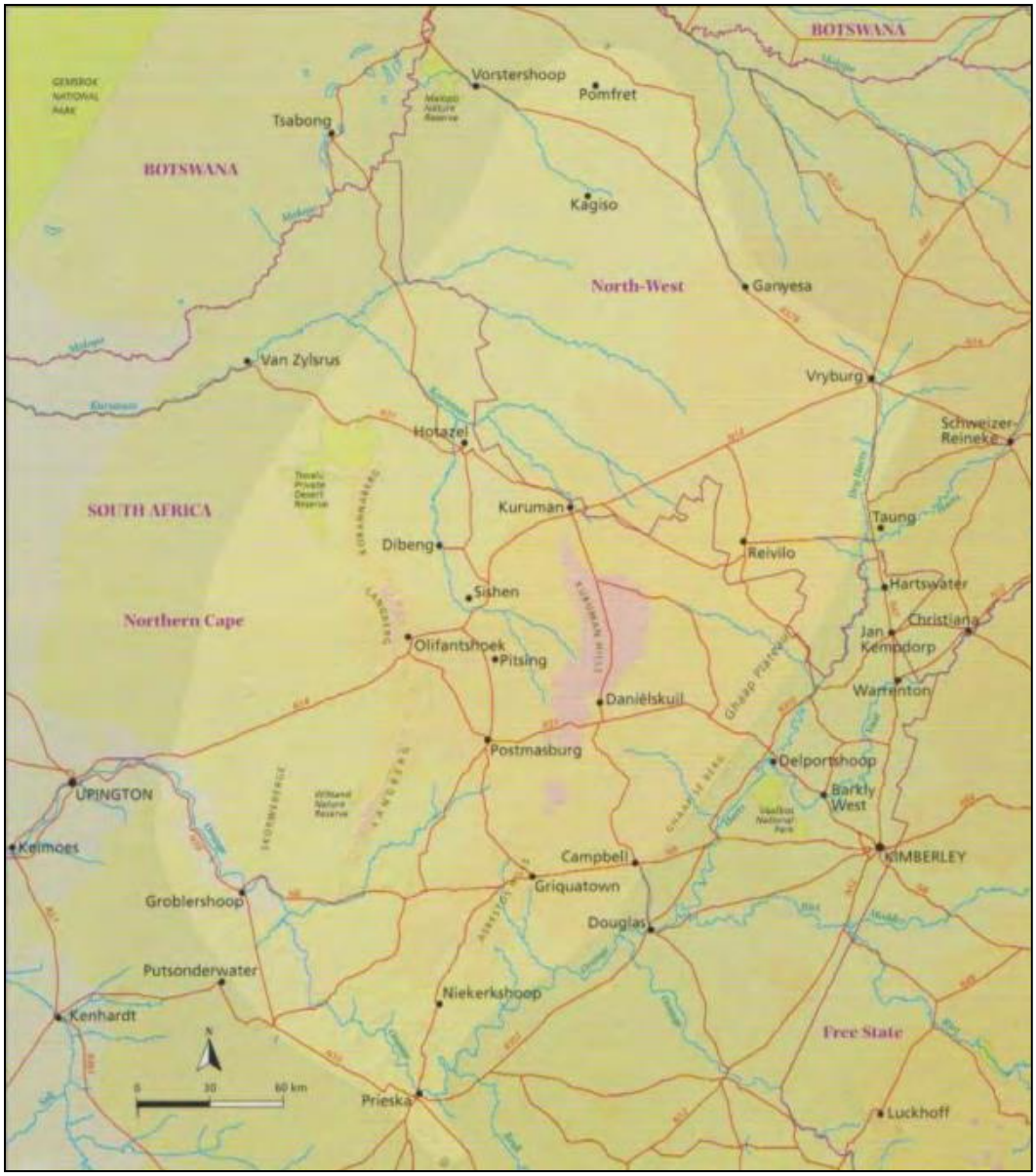


Figure 8-20: The GWC (light shaded) as proposed by van Wyk and Smith (2001), as cited by Red Kite

8.7.1.4. POSA Plant Species

The study area falls within the 2723CC Quarter Degree Square. Information on plant species recorded was extracted from the POSA online database hosted by SANBI, based on a 25 km x 25 km square surrounding the project area. A list of plant species that have previously been recorded in the aforementioned area (25 km x 25 km square) is provided in Appendix C of the Red Kite Report.

The results indicate that approximately two hundred and fifty-five (255) plant species occur within the square, consisting of sixty (60) families. The most prominent family is Poaceae, with forty-seven (47) species, followed by Asteraceae, with thirty (30) species. Thirty-two (32) endemic species were found to possibly occur in the area.

Table 8-2:Floral species summary for area queried (POSA)

Number of families	Number of species	SCC	Exotic species
93	416	52	5

Fifty-two (52) plant species listed for the area are classified as species of conservation concern (SCC) according to their endemism (32 species), the NFA (1 species) and the NCNCA (21 species). None of the plant species recorded for the area queried are listed in terms of the ToPS list and Red Data list.

Five (5) plant species not indigenous to South Africa were listed for the project area, however none of these species are listed as Alien Invasive Plant (AIP) species in terms of the NEMBA.

Table 8-3: SCC plant species recorded on POSA for the area queried

Family	Species	Conservation
Apocynaceae	*Acokanthera oppositifolia*	NCNCA: Protected; medicinal
Iridaceae	*Babiana bainesii*	NCNCA: Protected
Acanthaceae	*Barleria bechuanensis*	Endemic
Capparaceae	*Boscia foetida*	NCNCA: Protected
Asphodelaceae	*Bulbine narcissifolia*	NCNCA: Protected
Convolvulaceae	*Convolvulus boedeckerianus*	Endemic
Crassulaceae	*Crassula capitella*	NCNCA: Protected
Cucurbitaceae	*Cucumis heptadactylus*	Endemic
Poaceae	*Cynodon incompletus*	Endemic
Cyperaceae	*Cyperus indecorus*	Endemic
Orchidaceae	*Disperis macowanii*	NCNCA: Protected
Poaceae	*Eragrostis pseudobtusa*	Endemic
Asteraceae	*Eriocephalus ericoides*	Endemic
Euphorbiaceae	*Euphorbia avasmontana*	NCNCA: Protected
Euphorbiaceae	*Euphorbia inaequilatera*	NCNCA: Protected
Euphorbiaceae	*Euphorbia juttae*	NCNCA: Protected
Euphorbiaceae	*Euphorbia mauritanica*	NCNCA: Protected
Euphorbiaceae	*Euphorbia spartaria*	NCNCA: Protected
Amaranthaceae	*Exomis microphylla*	Endemic
Apocynaceae	*Fockea angustifolia*	NCNCA: Protected
Iridaceae	*Freesia andersoniae*	NCNCA: Protected; Endemic
Asteraceae	*Helichrysum pumilio*	Endemic
Aizoaceae	*Hereroa wilmaniae*	Endemic
Malvaceae	*Hermannia bryoniifolia*	Endemic
Acanthaceae	*Justicia puberula*	Endemic
Acanthaceae	*Justicia thymifolia*	Endemic
Fabaceae	*Lessertia frutescens*	NCNCA: Protected
Limeaceae	*Limeum viscosum*	Endemic
Fabaceae	*Lotononis parviflora*	Endemic
Fabaceae	*Melolobium exudans*	Endemic
Fabaceae	*Melolobium humile*	Endemic
Aizoaceae	*Mestoklema arboriforme*	Endemic
Asteraceae	*Metalasia trivialis*	Endemic
Iridaceae	*Moraea pallida*	NCNCA: Protected
Polygalaceae	*Muraltia alopecuroides*	Endemic
Asteraceae	*Osteospermum leptolobum*	Endemic
Oxalidaceae	*Oxalis haedulipes*	NCNCA: Protected
Oxalidaceae	*Oxalis lawsonii*	NCNCA: Protected
Asteraceae	*Pentzia viridis*	Endemic
Apocynaceae	*Pergularia daemia*	NCNCA: Protected
Apocynaceae	*Piaranthus decipiens*	NCNCA: Protected
Polygalaceae	*Polygala krumanina*	Endemic
Asteraceae	*Pteronia undulata*	Endemic
Celastraceae	*Putterlickia pyracantha*	Endemic
Amaranthaceae	*Salsola geminiflora*	Endemic
Anacardiaceae	*Searsia tridactyla*	Endemic
Scrophulariaceae	*Selago mixta*	Endemic
Apocynaceae	*Stapelia olivacea*	NCNCA: Protected; Endemic
Scrophulariaceae	*Sutera griquensis*	Endemic

Family	Species	Conservation
Asteraceae	*Tarchonanthus obovatus*	Endemic
Aizoaceae	*Trichodiadema pomeridianum*	NCNCA: Protected
Fabaceae	*Vachellia erioloba*	NFA: Protected

8.7.1.5. Medicinal plant species

Some of the species that were listed for the area queried have cultural and/or medicinal use. Various medicinal books and peer-reviewed articles were used to verify whether the species have any medicinal uses. Twelve (12) species were found to possibly occur on site that have medicinal uses.

Table 8-4: Medicinal plant species recorded for the area queried

Family	Species	Common name
Capparaceae	*Cadaba aphylla*	Desert broom
Fabaceae	*Calpurnia aurea*	Common calpurnia
Asteraceae	*Cichorium intybus*	Blue dandelion
Menispermaceae	*Cissampelos capensis*	Dawidjieswortel
Asteraceae	*Dicoma capensis*	Koorsbossie
Boraginaceae	*Ehretia rigida*	Puzzle bush
Ebenaceae	*Euclea undulata*	Common guarri
Fabaceae	*Senna italica*	Italian senna
Talinaceae	*Talinum caffrum*	Porcupine root
Asteraceae	*Tarchonanthus camphoratus*	Camphor bush
Santalaceae	*Thesium hystrix*	Kleinswartstorm
Fabaceae	*Vachellia karroo*	Sweet thorn

These plants are important from a cultural perspective and are used for traditional/cultural purposes. Traditional medicine in South Africa is an important practice on which seventy two percent of the Black African population relies, that accounts for 26.6 million consumers (Mander *et al*., 2007) as cited by Red Kite. Approximately 133 000 people are employed in the trade of traditional medicine, especially rural women (Mander *et al.,* 2007) as cited by Red Kite.

8.7.2. Site Evaluation

The proposed project footprint is located on flat rocky plains with a very well-developed, closed shrub layer and well-developed open tree stratum. The majority of the proposed project footprint (and most of the Mining Right Area) is still covered by natural veld in relatively good condition. The vegetation on site was rather homogenous as was the surrounding terrain.

The most noteworthy environmental features of the site are:

- The presence of quite a number of medium sized Camel thorn and Shepherd's trees. Should they have to be removed they will be compromised as both these species rarely (if ever) survives transplantation;
- The fact that the site is located within the Griqualand West Centre of Endemism;
- One species protected in terms of the NCNCA, Shepherd's tree, was also encountered;
- The vegetation composition of the study area was found to have a heterogenous vegetation composition, with low to moderate floral species diversity;
- No watercourses or wetlands were observed on the project footprint; and
- No invasive alien plant species were observed in natural areas.

Land uses, on and adjacent to the project area, currently consist of natural wilderness area, livestock grazing and existing mining operations.

Vegetation units were identified according to plant species composition, previous land use and topography. The state of the vegetation of the proposed project area varies from being natural to completely degraded.

The following broad classification of Vegetation Units (VU) were found to occur on the proposed project footprint:

1. Natural thornveld (VU1);and
2. Degraded and transformed areas (VU2).

The vegetation units, as identified during site visit, databases and aerial imagery are indicated in the figure below.

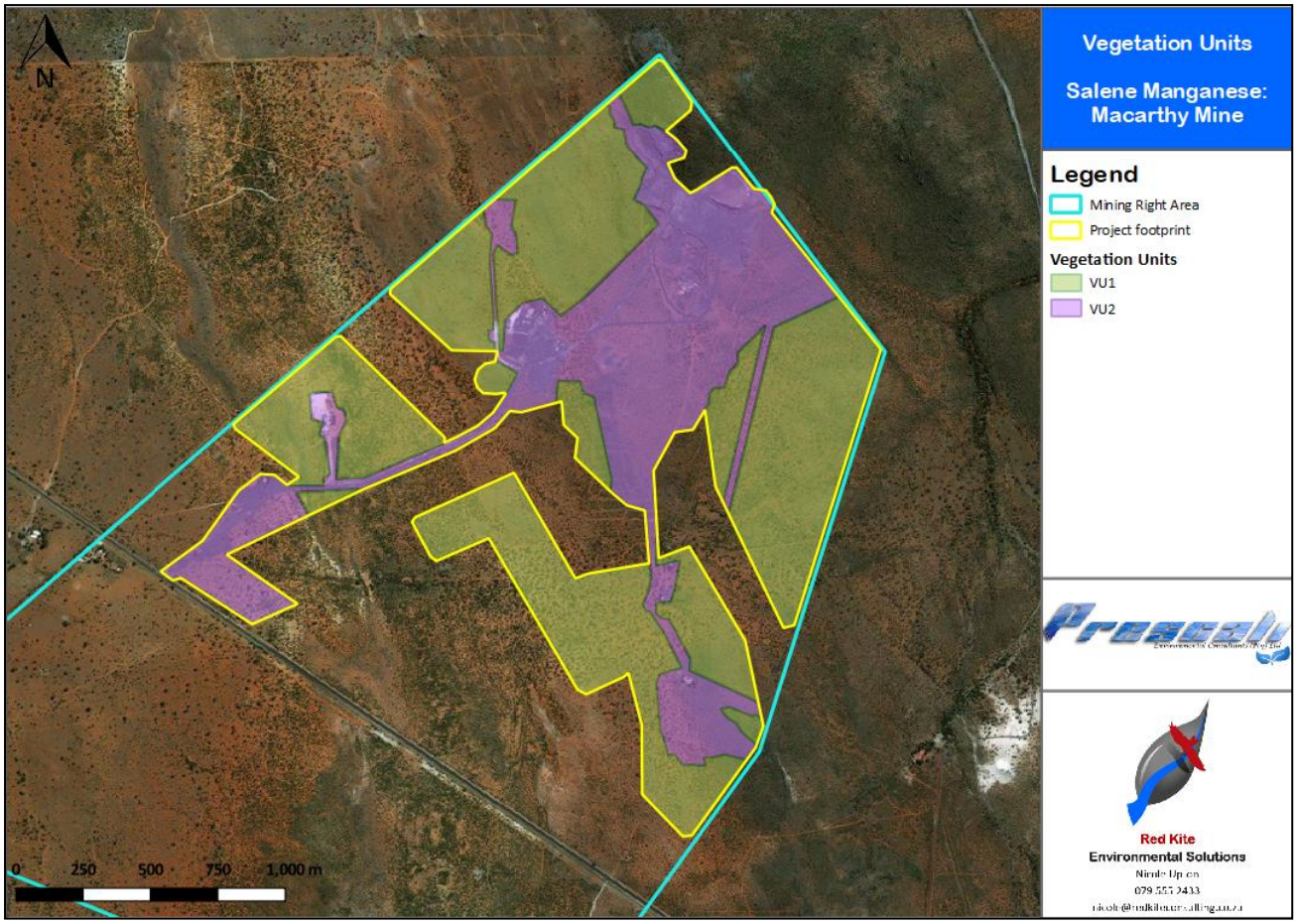


Figure 8-21: Vegetation units for project footprint

8.7.2.1. Vegetation Unit 1 (VU1)

This vegetation unit occurs on flat rocky plains. Sections of this VU located on the project footprint will be cleared entirely as part of the site preparation. One hundred and ninety (190) hectares of the project footprint is situated on VU1.

The vegetation of VU1 is natural thornveld which is considered to be in fair condition in light of the typical vegetation observed for the area. The vegetation structure is very well-developed, closed shrub layer and well-developed open tree stratum. Ground cover was found to be sparse, with very little grass cover present. No clear disturbances to vegetation condition were observed.

Land use in VU1 is largely related to natural wilderness and grazing.

Dominant trees and shrubs in this VU include: *Searsia keetii* (Slender karee), *Combretum hereroense* (Mouse-eared bushwillow), *Peltophorum africanum* (African wattle), *Terminalia prunioides* (Purplepod clusterleaf), *Kirkia wilmsii* (Mountain seringa), *Senegalia erubescens* (Blue thorn), *Lydenburgia cassinoides* (Sekhukhune bushman's tea), *Rhynchosia nitens* (Vaalboontjie) and *Euclea crispa* (Blue guarri).

Dominant species included trees and shrubs such as *Senegalia mellifera* (Black thorn), *Tarchonanthus camphoratus* (Camphor bush), *Cadaba aphylla* (Desert broom), *Grewia flava* (Brandybush) and *Boscia albitrunca* (Shepherd's tree).

Two (2) protected tree species in terms of the National Forest Act, 1998 (Act No. 84 of 1998) (NFA) were found to occur in VU1, namely *Boscia albitrunca* (Shepherd's tree) and *Vachellia erioloba* (Camel thorn). Shepherd's tree is also protected in terms of the NCNCA.

No Alien and Invasive Plant (AIP) species were observed to occur in VU1.

The vegetation unit is classified as having a high sensitivity due to the natural state of this vegetation unit, the SCC found to occur within the VU, and the low degree of disturbance and fragmentation to the vegetation composition.

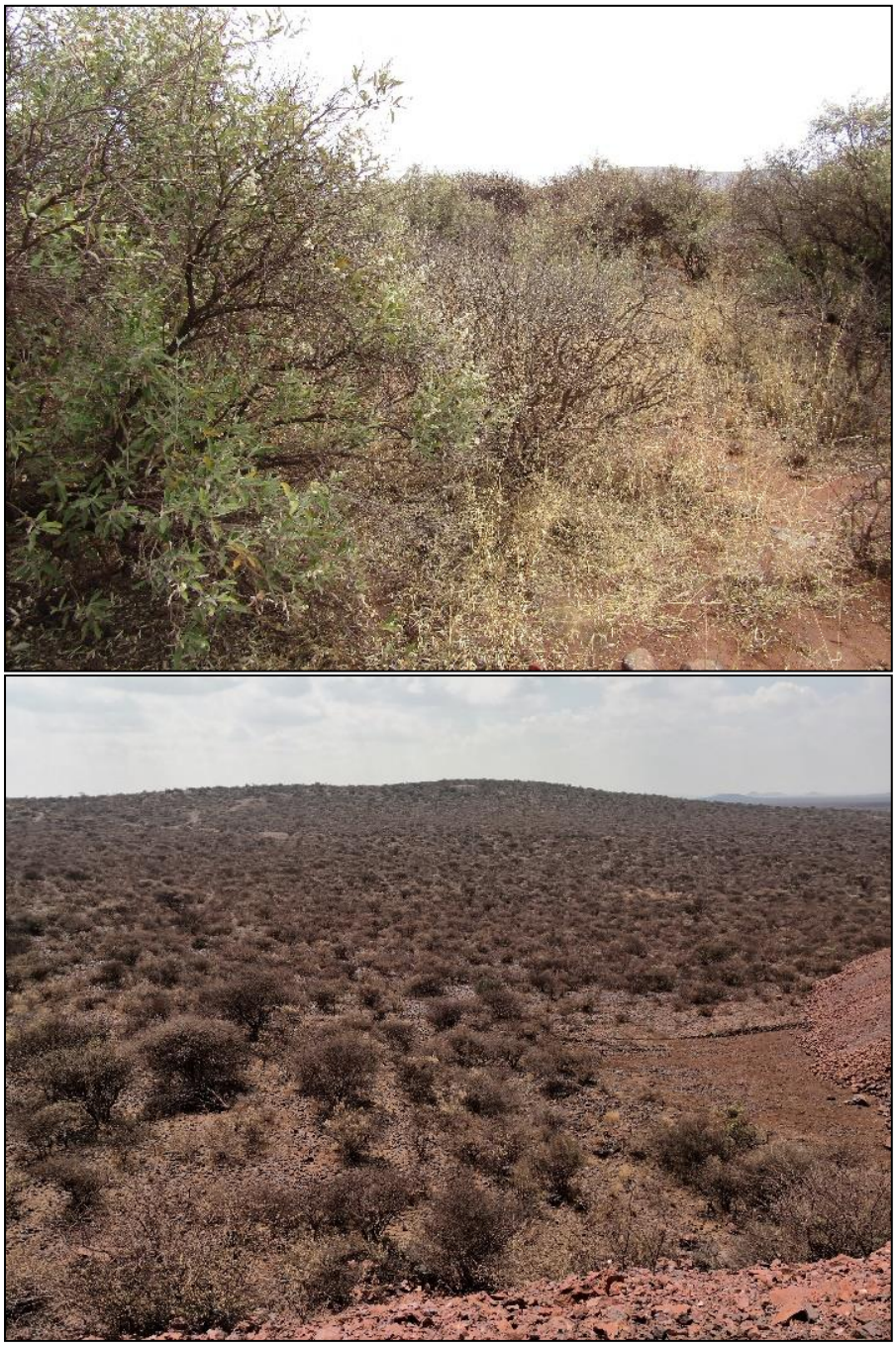


Figure 8-22: Typical vegetation character of VU1

8.7.2.2. Vegetation Unit 2 (VU2)

VU2 consists of exiting hauls roads, current mining operational areas, and previously mined areas, where little or no natural vegetation remains. One hundred and twenty-two (122) hectares of the project footprint is situated in this VU.

Small pockets of vegetation as described for VU1 is located in the areas delineated as VU2.

The vegetation unit is classified as having a low sensitivity due to the state of degradation, development can be supported in the area without significant additional impacts to vegetation. Care should however be taken regarding impacts on the adjacent natural bushveld and drainage lines.

Figure 8-23: Photographs of VU2 (transformed areas)

The table below list the flora species identified during the site verification in conjunction with their conservation status. Two (2) trees protected in terms of the NFA were identified on the project footprint, namely *Boscia albitrunca* (Shepherd's tree) and *Vachellia erioloba* (Camel thorn). Shepherd's tree is also protected in terms of the NCNCA.

One (1) of the species identified to occur on the project footprint are considered to have medicinal uses, namely *Cadaba aphylla* (Desert broom).

Table 8-5: Flora species identified during site survey

Species	Common name	Conservation
Aristida adscensionis	Annual three-awn	
Aristida canescens	Pale three-awn	
Aristida congesta	Tassle three-awn	
Aristida vestita		
Asparagus cooperi	Haakdoring	
Boscia albitrunca	Shepherd's tree	NFA: Protected; NCNCA: Protected
Cadaba aphylla	Desert broom	Medicinal
Cymbopogon pospischilii	Narrow-leaved turpentine grass	
Enneapogon scoparius	Bottlebrush grass	
Eragrostis rigidior	Curly leaf	
Eragrostis curvula	Weeping love grass	
Eragrostis trichophora	Hairy love grass	
Grewia flava	Brandybush	
Gymnosporia buxifolia	Spikethorn	
Peliostomum virgatum	Twiggy veld violet	
Searsia ciliata	Sour karee	
Senecio viminalis	Neta	
Senegalia mellifera	Black thorn	
Tarchonanthus camphoratus	Camphor bush	
Vachellia erioloba	Camel thorn	NFA: Protected

8.7.3. Fauna

All fauna species that occur in the applicable Quaternary Degree Square 2723 CC are listed in the 2020 specialist report Appendix D (Red Kite Environmental Solutions, 2020) and from these the following are deemed relevant to Macarthy Mine:

Table 8-6: Fauna SCC found in 2723CC QDS that may be relevant to the Salene Manganese Mine

Common name	Species	Conservation status
Mammalian species		
Rhinolophus denti	Dent's Horseshoe Bat	Near Threatened (2016)

8.7.3.1. Mammals

Ten (10) mammal species were found to possibly occur within the QDS, one (1) has been included within the National Red Data List, however, these species are likely to utilise the wider region as part of their range, since it has large range requirements and is therefore not permanently expected on-site:

- *Rhinolophus denti* Dent's Horseshoe Bat Near Threatened (2016).

The *Rhinolophus denti* (Dent's Horseshoe Bat) predominantly occurs in the Northern Cape, but marginally in the North West and Free State province. Its habitat preferences include abandoned mines, caves and other similar roosting sites, none of these are known to occur on the Salene Manganese mine. Important considerations regarding this bat are its short and broad wings with a low wing loading, implying that it has limited ability to disperse and colonies usually consist of only a few dozen individuals, therefore easily impacted.

These bats forage in the evenings, therefore occurrence will be difficult to confirm if the species does occur within the area, unless encountered during roosting in the day. Bats need different roosting conditions at different times of the year and they will often move around to find a roost that meets their needs. Hollow trees, and other structures such as caves could both be used at different times. In winter, bats use hibernation roosts.

As stated, roosting sites are limited to rocky outcrops with suitable cave structures, therefore, unlikely to be affected by the Salene activities (which are already partly in existence).

All mammals listed for the QDS are also included in Schedule 2 of the NCNCA (Appendix D).

8.7.3.2. Avifaunal

According to data collected during the Southern African Bird Atlas Project 2 (SABAP2) http://sabap2.adu.org.za, sixty-six (66) bird species were recorded within this area. No avifaunal SCC have been indicated for the specific pentads relevant to the development. However, all avifaunal species known to occur within the relevant pentads are also included in Schedule 2 of the NCNCA.

8.7.3.3. Butterflies

Five (5) butterfly species were found for the 2723CC, all of which are categorized as Least Concern by SANBI (Appendix D). All butterflies listed for the QDS are also included in Schedule 2 of the NCNCA as almost all families of butterflies are Provincially protected.

8.7.3.4. Other Invertebrates

Seven (7) species of Dung beetles were recorded for the QDS, all not listed on the IUCN Red list. Other invertebrates include one (1) Scorpion and three (3) Spiders, all of which have a Least Concern rating.

8.7.3.5. Reptiles

Three (3) reptile species are recorded for the QDS, the list of species that may possibly occur in the QDS are presented in Appendix D. None of the species known to occur within this QDS have a red listed status and it should be noted that the list available only included snakes.

8.7.3.6. Amphibians

Two (2) amphibian species were listed within this QDS (Appendix D) and none of these species were red listed for the QDS.

Table 8-7: Faunal species sighted or confirmed during the field assessment

Family	Scientific name	Common name	Red list category
Leporidae	*Lepus capensis*	Cape Hare	Least Concern, NCNCA Schedule 2[3]
Bovidae	*Tragelaphus strepsiceros*	Kudu	Least Concern, NCNCA Schedule 2
Bovidae	*Sylvicapra grimmia*	Grey or bush duiker	Least Concern, NCNCA Schedule 2
Herpestidae	*Suricata suricatta*	Suricate	Least Concern, NCNCA Schedule 2
Cercopithecidae	*Papio ursinus*	Chacma baboon	Least Concern, NCNCA Schedule 4[4]
Sciuridae	*Xerus inauris*	South African Ground Squirrel	Least Concern, NCNCA Schedule 2
Muridae	*Rhabdomys pumilio*	Four-striped grass rat	Least Concern, NCNCA Schedule 2
Hystricidae	Hystrix africaeaustralis	South African porcupine (quills)	Least Concern, NCNCA Schedule 2
Viperidae	Bitis arietans	Puff Adder	Least Concern
Agamidae	Agama aculeata aculeata	Ground Agama – many individuals sighted during the assessment	Least Concern
Coliidae	Colius colius	White-backed Mousebird	Least Concern, NCNCA Schedule 3
Coraciidae	Coracias caudatus	Lilac-breasted roller	Least Concern, NCNCA Schedule 2
Bucerotidae	Tockus rufirostris	Southern Red-Billed Hornbill	Least Concern, NCNCA Schedule 2
Upupidae	Upupa africana	African hoopoe	Least Concern, NCNCA Schedule 2
Lybiidae	Trachyphonus vaillantii	Crested Barbet	Least Concern, NCNCA Schedule 2
Alaudidae	Mirafra africana	Rufous-naped Lark	Least Concern, NCNCA Schedule 2
Hirundinidae	Ptyonoprogne fuligula	Rock Martin	Least Concern, NCNCA Schedule 2

3 Protected Species (Schedule 2)
4 Damage causing animal species (Schedule 4)

Family	Scientific name	Common name	Red list category
Dicruridae	Dicrurus adsimilis	Fork-tailed Drongo	Least Concern, NCNCA Schedule 2
Leiothrichidae	Turdoides jardineii	Arrow-marked Babbler	Least Concern, NCNCA Schedule 2
Muscicapidae	Myrmecocichla formicivora	Ant-eating chat	Least Concern, NCNCA Schedule 2
Muscicapidae	Cercotrichas leucophrys	White-browed scrub robin	Least Concern, NCNCA Schedule 2
Muscicapidae	Bradornis mariquensis	Marico flycatcher	Least Concern, NCNCA Schedule 2
Laniidae	Lanius collaris	Southern fiscal	Least Concern, NCNCA Schedule 2
Pycnonotidae	Pycnonotus nigricans	Black-fronted bulbul	Least Concern, NCNCA Schedule 3
Charadriidae	Vanellus armatus	Lapwing, Blacksmith	Least Concern, NCNCA Schedule 2
Columbidae	Streptopelia Senepalensis	Laughing Dove	Least Concern, NCNCA Schedule 2
Columbidae	Streptopelia Capicola	Cape Turtle -Dove	Least Concern, NCNCA Schedule 2
Corvidae	Corvus albus	Pied Crow	Least Concern, NCNCA Schedule 3[5]

The NCNCA specifically lists Schedule 1 (Specially Protected Species) and Schedule 2 (Protected Species). Many species sighted are protected in terms of Schedule 2, which includes many animal species naturally occurring and all indigenous birds unless otherwise listed. No National or Globally protected species have been recorded during the survey and the reptiles sighted are not listed Provincially (as opposed to the other species all being locally listed).

8.8. Surface Water

A Surface Water Assessment was conducted for the Marcarthy mine expansion project (Prescali, 2020). The Macarthy mining area is located within the Lower Vaal Water Management Area (WMA), specifically the Molopo Sub-WMA (DWAF, 2004) This WMA border on Botswana in the north and is semi-arid to arid resulting in Endorheic Rivers that typically cease to flow after some distance due to infiltration into the river bed and evaporation.

Minerals mined in this area are iron, manganese and diamonds, while farming ranges from extensive livestock production and rainfed cultivation and intensive irrigation enterprises (DWAF, 2004).

The Molopo River flows from approximately 35km north-east of Mmabatho all along the border with Botswana to the west where it joins the Nossob River approximately 70 km from the Namibian border and together with its tributaries it drains much of the northern part of the Lower Vaal WMA. Due to the low rainfall in the area the Molopo River does not make a meaningful contribution to the surface water resource (BKS, 2002).

5 Common Indigenous Species (Schedule 3)

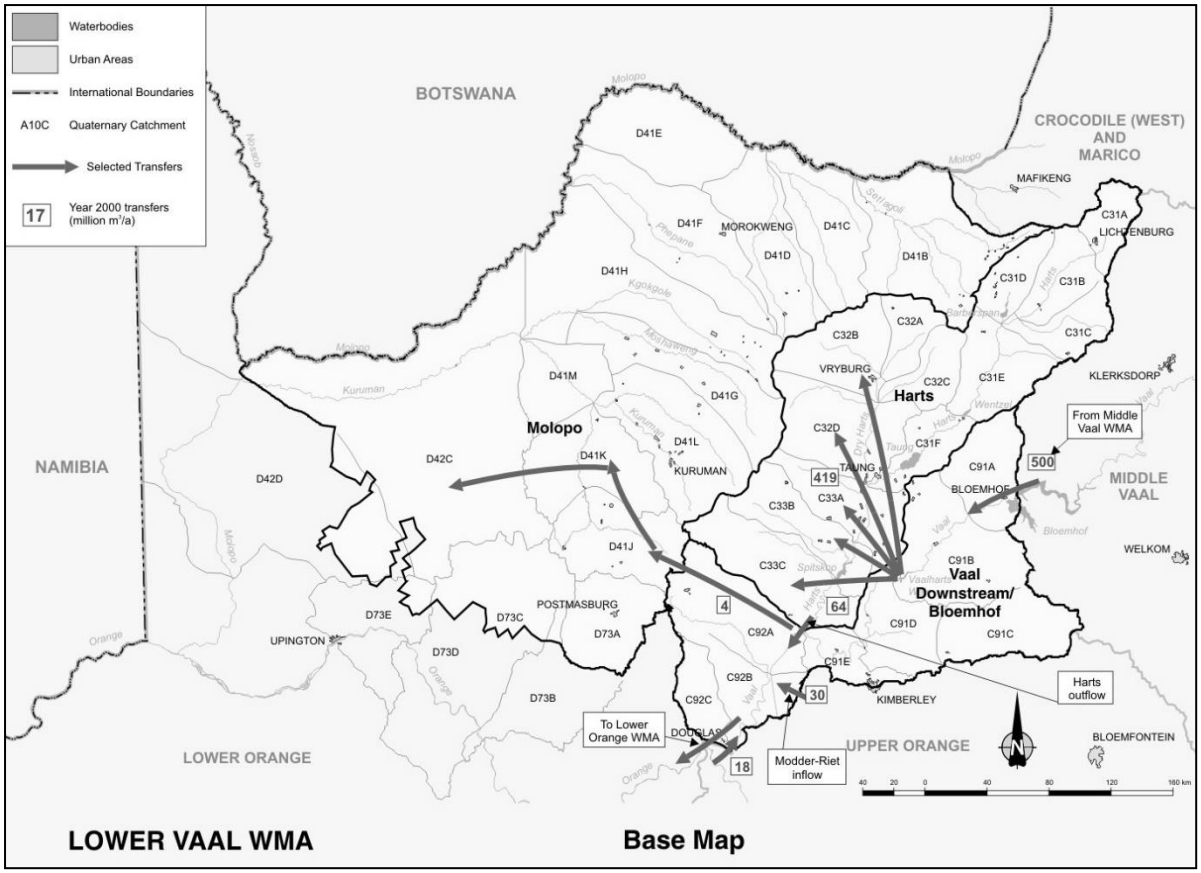


Figure 8-24:Lower Vaal Water Management Area (DWAF, 2004)

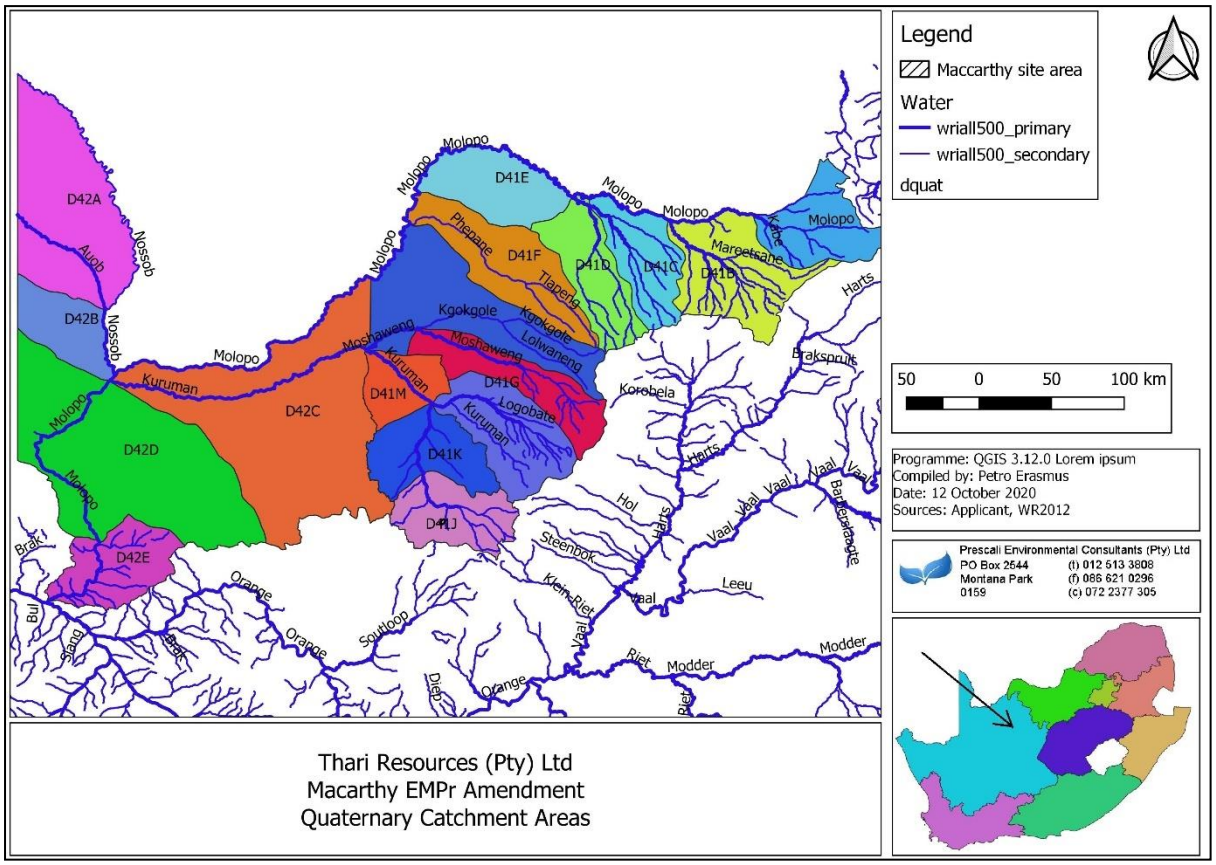


Figure 8-25: Molopo Catchment Quaternary areas

Table 8-8: Reconciliation of water requirements and availability for the applicable sub-management area Year 2005 (million m3/a) (DWAF, 2004).

Molopo					
Natural resource		Usable return flow	Total local yield (1)	Transfers in	Grand Total
Surface water	Ground water				
2	31	2 (mining and bulk)	35	4	39
Local Requirements		Transfers out	Balance		
36		0	3		
(1) After allowance for the impacts on yield of: ecological component of Reserve, River losses, alien vegetation, rain-fed agriculture and urban runoff					

8.8.1. Quaternary Catchments

The Macarthy mining operations are located within the D41J quaternary catchment which is traversed by the Ga-Mogara River. This quaternary drainage area also receives water from the Vaal-Gamagara Water Scheme (BKS, 2002).

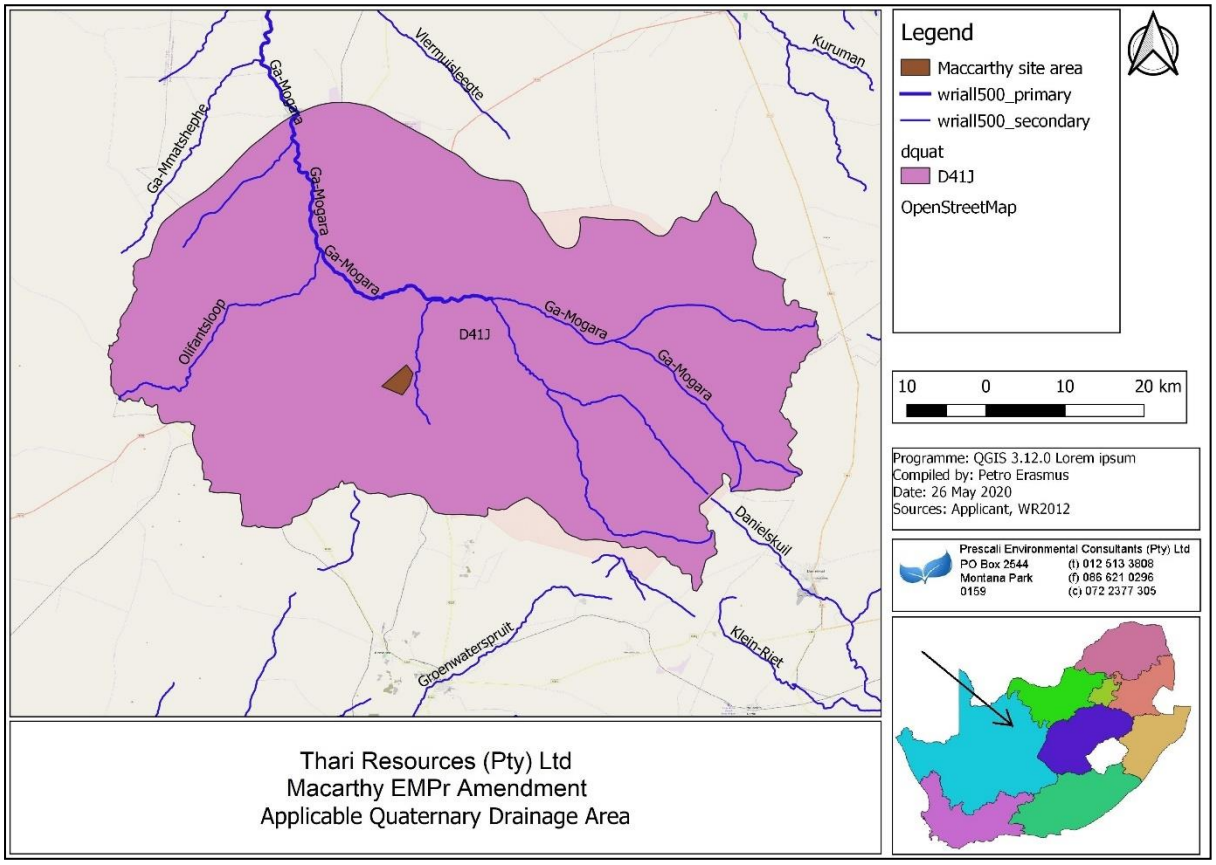


Figure 8-26: Location of Salene Manganese - Macarthy Mine within D41J

The mean annual evaporation, mean annual precipitation and MAR for the D41J quaternary catchment is indicated in Table 8-9.

Table 8-9: Applicable catchment areas MAR, MAP and MAE information (Baily & Pitman, 2015).

Area	Catchment area		MAE (mm) (S-pan)	MAP (mm)	MAR (million m^3/a)
	Nett (km^2)	Gross (km^2)			
Molopo (D41)	58367	31717	2234	335	59.24
D41J	3878	2518	2351	358	7.26
Mining Right Area	859.1016 ha 8.591016 km^2				0.02477

8.8.2. River Resource Classification

The ecological status (EcoStatus) of a river refers to its overall condition or health, i.e. the totality of the features and characteristics of the river and its riparian areas, which manifests in its ability to support a natural array of species. This ability relates directly to the capacity of the system to provide a variety of goods and services.

The Minister of Human Settlement, Water and Sanitation is required to establish a classification system, and to determine the class and resource quality objectives for all or part of the resources considered to be significant.

From the desktop data assessment is can be seen that the Present Ecological Status (PES) from the 1999 assessment to the 2018 assessment remained mostly the same Class B, however the 2018 classification provides more detailed information and it can be seen that the unnamed tributary of the Molopo River is deemed to be data sufficient and that downstream after the confluence with the Molopo River and Olifantsloop River the Molopo River is Class C. The Ecological Importance and Sensitivity Class (EI and ES) of the Macarthy mining right area are Low and Very Low[6].

Table 8-10: Classification of the River Reaches directly affected by Salene Manganese - Macarthy (CSIR, 2018) (CSIR, 2011).

Aspect	Ga-Mogara	Unnamed tributary
Flow	Ephemeral	Ephemeral
Order	3	1
Mainstem	1	0
PES1999	Class B: Largely Natural	Class B: Largely Natural
Ecoregion	29	29
Geomorphic Zone	E: Lower Foothills	E: Lower Foothills
River Type	29_N_L	29_N_L
FFRID	0	0
FFRREGION	Null	Null
FFRFlagship	0 – Not a Flagship River	0 – Not a flagship river
PES_2018	D – Largely Modified	Data Deficient
NBA2018ETS	CR – Critically Endangered	EN: Endangered
NBA2018PL	NP – Not Protected	NP – Not Protected
FRID_2018	0 – Not a free-flowing river	0 – Not a free-flowing river
FRFAG_2018	0 – Not a Flagship River	0 – Not a Flagship River
FEPA Code	4 Upstream management catchment	4 Upstream management catchment
EI and ES	EI (Low), ES (Very Low)	EI (Low), ES (Very Low)
Freshwater Ecoregion	South Kalahari [7]	South Kalahari

- FFRID: Free flowing river identification. Each system and its tributaries have the same identifier.
- FFRREGION: The lumped ecoregion into which free-flowing rivers fall, used to achieve representation of free-flowing rivers across the country.
- FFRFlagship: Flagship free-flowing rivers as identified through an expert review process.
- PES_2018: Data that became available between 2011 and 2017 from Reserve or Ecological Water Requirement (EWR) and Water Resource Classification System (WRCS) studies.

[6] http://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx 12 October 2020
[7] https://freshwaterbiodiversity.org/map/#search/d41/taxon=&search=d41&siteId=&collector=&category=&yearFrom=&yearTo=&months=&boundary=&userBoundary=&referenceCategory=&spatialFilter=&reference=&endemic=&conservationStatus=[]&modules=&validated=&sourceCollection=[%22fbis%22,%22gbif%22]&abioticData=&ecologicalCategory=&rank=&siteIdOpen=&orderBy=name&polygon= 12 October 2020

Aspect	Ga-Mogara	Unnamed tributary
• NBA2018ETS: Ecosystem threat status (ETS) of river ecosystem types: this was based on the extent to which each river ecosystem type had been altered from its natural condition. • NBA2018PL: Ecosystem protection level (EPL) of river ecosystem types: river ecosystem types in protected areas needed to be in good condition rivers (A or B ecological category) to be considered as protected. Well protected, moderately protected, poorly protected river ecosystem types have at least 100%, 50%, 5% of their biodiversity target in protected areas and in natural or near-natural ecological condition; not protected river ecosystem types have < 5%. • FRID_2018: Free-flowing river ID. Each system and its tributaries have the same identifier. • FRFAG_2018: In NBA 2018 where no river condition changes were recorded the free-flowing/flagship rivers remained unchanged.		

Ecoregion 29 (152829.6 km^2), Southern Kalahari vegetation consists of a variety of Kalahari Bushveld types and the Shrubby Kalahari Dune Bushveld, Kalahari Plains Thorn Bushveld and Kimberly Thorn Bushveld is dominant. Other that may occur are Orange River Nama Karoo (limited), Karroid Kalahari Bushveld, Thorny Kalahari Dune Bushveld (limited), Kalahari Mountain Bushveld, and Kalahari Plateau Bushveld (Prescali, 2020).

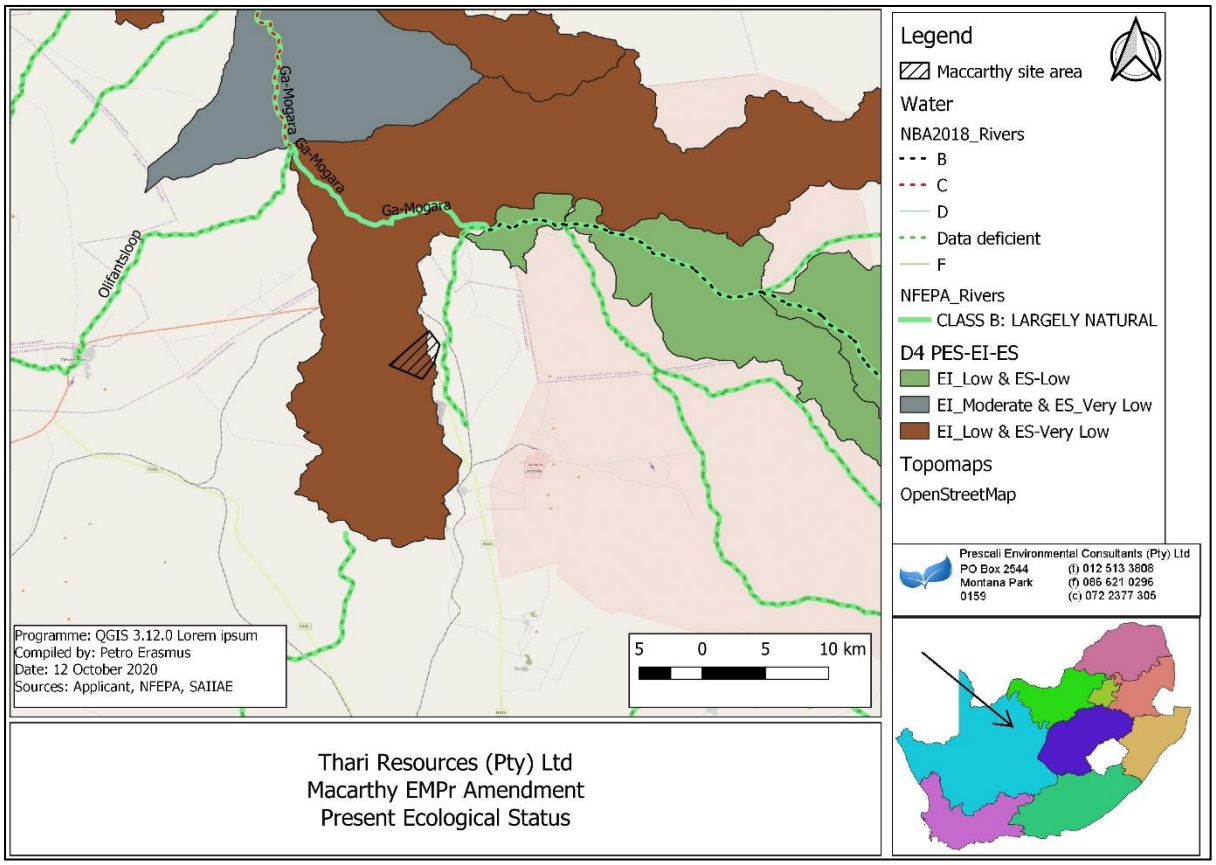


Figure 8-27: Present Ecological Status and Department of Human Settlements, Water and Sanitation[8])

Due to the ephemeral nature of the watercourses no bio-monitoring was conducted and no information could be sourced from the Freshwater Biodiversity Organisation website.

The catchment area has a NFEPA code 0 classification: Not classified.

- It does not fall within a fish sanctuary area for threatened species;
- It does not fall within a fish relocation area for threatened species;
- It does not fall within a fish translocation area for threatened species;
- It does not fall within a fish rehabilitation area for threatened species; and
- It does not fall within a fish Corridor area for threatened species.

[8]https://freshwaterbiodiversity.org/map/#search/d41/taxon=&search=d41&siteId=&collector=&category=&yearFrom=&yearTo=&months=&boundary=&userBoundary=&referenceCategory=&spatialFilter=&reference=&endemic=&conservationStatus=[]&modules=&validated=&sourceCollection=[%22fbis%22,%22gbif%22]&abioticData=&ecologicalCategory=&rank=&siteIdOpen=&orderBy=name&polygon= 12 October 2020

8.8.3. Background Water Quality

Due to the ephemeral nature of the watercourse no water quality data is available.

8.8.4. Surface Water Quantity

8.8.4.1. Mean Annual Runoff

The MAR is indicated in Table 8-9.

8.8.4.2. Flow

The affected watercourses are ephemeral and it is expected to flow only during high rainfall events. Based on the topography of the area water will flow in south-westerly direction and a portion of the flow is in a eastern direction towards the unnamed tributary.

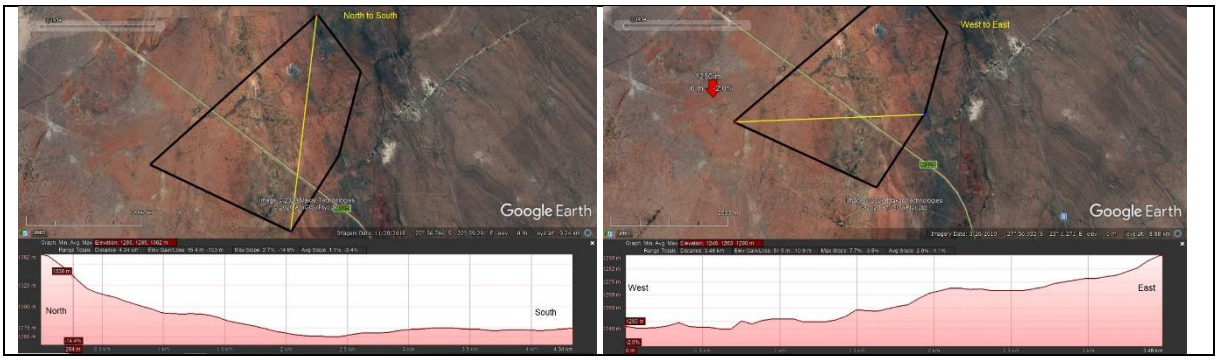


Figure 8-28: Topography

8.8.5. Site specific aquatic ecosystem Descriptions

8.8.5.1. Aquatic ecosystem types

Aquatic ecosystems can be classified into two types namely[9]:

- Lentic Ecosystems: and
- Lotic Ecosystems.

8.8.5.2. Lentic Ecosystems – Wetlands, Impoundments, Lakes

Lentic ecosystems refer to standing or basin ecosystems and include lakes, impoundments and wetlands[10].

- Lakes: Generally, lakes are formed in basins created by geological activities e.g. warping and faulting of the earth's crust or as a result of glacial activities[10]. There are no lakes within the Macarthy mining rights area.
- Impoundments: Impoundments, or dams are manmade infrastructures and can be onstem (i.e. the watercourse itself is dammed) or offstem (i.e. the dam is located a distance from the watercourse and water is pumped from the watercourse / underground reservoir to the dam) [10]. There are no onstem storage dams near the Macarthy mining rights arrea.
- Wetlands: A wetland as defined by the NWA means "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil". As described by (DWAF, 2005) the word "wetland" refers to ecosystems of which the primary driving force is water. Its prolonged presence in wetlands is a fundamental determinant of soil characteristics and plant and animal species composition. Any part of the landscape where water accumulates for long enough and often enough to influence the plants, animals and soils occurring in that area, is thus a wetland. The objective of the delineation procedure is to identify the outer edge of the temporary zone. This outer edge marks the boundary between the wetland and adjacent terrestrial areas.

[10] http://www.egyankosh.ac.in/bitstream/123456789/16255/1/Unit-8.pdf 18 August 2020

Wetlands must have one or more of the following indicators:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes);
- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil; and
- Terrain Unit indicator to identify the locality of the wetland within the landscape.

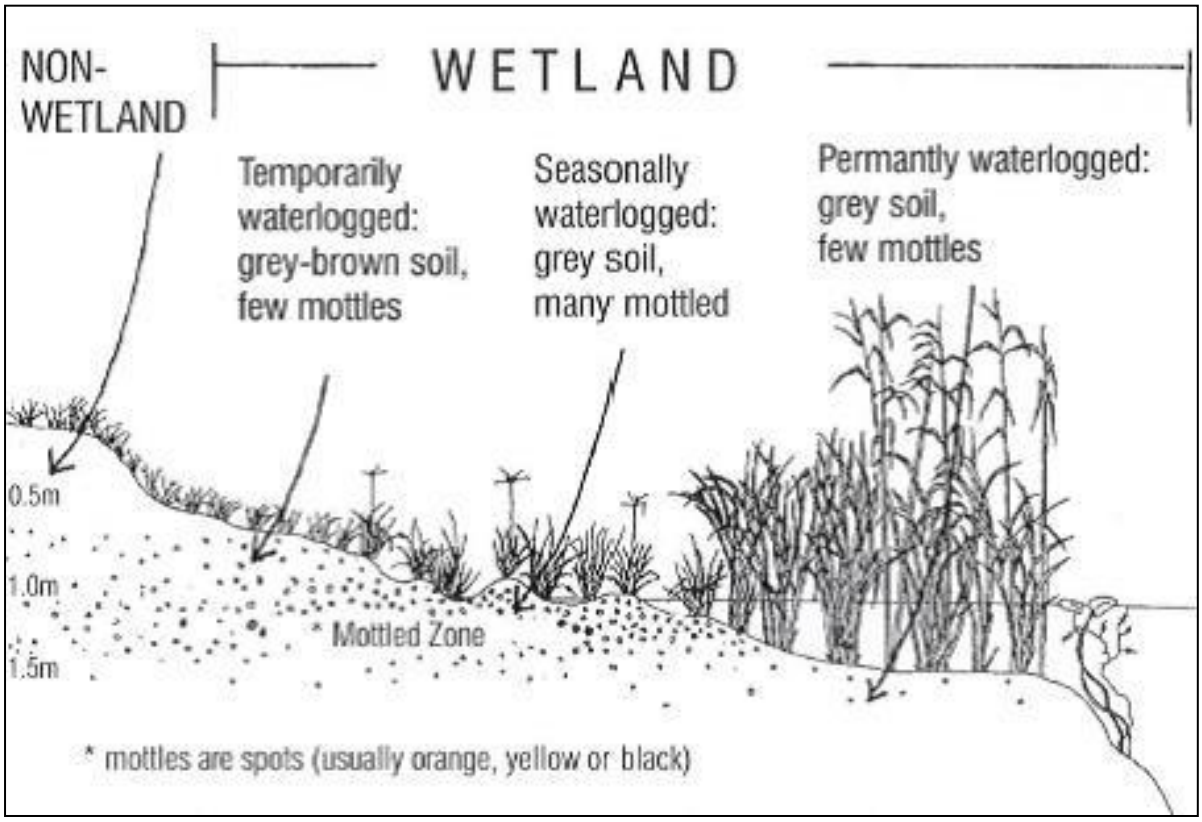


Figure 8-29: Cross section through a wetland (DWAF, 2005)

From the NFEPA database no natural wetlands were identified at the Macarthy mining right area or within 500m from the application boundary. This information was confirmed by the 2018 Wetlands (CSIR, 2018).

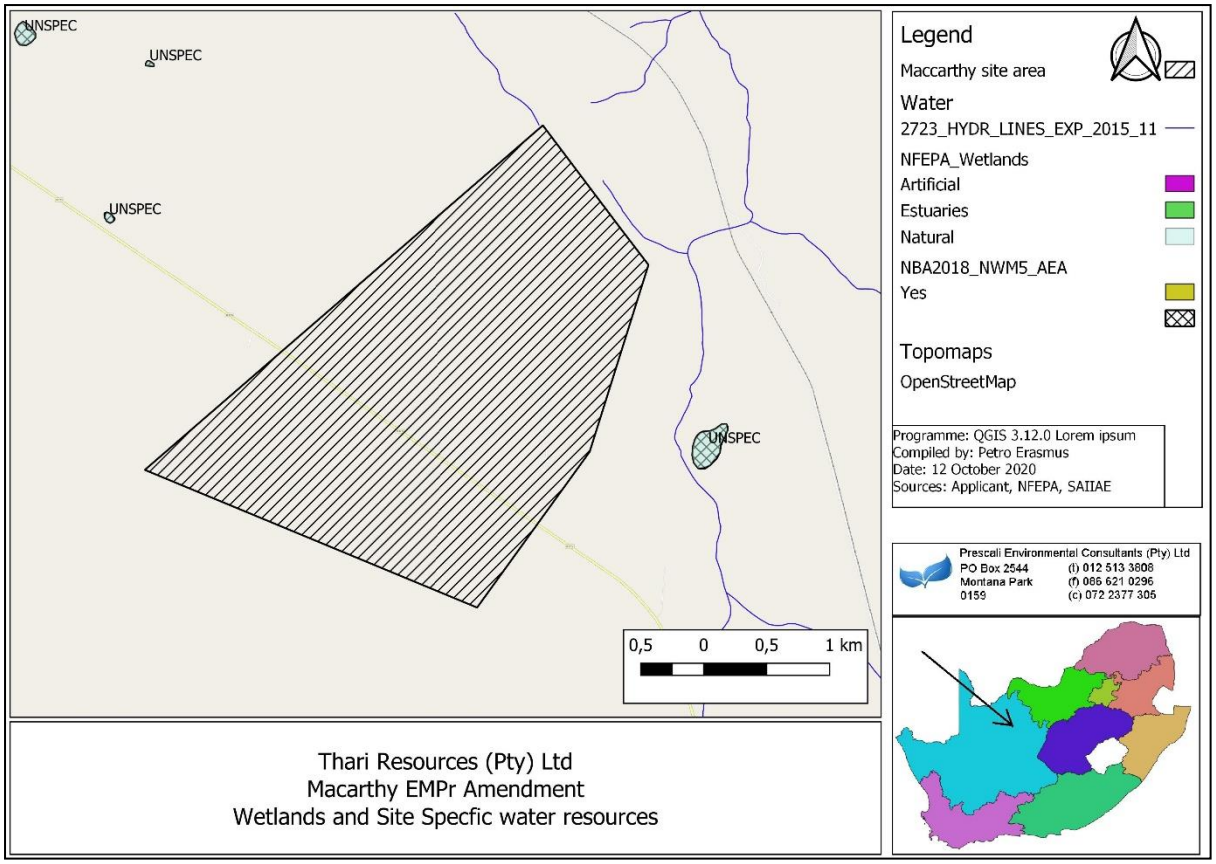


Figure 8-30: Wetlands As per the NFEPA database and site-specific water resources

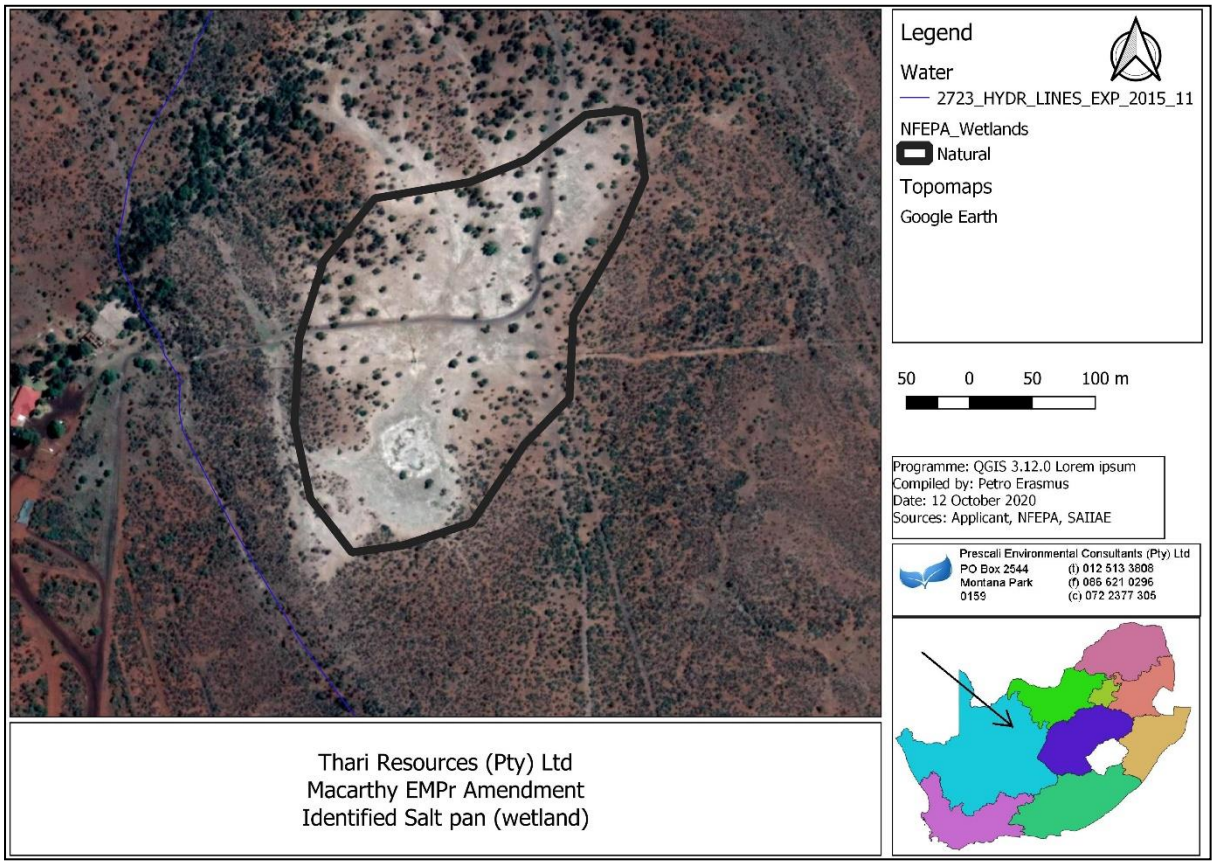


Figure 8-31: Google image of nearest wetland

8.8.5.3. Lotic ecosystems – Rivers, streams etc.

Lotic systems include rivers and the most outstanding feature of such habitats are flowing water which moulds the characteristics of the water bed and influences the distribution of the organisms therein[10].

A water course is defined by the NWA as:

- River or spring;
- A Natural channel in which water flows regularly, or intermittently;
- A Wetland, lake or dam into which, or from which water flows (refer to Section 8.8.5.2); and
- Any collection of water that the Minister may, by notice in the Gazette, declare to be a water course, and a reference to a watercourse includes where relevant, its bed and banks.

For the purpose of this assessment, the applicable river / watercourse reaches was classified according to the guidelines by DHSWS in "*A practical field procedure for identification and delineation of wetlands and riparian areas*" as shown in Figure 8-32. Using this classification, three sections along the length of a watercourse are defined based on their position relative to the zone of saturation in the riparian area:

1. Section “A” is defined as being above the zone of saturation and it therefore does not carry baseflow. They are mostly too steep to be associated with alluvial deposits and are not flooded with sufficient frequency to support riparian habitat or wetlands. This type does however carry storm runoff during fairly extreme rainfall events, but the flow is of short duration, in the absence of baseflow. The “A” watercourse sections are the least sensitive watercourses in terms of impacts on water yield from the catchment.
2. Section B reaches are in the zone of the fluctuating water table, baseflow is intermittent and dependant on the current height of the water table and as the channel bed is in contact with or in close proximity to the water table residual pools are often observed when flow cease. The top end of the B Section is marked by the most headward extent of base flow in the channel during wet periods, when the water table is high, and the bottom end of the B Section is marked by the most downstream extent of zero flow during dry periods (when the water table is low). With regards to slope, the channel bed is flat enough to allow for the deposition of material and initial signs of flood plain development may be observed.
3. Section C streams are perennial streams and thus always have contact with the zone of saturation (except during extreme drought conditions). These sections are very flat and a flood plain is usually present.

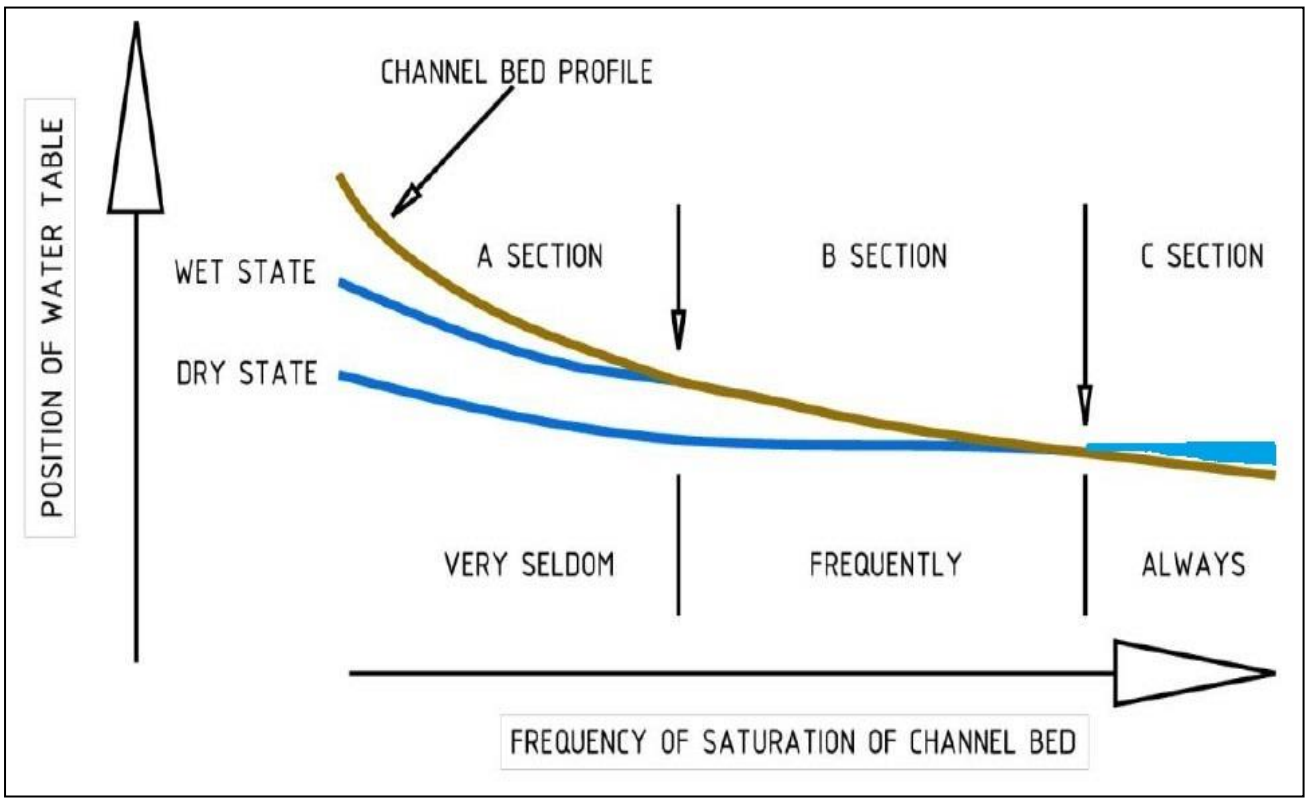


Figure 8-32: River Classification (DWAF, 2005)

There are no watercourses located within the Macarthy mining right area, though the northern part of the iron opencast is located on a watershed area.

The non-perennial tributary of the Ga-Mogara River, approximately 100 m north of the proposed footprint of the waste rock dump extension and Manganese opencast pit, was surveyed. The drainage line has a shallow and poorly defined channel with a rocky and sandy bed. There was no flow in the stream and it was reported that it only flows during and immediately after rain events.

No obligate or facultative wetland species were identified in or around the stream. Apart from slightly denser plant growth in the immediate vicinity of the tributary, no riparian zone could be identified in relation to the surrounding vegetation. Dominant plant species included trees and shrubs such as *Senegalia mellifera* (Black thorn), *Tarconanthus camphoratus* (Camphorbush), *Cadaba aphylla* (Desert broom), *Grewia flava* (Brandybush) and *Boscia albitrunca* (Shepherd's tree) (protected in term of the National Forest Act, 1998 (Act no. 84 of 1998)). No Alien and Invasive Plant (AIP) species were observed to occur along the section surveyed.

8.8.6. Normal Dry Weather Flow

No flow.

8.8.7. Drainage Density

There are no watercourses located within the Macarthy mining right area.

8.8.8. Flood Lines

No flood lines were determined or available for inclusion into this report as there are no watercourses on the mining right area.

8.9. Geohydrology and Aquifers

A Groundwater assessment was conducted for this project (Eco Elementum,, 2021)Appendix 6, the results of the site assessment are indicated below.

8.9.1. Aquifers

According to the Aquifer Classification map (DWA, 2012), the Macarthy mine area is situated in a minor aquifer classification area. Aquifer classification is based on the Parsons System (1995). Qualities in these aquifers can vary and is typically moderately yielding aquifers.

Table 8-11: Aquifer System Management Classes

Sole Aquifer System	An aquifer that is used to supply 50% or more of domestic water for a given area, and for which there is no reasonably available alternative sources should the aquifer be impacted upon or depleted. Aquifer yields and natural water quality are immaterial.
Major Aquifer System	Highly permeable formation, usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes. Water quality is generally very good (less than 150 mS/m).
Minor Aquifer System	These can be fractured or potentially fractured rocks that do not have a primary permeability, or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large volumes of water, they are important both for local suppliers and in supplying base flow for rivers.
Non-Aquifer System	These are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities. Water quality may also be such that it renders the aquifer unusable. However, groundwater flow through such rocks, although impermeable, does take place, and needs to be considered when assessing the risk associated with persistent pollutants.
Special Aquifer System	An aquifer designated as such by the Minister of Water Affairs, after due process.

During the Groundwater Complete study for Jenkins (bordering Macarthy mine the north-west) in 2016, several exploration boreholes were drilled, and the aquifer types were classified.

Two main aquifer systems exist in the Macarthy mine region. Firstly, is a swallow, weathered aquifer, semi-confined or unconfined, which is found in the first 7 to 30 mbs. This aquifer is found at the contact between the weathered bedrock zone and the fresh bedrock below. Yields of this aquifer can range between 0.2 and 2l/s and is often utilised by the farmers in the area for domestic and livestock purposes. This aquifer is important in the opencast mining industry due to dewatering of this aquifer, where the water levels are above the base of the pits and also post-closure in terms of pollution due to the higher hydraulic conductivity of the aquifer. This aquifer is often classified as a minor aquifer system. The water levels in the majority of the boreholes at Macarthy mine exceeded 30 mbs, which indicates that this aquifer may be absent at the site.

Secondly is a deeper semi-confined to confined fractured aquifer. "Fracturing in the aquifer usually occurs in the chert breccia (Manganese Marker), banded iron formation and to a lesser extent the underlying dolomite at depths of between ± 30 and 160 m below surface. Yields in the aquifer may vary from 1 to more than 40 l/s". The three yield tests conducted at Salene Manganese indicated yield varying between 0.3 l/hr and 1.3 l/hr. "Fracturing is usually concentrated near the haematite ore bodies where mineralization and preservation of ore occurred through folding, thrusting, fracturing and sinkhole formation/slumping. This aquifer system usually displays semi-confined or confined characteristics with piezometric heads often significantly higher than the water-bearing fracture position. The fractures may occur in any of the co-existing host rocks due to different tectonic, structural and depositional processes. According to the Parsons Classification system the aquifer could be regarded as a major aquifer system", (Coza, 2012).

Table 8-12: Borehole yield tests results for Salene Manganese Boreholes.

Borehole	Yield (l/hr)	Yield (l/s)	Pump Duration
EUB-12	2 520	0.7	6.5 hrs
GWM-B1	1 000	0.3	3.5 hrs
EUB-1	4 800	1.3	3 hrs

8.9.1.1. Aquifer Classification

Table 8-13: GQM Classification for the Macarthy Mine Area

Aquifer System Management Classification		Aquifer Vulnerability Classification		GQM		GQM
Class	**Points**	**Class**	**Points**	**Index**	**Level of protection**	**Macarthy mine**
Sole Source Aquifer System	6	High	3	<1	Limited	
Major Aquifer System	4	Medium	2	1 - 3	Low	
Minor Aquifer System	2	Low	1	3 - 6	Medium	4
Non-aquifer System	0			6 - 10	High	
Special Aquifer System	0-6			>10	Strictly non-degradation.	

The level protection for the Macarthy mine according to the GQM Index is 4. This indicates a medium level of protection. Based on the findings of the geohydrological study it is highly recommended that a proposed monitoring protocol should be in place for the project area.

The DWS (previously DWA – Department of Water Affairs) has also compiled a susceptibility map for South Africa (2013). This map indicates the qualitative measure of the relative ease with which an aquifer can potentially be contaminated. According to the aquifer susceptibility map, the Macarthy mine area is classified as highly susceptible to contamination.

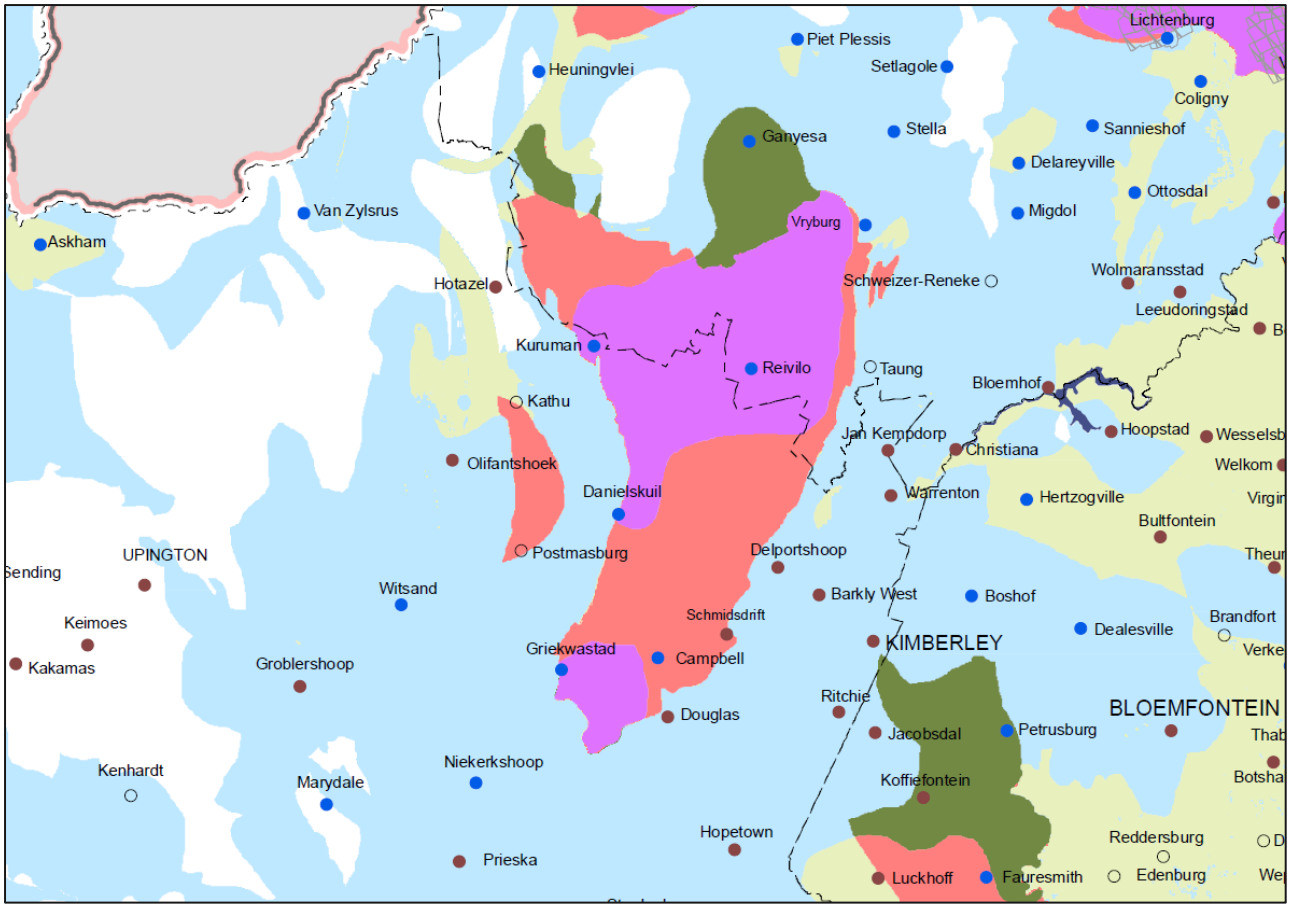


Figure 8-33: Susceptibility Map of South African indicating he high susceptibility of Macarthy mine.

8.9.1.2. Hydrocensus

A hydrocensus survey is conducted to locate boreholes and springs within a specified area. The uses of the groundwater from the boreholes and springs are recorded together with abstraction rates, borehole depths and all possible properties of the boreholes are noted. Where possible water levels and water samples are taken for analysis.

A hydrocensus survey was conducted by Eco Elementum in September 2020. During this census a total of 7 boreholes were located. Three water levels could be measured, and four samples were collected for quality analysis (Table 8-14). These boreholes are within the mine boundary area. EUB-12 is used for production, drinking and wildlife water purposes and the borehole is equipped with a pump. Windmills are located at EUB-1 and EUB-12. A windmill is also located at EUB-3, but the borehole is blocked at 7 m. The majority of the located boreholes were also proposed as monitoring boreholes in 2012, but currently no monitoring of the boreholes occur. The locations of the hydrocensus boreholes are located in Figure 8-34.

Table 8-14: 2020 Hydrocensus borehole information

Borehole ID	South ºS WGS84	East ºE WGS84	Sampled	Use	Comments
EUB-1	-27,93665	23,00836	Y	Drinking Water	4800 l/hr
EUB-3	-27,94028	23,00181	N	None	Dry/Blocked
EUB-4	-27,94228	23,00103	N	Drinking Water	Windmill
GWM-B1	-27,93044	23,02467	Y	None	1000 l/hr
GWM-B2	-27,93511	23,01073	Y	None	Murky Water
EUB-8	-27,94279	23,00873	N	None	Bees
EUB-12	-27,94169	23,02337	Y	Production, drinking and wildlife water	Murky Water

During the Groundwater Complete study (2016) at the neighbouring Jenkins mining project, a comprehensive hydrocensus was also conducted for the area (Figure 8-35). A total of 52 boreholes were located during the hydrocensus and the information of this census is indicated in Appendix A. 44% of the boreholes located during this census were exploration boreholes, 15% were monitoring boreholes and 41% were used for Irrigation, Livestock or Domestic purposes.

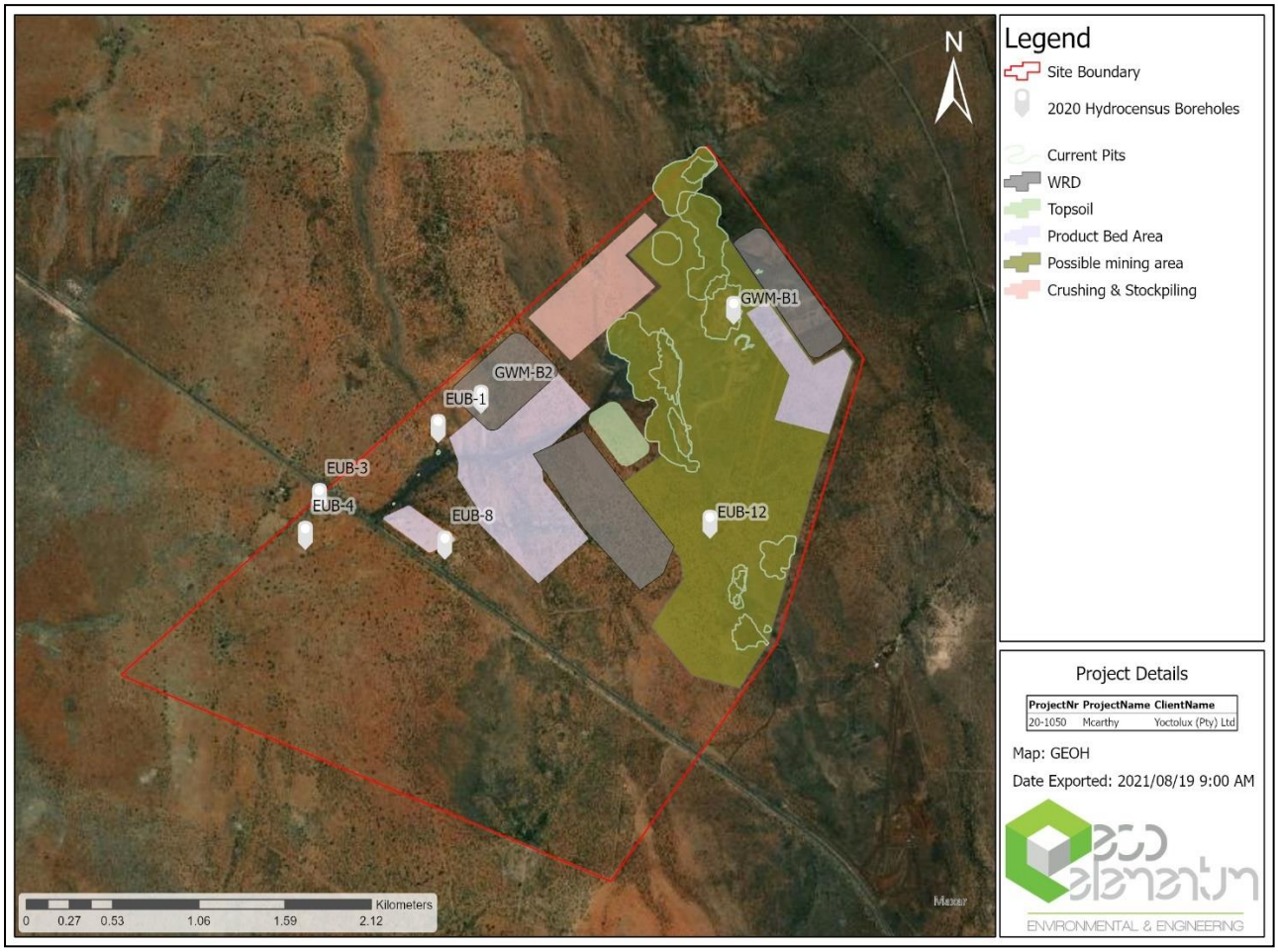


Figure 8-34: Hydrocensus boreholes located during the groundwater assessment site visit.

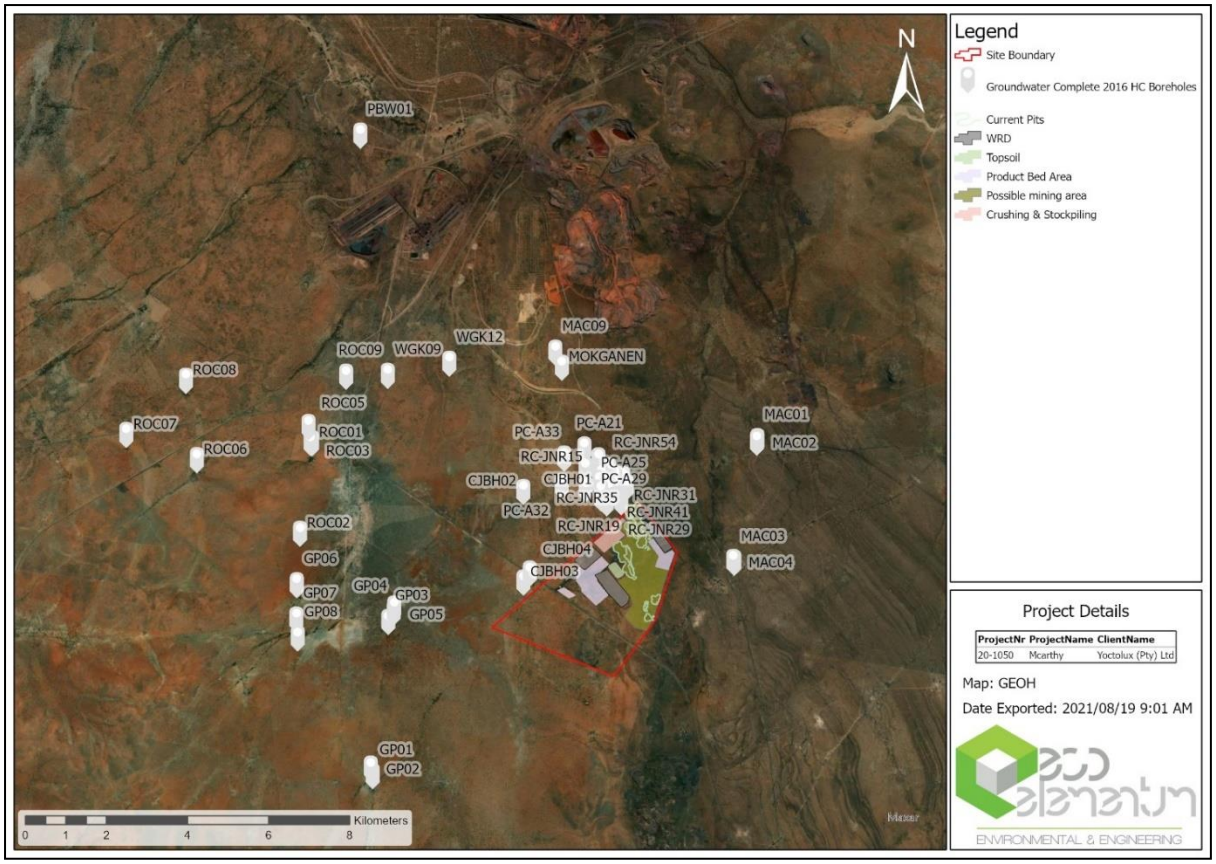


Figure 8-35: Hydrocensus boreholes located in neighbouring Jenkins mining area, (Coza, 2012)

8.10. Heritage Resources

A Phase I Heritage Impact Assessment has been conducted by A Pesler (Pesler, 2020) Appendix 6. A number of sites and features of cultural heritage (archaeological and/or recent historical) origin and significance were identified and recorded in the area during the assessment. These included sites dating to the Stone Age (open-air surface scatters and single artifacts), recent historical structures and a cemetery.

8.10.1. Stone Age Sites

Four sites (Sites 1, 3, 4 & 7) were recorded. Three of these were either single or small scatters of MSA & LSA stone tools and flakes, while Site 1 contains a dense scatter of formal tools, waste-flakes and flake-tools. Although these were the only visible sites there is a possibility that more could be located in the area – especially in sections covered by red Aeolian (Kalahari) sands.

Site 1 is located on top of a hill with large boulders. These large boulders provide some shelter and it seems as if the material found here is the result of stone knapping (manufacture of tools) activities around these boulders and sheltered area. From the hill there is a good view of the entire area below. The amount of artifacts found here warrants further investigation and the site is rated of Medium to High Heritage Significance. The site is located within the proposed iron opencast pit footprint and as a result will be negatively impacted. The following mitigation measures are therefore recommended:

- Detailed mapping and recording of Site 1 and potentially other sites located around the hill;
- Surface sampling of material from the site and the hill.

These mitigation measures need to be implemented prior to any mining activities being undertaken in this area.

8.10.2. Recent Historical Sites

These three sites (Sites 2, 5 & 6) all date to recent (less than 60 years of age) times. Site 2 consists of the remains of recently constructed mining related structures that have been abandoned and Site 5 is an existing

farmstead dating to the 1970's that is currently utilized as offices. Both these sites have no Heritage Significance.

Site 6 is a cemetery containing 10 graves of the Kotze (previous farm owner) and Jacobs families. Although the graves are not older than 60 years of age graves always carry a High Significance Rating from a Heritage perspective. The cemetery is located close to the current Site Offices and is properly fenced in and will not be impacted by any mining activities. A 30m buffer zone within which no development will be allowed needs to be adhered to.

Figure 8-36: A general view of a part of the study area. Note the current mining activities

Figure 8-37:A view of the hill where Site 1 is located

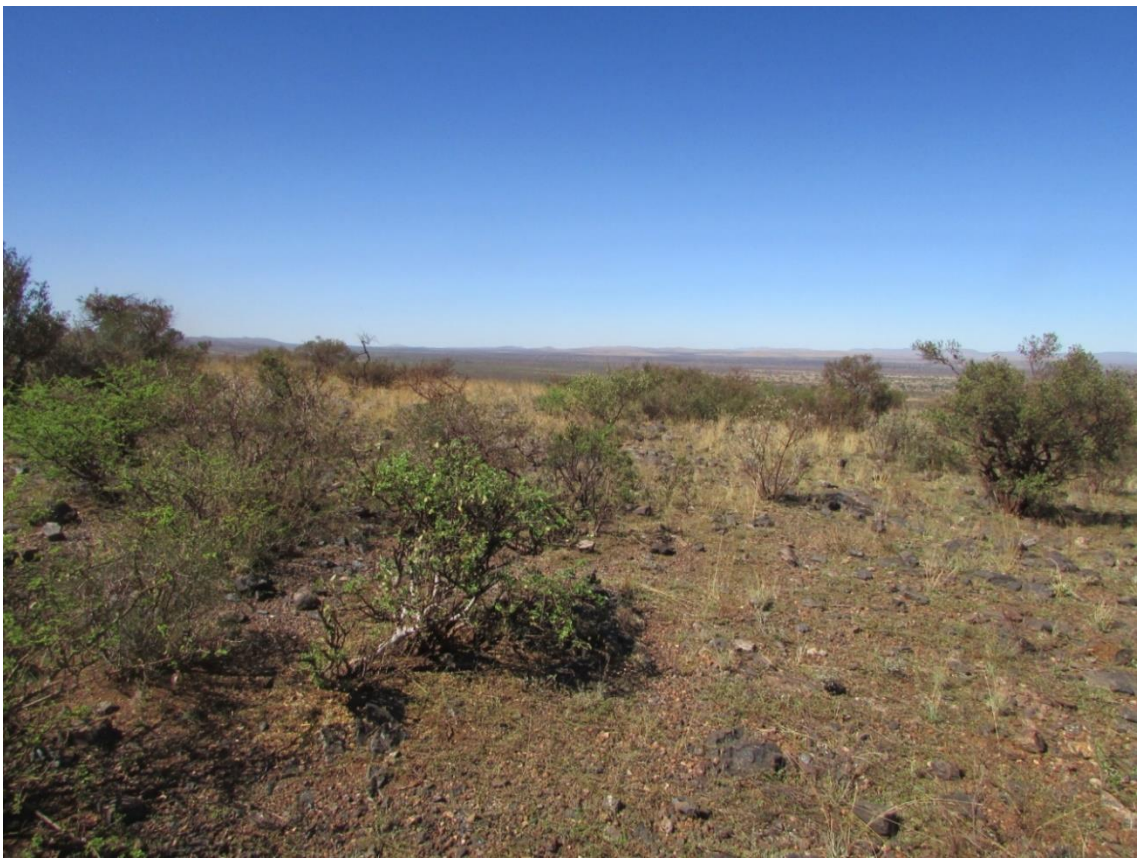


Figure 8-38:Site 1

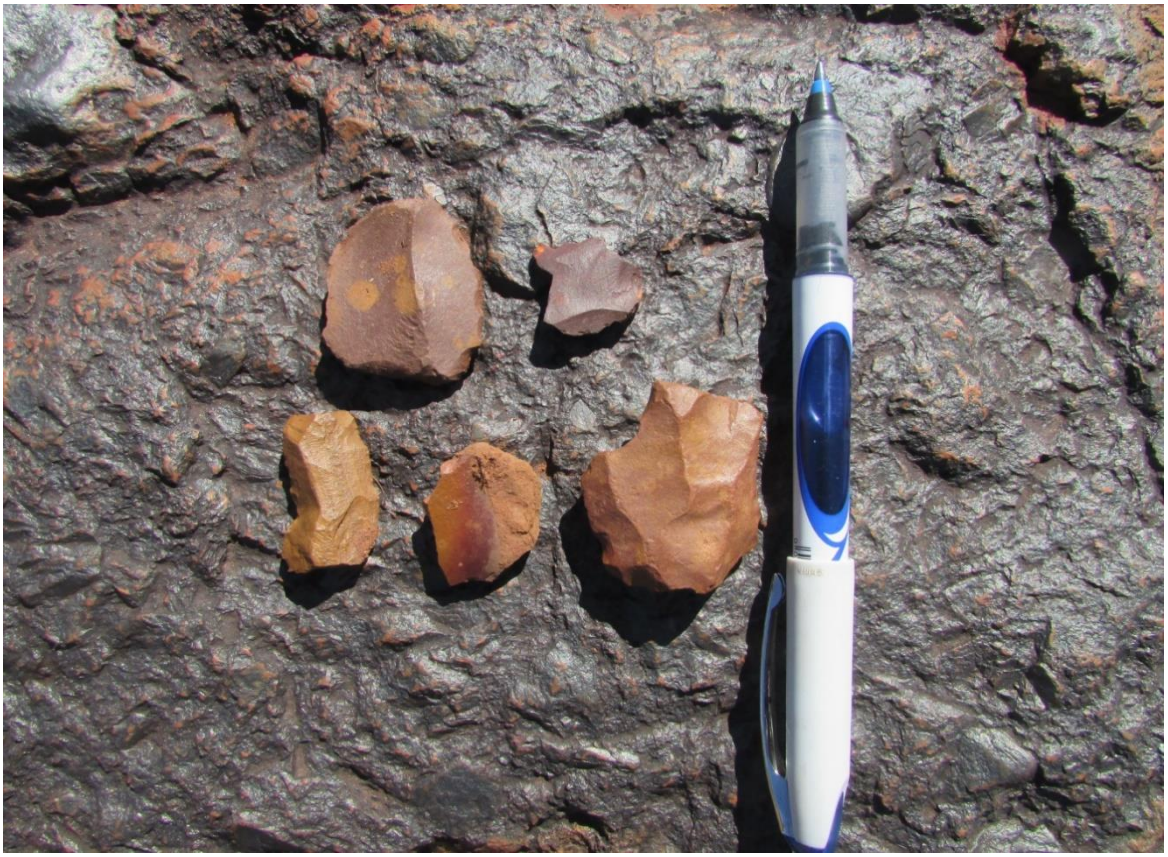


Figure 8-39:Some of the stone tools from Site 1

Figure 8-40:One of the recent mining related structures on Site 2

Figure 8-41:A single MSA/LSA flake-tool (scraper) at Site 3

Figure 8-42:The single MSA/LSA artifact from Site 4

Figure 8-43:The recent farmstead at Site 5

Figure 8-44:A view of the Kotze family graves on Site 6

Figure 8-45:A view of the Jacobs family graves at Site 6

Figure 8-46:The Site 6 cemetery is properly fenced

Figure 8-47:The 2 Stone Age artifacts from Site 7

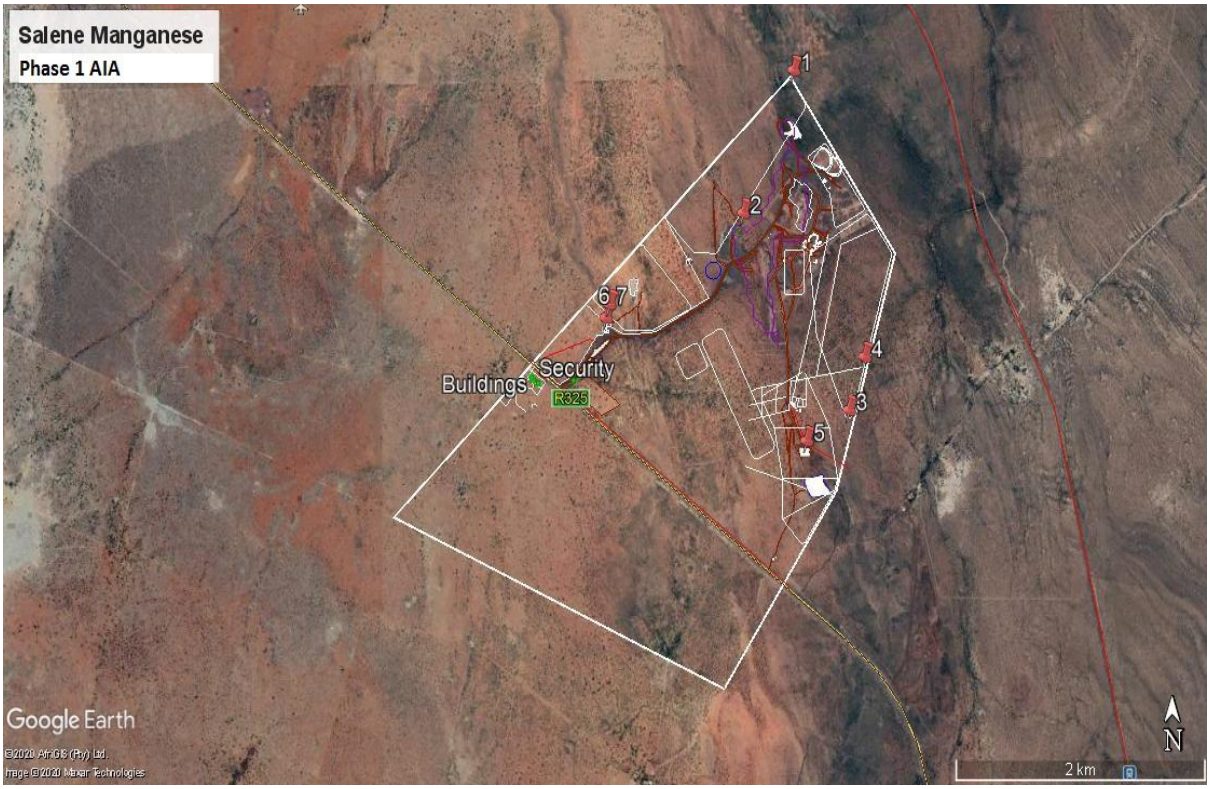


Figure 8-48:The location of the sites recorded (Google Earth 2020)

8.11. Socio-Economic Environment

A Socio-Economic Assessment was conducted in 2020-2021 by Gudani Consulting (Gudani Consulting, 2021) taking into consideration that Salene Manganese Mine is located 60 km from Postmasburg and 30 km from Kathu. These are small towns in Tsantsabane Local Municipality in the Northern Cape Province. It falls under ZF Mgcawu District Municipality which is one of the 5 districts ofthe Northern Cape Province of South Africa.

8.11.1. Population and Demography

The Macarthy Manganese Mine is located 60 km from Postmasburg and 30 km from Kathu. These are small towns in Tsantsabane Local Municipality in the Northern Cape Province. It falls under ZF Mgcawu District Municipality which is one of the 5 districts of the province of. Postmasburg has a population of roughly 4,668 (Census 2011, as cited by Gudani) with 1,561 households. The topography of Postmasburg is generally flat.

The ZF Mgcawu Municipality under which the Salene Mine falls feature approximately 9,839 settlements, with Kimberly constituting the main urban centre. Other urban centre closest to the proposed Salene mine are Vergenoeg, Boitshoko, Kameelhoek, Swartkoppies, Aucampsrus and Bloubospan. The spatial location of these first order centres generally coincide with the municipality's dominant economic activities namely mining and agriculture. Despite having been influenced by the spatial demarcation of the former homeland areas, the spatial occurrence of settlements has also been influenced by:

- The spatial location of mining and agricultural activity areas; and
- The spatial location of major roads such as R385, R325. The major routes running through Postmasburg include R385 that links Postmasburg with Kimberley to the east and the N14 to the west and the R325 that links Postmasburg with the N14 to the north.

It is estimated that a total of 4 668 people reside in Postmasburg. The town compriseof approximately 1 561 households with an average of 3,8 persons per household. In terms of the demography of the population 48% are female and 52% are male. Thereare a high (10%) number of children between 0- 4 years, youth between 20 - 24 years (11%) and 25 - 29 years (11%) which indicates a potential for marked rise in local population in the next decade as pre-adolescent reach child bearing age. This groupcan be viewed as being highly vulnerable to HIV/Aids and other sexually transmitted diseases in the absence of health education.

Only 3% of the households have one person. 20% are two people living on the same stand and in one household, which may be interpreted as couples. 14% are 3 person households, 14% are four person households, 9% amounted to five person households,6% to six person households and 4% to seven person household, 2% comprises of eight person household, 1% to nine person household and 2% to ten or more persons in each household. 68% of households are headed by males and 32% are headed by females. Itis uncommon however, to have two or more households living in one stand. While somehouseholds may have immediate and extended families on the same stand, the head families may use the extra room to rent out to workers and other relocating families astemporary residencies in the form of backroom until a permanent solution is reached.It is therefore quite uncommon to have more than one households living in one stand this area.

It may be interpreted that of the two and more household sizes, some may be single parents and some may have live-in partners and children. The average size of a family in Postmasburg is equivalent to that in advanced urban area (i.e. cities).

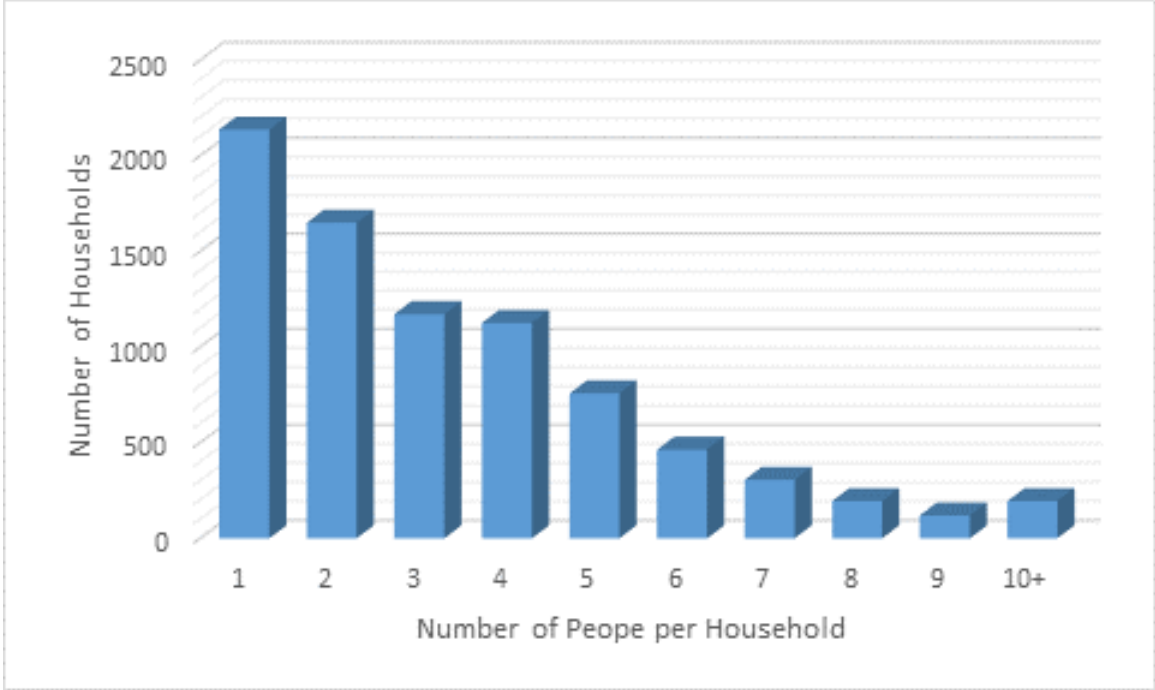


Figure 8-49: Number of people per household

8.11.2. Institutional Arrangements

Postmasburg is located in the Northern Cape Province in Tsantsabane Local Municipality of the ZF Mgcawu District Municipality. The town is under municipal jurisdiction and has municipal councils who work with the respective community to promote local economic development.

8.11.3. Economic Activities, Employment and Income

Postmasburg has extensive positive opportunities – including abundance of mining potential within the area. The major economic drivers in the local municipality are mining, agriculture and tourism, with mining as the mainstay of the local economy. It would therefore suffice to say that mining (both large and small scale) has a huge potential for the immediate future.

8.11.3.1. Agricultural Sector

Agriculture has undergone extensive restructuring since the opening up of the South African economy and substantial growth took place between 1998 and 2002. This growth was however impacted due to mounting pressures from market competition andlegislative changes. Tsantsabane Local Municipality mainly consists of large commerciallivestock farms and subsistence grazing activities.

8.11.3.2. Tourism Sector

The tourism sector in the Tsantsabane Local Municipality is connected to the local economic activities, mainly mining. The municipality hosts heritage sites and tourism assets that can reinforce future growth potential for the tourism sector. There exist tourist attractions such as the Blinkklipkop, Howitzer Gun Civic Centre, Postmas Diamond Mine, and the Reformed Church and Reverend Dirk Postma Statue which are of great significance to the growth of the sector. Although tourism has been viewed as one of the emerging growth sectors in the municipality, the municipality lacks major product to draw a sizable portion of holiday tourists to the area.

8.11.3.3. Mining Sector

The Northern Cape has a strong and diverse mining sector with a concentration of base metals (iron ore, manganese, zinc and copper) and industrial minerals such as gypsum, salt and building stone. The Northern Cape produces more than 84% of South Africa's iron ore. The province has two major iron belts, from Postmasburg to Hotazel, and running through Sishen and Kathu. Sishen is the most important iron-ore mine in

South Africa, where operations include extraction and four beneficiation plants. The Sishen- Saldanha takes ore to the coast and the Gamagara corridor focus on the tremendous iron ore and manganese reserve in the area and being able to develop the area to facilitate this development, but also to create a simultaneous parallel socioeconomic contexts to provide for the community when the mineral reserves are depleted.

At present, operational mines found within the district area include the likes of Kumba Kolomela which is located 22 km away from Postmasburg, Salene Manganese (30 km from Kathu) and Assmang Beeshoek mines which is situated near Postmasburg. In spite of the involvement of major mining companies, mining in the municipality has not yet reached maximum production limits.

8.11.3.4. Local Employment and Income

Employed persons in Postmasburg add up to 71%, 27% is unemployed persons, and 2% is discouraged work seekers. Majority (14%) have no means of income. The annual household percent income distribution Postmasburg is as follows: 3% of the households fall within the income bracket R1 – R 4 800. This income bracket is constituted predominantly by those households earning a living solely from government grant, pension or labour. Those earning between R 4 801 – R 9 600 constitute 4% and are most likely earning a salary. 12% earn between R 9 601 – R 19 600, 17% earn between R 19 601 – R 38 200, 17% earn between R 38 201 -R 76 400, 15% earn R 76 401 – R 153 800, 10% earn R 153 801 – R 307 600, 5% earn R 307 601 – R 614 400, 1% earn R 614 001 – R 1 228 800 and another 1% earn R 1 228 801 or more. These are most likely to be skilled workers.

8.11.3.5. Health and Medical Facilities

The medical facilities in Postmasburg are well distributed with clinics in Postdene, Biochoko and Newtown. The nearest hospital is the Postmasburg Hospital which is located towards the North Western. The existing health care/medical facilities are sufficient to meet all the health requirements and needs of the community.

8.11.3.6. Housing

The community of Maremane is an independent informal settlement. The locations of this type of settlement mainly correspond to the mining areas and are therefore located along the edges of the mining belt. These settlements largely contain households of mine employees. The informal settlements are characterized by a lack of security of tenure and a lack of basic municipal services. It is imperative that these settlements are provided with the basic amenities in order to improve the social status and life of the people living in these townships. This type of settlement is likely to encroach the Salene Mine area due to job seekers.

Most households or homesteads comprise of a dwelling, a small patch of cultivated ground, often with a kraal for livestock. Houses are typical corrugated iron shacks and a few brick and concrete with corrugated iron or tile roof.

Figure 8-50: Typical Houses around Maremane and Access Streets

8.11.3.7. Education Levels and Training

There are several schools in Postmasburg. These learning facilities do not offer vocational/business training to locals. The following are existing schools:

- Postmasburg Secondary School;
- Blinkklip Sekondêre Skool;
- Postmasburg Primary School;
- Assmang Primêre Skool;
- Hoërskool Postmasburg;
- Agang Thuto Primary School; and
- Trinity College (Intermediate School).

There is a need for more schools and additional technical high school that willrespond to or address the needs of the mining sector.

According to the 2011 data from *Stats SA*, 11% of the population in Postmasburg have no schooling, 13% have some primary schooling, 5% have complete primary schooling, 37% have secondary schooling, 27% have standard 10/ grade 12(matric) and 6% have higher education level. The poor level of education has serious implications for the potential of local people to gain employment. This is worsened by the general shortage of skills, compounded by the lack of training opportunities in areas of science, computer literacy, technical and technological expertise.There are a number of people with teaching diplomas, and a few drivers, motor mechanics and builders.

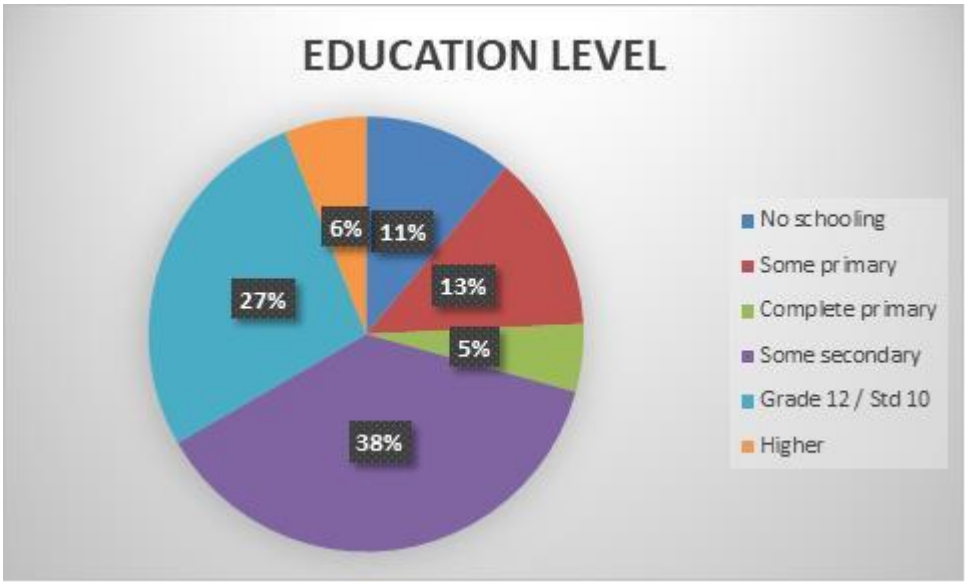


Figure 8-51: Edcucation Level in Postmasburg

The poor level of education has serious implications for the potential of local people to gain employment. This is worsened by the general shortage of skills inthe local community, compounded by the lack of training opportunities in areas of science, computer literacy, technical, artisan and technological expertise. With the potential employment opportunities from Salene Manganese Mine, there will be few qualified persons available to fulfil the job specifications. There are a number of people with teaching diplomas, and a few drivers, motor mechanics and builders – however the overall empowerment in the livelihoods the affected communities would largely depend on capacity building and technical skills training from Salene Manganese Mine, and other mines in the area.

8.11.3.8. Agriculture

Very few patches of land have intermediate suitability for arable agriculture. The majority of the rest of the land is suitability for grazing. The rest of the municipal area is suitable for grazing. It should be noted that the soil capability excludes the availability of water.

8.11.3.9. Settlements

Three (03) settlement types located within the Tsantsabane Local Municipal Areas can be distinguished. These are urban settlements, rural settlements and informal settlements. These settlement types are distinguished from each other by the presence or absence of security of tenure and basic municipal services such as water and electricity.

8.11.3.10. Urban Settlements

These settlements have a formal township layout. There is a full range of municipalservices (water, sewer, electricity and tarred roads) available to residents or the households located within these settlements. The owners have security of tenure (they hold a title deed). There are no such settlements in the immediate vicinity ofSalene Manganese Mine.

8.11.3.11. Rural Settlements

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

8.11.3.12. Informal Settlements

The other type of settlement within the district and local municipal areas is informal settlements. Maremane settlement falls under this category. The locationsof these settlements mainly correspond to the mining/semi urban areas and are therefore located along the edges of the mining/urban belts. These settlements largely contain households seeking employment at the mines/urban areas. The informal settlements are characterized by a lack of security of tenure and a lack of basic municipal services. This type of settlement is likely to gradually encroach to Salene Mine area due to job seekers.

8.11.3.13. Business

Big and small businesses are present in Postmasburg - shopping complex, shops,taxi rank, street vendor and filling stations. The smaller businesses are found scattered through the residential area (Maremane) and are informal in character - such as shops, taverns/bars, and day-care centres. Lack of business and employment has caused people to migrate to the bigger towns especially Postmasburg and Kathu, in search job opportunities.

8.11.3.14. Water and Sanitation

Water supply in Postmasburg is mainly from underground sources. The totalpotable water demand of Postmasburg is supplied directly from 12 boreholes in andaround the town as well as three connections to the Vaal-Gamagara pipeline. Six boreholes, namely the ACVV, Honeyball, Houtstraat, Kooperasie, Bloudak and Makou boreholes feed directly into the Postmasburg\Newtown network and, when the demand is low, fill the Newtown reservoirs. There are 4 water distribution zones with 4 reservoir sites, 7 reservoirs, 4 towers and 9 boreholes.

Water is pumped from underground into a reservoir/elevated tank on the surface, from where is directed to various communal/public stand pipes/taps. 19% of the households depend on the communal taps for access to drinking water. (45%) have piped connections and running water in their individual households, a further 33%of the households have boreholes in their respective yards and 3% do not have access to water.

Provision of *water* is at full capacity in, *Postmasburg.* However, the migration of people to these areas may increase water shortages. 73% of the households have flush or septic tank toilets in Postmasburg. 1% of the households have pit toilets with no ventilation systems and a further 1% have the same pit with ventilation. Another 1% have chemical toilet, 17% of the households have no latrine facilities and 7% are using the bucket system, resulting in proper ablution being compromised.

8.11.3.15. Infrastructure, Electricity and Communication

The level of infrastructure in Postmasburg is typical of small towns. There is commercial infrastructure and potential for future business opportunities.

Of the entire Postmasburg population, only 45% has piped (tap) water inside their dwellings and 33% has piped (tap) water inside the yard. 3% has no access to piped (tap) water which implies that they rely on rain water or have to walk long distances to fetch water.

There is no police station at Maremane settlement. Access to local policing services can only be acquired at Postmasburg and Kathu which are 60 km and 30 km away respectively. Maremane is linked to these two urban centres by the main tar road – R325.

There is no formal waste disposal site and collection method within Maremane. The predominant disposal methods are burning or burying.

There is electricity reticulation in the Maremame. However, the said electricity power is mainly used for lighting in some households due to financial constraints for other uses such as heating and cooking. Being an informal settlement, most households in Maremane depend on paraffin for their energy source requirements and it is ascertained that a substantial amount of the respondents depend on wood as an energy source either for cooking or heating.

It is important to note that all households in Postmasburg are electrified. However, in an instance where there is electricity backlog, this needs to be addressed to ensure electrification in all households. The lack of access to electricity poses a problem to the municipality as it impacts negatively on local economic development and

community projects. Communication within the Maremane community is by mobile public phones and individual cell phones. Other forms of communication include radio and satellite television.

8.11.3.16. Access Roads

Postmasburg can be accessed using the R325 and R385 national roads. Access is by both tar and gravel roads. Transport is mainly by taxis, private cars, and buses. According to the IDP, a survey conducted over a period of five days shows that this road currently carries an average of 9 200 vehicles during the morning hours (06h00 - 09h00), approximately 8290 vehicles during daytime (12h00 - 14h00) and 9 100 vehicles in the evening (16h00 - 18h00).

8.11.3.17. Language Religion and Heritage Aspects

Postmasburg is dominated by Afrikaners, an ethnic group descended from predominantly Dutch settlers first arriving at the Cape of Good hope in the 17th and 18th centuries. They traditionally dominated South Africa's politics and commercial agricultural sector prior to 1994. Afrikaans, South Africa's third most widely spoken home language, evolved as the mother tongue of Cape Coloureds. It originated from the Dutch vernacular of South Holland incorporating words brought from the Dutch East Indies (now Indonesia) and Madagascar by slaves. Afrikaners make up approximately 5.2% of the total South African population based on the number of White South Africans who speak Afrikaans as a first language.

Afrikaans has the widest geographical and racial distribution of all the 11 official languages of South Africa. It is the majority language of the western half of South Africa—the provinces of the Northern Cape and Western Cape - and the first language of 75.8% of Coloured South Africans (4.8 million people), 60.8% of White South Africans (2.7 million); 4.6% of Asian South Africans (58,000 people), and 1.5% of Black South Africans (600,000 people).

8.11.3.18. Crime and Social Problems

Crime is common in most settlement areas and the adjacent communities of Maremane is not different. However, due to the informal nature of the settlement, crime may be higher comparative to urban centres such as Postmasburg and Kathu – especially since police are far away.

Crime, Covid-19 and HIV statistics in the abovementioned communities adjacent to Salene Mine have NOT been verified in this SEA study, however as a general norm influx of foreign people and job seekers in the communities adjacent to large scale projects such as the Salene Manganese Mine is inherent. Covid-19, HIV and crimes such as theft, sex crimes, traffic violations, fraud and drugs are possible, and likely to increase if not managed and policed in Maremane settlement.

8.12. Description of the Current Land Uses

Apart from the current mining activities within the study area, the Macarthy mining right area is used for livestock grazing. During the site visit, sheep were seen grazing the veld. While wildlife may be present on the property, the study area is not used for game farming and associated activities. The surrounding land uses are limited to livestock farming. Stock and/or game farming will be a viable post mining land use of the study area as long as the field quality is maintained by never exceeding the grazing capacity. The existing access roads on the property are covered by a gravel layer for stability (Figure 8-17). This material was transported onto site from somewhere else.

8.13. Description of Specific Environmental Features and Infrastructure on the Site

8.13.1. Environmental features

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

As a desktop exercise, sensitive areas were identified using the information from the Screening Tool compiled in 2021 (www.environment.gov.za) and a composite map indicating very high and high sensitivity areas are presented in Figure 8-52 and the overall sensitivities for the environmental themes are provided in Table 8-15.

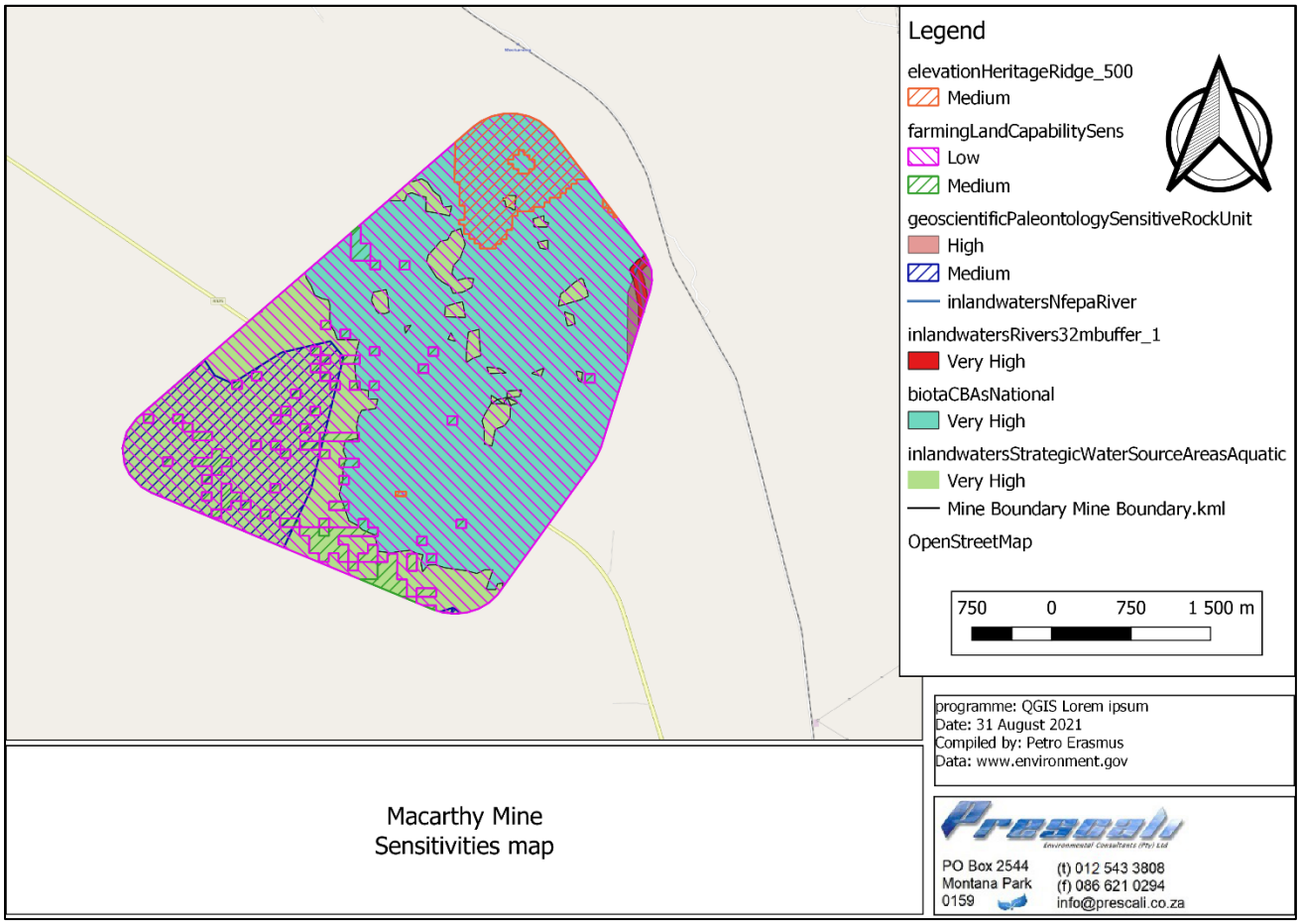


Figure 8-52: Sensitive environmental features as per the Screening Tool

Table 8-15: Summary of environmental sensitivities as per the 2020 Screening tool

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme			X	
Animal Species Theme			X	
Aquatic Biodiversity Theme	X			
Archaeological and Cultural Heritage Theme			X	
Paleontology Theme			X	
Civil Aviation Theme				X
Defense Theme				X
Plant Species Theme				X
Terrestrial Biodiversity Theme	X			

The above was expanded on and fine tuned (for the proposed expansion areas) in the 2020 specialist assessments conducted and the following sensitive areas were identified as discussed below.

8.13.1.1. Air quality receptors

Sensitive receptors in the immediate vicinity of Macarthy mine are the town of Kathu, Postmasburg and various informal settlements as indicated in Figure 8-53.

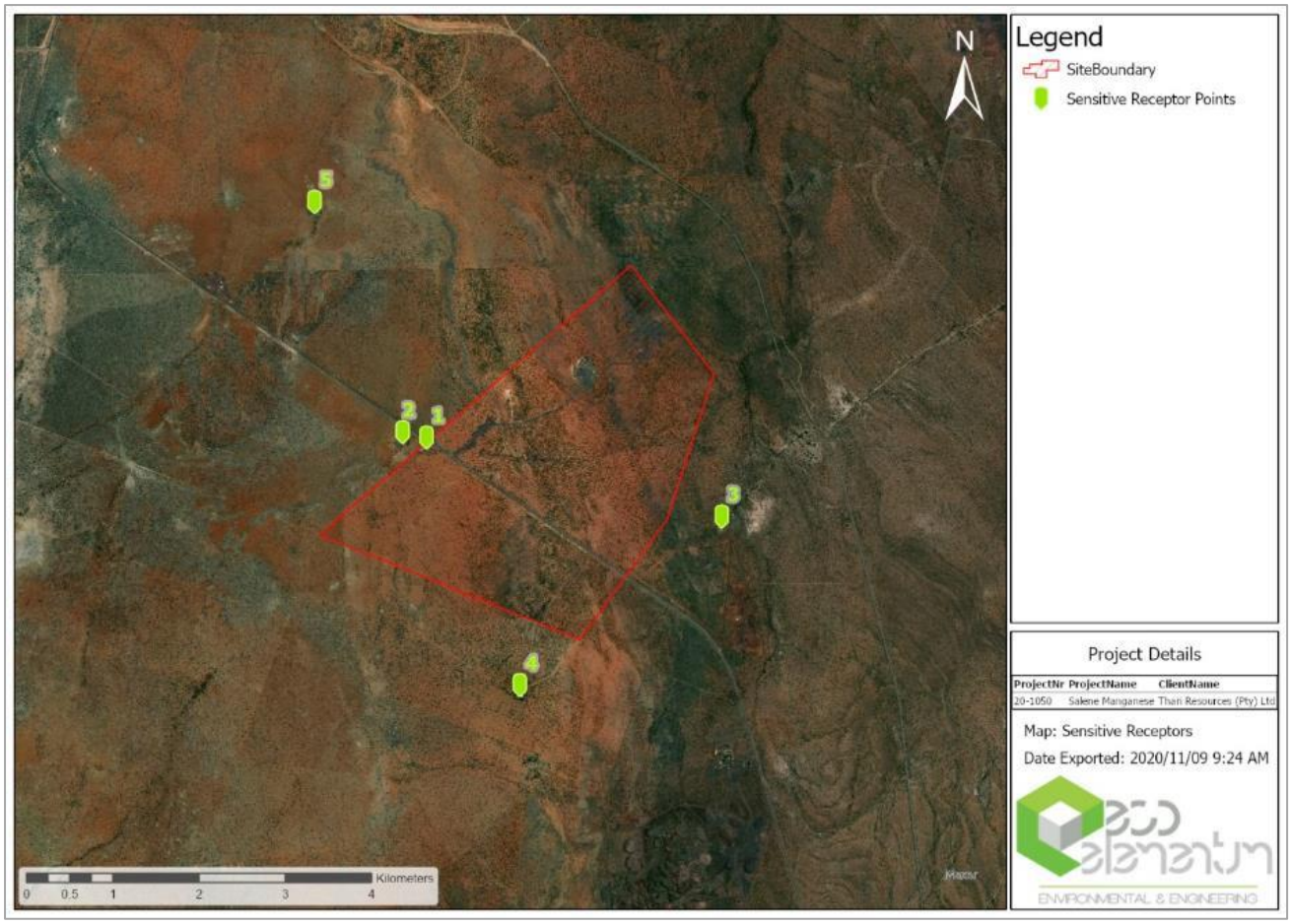


Figure 8-53: Air quality related sensitive receptors in the immediate area of the mining boundary

8.13.1.2. Heritage resources sensitivity

Heritage resources with a low to high sensitivity were identified on site and are described in Section 8.13.1.2 . Figure 8-46, Figure 8-47and Figure 8-48 shows areas where sensitive artefacts were identified.

8.13.1.3. Terrestrial Ecological resources sensitivity

Reference is made to the desktop assessment for the site as indicated in Figure 8-54. For the sites assessed in 2020 (Red Kite Environmental Solutions, 2020) the following sensitivities were assigned based on the identified vegetation unit:

An explanation of the different sensitivity classes is given in Table 8-16. Areas containing untransformed natural vegetation that is important for Red List organisms are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 8-16:Explanation of sensitivity ratings

Sensitivity	Factors contributing to sensitivity
No-go areas	Indigenous natural areas that are highly positive for the following: • Presence of habitats critical for the survival of populations of threatened species (Critically Endangered, Endangered, Vulnerable).
High	Indigenous natural areas that are highly positive for any of the following: • Presence of threatened species (Critically Endangered, Endangered, Vulnerable). And may also be positive for the following: • High intrinsic biodiversity value (high species richness and/or turnover, unique habitat).

Sensitivity	Factors contributing to sensitivity
	• Presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species). • Low ability to respond to disturbance (low resilience, dominant species very old).
Medium	• Other indigenous natural areas in which factors listed above are of no particular concern. • May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional. • Degraded or disturbed indigenous natural vegetation. May also include secondary vegetation in an advanced stage of development in which habitat is still ecologically functional and which could potentially provide habitat for species of concern.
Low	No natural habitat remaining.

The natural thornveld vegetation unit (VU1) was rated as having a High sensitivity, based on the relatively undisturbed condition of the vegetation, the presence of species of conservation concern and that the vegetation unit is situated in the Griqualand West Centre of Endemism (GWC). The vegetation itself is not considered vulnerable, but the larger site shows good connectivity with surrounding ecosystems (e.g. rocky outcrops of the Kuruman Mountain Bushveld).

Transformed areas (VU2) are disturbed and cannot be considered sensitive. Therefore, a low sensitivity was assigned to this vegetation unit.

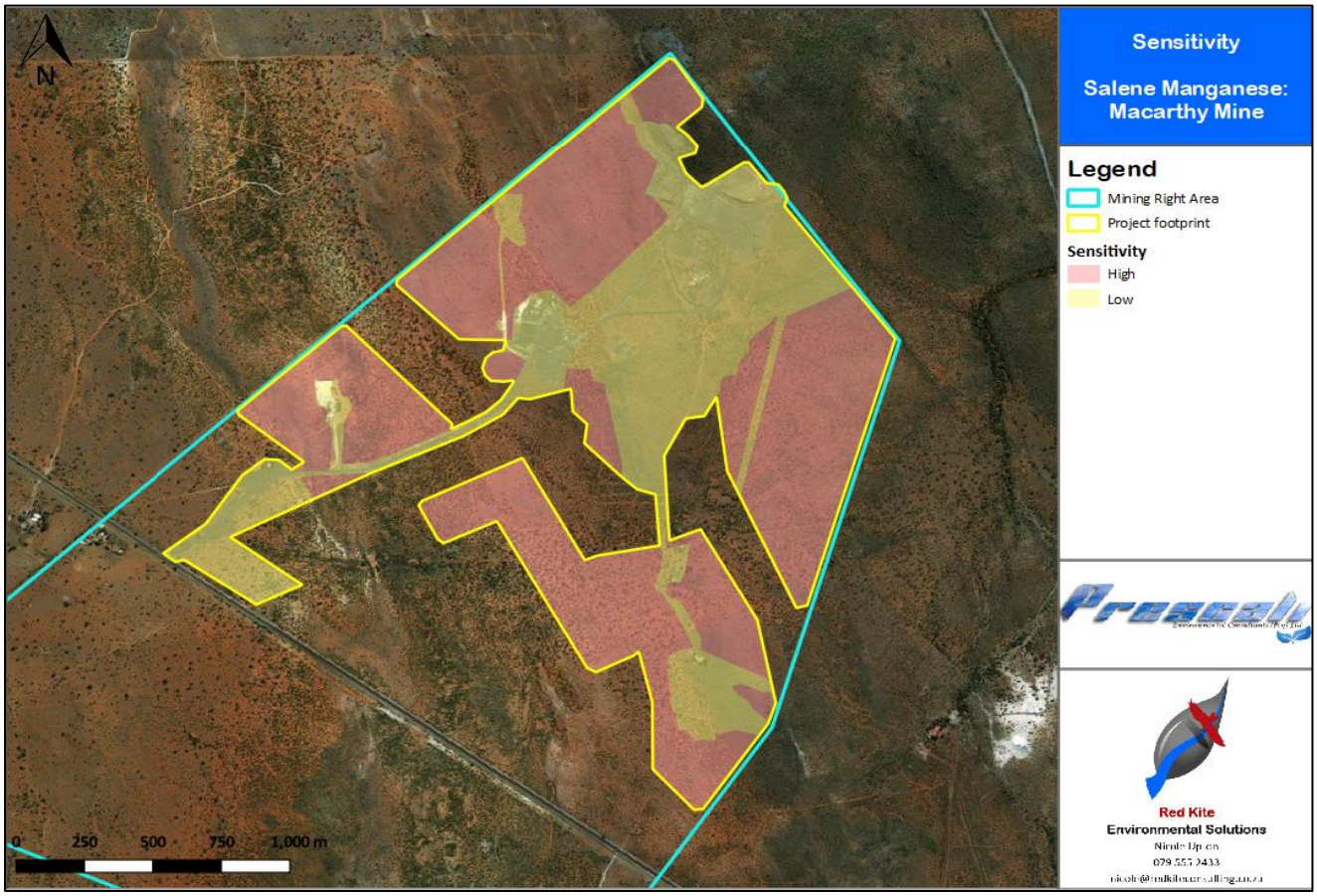


Figure 8-54: Terrestrial Biodiversity Sensitivity Map

8.13.1.4. Noise receptors

Six potential sensitive nosie receptors were identified as indicated below.

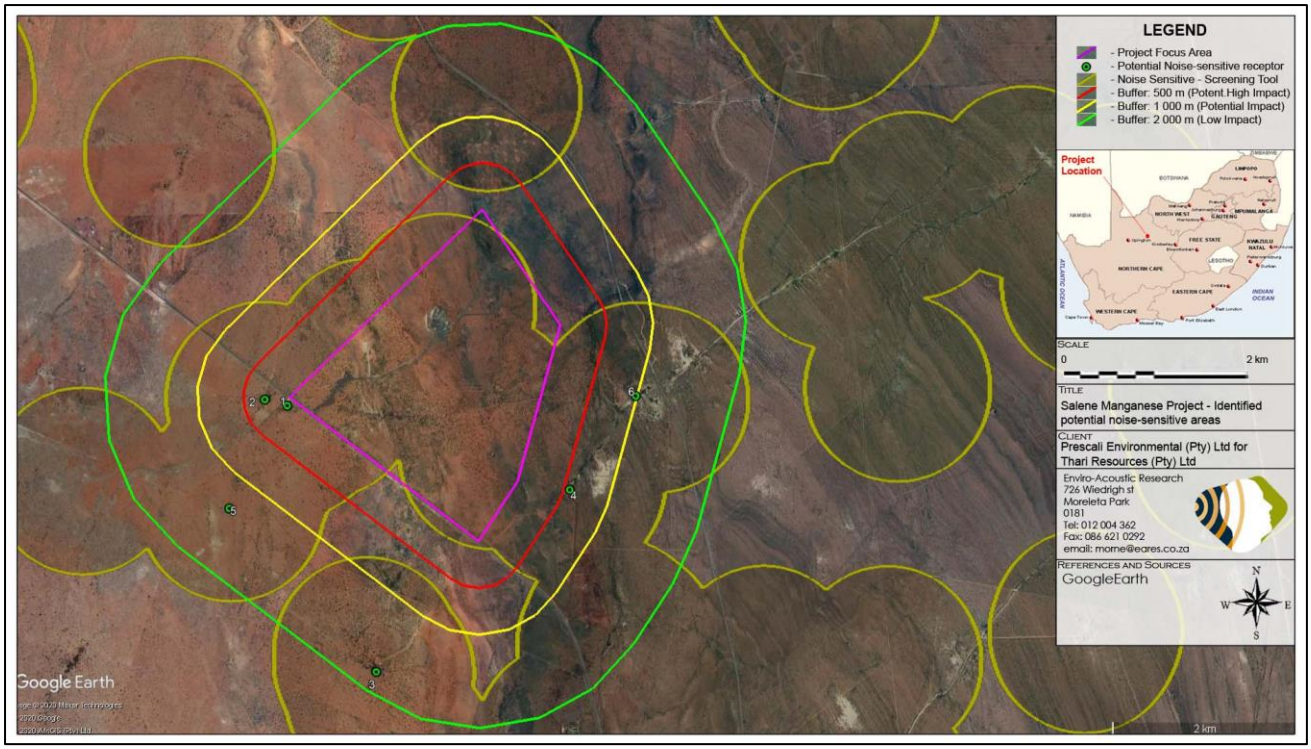


Figure 8-55: Noise sensitive receptors

8.13.1.5. Agricultural resources sensitivity

As per the Screening tool the entire Macarthy mine is classified as Low to Medium potential, during the assessment done in 2020 for the expansion areas the following conclusions were made.

The map that was extracted from this report for the Agricultural Combined Sensitivity, also shows an area of approximately 3 km outside of the Macarthy mining right boundary. According to Figure 8-56 and Figure 8-57, the Macarthy mining right area consists largely of land with low sensitivity. The western part of the area includes several small patches of land with medium agricultural sensitivity. Directly south of the mining right area, a larger area of land with Medium sensitivity is present. The land directly north and east of the mining right area consists predominantly of land with low agricultural sensitivity.

No areas with high or very high agricultural sensitivity has been identified within the Macarthy mining right area as well as within a 3km buffered zone around the area.

Figure 8-56: Screening Tool Agricultural Sensitivity Map

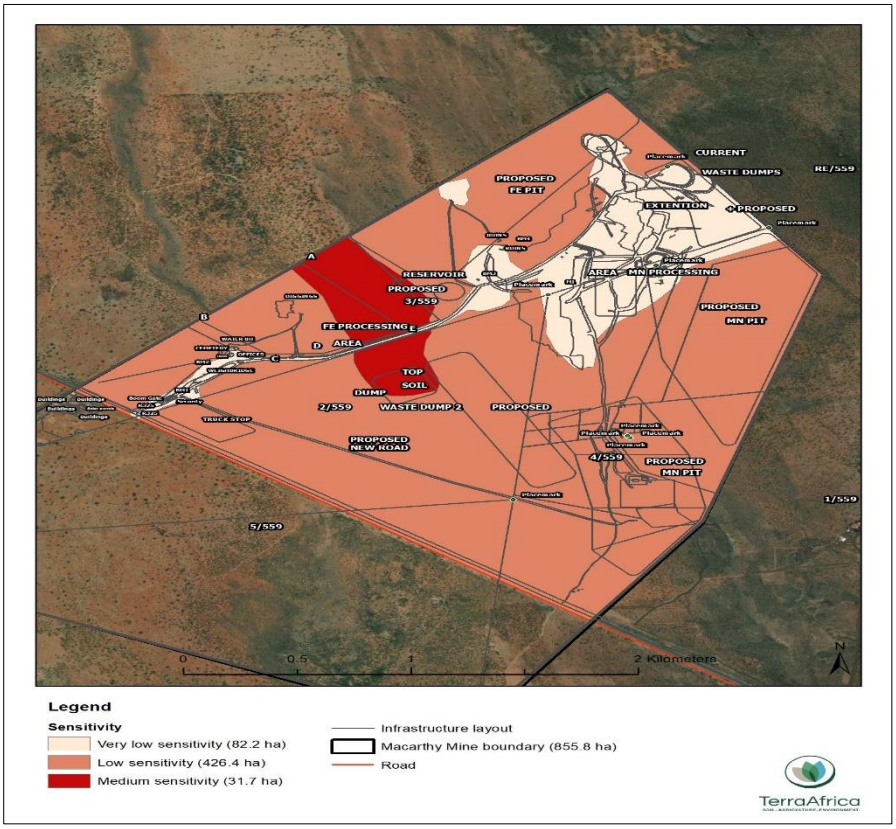


Figure 8-57: Agricultural Sensitivity for the proposed development.

8.13.1.6. Surface water sensitivity

Environmentally sensitive (Envirometrics and MetroGIS, 2009) areas are defined as landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water or other natural resources both on the site and in a regional context, includes:

- wildlife habitat areas inclusive of:
    - focus areas for contributing to biodiversity thresholds that are likely to become future protected areas;
    - private nature reserves, conservancies, core areas of biosphere reserves and other protected areas that are part of a stewardship programme or provincial protected area expansion strategy;
    - National and Provincial Parks and Reserves as defined in the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003), as amended;
    - National Parks view-shed protection areas that contain sensitive view areas around National Parks as identified by SANParks;
    - priority areas in the vicinity of National Parks that have been identified for the long-term survival of biodiversity around the National Parks or upon which the long-term survival of the parks depend to a significant extent; and
    - critically endangered and endangered ecosystems as identified by the South African National Biodiversity Institute in the Limpopo;
- steep slopes consisting of:
    - all areas with a slope of 8 degrees or steeper; and
    - important topographical features topographical features that were delineated using the 20 m contour interval terrain model of South Africa and based on the inherent scenic value of these features;
- rivers, wetlands and other water bodies consisting of rivers with a potential zone of influence buffer of 32 metres on each side from the banks of the rivers, wetlands with a potential zone of influence of 10 metres from the edge of the wetlands and dams with a potential zone of influence of 10 metres from their high-water lines, please refer to the sections below; and
- prime agricultural lands.

Also included in the sensitive features are the regulated areas as per the NWA:

- 1 in 100-year flood;
- 100 m buffer; and
- Riparian area.

The interconnectivity of these sensitive areas creates greenway corridors that consist of networks of linked landscape elements that provide ecological, recreational, and cultural benefits to a community.. Taking into consideration that riparian vegetation visible using Google Earth™ is located in the bed / within a very close distance to the bed, the 32 m buffer area for all watercourses are classified as High Sensitivity.

Based on the above assessment, the high sensitivity areas are thus as indicated in Figure 8-58.

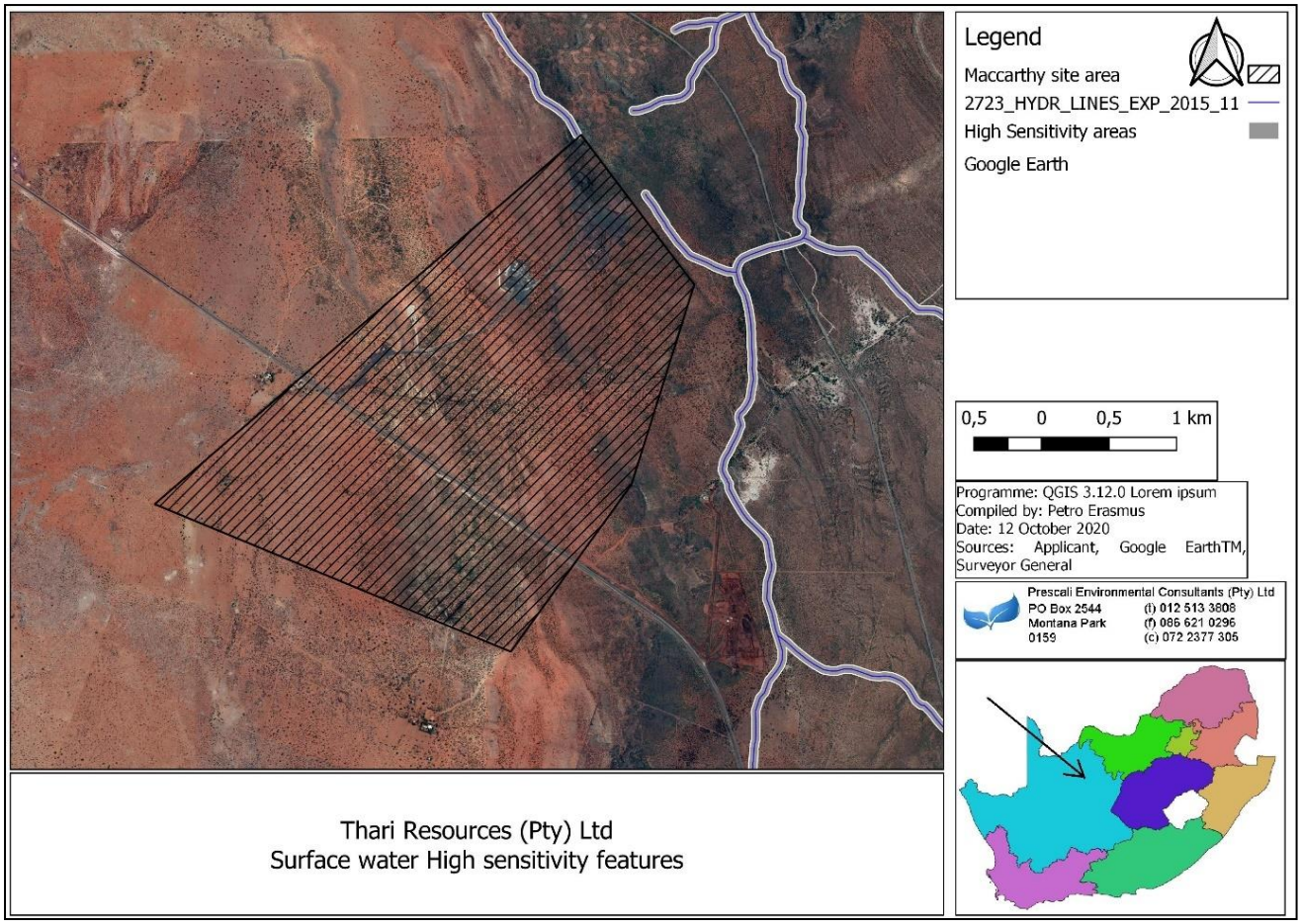


Figure 8-58: Surface water sensitive features near the Mining right area

8.13.1.7. Geohydrological sensitivity

The aquifer at Macarthy Mine is classified as having a low vulnerability and a medium level of groundwater protection is required Table 8-13.

8.13.1.8. Visual receptors

GIS ranked the visual exposure of the Macarthy site. Only locations that did not receive a 0 are shown and the ratings are ranked 1 - 5, 1 being very low and 5 very high. The system only takes into account the variables as described in this report (Eco Elementum, 2020) and the amount of infrastructure that would be visible. Factors like real time and micro scale vegetation are not taken into account, thus the actual rating may be lower or higher depending on the updated land use in the vicinity or latest vegetation growth or height on a micro and macro scale.

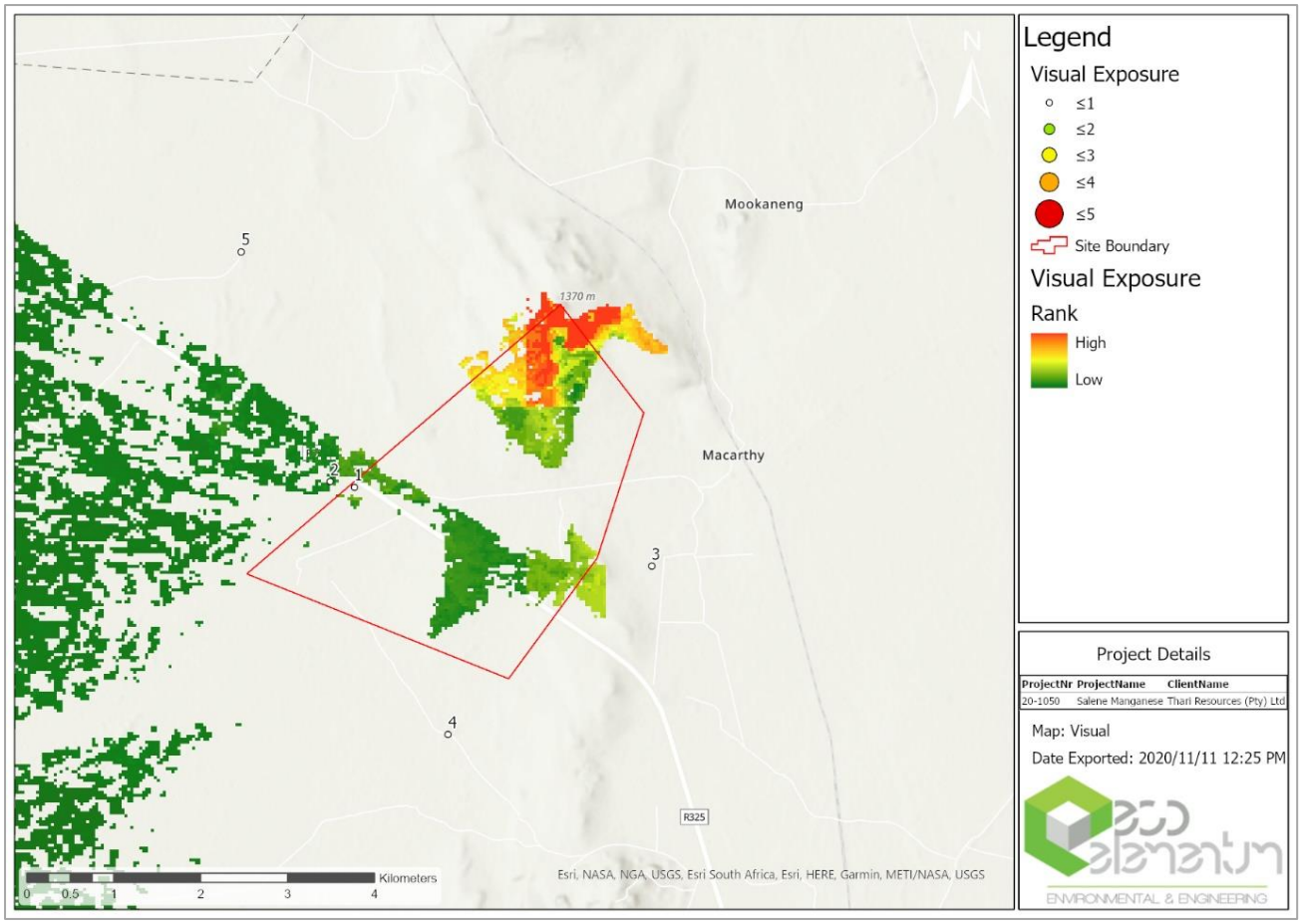


Figure 8-59: Viewpoint sensitive receptor overlaid on the Visual Exposure Ranking.

8.13.2. Infrastructure on site

Macarthy Mine is an operational mine and infrastructure on site includes:

- Access roads;
- Offices;
- security building;
- opencast pits; and
- existing waste rock dump on site.

8.14. Environmental and Current Land Use Map

(Show all environmental, and current land use features)

Apart from the current mining activities within the study area, the Macarthy mining right area is used for livestock grazing. During the site visit, sheep were seen grazing the veld. While wildlife may be present on the property, the study area is not used for game farming and associated activities. The surrounding land uses are limited to livestock farming. Stock and/or game farming will be a viable post mining land use of the study area as long as the field quality is maintained by never exceeding the grazing capacity. The existing access roads on the property are covered by a gravel layer for stability.

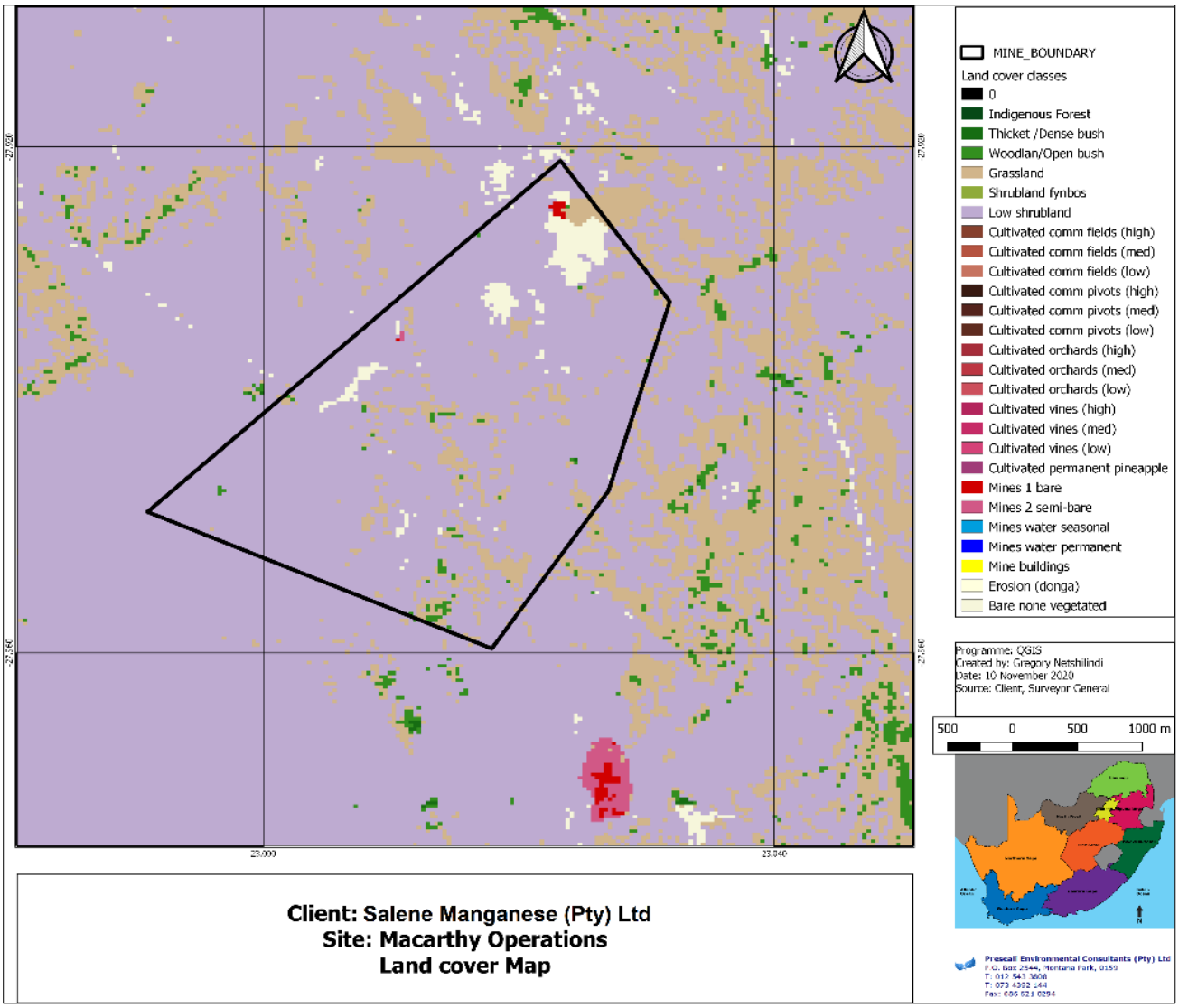


Figure 8-60: Land use Map for Macarthy mine and surrounding areas

9. IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT

9.1. Impacts Identified

(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).

9.1.1. 2020 Expansion activities

The potential impacts that could occur as a result of the proposed 2020 expansion activities were initially rated specifically with the assumption that no mitigation measures were applied and was re-assessed following the implementation of management and mitigation measures. The potential impacts and key issues was thoroughly investigated during the EIA phase and include the following:

- Public participation;
- Heritage assessment;
- Geo-hydrological studies;
- Surface water assessment;

- Fauna and flora assessment;
- Soil assessment;
- Archaeological assessment;
- Noise assessment;
- Visual assessment; and
- Air quality assessment.

The results of the assessments are summarised in Table 9-1 and the assessment of the impacts are provided in Table 17-1.

9.1.2. Historical and current operational activities

The impacts identified for the historical and existing activities as outlined in the latest approved EMPR (2013) which was a consolidation of previous EMPr's is also indicated in Table 9-1 to allow for the consolidation of all the approved addendums to the original EMPr and the assessment of the impacts are provided in Table 17-1.

Table 9-1: Identified impact and associated activities

Reference	Activity/Receptor	Potential Impacts	Aspects affected
Ecology_20	Expansion activities[11]	Possible loss of identified ecological support areas or ecological corridors. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Flora
Ecology_20	Expansion activities	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas.	Flora
Ecology_20	Expansion activities	Development and related activities may impact on the sensitive habitats related to the watercourses situated in close proximity to the development footprint.	Flora
Ecology_20	Expansion activities	Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining.	Flora
Ecology_20	Expansion activities	Construction will result in an increase of potentially destructive movement within the designated area. Destruction of habitat and other specialised animal species that are currently finding refuge within the area will migrate to other more favourable areas.	Fauna
Ecology_20	Expansion activities	The construction activities might result in impacts on sensitive areas or large-scale destruction (opencast or new stockpile areas) including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.	Fauna
Ecology_20	Expansion activities	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area.	Fauna
Ecology_20	Expansion activities	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Plan (EMP) and Final Rehabilitation programme compiled for the specific mining area.	Fauna
Surface Water20	Operation and establishment of the opencast pits	The location of the opencast pits in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the proposed iron opencast pit which is of concern as it is located on a watershed area.	Surface water
Surface Water20	Operation and establishment of the opencast pits	Rainwater captured in the opencast pits will reduce sheet flow to nearby watercourses and may be contaminated and needs to be pumped to the pollution control dam to prevent impacts on water quality downstream that in turn could impact on the habitat and biota.	Surface water

[11] Expansion activities: this refers to the activities as outlined in Section 3.2.2 and refers to opencast pits, topsoil dumps, waste rock dumps, manganese static plant, access roads, groundwater abstraction, water storage reservoirs, workshop area, substation, container on-boarding facility and storm water infrastructure.

Reference	Activity/Receptor	Potential Impacts	Aspects affected
Surface Water20	Operation and establishment of the opencast pits	It is not expected that it would be possible to backfill the opencast pits 100% due to insufficient material being available thereby creating a permanent sink for water if not diverted around the opencast pits.	Surface water
Surface Water20	Operation and establishment of the waste rock dumps	The location of the WRD in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the existing WRD and its proposed expansion which is of concern as it is located on / near a watershed area.	Storm water
Surface Water20	Operation and establishment of the opencast pits	Run-off from the WRD could be contaminated (to be confirmed by leachate test) and this could result in water quality impacts downstream if not contained in a pollution control dam.	Storm water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Chemical or fuel spillages from equipment used in the all the mining related activities could contaminate the soil profile.	Storm water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff that if not managed and captured correctly could reach surface water resources during rainfall events.	Storm water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in nearby watercourses	Storm water
Surface Water20	Removal of topsoil and overburden/waste rock and stockpiling	If not managed correctly the topsoil heap could fail and result in increased siltation in watercourses.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of	Depending on the waste classification and leachate generated by the overburden / Waste rock run-off from these areas could result in poor quality water entering the watercourses.	Surface water

Reference	Activity/Receptor	Potential Impacts	Aspects affected
	the run of mine and other activities		
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.	Surface water
Surface Water20	Establishment of an access route as the opencast pits expands, mobilisation of equipment and preparation of area for mining	Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Concentrated storm runoff from the opencast pits surrounds and infrastructure areas could be erosive, causing sheet, rill and donga erosion features.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Dirty storm water from the opencast pits could impacts on the water quality of downstream surface water areas.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Should water be allowed to be captured in the opencast pits it could result in less water to the downstream surface water area.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue	Altered storm water runoff response due to large impervious areas (hardened surfaces) and concentrated runoff in drainage systems.	Surface water

Reference	Activity/Receptor	Potential Impacts	Aspects affected
	deposit stockpiles, workshop, beneficiation of the run of mine and other activities		
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act, 1998 (Act No. 36 of 1998).	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Contaminated runoff or leachate concentrated in mined out opencast pits can decant or contaminate through controlled discharge of partially treated water into natural systems. Opencast pit sump.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked out pit and can lead to increased groundwater recharge and potential regional impact of low quality water.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.	Surface water
Surface Water20	Operation and generation of Residue deposits (Waste rock dumps)	Stockpiling of these materials could result in salinization, mineralisation and toxic contamination of soils beneath them.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles,	Leachate from these materials could result in poor quality water entering the surface water resource which could impact on the health of the system.	Surface water

Reference	Activity/Receptor	Potential Impacts	Aspects affected
	workshop, beneficiation of the run of mine and other activities		
Surface Water20	Sewage generation, workshop operations	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff.	Surface water
Surface Water20	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.	Surface water
Surface Water20	Dust Generation	Dust generation from the beneficiation processes, product and waste transport routes, residue stockpiles or deposits and un-rehabilitated areas can impair aquatic vegetation photosynthesis and could potentially impact on water quality depending on the constituents.	Surface water
Geohydrology_21	Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Groundwater
Geohydrology_21	Hydrocarbon spills.	Spills from construction vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater
Geohydrology_21	ROM stockpiling & Waste Rock Dump.	Contamination may be expected in terms of nitrate from explosives.	Groundwater
Geohydrology_21	Hydrocarbon spills.	Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater
Geohydrology_21	Opencast Mining.	A plume can begin to migrate downgradient since dewatering of the pit is not expected to be conducted.	Groundwater
Geohydrology_21	Infrastructure removal.	Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality.	Groundwater
Geohydrology_21	Opencast Pits	A plume may continue to migrate further downgradient of the rehabilitated opencast pits.	Groundwater
Visual _20	Overall construction	Impacts on viewpoints that had a visual exposure during construction phase.	Visual
Visual _20	Overall construction and Operation	Permanent visual impact of the structures on users of roads and land owners.	Visual
Air Quality 20	Site clearing, removal of topsoil and vegetation	A number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction.	Air Quality
Air Quality 20	Construction of surface infrastructure	Construction of access roads, pipes, storm water diversion berms, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient	Air Quality

Reference	Activity/Receptor	Potential Impacts	Aspects affected
		air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).	
Air Quality 20	General transportation, hauling and vehicle movement on site	Transportation of workers and materials in and out of the mine site will result in the production of fugitive dust (containing TSP, as well as PM10 and PM 2.5) due to suspension of friable materials from earth roads.	Air Quality
Air Quality 20	Overall operational activities	Use and maintenance of access road, dust and material handling, Haul roads, and wind erosion from stockpile.	Air Quality
Air Quality 20	Demolition & Removal of all infrastructure (incl. transportation off site)	Demolition of buildings, foundations, and removal of rubbles, cleaning up of workshops, fuel reagents , removal of power supply and removal of haul and access roads will generate fugitive dust similar to impacts during construction phase.	Air Quality
Air Quality 20	Rehabilitation (spreading of soil, revegetation & profiling/contouring).	Topsoil reshaping and restructuring of the landscape. Incorrect rehabilitation will cause permanent damage to the surface infrastructure.	Air Quality
Archeology_20	Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Heritage and Culture
Paleontology_20	Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Heritage and Culture
Socio Economy_20	Overall construction and operational activities	Development and related activities may impact on the sensitive habitats related to the gravesite and other heritage sensitive area situated in close proximity to the development footprint may be affected by the proposed development.	Heritage and Culture
Socio Economy_20	Crime. Health, HIV and Covid-19	Influx of foreigners and job seekers and increase in disposable income for local people may have negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Socio-Economy
Socio Economy_20	Crime. Health, HIV and Covid-19	Cumulative: Possible loss of Life and Covid Pandemic spread.	Socio-Economy
Socio Economy_20	Land tenure, use and capability	Land capability of the affected area will be permanently be affected especially the open pit area. The proposed expansion will increase loss of grazing land, restricted access and loss of cultural or traditional practices.	Socio-Economy
Socio Economy_20	Land tenure, use and capability	Cumulative: Further changes in land use due to secondary industries that may be developed around the area.	Socio-Economy
Socio Economy_20	Noise	The proposed Salene Mine activities will not raise noise levels significantly. Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active	Socio-Economy
Socio Economy_20	Noise	Cumulative: The noise impacts of the proposed Salene Mine expansion projects and exiting Maremane settlement activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	Socio-Economy
Socio Economy_20	Air Pollution	Excessive dust may have an impact on surrounding vegetation and an indirect impact on animals that feed on the vegetation as well as any nearby communities or farm homesteads. Dust will be	Socio-Economy

Reference	Activity/Receptor	Potential Impacts	Aspects affected
		generated from the Salene Mine activities, access roads to and from the opencast pits and waste rock dumps.	
Socio Economy_20	Air Pollution	Cumulative: Expansion activities may add to the annual PM10 concentrations in the area,	Socio-Economy
Socio Economy_20	Light and Visual	The proposed Salene Manganese mine waste rock dumps, opencast pits activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine is visible from R325 main road.	Socio-Economy
Socio Economy_20	Expansion activities	Cumulative: The proposed additional mining infrastructure at Salene Mine may form part of the "sense of place" in the long term, even after operations cease.	Socio-Economy
Socio Economy_20	Economic opportunities, infrastructure development and employment	Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The adjacent community (Maremane) in terms of skills training, local economic development projects, and improved infrastructure. This is a requirement in terms of Section 22 and Regulation 42 of the MPRDA, 2002. Increase in disposable income may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Socio-Economy
Socio Economy_20	Economic opportunities, infrastructure development and employment	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation.	Socio-Economy
Noise_20	Daytime construction	Noise caused by multiple construction activities during daytime.	Noise
Noise_20	Nighttime construction	Noise caused by multiple construction activities during night time.	Noise
Noise_20	Daytime overall operational activities	Noise caused by multiple operational activities during daytime such as haul truck movement and processing plant.	Noise
Noise_20	Nightime overall operational activities	Noise caused by multiple operational activities during night time such as haul truck movement and processing plant.	Noise
Blasting_20	Ground vibration	Impacts on surrounding communities caused by vibrations during blasting activities.	Social
Blasting_20	Ground vibration	Damage to residential structures within the area.	Social
Blasting_20	Ground vibration	Damage to tar roads and railway line close to the mine.	Socio-Economy
Blasting_20	Air Blast	Air blast impact for a 924kg blast (Worst case).	Topography
Blasting_20	Fly rock	Risk of fly rock hitting adjacent road users, neighbouring properties, humans and fauna.	Socio-Economy
Soil_20	Overall construction and operational activities	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	Soil
Soil_20	Overall construction and operational activities	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an	Soil

Reference	Activity/Receptor	Potential Impacts	Aspects affected
		undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project.	
Soil_20	Overall construction and operational activities	Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	Soil
Soil_20	Overall construction and operational activities	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture.	Soil
Soil_20	Overall construction and operational activities	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	Land Capability
Soil_20	Overall construction and operational activities	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion.	Soil
Soil_20	Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Soil
Soil_20	Overall construction and operational activities	Infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.	Soil
Soil_20	Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	Soil
Soil_20	Overall construction and operational activities	Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution.	Soil
Soil_20	Overall construction and operational activities	Decommissioning will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time.	Land Capability

10. METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

(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).

10.1. Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) and as amended from time to time (DEAT, Impact Significance, Integrated Environmental Management, Information series 5., 2002).

The level of detail as depicted in the EIA Guidelines (DEAT, Environmental Impact Assessment Guidelines., 1998) (DEAT, Impact Significance, Integrated Environmental Management, Information series 5., 2002)) was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

An explanation of the impact assessment criteria is defined below.

Table 10-1: Impact Assessment Criteria

EXTENT	
Classification of the physical and spatial scale of the impact	
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site	The impact could affect the whole, or a significant portion of the site.
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
National	The impact could have an effect that expands throughout the country (South Africa).
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
DURATION	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
Short to Medium term	The impact will be relevant through to the end of a construction phase (1.5 years).
Medium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long term	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
INTENSITY	
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.

PROBABILITY	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

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

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

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

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

10.1.1. Mitigation

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

10.1.1.1. Determination of Significance-Without Mitigation

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

Table 10-2: Significance-Without Mitigation

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

10.1.1.2. Determination of Significance-With Mitigation

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

Table 10-3: Significance-With Mitigation

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

10.1.2. Assessment Weighting

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

10.1.2.1. Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact (refer Table 10-4). The purpose of assigning weights serves to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

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

Table 10-4: Description of assessment parameters with its respective weighting

EXTENT		**DURATION**		**INTENSITY**		**PROBABILITY**		**WEIGHTING FACTOR (WF)**		**SIGNIFICANCE RATING (SR)**	
Footprint	1	Short term	1	Low	1	Improbable	1	Low	1	Low	0-19
Site	2	Short to Medium	2			Possible	2	Low to Medium	2	Low to Medium	20-39
Regional	3	Medium term	3	Medium	3	Likely	3	Medium	3	Medium	40-59
National	4	Long term	4			Highly Likely	4	Medium to High	4	Medium to High	60-79
International	5	Permanent	5	High	5	Definite / Uncertain	5	High	5	High	80-100

MITIGATION EFFICIENCY (ME)		**SIGNIFICANCE FOLLOWING MITIGATION (SFM)**	
High	0.2	Low	0 - 19
Medium to High	0.4	Low to Medium	20 - 39
Medium	0.6	Medium	40 - 59
Low to Medium	0.8	Medium to High	60 - 79
Low	1.0	High	80 - 100

10.1.2.2. Identifying the Potential Impacts Without Mitigation Measures (WOM)

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

Equation 1:

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

10.1.2.3. Identifying the Potential Impacts with Mitigation Measures (WM)

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

10.1.2.3.1. Mitigation Efficiency (ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation efficiency (ME) rating (refer to *Table 10-4*). The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

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

Equation 2:

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

or WM = WOM x ME

10.1.2.4. Significance Following Mitigation (SFM)

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

11. 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)

No Alternatives are being considered for the proposed expansion project, the proposed openpits were identified based on availability of the ore resources. The final site layout took incot consideration the optimal mining of the resource and support infrastructure (including waste residue stockpiles and storm water management infrastrutcure) was planned around this. The DMS plant which formed part of the initial layout (Scoping phase) has now been removed from the final site layout.

The supply of water from the Sedibeng water scheme will result in less of an impact on surrounding groundwater users as less water will be used from the immediate area.

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

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

Issues and concerns raised by the I&APs relating to the environment are outlined in Table 7-1, in addition to a brief discussion on the mitigation required / need thereof to address the concerns raised.

13. THE OUTCOME OF THE SITE SELECTION MATRIX - FINAL SITE LAYOUT PLAN

(Provide a final site layout plan as informed by the process of consultation with interested and affected parties)

Please refer to Section 6.1. Macarthy Mine is an operational mine and the mineral resource and the current infrastructures (Section 8.13.2) as well as the historical mining activities are taken into consideration for all phased activities undertaken by the mine. The final site layout plan is provided in Appendix 4.

14. MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

As an operational mine any new infrastructure at Macarthy Mine is planned in accordance with the location of the existing activities and infrastructures as well as historically impacted areas. No alternatives were considered for the openpits, access roads considered were based on accessibility to all mining area.

With regards to water supply for the mine, alternatives were investigated of using groundwater only, this was not feasible and an allocation was sourced from Sedibeng Water. However as the water supply may be interrupted, it was decided to apply for a water use licence to abstract 150 m^3 per day from the groundwater resource which is half the water supply needed for the mine. This is a little over the volume that can be abstracted in terms of the a general auhtorisation.

15. STATEMENT MOTIVATING THE PREFERRED SITE

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

As an operational mine any new infrastructure at Macarthy Mine is planned in accordance with the location of the mineral ore being exploited, existing activities and infrastructures as well as historically impacted areas. This plan also took into consideration the the recommendations of the specialists (Part A Section 18), and the advantages and disadvantages of the activities (Part A Section 11).

16. 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.)

The existing activities were assessed historically as part of the various EMPr amendments as submitted to the DMRE. This information was consolidated into Table 9-1. The proposed new activities were assessed by each of the specialist as appointed for their respective fields and cumulative impacts were also assessed using the methodology as outlined in Section 10. Below is a summary of the methodology used by the respective specialist in their modelling and general assessments. For the results if the assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy operation please refer to Table 9-1 and Table 17-1.

16.1. Air Quality

16.1.1. Methodology used

To determine the extent of the potential impacts of proposed activities the monitoring data as available from Macarthy was used in a dispersion model. Emission factors were quantified using the Australian National Pollutant Inventory (NPI) for fugitive dust deriving from material handling, on-site roads, milling and crushing operations, drilling and blasting, and wind erosion from exposed surfaces. The regulatory model of the US.EPA, AERMET/AERMOD dispersion model suite, was chosen for the study as it uses both surface and upper air data and the model has a terrain pre-processor (AERMAP) for including a large topography into the model. A radius of 10 km was used in the model and impacts for unmitigated and mitigate activities were undertaken. Detail on the dispersion model parameters are outlined in Section 7 of the 2020 Air Quality Impact Assessment Report (Eco Elementum, 2020)

16.1.2. Description of environmental issues and risks

16.1.2.1. Modelling results - 2020

The results of the modelling for impacts on air quality, specifically PM10 and Total Suspended Particulate (TSP) is provided in Figure 16-1, Figure 16-2, Figure 16-3, Figure 16-4, Figure 16-5, Figure 16-6, Figure 16-7 and Figure 16-8 for unmitigated and mitigated scenarios. From the figures the following conclusions are drawn:
(Isopleth plots are shown in the images below to visually show the predicted ground level concentrations of PM10 and dust fallout levels.)

- When unmitigated an increase of PM10 levels of 40 – 300 ug/m^3 are predicted to occur and this is significantly reduced in extend and intensity when mitigation measures are implemented; and
- The predicted annual TSP deposition (unmitigated) is predicted to increase to 300 – 2400 mg/m^2/day on the northern side of the mining area.

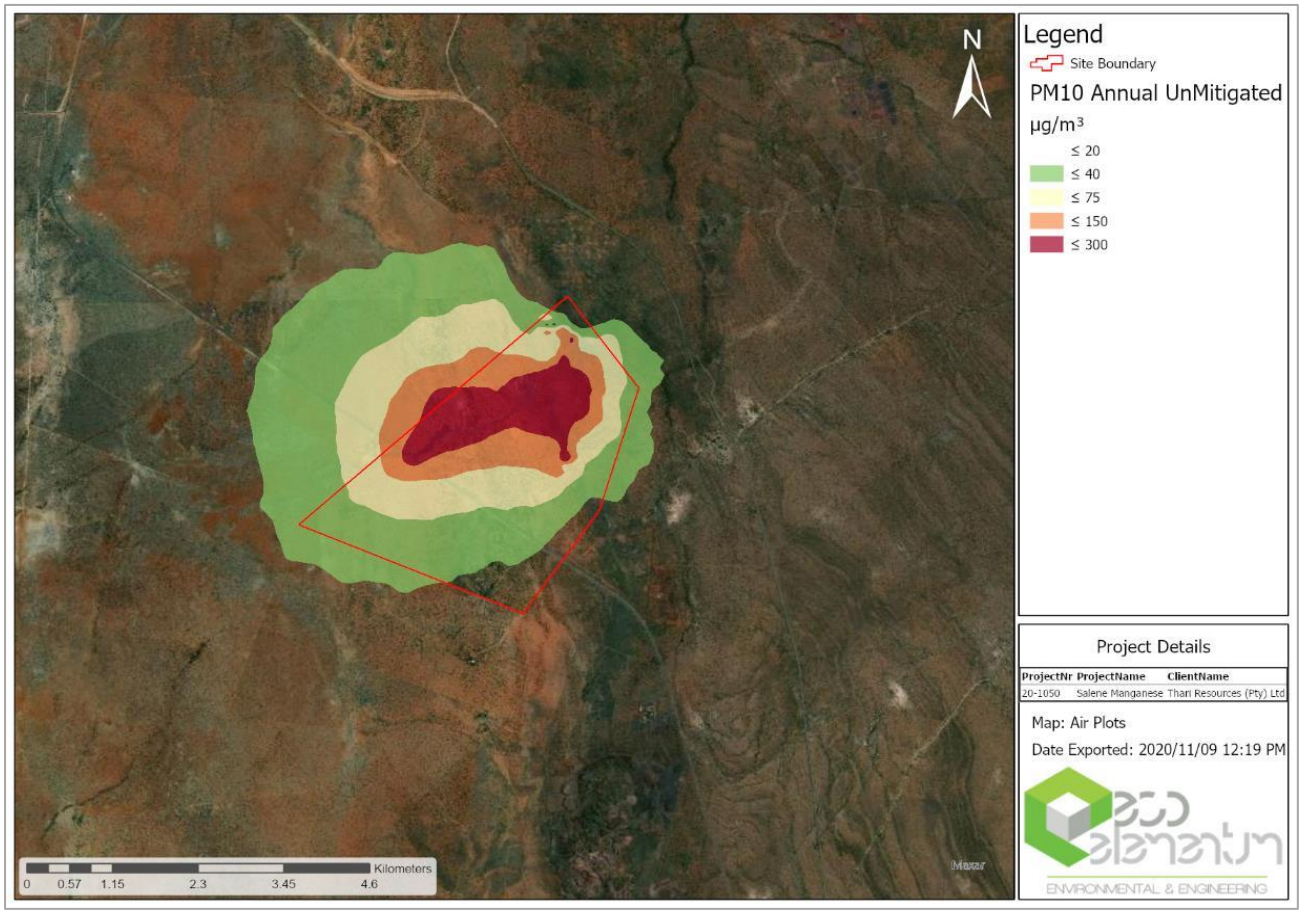


Figure 16-1: Predicted average annual concentrations for PM10 for the proposed project when unmitigated

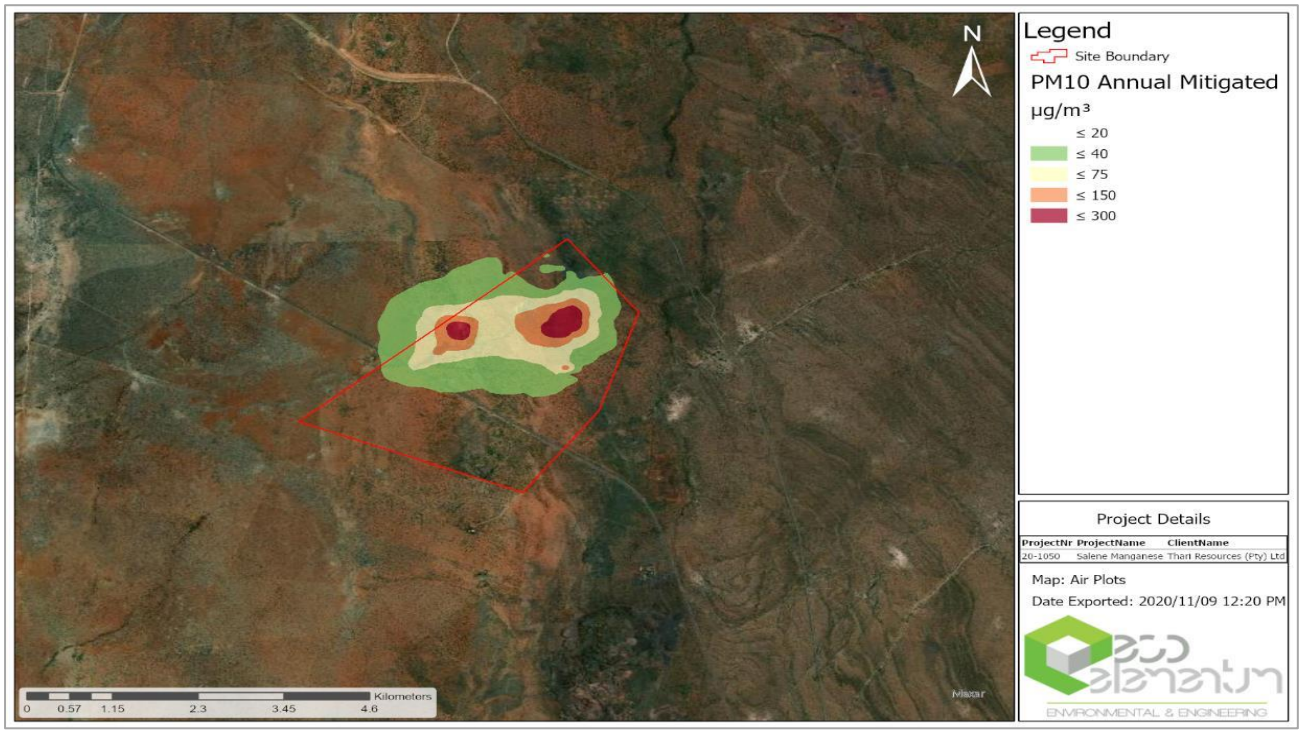


Figure 16-2: Predicted average annual concentrations for PM10 for the proposed projected operations when mitigated

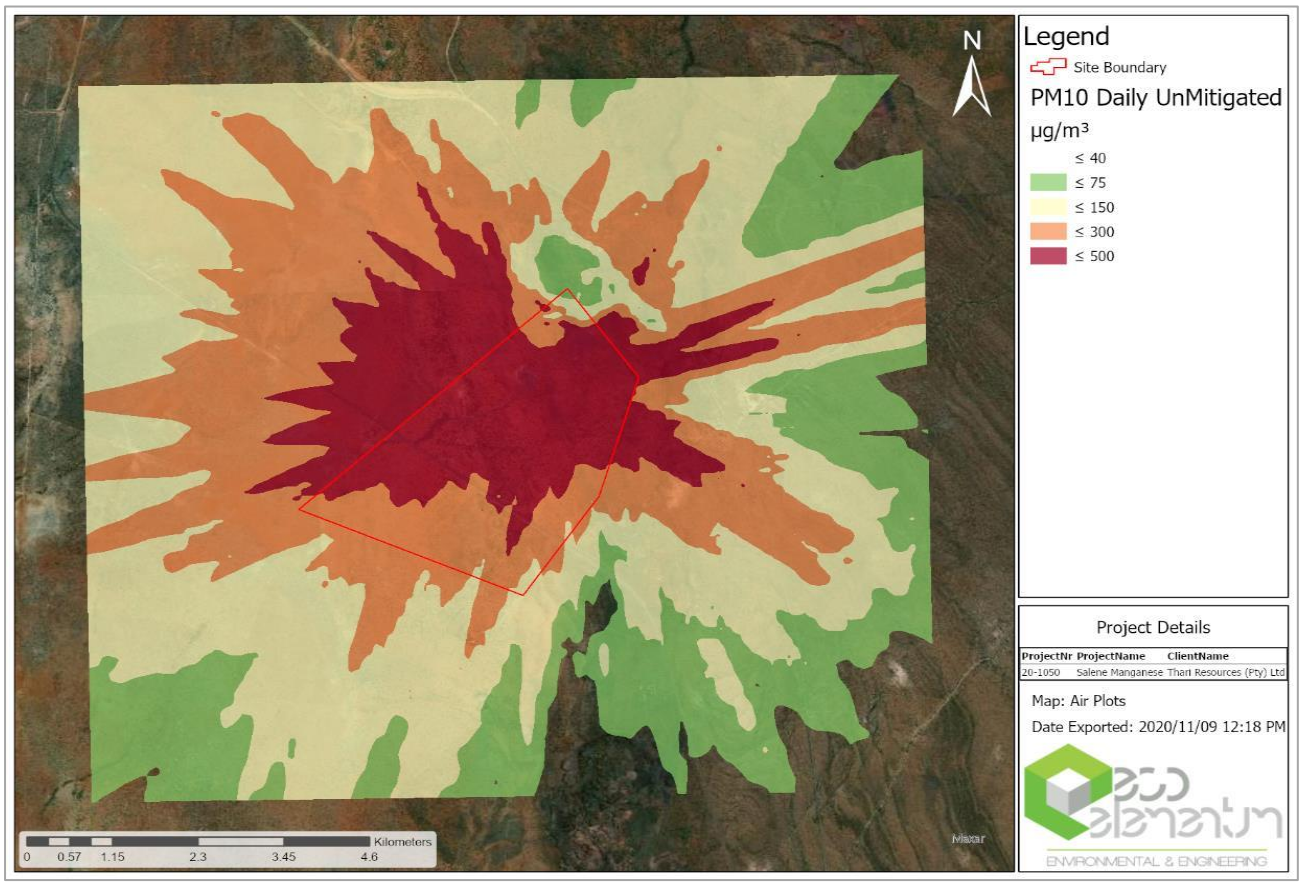


Figure 16-3: Predicted 2nd Highest daily concentrations for PM10 for the proposed projected operations when unmitigated

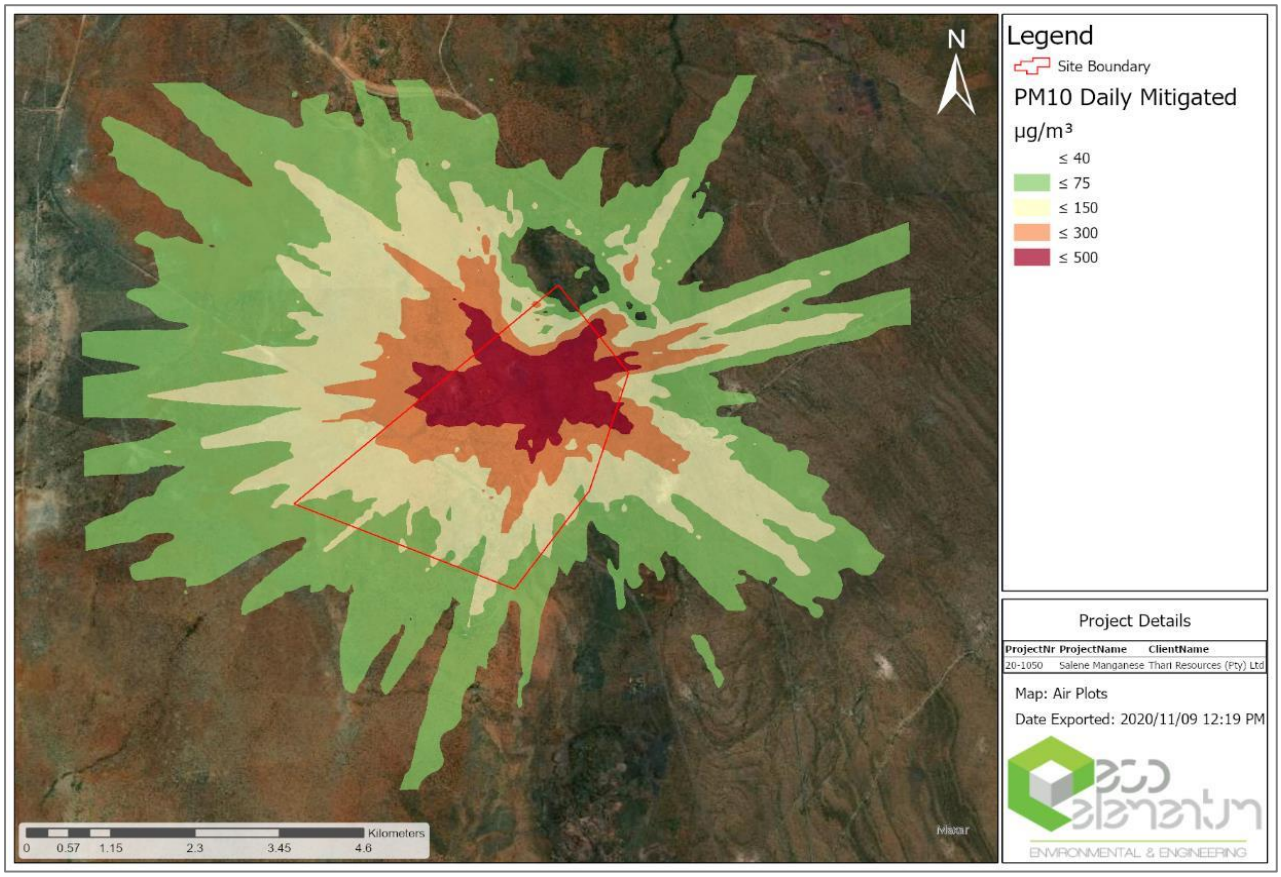


Figure 16-4: Predicted 2nd higest daily concentration for PM10 for the proposed project operations when mitigated

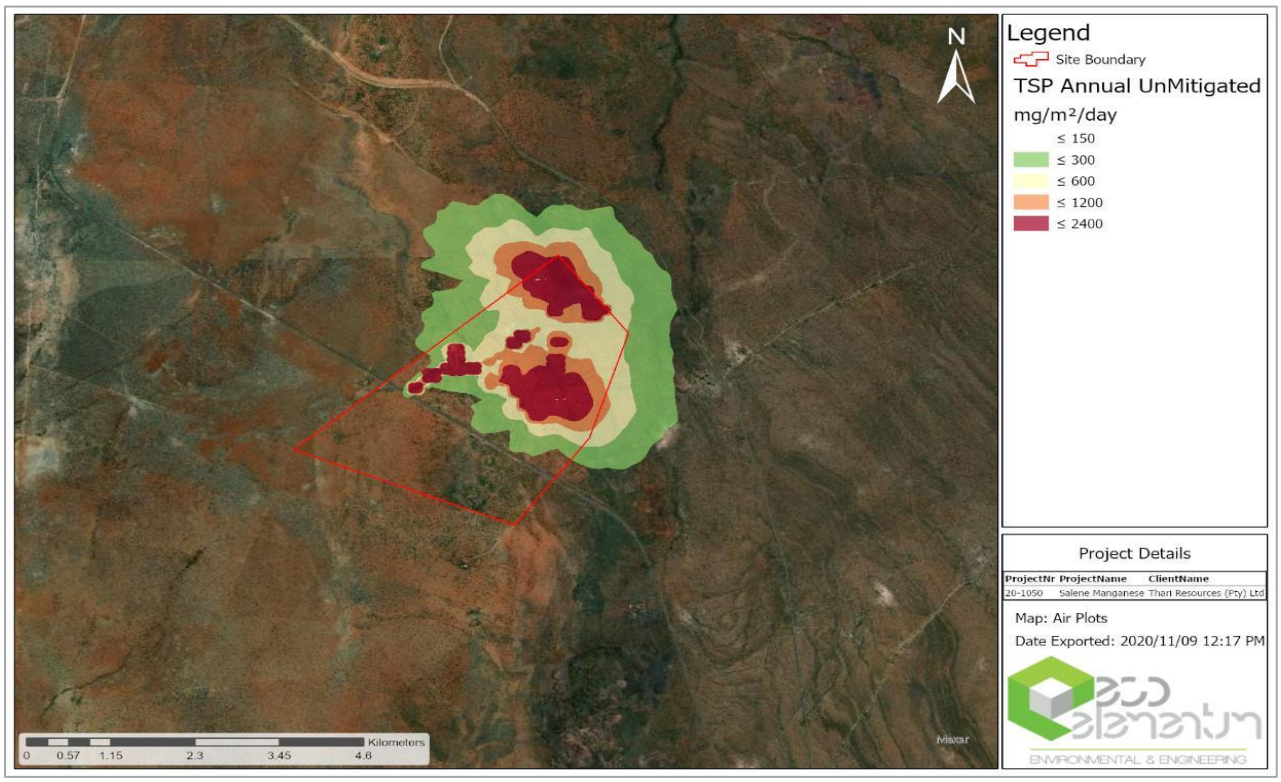


Figure 16-5: Predicted average annual deposition for TSP for the proposed project operations when unmitigated

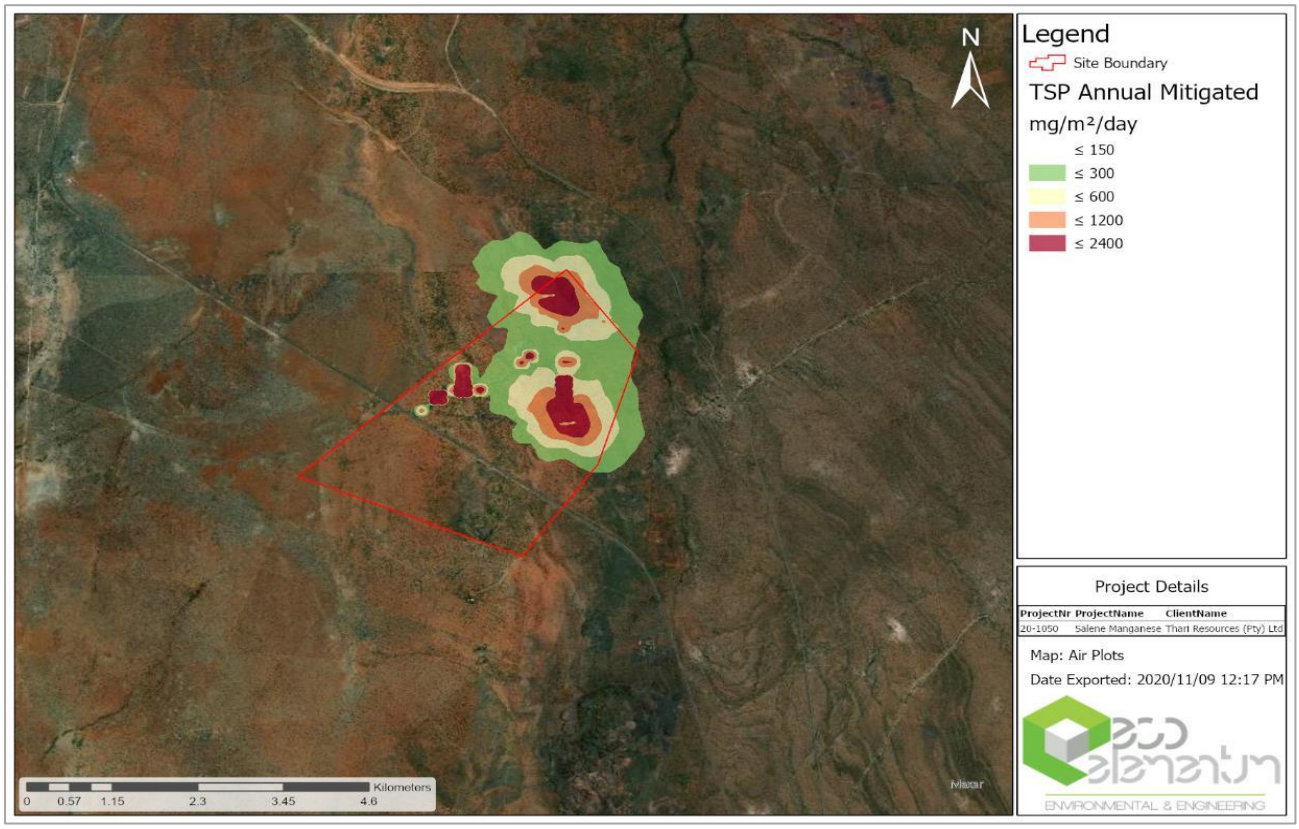


Figure 16-6: Predicted average annual deposition for the TSP for the proposed project operations when mitigated

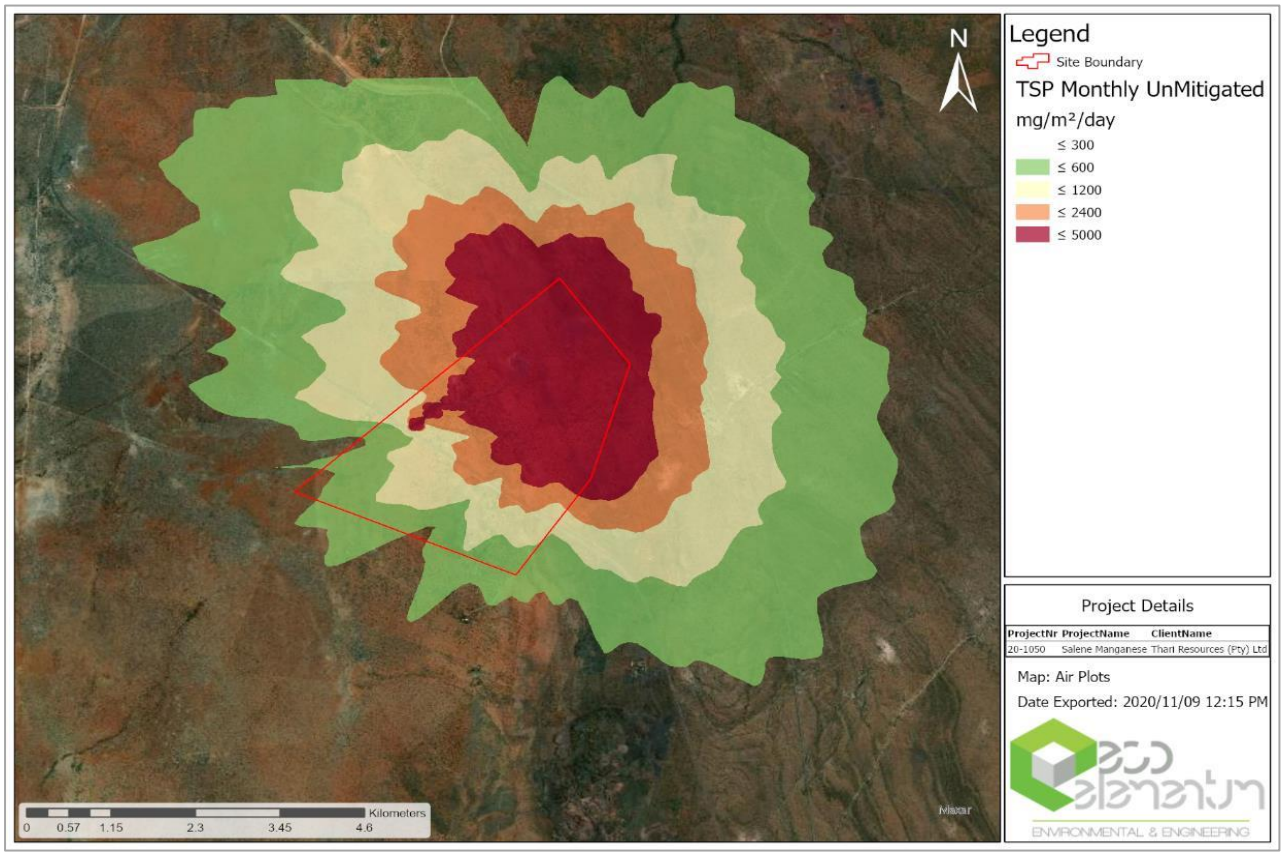


Figure 16-7: Predicted highest monthly deposition for TSP for the proposed project operations when unmitigated

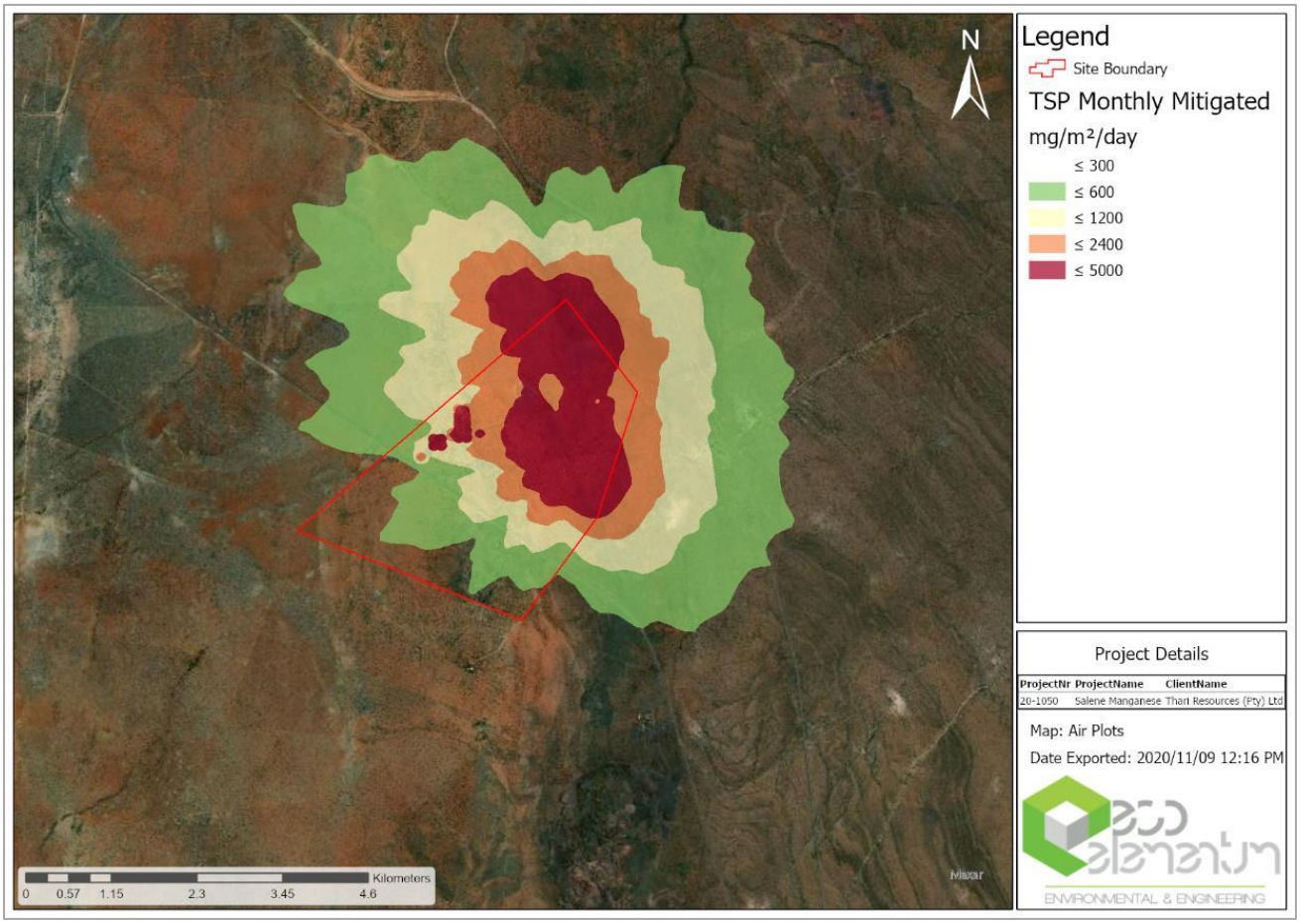


Figure 16-8: Predicted highest monthly deposition for TSP for the proposed project when mitigated

16.1.2.2. General description of impacts and risk identified

Potential impacts that could occur as a result of construction, operation and closure / decommissioning phases for the WRD expansion were assessed and descriptions are provided below:

- During this activity, a number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction. Initially, topsoil and subsoil will be removed with large scrapers. The topsoil will be stockpiled for rehabilitation in the infrastructure area. It is anticipated that each of the above-mentioned operations will have its own duration and potential for dust generation. Fugitive dust (containing TSP (total suspended particulate, will give rise to nuisance impacts as fallout dust), as well as PM10 and PM2.5 (dust with a size less than 10 microns, and dust with a size less than 2.5 microns giving rise to health impacts)) It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing meteorological conditions. This activity will be short-term and localised, seizing after construction activities. Material will be removed by using a bulldozer and then storing this material separately for use during rehabilitation at end of life of mine when the operation cease. These construction sites are ideal for dust suppression measures as land disturbance from clearing and excavation generates a large amount of soil disturbance and open space for wind to pick up dust particles and deposit it elsewhere (wind erosion). Issues with dust can also arise during the transportation of the extracted material, usually by truck and shovel methods, to the stock piles. The dust can further be created by the entrainment from the vehicle itself or due to dust blown from the back of the bin of the trucks during transportation of material to and from stockpiles.
- During this phase, it is anticipated there will be construction of infrastructure. This will include, access roads, pipes, storm water diversion berms, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust). Opencast mining will commence with the stripping of the vegetation for the initial box cut. Topsoil and overburden need to be removed and stockpiled separately by means of truck and shovel methods (front

end loaders, excavators and haul trucks). Once the rock has been reached will blasting be required to further remove material to the point where the mineral can be extracted. Bulldozing, excavation, drilling and blasting operations will result in the emission of dust to atmosphere. The construction of roads take place through removing the topsoil and then grading the exposed surface in order to achieve a smooth finish for vehicles to move on. Temporary stockpiles will be created close to the edge of the road in order to be backfilled easily once the road has expired or need to be rehabilitated.

- Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.
- During this activity, there is demolition of buildings and foundation and subsequent removal of rubbles generated. There is cleaning-up of workshops, fuels and reagents, removal of power and water supply, removal of haul and access roads. Potential for impacts during this phase will depend on the extent of demolition and rehabilitation efforts during closure as well as features which will remain.
- The impacts on the atmospheric environment during the decommissioning phase will be similar to the impacts during the construction phase. The process includes dismantling and demolition of existing infrastructure, transporting and handling of topsoil on unpaved roads in order to bring the site to its initial/rehabilitated state. Demolition and removal of all infrastructures will cause fugitive dust emissions. The impacts will be short-term and localised. Any implication or implications this phase will have on ambient air quality will seize once the activities are finalised.
- During this activity, there is the reshaping and restructuring of the landscape. Topsoil can be imported to reconstruct the soil structure. There is less transfer of soil from one area to other therefore negligible chances of dust through wind erosion. Profiling of dumps and waste rock dump to enhance vegetation cover and reduce wind erosion from such surfaces post mining.

- Cumulative Impacts

- *Project site localised cumulative impacts*: These are the cumulative impacts that result from mining operations in the immediate vicinity of the project site. Project site localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers. These include mainly dust deposition. From this air impact assessment conducted for the proposed project the modelling indicates the cumulative pollution plume emanating from this site as a combination of activities and shows that the impacts will be mainly localised around and in the vicinity of the operations.
- *Regional cumulative impacts*: Regional cumulative impacts include the project's contribution to impacts that are caused by mining operations throughout the region. Each mining operation in itself may not represent a substantial impact, however the cumulative effect on air quality in the region may warrant consideration. Other mining areas can be found to the north and south of the proposed Salene Manganese project areas. These mining operations will also generate fugitive dust and particulate matter emissions. The Salene Manganese project will contribute to the cumulative air quality impacts of the region.
- *Global cumulative impacts*: The only impact from the project that is potentially global is the generation of potential greenhouse gas emissions. However, the level of emissions from the project represents a very minor and insignificant contribution at this scale.

16.1.3. Significance assessment

Please refer to Table 9-1 and Table 17-1.

16.2. Terrestrial Ecology

16.2.1. Methodology

The following was undertaken as part of the terrestrial ecological impact assessment (Red Kite, 2020):

- Desktop assessment: to determine if there are any potentially sensitive species / receptors Aerial photography and satellite imagery was used to delineate potential sensitive habitats for the field assessment and the South African National Biodiversity Institute's (SANBI) online biodiversity tool as well as the Virtual Museum and Animal Demography Unit (ADU) was used to query species lists for the quarter degree grid cell the project is located in. This was supplemented by researching all available books and peer reviewed websites.
- Site verification: A site survey was conducted on 8th October 2020. The site verification was undertaken to supplement and confirm several findings indicated during the desktop analysis. This will serve as a fatal flaw analysis to determine whether there are any major ecological concerns with regards to the development.

The site was traversed on foot and species recorded as they were encountered. Specific aspects that were investigated during the site verification were potential impacts of the development the remaining natural environment and the status of the current natural environment within the study area, indicating indigenous nature and habitat integrity.

The following data was recorded during the site verification:

- All identifiable indigenous and exotic flora species;
- All identifiable fauna species encountered during the site verification; and
- General ecological and habitat data that may assist in the description of the ecological context of the study area.

As part of the site verification a Species of Conservation Concern (SSC) scan was undertaken for SCC floral species identified during the desktop assessment.

A plotless sampling method was used to record data. Fauna and flora species observed in the study area during the time of the study were recorded and included in the species lists. Plant species identification was done following the checklist of Germishuizen & Meyer (2003) as cited by RedKite.

16.2.2. Description of environmental issues and risks

16.2.2.1. Modelling results

No modelling was applicable to the ecological assessment.

16.2.2.2. Other issues and risks

For the 2020 expansion activities the following impacts were identified:
Construction phase:

- Most of the impacts on plant species will occur during the construction phase when removal of plant communities will take place on site.
- Vegetation clearance will likely destroy habitats and lead to possible invasive and/or exotic species establishing in the area and edge-effects occurring surrounding the development. Bare areas may become vulnerable to AIP species and these may compete with indigenous species, likely leading to the migration of sensitive species from the site to a more favourable habitat.
- The onset of new construction activities will result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles may result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat.
- Impacts on Species of Conservation Concern (SCC) associated with the area.

Operational phase:

- This continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavorable).

- Invasive plant species may increase during the operational phase of the project. This will mostly take place in the remaining natural areas. Removal of these species is an ongoing process and if not managed regularly could result in severe changes and competition in plant communities.
- Possible impacts on Species of Conservation Concern (SCC) if encountered by employees and/or contractors.

Decommissioning phase:

- Decommissioning and rehabilitation will have similar impacts as the construction phase, but thereafter positive impacts as the natural environment starts to recover, restoring balance.

16.2.3. Significance assessment

Please refer to Table 9-1 and Table 17-1.

16.3. Noise

16.3.1. Methodology

As part of the 2020 noise assessment modelling was conducted (EARES, 2020) and the noise emissions from various point sources were calculated in detail for the conceptual existing and operational activities by using the sound propagation algorithms described by the ISO 9613-2 model. While noise emission into the environment due to project road traffic (linear sources) was calculated using the sound propagation model described in RLS-90.

16.3.2. Description of environmental issues and risks

16.3.2.1. Modelling results

The construction and operational phase for the proposed expansion project was modelled and results are provided in the figures below. The noise contours are illustrated from 35 dBA upwards for the night-time scenario and 45 dBA for the daytime scenario. From the figures it can be seen that at night sound travels further than during the day and that it is still mostly localised close to the operational areas and the provincial roads. During night time some of the identified potential sensitive receptors may be exposed to increased noise levels of 45 – 65 dBa

Figure 16-9: Conceptual noise sources for Construction Phase

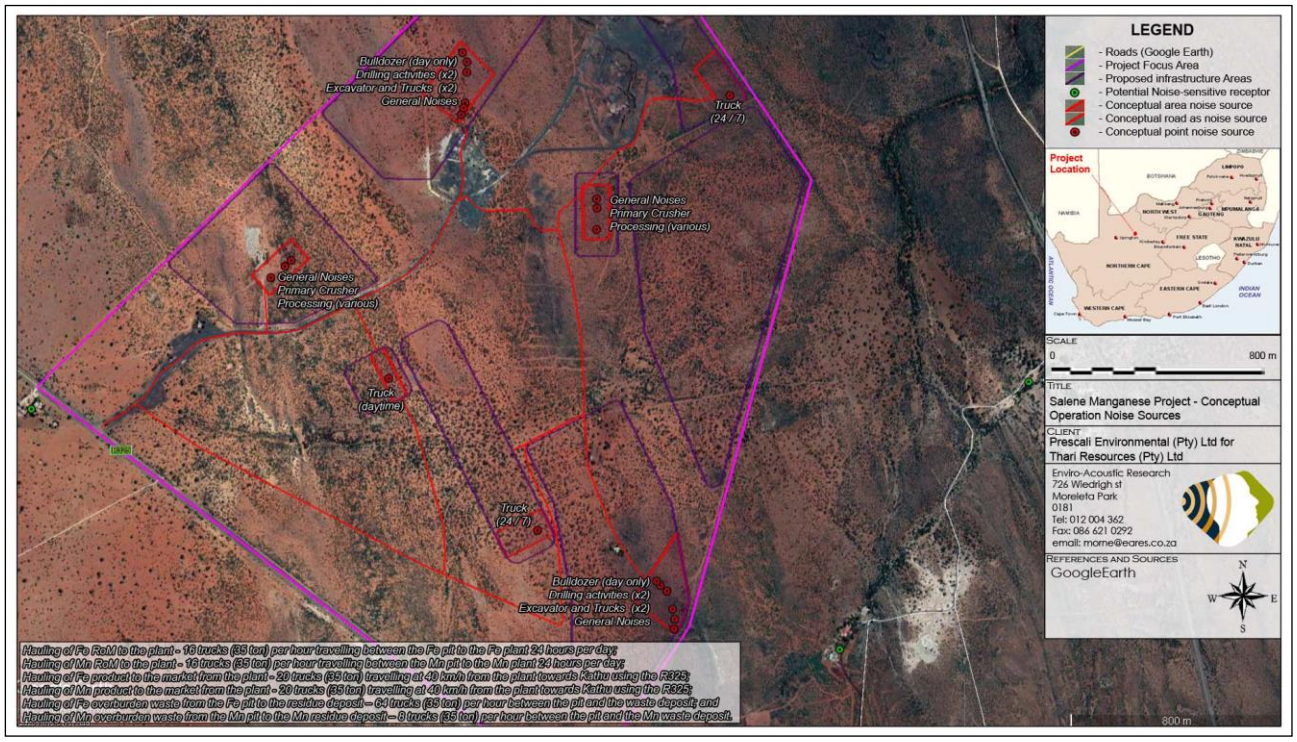


Figure 16-10: Conceptual noise sources for the future construction/operational phase

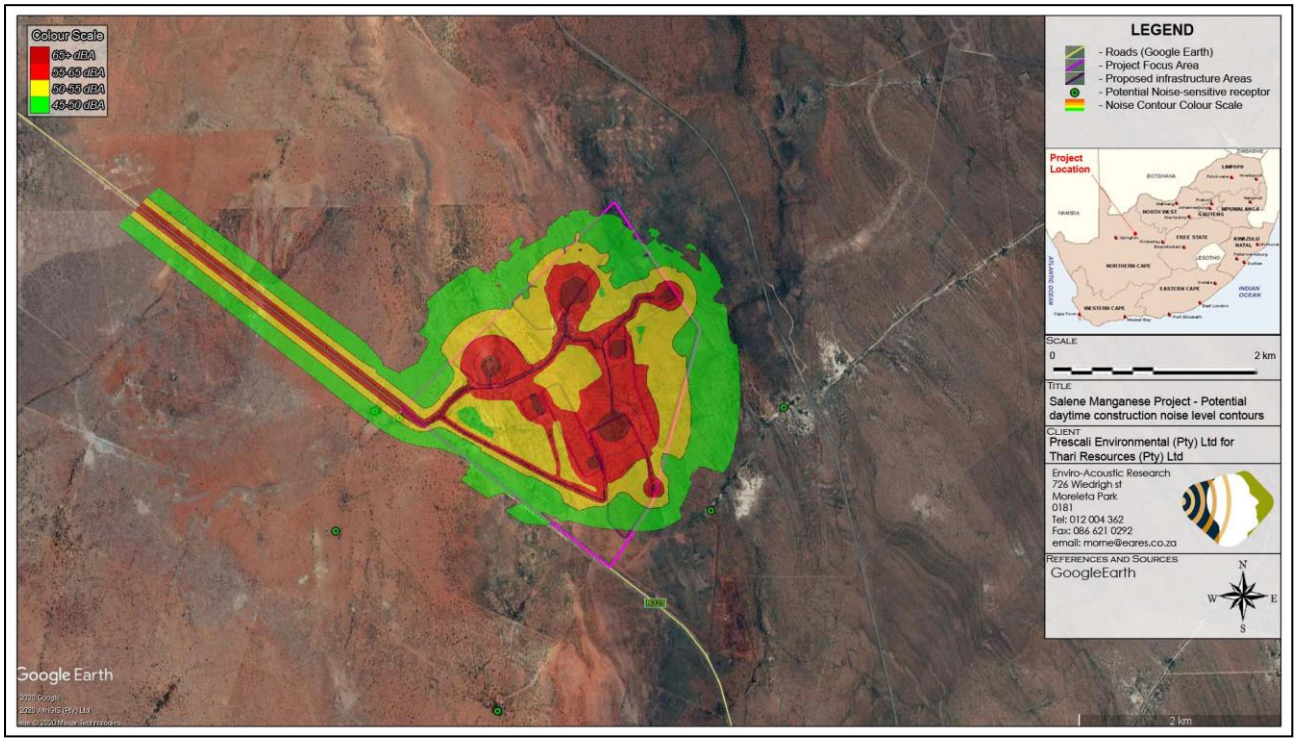


Figure 16-11: Projected construction daytime noise levels

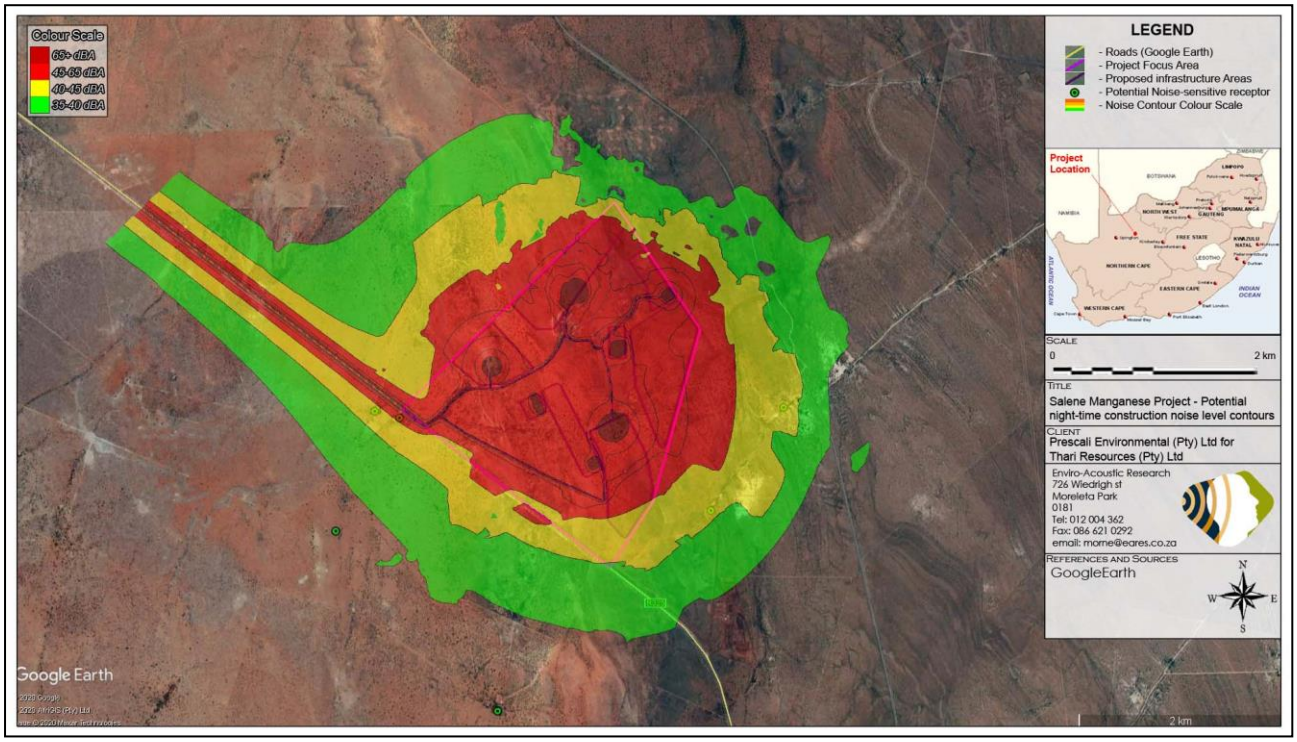


Figure 16-12: Projected construction night-time noise levels

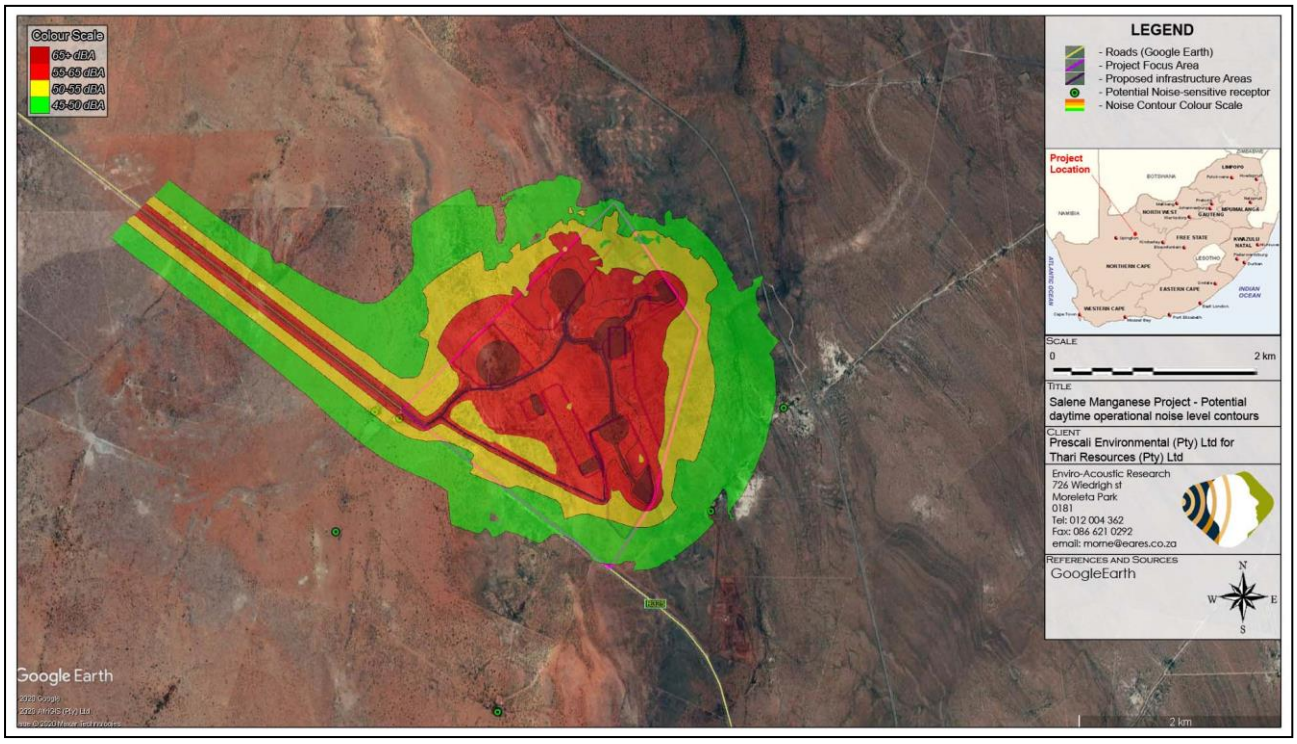


Figure 16-13: Projected conceptual operational daytime noise levels

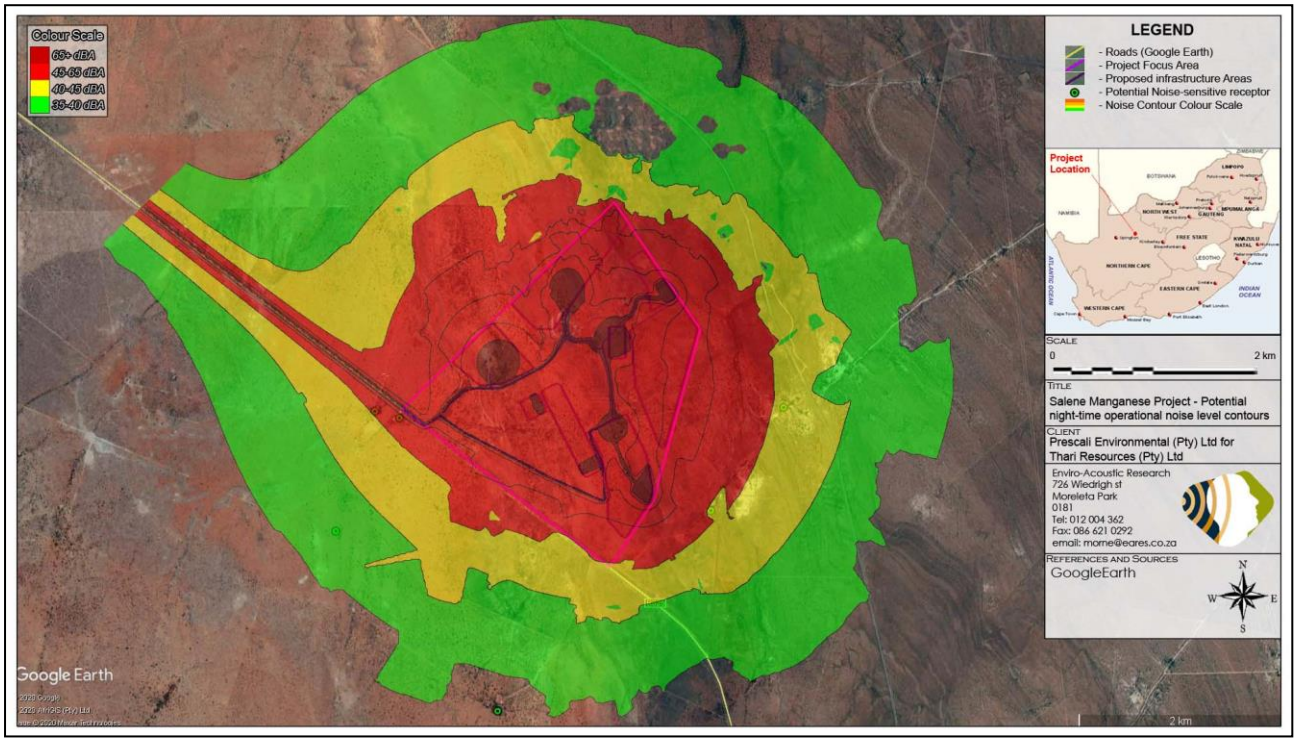


Figure 16-14: Projected conceptual operational night-time noise level

16.3.2.2. General Description of Impacts Identified

Construction phase:

- Considering ambient sound levels as measured at receptor NSD 1, noises from hauling activities will be clearly audible at receptors NSD 1 and 2 at times. Noise levels will not exceed 55 dBA during the daytime period.
- Considering ambient sound levels as measured at receptor NSD 1, noises from any night-time construction traffic (especially trucks) may be audible at receptors NSD 1 and 2 at times. Noise levels may exceed 45 dBA at night during high traffic periods or when traffic use horns or engage air brakes.

Operational Phase:

- Considering ambient sound levels as measured at receptor NSD 1, noises from hauling activities may be clearly audible at receptors NSD 1 and 2 at times. Noise levels will not exceed 55 dBA during the daytime period.
- Considering ambient sound levels as measured at receptors NSD 1, noises from any night-time construction traffic (especially trucks) may be clearly audible at receptors NSD 1 and 2 at times. Noise levels may exceed 45 dBA at night during high traffic periods. Noises due to active mining activities may be audible at NSD 4 and 6..

16.3.3. Significance assessment

The results if the noise impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy operation is provided in Table 9-1.

16.4. Visual

16.4.1. Methodology used

The full methodology used is outline in Sections 4 and 5 of the 2020 assessment conducted (Eco Elementum, 2020) Viewshed and viewing distances of up to 15 km from the proposed infrastructures were modelled using 1 km concentric radii zones. A visual exposure analyses was also conducted and included the following parameters: Slop angle, Aspect of slope, Landforms, Slope Position of structure, Relative Elevation of structure, Terrain, visual absorption capacity (VAC[12]) and overall visual impact.

[12] The ability of elements of the landscape to "absorb" or mitigate the visibility of an element in the landscape. Visual absorption capacity is based on factors such as vegetation height (the greater the height of vegetation, the higher the absorption capacity), structures (the larger

16.4.2. Description of issues and risks

16.4.2.1. Modelling results

Based on the modelling results conducted in 2020 the ruggedness[13] of the Macarthy Mining area is very rugged (Figure 16-15) and the area has a low VAC (Figure 16-16). The Visual exposure ranking was modelled (Figure 16-17) and from the results it can be seen that Macarthy ranked from very low. Overlaying the sensitive receptors with the visual exposure ranking (Figure 16-18) indicated that none of the identified sensitive receptor locations would be able to see the new expansion structures.

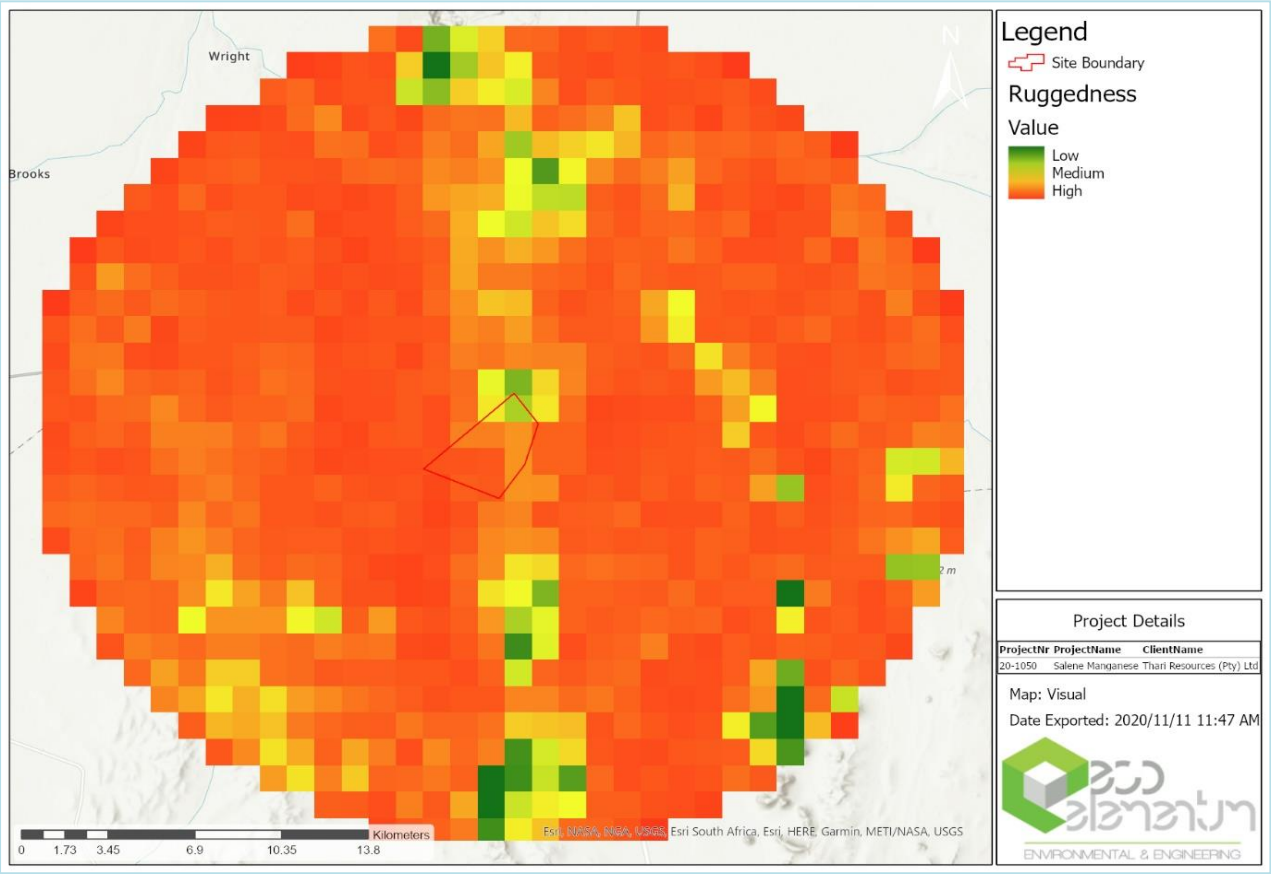


Figure 16-15: Terrain ruggedness

and higher the intervening structures, the higher the absorption capacity) and topographical variation (rolling topography presents opportunities to hide an element in the landscape and therefore increases the absorption capacity).

[13] Homogeneousness of the terrain.

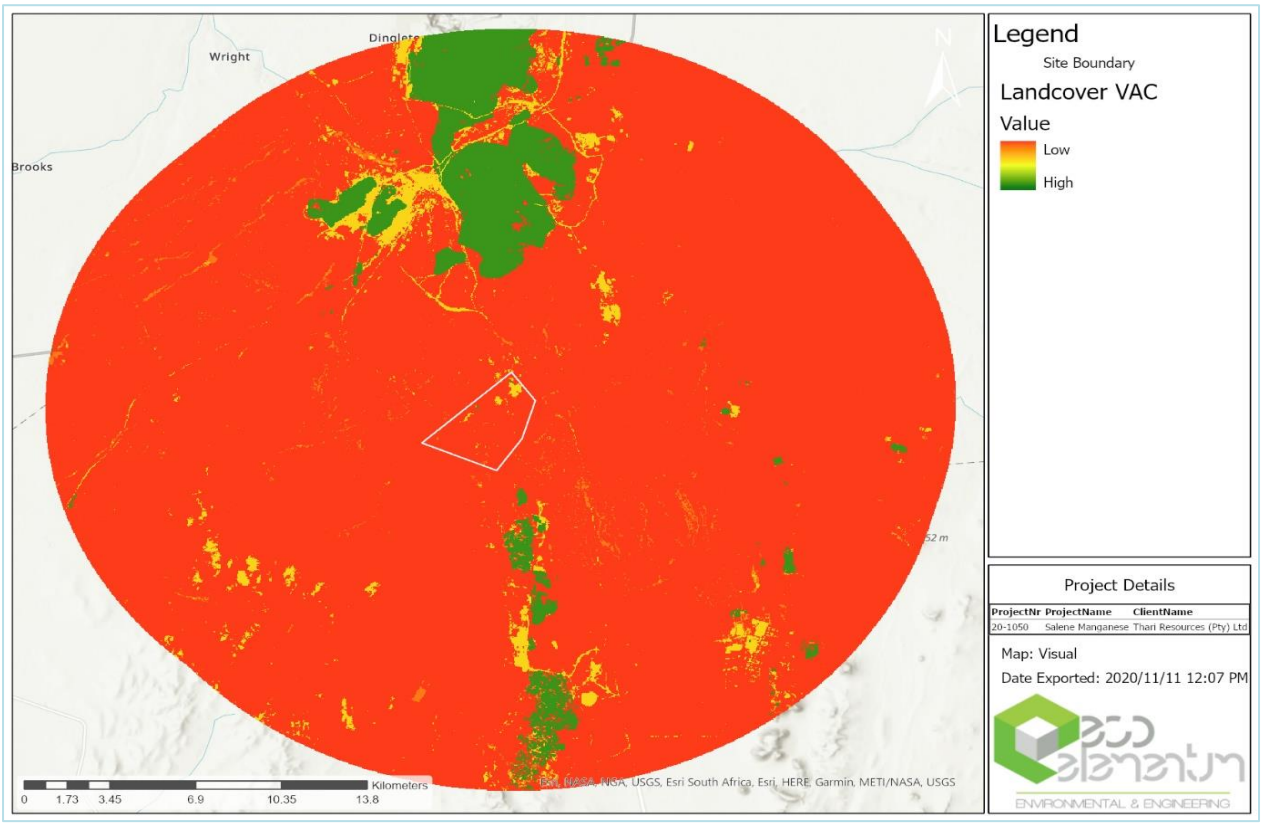


Figure 16-16: Possible VAC of the land cover

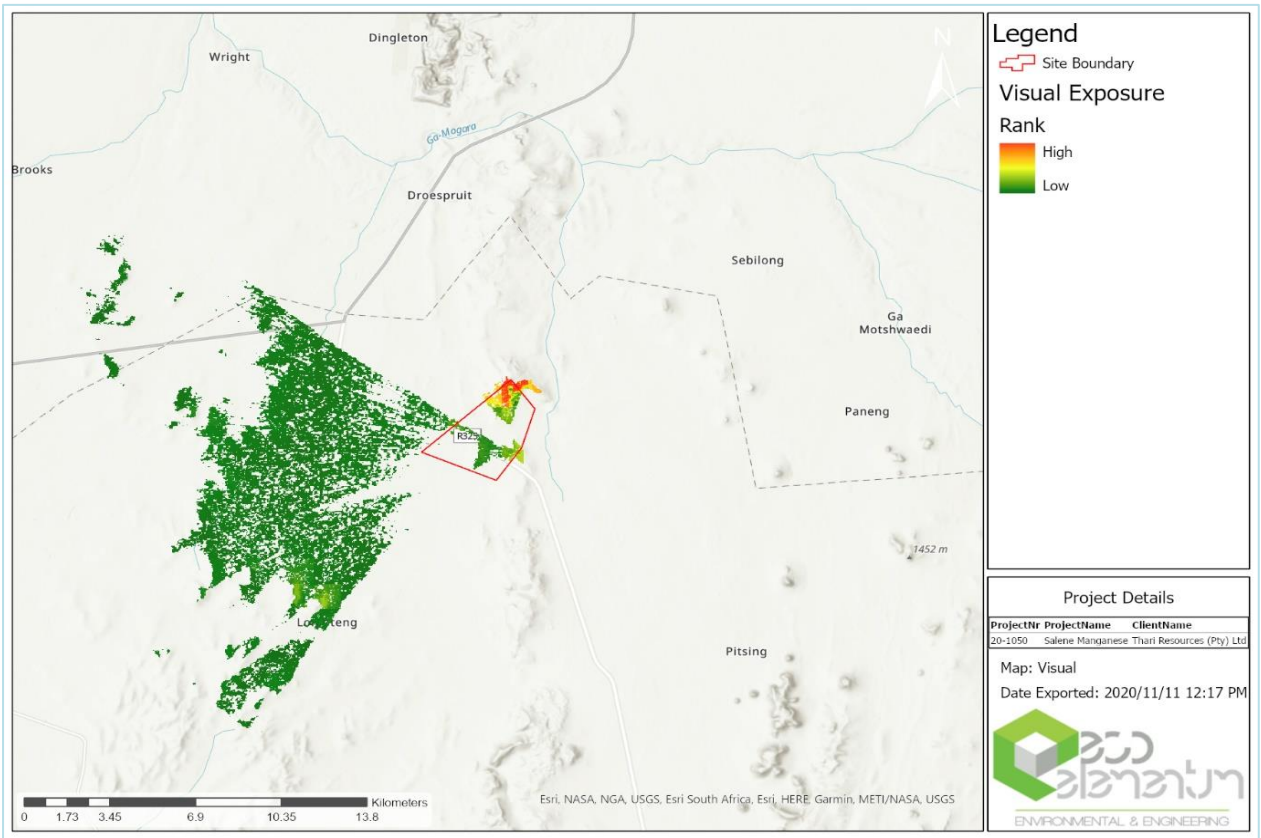


Figure 16-17: Visual exposure ranking

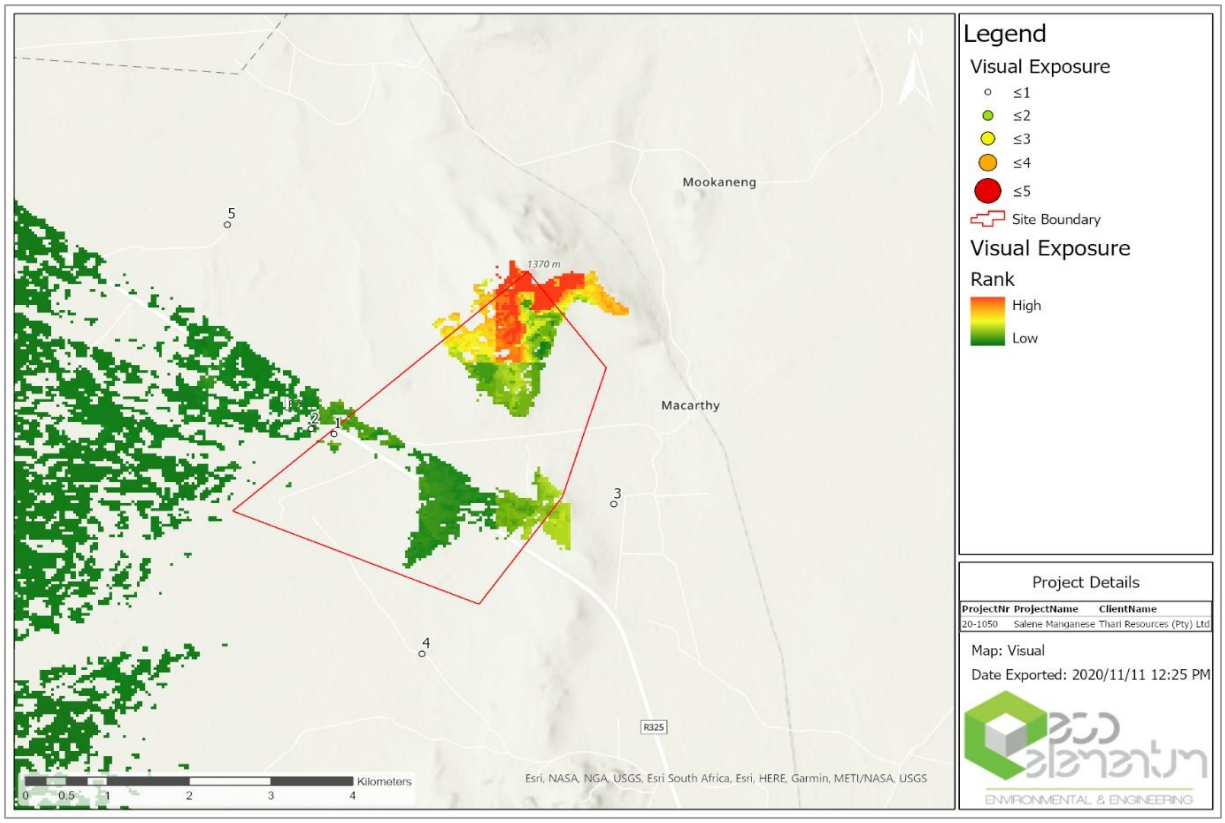


Figure 16-18: Viewpoint sensitive receptors overlaid with Visual exposure ranking – Visual impact

16.4.2.2. Other issues and risks

From the 2020 assessment the significance rating was low as modelling indicated that none of the identified sensitive receptor locations would be able to see the new expansion structures.

16.4.3. Significance assessment

The results if the visual impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy mining operation is provided in Table 9-1 and Table 17-1.

16.5. Surface Water

16.5.1. Methodology used

The surface water assessment was conducted using available desktop information from various sources as indicated in Section 4 of the specialist report (Prescali, 2020). The desktop assessment was augmented by a site visit on the 21st of September 2020 (riparian assessment) and 08th October 2020.

A plotless sampling method was used and plant species observed in the riparian zone of the study area during the time of the study were recorded. The floristic composition of the riparian areas assessed are described and discussed. Plant species identification was done following the checklist of Germishuizen, G. & Clarke, B., (2003) sa cited in the report.

16.5.2. Description of issues and risks

16.5.2.1. Modelling results

No modelling is applicable.

16.5.2.2. Other issues and risks

The construction (C), operation(O) and decommissioning(D)/closure and post closure(P) impacts from the 2020 expansion infrastructure are as follows:

- (C) The location of the opencast pits in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the proposed iron opencast pit which is of concern as it is located on a watershed area. (D) It is not expected that it would be possible to backfill the opencast pits 100% due to insufficient material being available thereby creating a permanent sink for water if not diverted around the opencast pits. (C, O, D) The location of the opencast pits are not located within or near any delineated watercourse therefore fragmentation of habitats or isolation of communities are highly unlikely. (C, O) Rainwater captured in the opencast pits will reduce sheet flow to nearby watercourses and may be contaminated and needs to be pumped to the pollution control dam to prevent impacts on water quality downstream that in turn could impact on the habitat and biota.
- (C) The location of the WRD in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the existing WRD and its proposed expansion which is of concern as it is located on / near a watershed area. (C, O, D, P) Run-off from the WRD could be contaminated (to be confirmed by leachate test) and this could result in water quality impacts downstream if not contained in a pollution control dam
- (C, O) Chemical or fuel spillages from equipment used in the all the mining related activities could contaminate the soil profile. (C, O, D) Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff that if not managed and captured correctly could reach surface water resources during rainfall events.
- (C, O) Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. (C, O) Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in nearby watercourses.
- (C, O) If not managed correctly the topsoil heap could fail and result in increased siltation in watercourses. (C, O) Depending on the waste classification and leachate generated by the overburden / Waste rock run-off from these areas could result in poor quality water entering the watercourses. (D, P: post closure) Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.
- (C, O) Hydrocarbons spills from mining equipment could results in water quality impacts if not managed. (C, O) Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. (C, O) Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in watercourses.
- (C, O) Concentrated storm runoff from the opencast pits surrounds and infrastructure areas could be erosive, causing sheet, rill and donga erosion features. (O) Dirty storm water from the opencast pits could impacts on the water quality of downstream surface water areas. (O) Should water be allowed to be captured in the opencast pits it could result in less water to the downstream surface water area. (C, O, D) Altered storm water runoff response due to large impervious areas (hardened surfaces) and concentrated runoff in drainage systems. (C, O, D) Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act. (C, O, D, P) Contaminated runoff or leachate concentrated in mined out opencast pits can decant or contaminate through controlled discharge of partially treated water into natural systems. Opencast pit sump (O, D, P) Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked out pit and can lead to increased groundwater recharge and potential regional impact of low quality water. (O, D) Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.
- (O, D) the Stockpiling of these materials (waste rock, RoM and Product) could result in salinization, mineralisation and toxic contamination of soils beneath them. (C, O, D, P) Leachate from these materials could result in poor quality water entering the surface water resource which could impact on the health of the system.
- (C, O, D) Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff. (C, O, D) Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.
- (C, O, D) Dust generation from the beneficiation processes, product and waste transport routes, residue stockpiles or deposits and un-rehabilitated areas can impair aquatic vegetation photosynthesis and could potentially impact on water quality depending on the constituents.

16.5.3. Significance assessment

The results if the surface water impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy mine operation is provided in Table 9-1 and Table 17-1.

16.6. Heritage / Archaeological

16.6.1. Methodology used

The 2020 heritage assessment was done using a survey of available history, a field survey and oral history. The field survey was conducted using generally accepted archaeological and heritage impact assessment practises and aimed at locating all possible objects, sites and features of heritage importance (Pelser, A., 2020).

16.6.2. Description of issues and risks

16.6.2.1. Modelling results

No modelling is applicable.

16.6.2.2. Other issues and risks

Sites of historical importance were recorded at the proposed project (see Section 8.10) and Appendix 6. Permission from the heritage agency will be needed to impact this area.

16.6.3. Significance assessment

The results if the heritage impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy operation is provided in Table 9-1.

16.7. Soil, Agriculture and Land Use

16.7.1. Methodology used

For the 2020 soil and agricultural potential assessment a desktop assessment was conducted using available GIS information and a site inspection was conducted (Terra, 2021). Land capability was determined following the guidelines in Section 7 of “The Chamber of Mines Handbook of Guidelines for Environmental Protection (Volume 3, 1981)” and the Procedures For The Assessment And Minimum Criteria For Reporting On Identified Environmental Themes In Terms Of Sections 24(5)(A) And (H) And 44 of The National Environmental Management Act, 1998. (P 30 Government Gazette, 20 March 2020). For the soil classification, a hand-held bucket soil auger was used to observe soil profiles to a depth of 1.5m or refuse, depending on the effective soil depth of the area. Additional information was obtained from the Land type information (Land Type Survey Staff. 1972 – 2006). More detailed information is provided in Section 7 of the specialist report (Terra, 2021).

16.7.2. Description of issues and risks

16.7.2.1. Modelling results

No modelling is applicable.

16.7.2.2. Other issues and risks

During the construction phase, all infrastructure and activities required for the operational phase will be established. The main envisaged activities include the following:

- Transport of materials and labour with trucks and buses as well as other light vehicles using the existing access roads. This will compact the soil of the existing roads and fuel and oil spills from vehicles may result in soil chemical pollution.
- Earthworks will include clearing of vegetation from the surface, stripping topsoil (soil excavation) and stockpiling.
- Construction of the new WRD and expansion of the existing WRD.
- Extension of access roads and upgrading of existing roads that will include surface compaction.
- Erection of reservoirs and storm water dams.
- Other activities in this phase that will impact on soil are the handling and storage of building materials and different kinds of waste. This will have the potential to result in soil pollution when not managed properly.

16.7.3. Significance assessment

The results if the agriculture and land use impact assessment inclusive off the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy mine operation is provided in Table 9-1 and Table 17-1.

16.8. Geohydrological

Detailed information is available in the (Eco Elementum,, 2021) report (Appendix 6).

16.8.1. Methodology used

The Processing Modflow 8 (PMWIN) modelling package was used for the numerical flow and mass transport simulations. PMWIN is a finite difference modelling package where the domain is broken up into blocks or rectangular cells where the finite difference analogue of the partial differential equation for flow is applied to a node within a cell.

Boreholes used in the calibration of the model is indicated in the figure below and the stady state of the water level is indicated in Figure 16-20.

With regards to plume modelling two options regarding the proposed liner system for the waste activities and stockpile areas were modelled. No liner and a Class D liner.

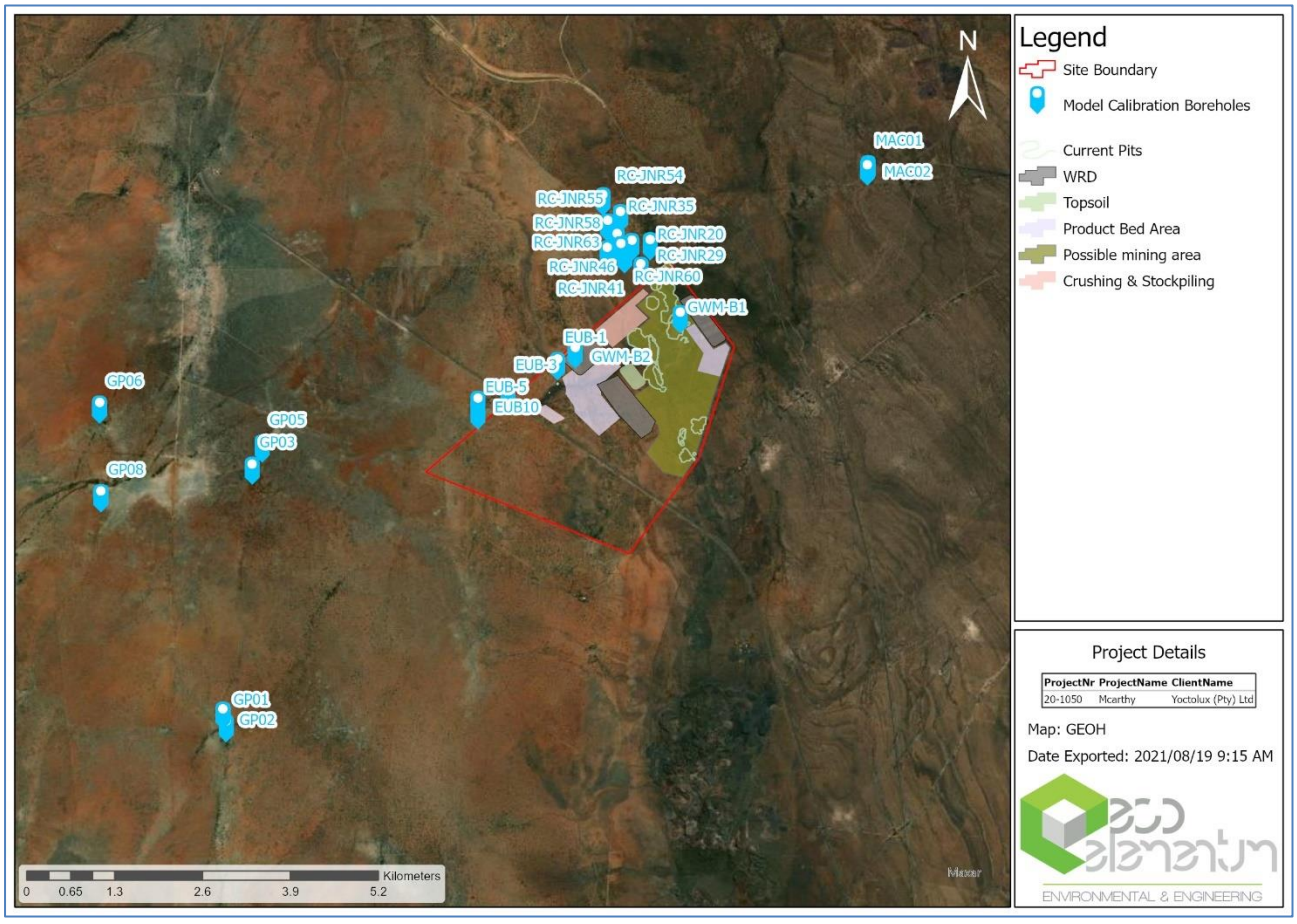


Figure 16-19: Boreholes used in the calibration of the model

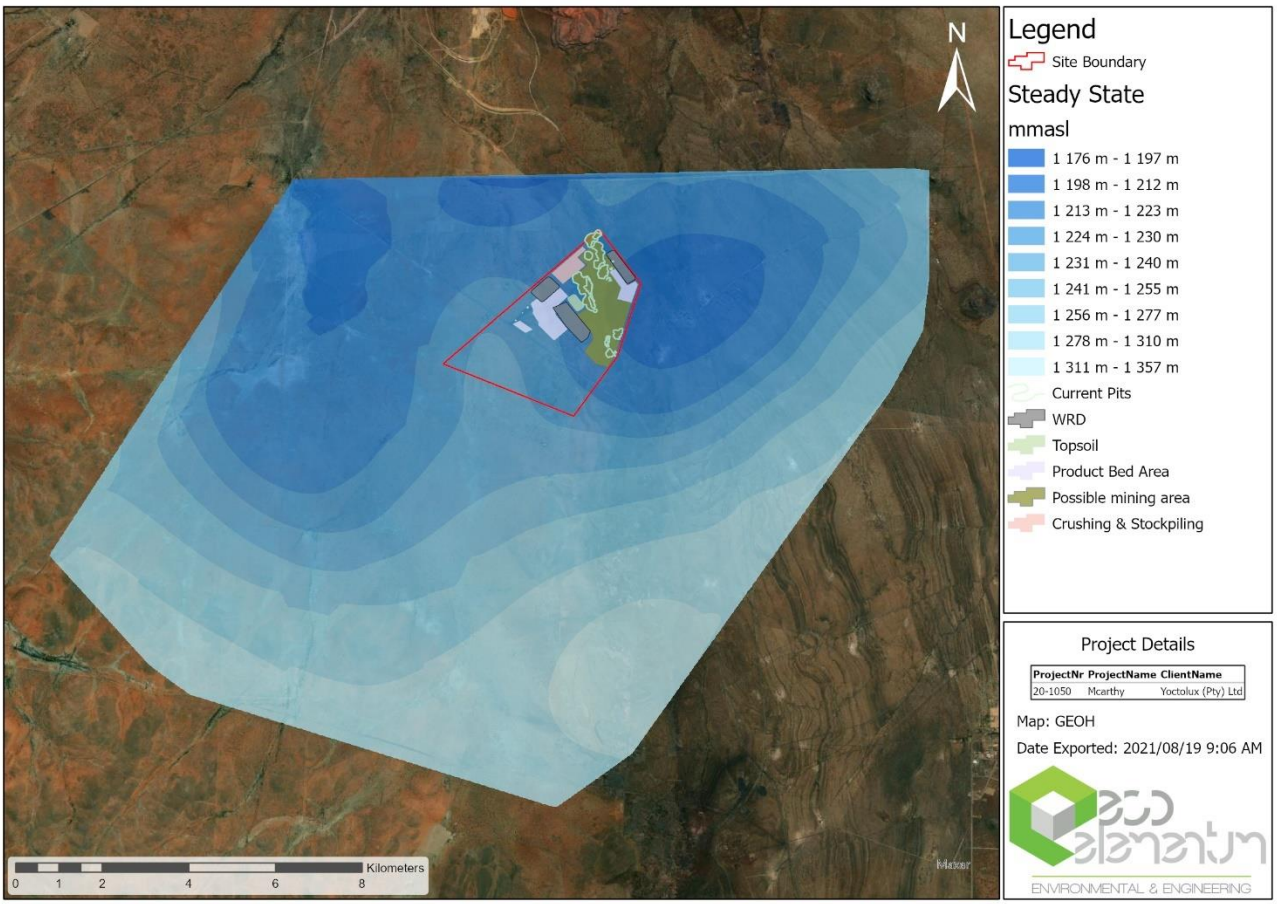


Figure 16-20: Groundwater level steady state

16.8.2. Description of issues and risks

16.8.2.1. Modelling results

The results of the modell is provided in the figures below.

The potential surface contaminations sources were simulated with no liner or barrier system in place. It is expected that the contamination plume will migrate more than 110 m from any of the potential source areas at the end of the 30 years of life of mine. The contamination is also not expected to be more than 15% of the original source concentration. The mass transport simulations with no liner at the end of the proposed mining operations for the proposed Macarthy mine activities as are presented in Figure 16-21.

The potential surface contaminations sources were simulated with a Class D barrier system in place at the WRD and stockpile areas. The system has been assigned a hydraulic conductivity of 0.00086 m/day and will also effectively decrease the recharge to the underlying aquifer. Simulated recharge was decreased from 3 to 1% at the Class D barrier areas. It is expected that the contamination plume will migrate up to 80 m from the Class D potential source areas at the end of the 30 years of life of mine. The expected contamination concentration in the underlying aquifers of the Class D barrier areas will decrease and may only reach 6% of the original source concentrations. The mass transport simulations with the Class D barrier at the end of the proposed mining operations for the proposed Macarthy mine activities as are presented in Figure 16-22. The plume expected from the pit area will still migrate away from the pit.

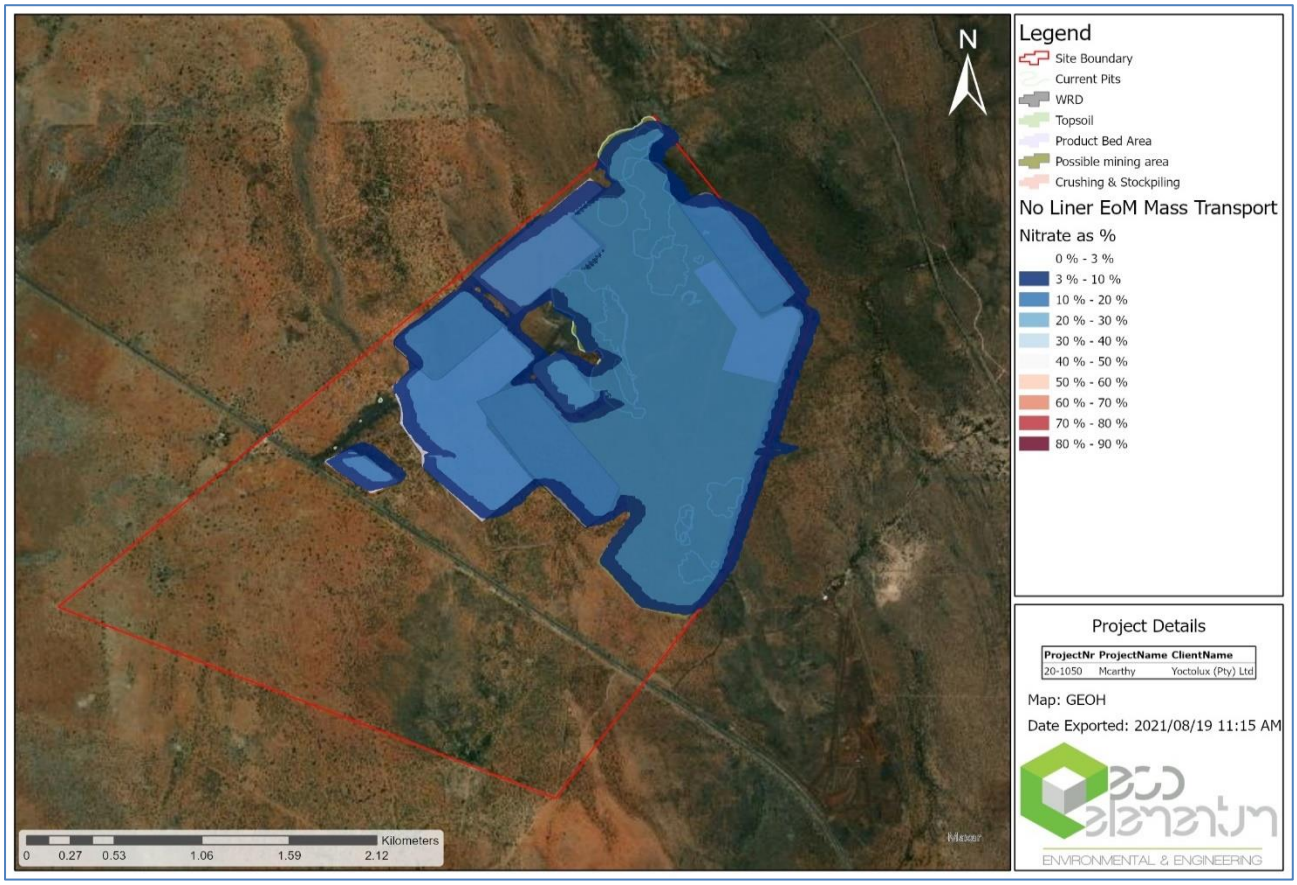


Figure 16-21: No Liner Mass transport modelling results

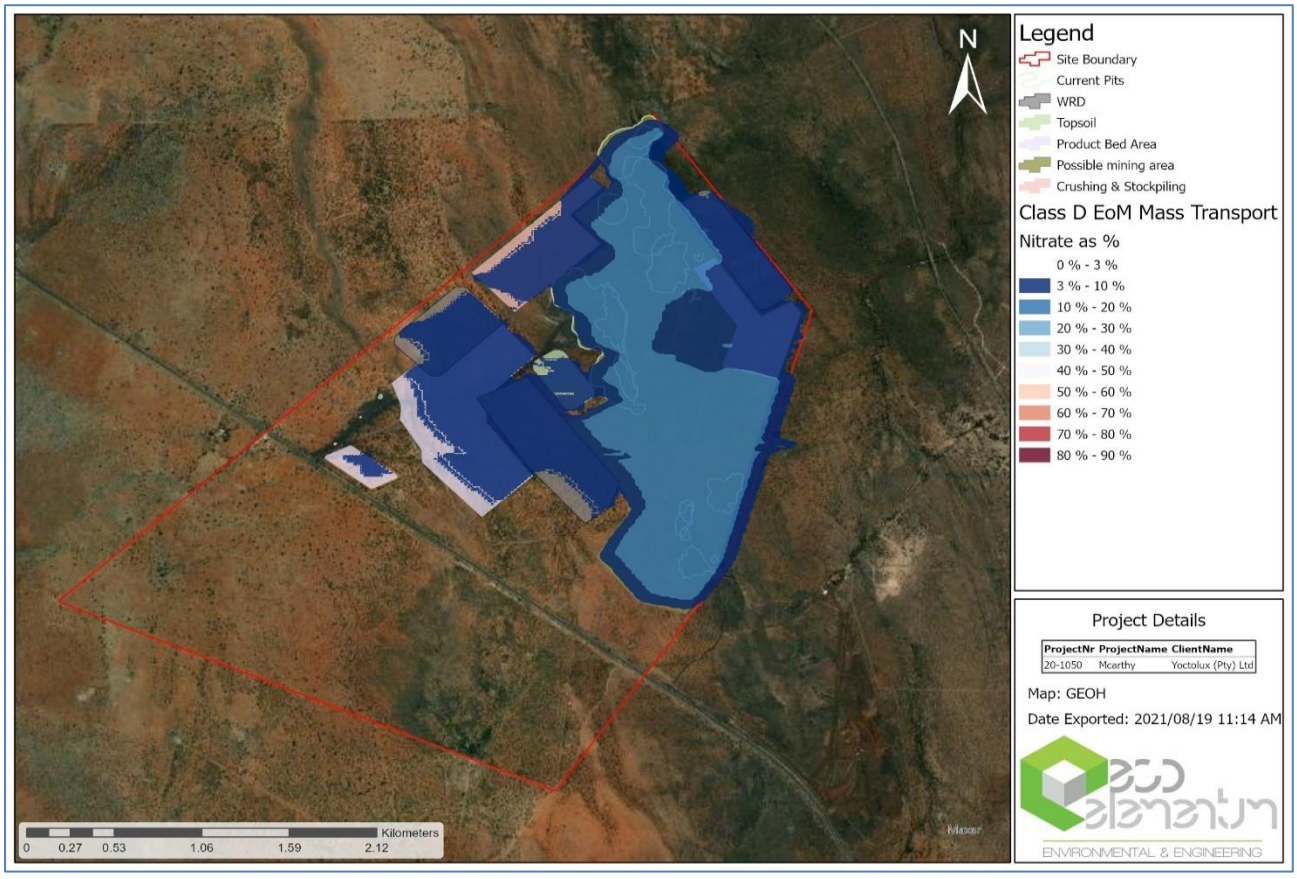


Figure 16-22: Class D liner system mass transport model results

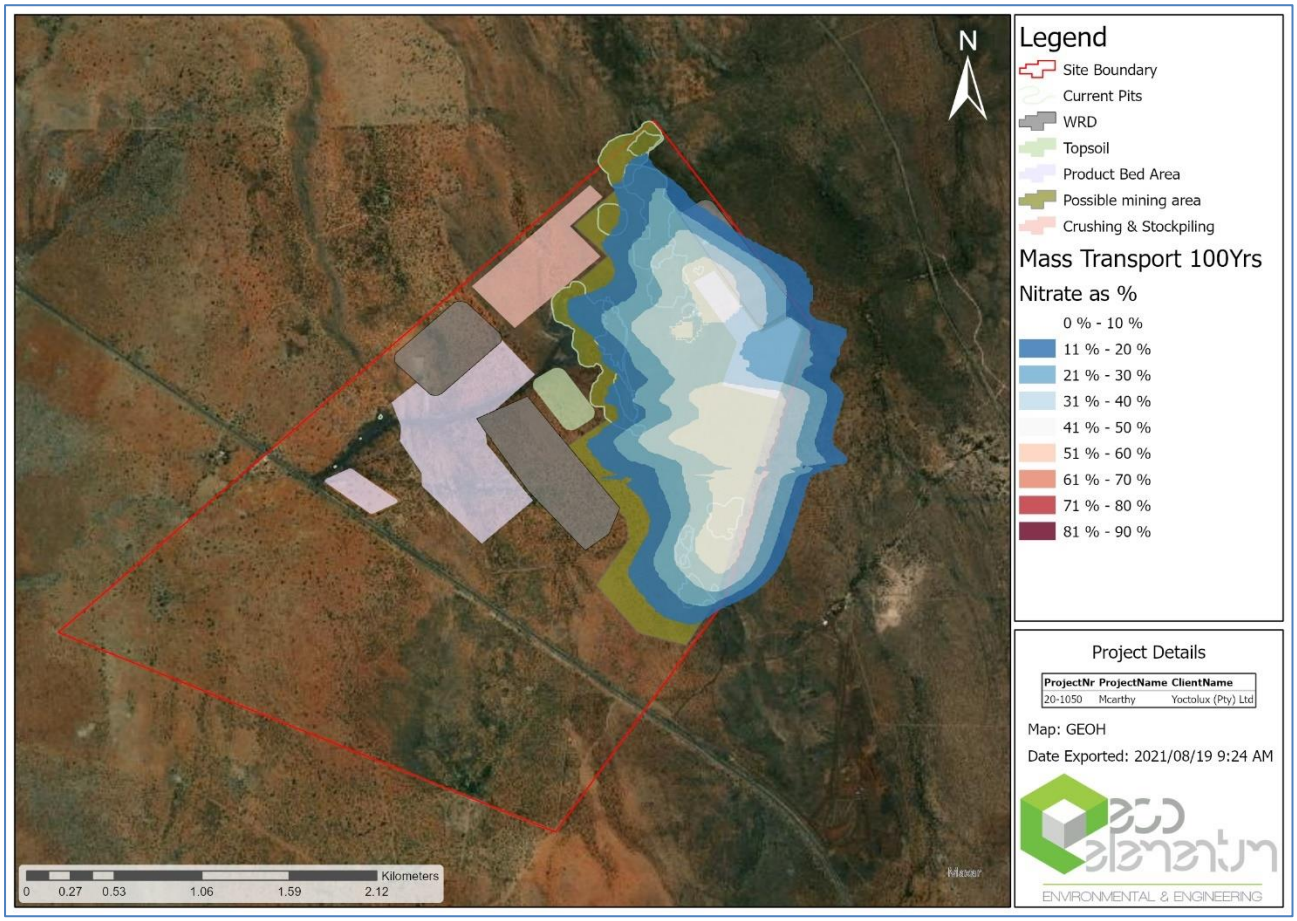


Figure 16-23: Mass transport model 100 years

16.8.3. Description of identified impacts

- **Construction phase:**
  - Impacts on groundwater quality: No significant impacts are expected during the construction phase in terms of groundwater quantity. The removal of vegetation in preparation of the mining area and associated infrastructure construction may cause an increase in surface runoff and therefore a small decrease in aquifer recharge.
  - Impacts of groundwater quantity: The proposed Macarthy mine activities is not expected to impact on the groundwater quality during the construction phase. The only possible impacts may be from example fuel spillages from the construction vehicles.
  - Groundwater Management: Should fuel spillages occur during the construction phase immediate action is required to minimise the impact on the groundwater regime.
- **Operational phase:**
  - Impacts on groundwater quantity: The maximum depth of the proposed mining area will be approximately 89 m towards the northern are of the mine. The lowest pit floor elevation is expected to be at 1 222 mamsl. The current available water level information indicates that the mining will not intersect the water table. Therefore, groundwater inflow and dewatering are not expected to occur during the operational phase of the activities. Therefore, significant impacts on the groundwater quantity are not expected during the operational phase.
  - Impacts on groundwater quality: In the iron and manganese mining environment, nitrate is often the main contaminant as a result of the remnants of explosives. The nitrate concentrations in the groundwater surrounding the opencast, crushing and screening plant, ROM stockpiles and waste rock dump areas start to increase. The nitrate is highly soluble in water and will seep through the waste rock dump and ROM material down to the aquifer. The potential nitrate pollution plume at Salene Manganese is not expected to migrate more than 220 m from the potential source boundaries at the end of the operational phase.
  - Currently, dewatering of the pit is not expected since the water table will not be intersected by mining. In the case where dewatering in the open pit may be required during the operational phase, the mine void will act as a groundwater sink area. This will also continue post-closure until the water level has

reached equilibrium. Groundwater gradients and therefore groundwater flow will be towards the pit area. For this reason, groundwater contamination will not be able to flow down gradient from the pit area during the operational phase.
  - Impacts on Surface Water: No wetlands or major rivers and streams are present in the Salene Manganese impact zone. The streams in the region of the mining area are non-perennial.
  - Since the mining is not expected to intersect the groundwater table, no impacts in terms of water quantity to the surface water streams are expected. Simulated potential contamination impacts during the operational or post-closure phases is also not expected to affect any of the nearby surface water features.
  - No impacts on the surface water are therefore foreseen as a result of the proposed Salene Manganese mining activities.
- Groundwater Management: Dewatering of the mine pits are not expected since the current information indicates that the mining operations will not intersect the groundwater table. Since dewatering is not expected, the pit areas do not act as groundwater sink areas and any contamination from potential source areas are expected to start migrating away from the source areas.

16.9. Socio Economic Assessment

16.9.1. Methodology used

A desktop regional socio-economic analysis was conducted based on regional socio-economic information. The regional information firstly elaborates on the legal and institutional framework, under which the Salene Manganse-Macarthy project will operate. Secondly, it provides a detailed regional situation analysis for the provincial, district and surrounding communities. The data used in the desktop study analysis were sourced from the district (ZF MGcawu) and local municipality (Tsantsabane) integrated development plans (IDPs).

Field and site investigations were undertaken by the Gudani team within the project area and foot-print to identify all socio-economic issues, impacts and risks. This phase also included some public participation process and stakeholder engagement process. A ten (10) page questionnaire made up of multiple choice questions on demographic information, employment and economic activities of the community, settlement and infrastructure, agricultural activities, educational information, health information and social grants was developed but could not be administered due to Covid-19 epidemic restrictions and regulations.

16.9.2. Description of issues and risks

16.9.2.1. Modelling results

No modelling was conducted as part of the Socio-Economic Assessment.

16.9.2.2. Other issues and risks

- Heritage and Culture:
  - There is an existing cemetery (adjacent to Salene Offices), old diggings and ruinswhich are archaeological or heritage sites identified within the site footprint both during the initial construction and operational phases. This must however be verified by a heritage specialist through a detailed heritage impact assessment as part of the EMP process.
  - Development of access and haul roads, opencast pits, surface infrastructure, tailings storage and waste rock dumps disturbs and destroys the surface and sub-surfacecomponents of the earth crust. There is the possible event that some cultural, heritageor archaeological resources are encountered during any future mining activities or construction associated surface infrastructure, these may be destroyed by the earth moving machinery used in both activities.
- Crime, Health, HIV and Covid-19
  - Crime is common in most settlement areas and the community of Maremane is not different. However, due to the semi-rural and informal nature of the settlement, crime may be higher comparative to urban centres such as Kathu and Postmasburg. The lack of traditional livelihoods and sharing of communal resources in such settlements also increases crime to some extent.
  - Crime, Covid-19 and HIV statistics in Maremane village have NOT been verified in this socio-economic study, however as a general norm its informal nature, influx of foreign people and job seekers in communities adjacent to large scale projects such as the Salene Manganese mine project is inherent. Covid-19, HIV and crimes such as theft, sex crimes, traffic violations, fraud and drugs are possible, and likely to increase if notmanaged and policed because of the Salene Mine and other similar industries in the area.
- Land Tenure, Use and Capabiities:

- The construction and expansion of the Salene Manganese mine surface infrastructure including opencast pits, plant and associated infrastructure, water storage and storm-water facilities, waste rock dumps, access roads will require topsoil strippingand clearing of vegetation. The inherent land capability will be permanently lost belowthe footprint of these mining entities. The severity of the impact is considered to be of moderate to high significance. The reason for the moderate severity is that the landis zoned for mining and currently being mined by Salene Mine (Salene Manganese).
- The proposed expansion project entities and associated mining infrastructure will not alter the landuse at the mine footprint due to current mining activities at the Salene mine. The additional mining infrastructure will add to the existing impacts of air pollution due to dust, topography, visual impacts, and extraction of water for mining purposes due the existing mining operations. There is no major impact on the landuse since the area is already zoned for mining.
- The positive impact of mining in the project area include increased business opportunities, greater demand for goods and services, pressures for housing (ability to own houses), etc.

- Noise:
  - The natural ambient noise levels in the area are largely determined by natural sounds, i.e. birds, insects and the wind in the foliage of plants. Occasional anthropogenic sounds include vehicles moving on R325 main road from Postmasburg to Kathu and the occasionally aircraft flying over the area. The estimated noise levels are comparative (80 - 90 dBA during the day and 30 - 40 dBA during the night) to those listed in the revised SABS 0103 standard, where the typical ambient noise level for a 'semi-urban residential' area is given as 80 - 90 dBA and 35 - 45 dBA during the day and night respectively. The proposed Salene Mine activities will not raise noise levels significantly. Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active. The noise levels will increase to 90 - 100 dBA during day time (5h00 – 19h00). Rock breakers and blasting for the excavation during mining operations will generate noise levels of 100 – above 120 dBA respectively. There is no formal or informal settlement within the Salene Mine which may be impacted by the noise generated from the activities that will be taking place on the site. However, theclosest village (Maremane) to Salene Mine is 10-15 km away and less likely to be impacted due to it being further away from the site. Noise rating for activities similar to that proposed at Salene Mine vary between 70 dB (A) and 80 dB (A).
  - Complaints can be expected if the difference between neighbourhood noise levels and the ambient noise levels are more than 10dB. Alternatively, noise levels in excess of 45dB would be a nuisance especially during the night when neighbourhood noise levels are low.
- Air pollution:
  - Air pollution is a factor of impacts of fine particulates or PM_{10} (i.e. particulate matter with an aerodynamic diameter of < 10 µm). The Department of Environmental Affairs (DEA) has stipulated guidelines for highest daily and annual average PM_{10} concentrations. New limit values for South Africa as published by the South African National Standards (SANS 1929: 2005) have been included in legislation (Air Quality Act, 2004), which are in line with international criteria.
  - Once the vegetation has been cleared, construction equipment will generate dust from exposed surfaces.excessive dust may have an impact on surrounding vegetation and indirect impact on animals that feed on the vegetation as well any nearby communities or farm homesteads.
  - Dust will also be generated from the Salene Mine activities, access roads to and from the opencast pits and waste rock dumps. Dust pollution will be high during dry winter months and windy autumn season. Fall-out dust will be generated during mining operations. The effect however will be localised and in the main be confined to within the working areas.
  - In term of the requirements of the Mine Health and Safety Act, 1996, Salene Manganese must provide protective clothing and equipment for all its employees, and must periodically conduct risk assessments to analyze and monitor the effects of dust on the staff members and the surrounding environment due to their mining and construction activities.
  - Controlled movement of haul trucks and light delivery vehicles (ldvs) around the site will generate some nuisance dust into the atmosphere. The typical ambient dust levels around semi-urban and rural settlements areas ranges between 50 – 90 $mg/m^2/day$ TSP depending on daily wind speed and direction, and movement of vehicles. It is estimated that the said vehicle movements may increase the dust levels to approximately 80 - 100 $mg/m^2/day$ during day time mine operational phase. This is, however, significantly low and well within the maximum allowable guidelines set by SANS 1929:2005 for both residential and industrial areas.
    - Residential = $D < 600\ mg/m^2/day$ – over 30 day average
    - Industrial = $600 < D < 1200\ mg/m^2/day$ over 30 day average
- Cultural and Heritage aspects:
  - Visual impact will result from the visual contrast of the site with the surrounding areas due to the following factors:

- The waste rock dumps, and opencast pits activities create a high visual contrast with the surrounding areas, which are greener and less uniform. In the first phase of rehabilitation, trees and natural vegetation will be used to disguise or buffer the mine workings as far as possible and provide some degree of stabilization of the substrate;
- The position of the waste rock dump above the R325 Road, will raise above the level of any naturally occurring tree, making them more visible;
- The relatively undeveloped nature of the surrounding area immediately reveals the presence of man-made infrastructure and man-made forms (straight lines, bold colours etc.)

The proposed Salene Manganese mine waste rock dumps, opencast pits activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine is visible from R325 main road.

- Economic Activities, Infrastructure development and employment opportunities:
  - Maremane is an informal settlement and the closet and most likely to be affected by tothe Salene mine expansion project. It is characterized by rural to semi-urban settlements with high levels of poverty and high unemployment levels as well as low literacy levels. The region's economy is derived from a variety of sectors, of which mining, tourism and agriculture are the main contributors.
  - A high percentage of residents in the local settlement of Maremane are unemployed. The mine will contribute to alleviate this unemployment problem, though it will not eradicate it completely.
  - Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The life of mine (LOM) is expected to be over 25 years, which translate to 25 years and more of economic activity in the region.
  - The social and labour plan (SLP) to be implemented by Salene Manganese will contribute to the development of the adjacent community (Maremane) in terms of skills training, local economic development projects, and improved infrastructure. Thisis a requirement in terms of Section 22 and Regulation 42 of the MPRDA, 2002.

16.9.3. Significance assessment

The results of the socio-economic impact assessment inclusive of the environmental issues and risks identified and the significance assessment for all the phases of the Macarthy mining operation is provided in Table 9-1 and Table 17-1.

17. 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). The supporting impact assessments conducted by the EAPs are attached in Appendix 6.

Table 17-1: Assessment of each identified potentially significant impact and risk

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2020	Expansion activities[11]	Possible loss of identified ecological support areas or ecological corridors. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Flora	C,O	Medium to High	Control Planning Rehabilitation	Medium
2020	Expansion activities	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas.	Flora	C,O	Low to Medium	Control Monitoring	Low
2020	Expansion activities	Development and related activities may impact on the sensitive habitats related to the watercourses situated in close proximity to the development footprint.	Flora	C,O	Medium to High	Control Planning Removal Monitoring	Medium
2020	Expansion activities	Construction will result in an increase of potentially destructive movement within the designated area. Destruction of habitat and other specialised animal species that are currently finding refuge within the area will migrate to other more favourable areas.	Fauna	C,O	Medium	Planning Education Removal Rehabilitation	Medium
2020	Expansion activities	The construction activities might result in impacts on sensitive areas or large-scale destruction (opencast or new stockpile areas) including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.	Fauna	C,O	Medium to High	Planning Education Removal Rehabilitation	Medium
2020	Expansion activities	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area	Fauna	O	Medium	Planning rehabilitation Noise control Light control	Medium

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2020	Expansion activities	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Plan (EMP) and Final Rehabilitation programme compiled for the specific mining area.	Fauna	CI	Low to Medium	Planning rehabilitation Noise control Light control	Medium
2020	Operation and establishment of the opencast pits	The location of the opencast pits in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the proposed iron opencast pit which is of concern as it is located on a watershed area	Surface water	C	Low to Medium	Planning and Management	Low
2020		Rainwater captured in the opencast pits will reduce sheet flow to nearby watercourses and may be contaminated and needs to be pumped to the pollution control dam to prevent impacts on water quality downstream that in turn could impact on the habitat and biota.	Surface water	C,O	Low	Planning and Management	Low
2020		It is not expected that it would be possible to backfill the opencast pits 100% due to insufficient material being available thereby creating a permanent sink for water if not diverted around the opencast pits	Surface water	D	Low to Medium	Planning and Management	Low
2020	Operation and establishment of the waste rock dumps	The location of the WRD in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the existing WRD and its proposed expansion which is of concern as it is located on / near a watershed area	Storm water	C	Low to Medium	Planning and Management	Low
2020		Run-off from the WRD could be contaminated (to be confirmed by leachate test) and this could result in water quality impacts downstream if not contained in a pollution control dam	Storm water	C,O,D	Medium	Planning and Management	Low to Medium
2020	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Chemical or fuel spillages from equipment used in the all the mining related activities could contaminate the soil profile	Storm water	C,O	Low to Medium	Planning and Management	Low
2020		Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff that if not managed and captured correctly could reach surface water resources during rainfall events.	Storm water	C,O,D	Low	Planning and Management	Low

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2020	Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities Removal of topsoil and overburden/waste rock and stockpiling Storm water Management	Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in nearby watercourses	Storm water	C,D	Low to Medium	Planning and Management	Low
2020		If not managed correctly the topsoil heap could fail and result in increased siltation in watercourses.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Depending on the waste classification and leachate generated by the overburden / Waste rock run-off from these areas could result in poor quality water entering the watercourses.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.	Surface water	C,O,D	Low to Medium	Planning and Management	Low
2020		Concentrated storm runoff from the opencast pits surrounds and infrastructure areas could be erosive, causing sheet, rill and donga erosion features.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Dirty storm water from the opencast pits could impacts on the water quality of downstream surface water areas.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Should water be allowed to be captured in the opencast pits it could result in less water to the downstream surface water area.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Altered storm water runoff response due to large impervious areas (hardened surfaces) and concentrated runoff in drainage systems.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act, 1998.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Contaminated runoff or leachate concentrated in mined out opencast pits can decant or contaminate through controlled discharge of partially treated water into natural systems.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked out pit and can lead to increased groundwater recharge and potential regional impact of low quality water.	Surface water	C,O,D	Low	Planning and Management	Low
2020		Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.	Surface water	C,O,D	Low	Planning and Management	Low
2020	Operation and generation of	Stockpiling of these materials could result in salinization, mineralisation and toxic contamination of soils beneath them.	Surface water	C,O,D	Low	Planning and Management	Low

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2020	Residue deposits (Waste rock dumps)	Leachate from these materials could result in poor quality water entering the surface water resource which could impact on the health of the system.	Surface water	C,O,D	Low	Planning and Management	Low
2020	Sewage generation, workshop operations	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff.	Surface water	C,O,D	Low to Medium	Planning and Management	Low
2020		Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.	Surface water	C,O,D		Planning and Management	Low
2020	Dust Generation	Dust generation from the beneficiation processes, product and waste transport routes, residue stockpiles or deposits and un-rehabilitated areas can impair aquatic vegetation photosynthesis and could potentially impact on water quality depending on the constituents.	Surface water	C,O,D	Low to Medium	Planning and Management	Low
2021	Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Groundwater	C	Low	Monitoring	Low
2021	Hydrocarbon spills.	Spills from construction vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater	C	Medium	Monitoring	Low
2021	ROM stockpiling & Waste Rock Dump.	Contamination may be expected in terms of nitrate from explosives.	Groundwater	O	Medium	Monitoring	Low
2021	Hydrocarbon spills.	Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater	O	Medium	Monitoring	Low
2021	Opencast Mining.	A plume can begin to migrate downgradient since dewatering of the pit is not expected to be conducted	Groundwater	O	Medium	Monitoring	Low
2021	Infrastructure removal.	Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality.	Groundwater	Cl	Medium	Monitoring	Low
2021	Opencast Pits	A plume may continue to migrate further downgradient of the rehabilitated opencast pits.	Groundwater	P Cl	Medium	Monitoring	Low
2020	Overall construction	Impacts on viewpoints that had a visual exposure during construction phase.	Visual	C	Low	Management	Low
2020		Permanent visual impact of the structures on users of roads and land owners	Visual	O	Low to Medium	Planning Management Rehabilitation	Low
2020	Site clearing, removal of topsoil and vegetation	A number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction.	Air Quality	C	Low	Planning Management Rehabilitation	Low

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2020	Construction of surface infrastructure	Construction of access roads, pipes, storm water diversion berms, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).	Air Quality	C	Low	Dust management Planning Rehabilitation	Low
2020	General transportation, hauling and vehicle movement on site	Transportation of workers and materials in and out of the mine site will result in the production of fugitive dust (containing TSP, as well as PM10 and PM 2.5) due to suspension of friable materials from earth roads.	Air Quality	C	Low to Medium	As Above	Low
2020	Overall operational activities	Use and maintenance of access road, dust and material handling, Haul roads, and wind erosion from stockpile.	Air Quality	O	Low to Medium	As Above	Low
2020	Demolition & Removal of all infrastructure (incl. transportation off site)	Demolition of buildings, foundations, and removal of rubbles, cleaning up of workshops, fuel reagents , removal of power supply and removal of haul and access roads will generate fugitive dust similar to impacts during construction phase.	Air Quality	D	Low	As Above	Low
2020	Rehabilitation (spreading of soil, revegetation & profiling/contouring).	Topsoil reshaping and restructuring of the landscape. Incorrect rehabilitation will cause permanent damage to the surface infrastructure.	Air Quality	D	Low to Medium	As Above	Low
2020	Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Heritage and Culture	C,O,D	Medium	Collection and preservation of artefacts	Low to Medium
2020	Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Heritage and Culture	C,O,D	Low to Medium	As Above	Low to Medium
2021	Overall construction and operational activities	Development and related activities may impact on the sensitive habitats related to the gravesite and other heritage sensitive area situated in close proximity to the development footprint may be affected by the proposed development.	Heritage and Culture	C,O,D	Medium to High	Implementing Policies and plans Community participation	Medium
2021		Cumulative Impacts.	Socio-economy	C,O,D	Medium	As Above	Low to Medium

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2021		Influx of foreigners and job seekers and increase in disposable income for local people may have negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Socio-Economy	C,O,D	Medium	Implementing Policies and plans Community participation	Low to Medium
2021		Cumulative: Possible loss of Life and Covid Pandemic spread.	Socio-Economy	C,O,D	Low to Medium	As Above	Low to Medium
2021		Land capability of the affected area will be permanently be affected especially the open pit area. The proposed expansion will increase loss of grazing land, restricted access and loss of cultural or traditional practices.	Socio-Economy	C,O,D	Medium	As Above	Low to Medium
2021		Cumulative: Further changes in land use due to secondary industries that may be developed around the area.	Socio-Economy	C,O,D	Low to Medium	As Above	Low to Medium
2021		The proposed Salene Mine activities will not raise noise levels significantly. Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active	Socio-Economy	C,O,D	Low to Medium	As per Noise impacts Identified	Low
2021		Cumulative: The noise impacts of the proposed Salene Mine expansion projects and exiting Maremane settlement activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	Socio-Economy	C,O,D	Low	As Above	Low
2021		Excessive dust may have an impact on surrounding vegetation and an indirect impact on animals that feed on the vegetation as well as any nearby communities or farm homesteads. Dust will be generated from the Salene Mine activities, access roads to and from the opencast pits and waste rock dumps.	Socio-Economy	C,O,D	Medium	As per Air Quality Impacts Identified	Low to Medium
2021		Cumulative: Expansion activities may add to the annual PM10 concentrations in the area,	Socio-Economy	C,O,D	Low to Medium	As Above	Low
2021		The proposed Salene Manganese mine waste rock dumps, opencast pits activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine is visible from R325 main road.	Socio-Economy	C,O,D	Medium to High	As per visual Impacts identified	Medium

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2021		Cumulative: The proposed additional mining infrastructure at Salene Mine may form part of the sense of place" in the long term, even after operations cease.	Socio-Economy	C,O,D	Low to Medium	As Above	Low to Medium
2021		Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation.	Socio-Economy	C,O,D	Medium	As Above	Low to Medium
2021	Daytime construction	Noise caused by multiple construction activities during daytime.	Noise	C	Low	Control Planning Removal Monitoring	Low to Medium
2021	Nighttime construction	Noise caused by multiple construction activities during night time.	Noise	C	Low to Medium	As Above	Low
2021	Daytime overall operational activities	Noise caused by multiple operational activities during daytime such as haul truck movement and processing plant.	Noise	O	Low to Medium	As Above	Low to Medium
2021	Nightime overall operational activities	Noise caused by multiple operational activities during night time such as haul truck movement and processing plant.	Noise	O	Low to Medium	As Above	Low to Medium
2020	Ground vibration	Impacts on surrounding communities caused by vibrations during blasting activities.	Social	C,O	Low to Medium	As per noise and socio-economy impacts identified	Low
2020	Ground vibration	Damage to residential structures within the area.	Social	C,O	Low	As Above	Low
2020	Ground vibration	Damage to tar roads and railway line close to the mine.	Socio-Economy	C,O,D	Low	As Above	Low
2020	Air Blast	Air blast impact for a 924 kg blast (Worst case).	Topography	O	Low	As Above	Low
2020	Fly rock	Risk of fly rock hitting adjacent road users, neighbouring properties, humans and fauna.	Socio-Economy	O	Low	As Above	Low
2021	Overall construction and operational activities	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	Soil	C	Medium	Management Rehabilitation Planning	Low to Medium

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2021	Overall construction and operational activities	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project.	Soil	C	Medium to High	Management Rehabilitation Planning	Medium
2021	Overall construction and operational activities	Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	Soil	C	Medium	Management Rehabilitation Planning	Low
2021	Overall construction and operational activities	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture.	Soil	C	Medium to High	Management Rehabilitation Planning	Medium
2021	Overall construction and operational activities	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	Land Capability	C,D	Medium to High	Management Rehabilitation Planning	Medium
2021	Overall construction and operational activities	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion.	Soil	O	Medium	Management. Rehabilitation Planning	Low to Medium
2021	Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high.	Soil	O	Medium to High	Management Rehabilitation Planning	Medium
2021	Overall construction and operational activities	Infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.	Soil	O	Medium	Management Rehabilitation Planning	Low
2021	Overall construction and operational activities	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	Soil	D	Medium	Management Rehabilitation Planning	Low to Medium

Year	Activity / Receptor	Potential Impacts	Aspects affected	Phase	Significance WOM	Mitigation Type	S w M
2021	Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Soil	D	Medium to High	Management Rehabilitation Planning	Medium
2021	Overall construction and operational activities	Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution.	Soil	D	Medium	Management Rehabilitation Planning	Low
2021	Overall construction and operational activities	Decommissioning will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time.	Land Capability	D	Medium to High	As Above	Low to Medium

18. SUMMARY OF SPECIALST 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). Copies of specialist reports are attached in Appendix 6.

Table 18-1: Summary table of specialist recommendations

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
Air Quality	It is recommended that ambient air quality monitoring is expanded to get a better baseline condition prior to the onset of the operations and in order to establish the level at which the proposed operations are noted to impact on the ambient air quality.	X	Part B Section 8.1
	Fallout monitoring should be continued for the life of mine to better assess the level of nuisance dust associated with both mining and process related operations. Sampling of fallout should be undertaken within the neighbouring areas as well as on-site. Dust fallout monitoring is recommended at the locations as shown.	X	Part B Section 8.1
	PM10 and PM2.5 dust monitoring must also be undertaken at the same sites as mentioned under the previous bullet but also in and around potential fugitive emission sources to determine mitigation measures and focus management efforts.	X	Part B Section 8.1
	If it is found that dust and PM10 levels are measured to be exceeding limits, it is highly recommended to establish a Real-Time indicative monitoring network to quantitatively help identify the sources and to assist in the management of the mitigation of these sources.	X	Part B Section 8.1
	The impacts from dust fallout and Particulate matter can be reduced by implementing dust control measures. The highest intensity of the construction work should be carried out during the summer months and not over the harsh winter months as can result in increased dispersion of fugitive dust. The mine should ensure that unpaved roads are continuously watered and treated with dust binding additive products to reduce the volume of fugitive dust emitted from unpaved roads.	X	Part A Table 20-1
	Mitigation and management measures for mining operation as discussed in this report should be sufficient to ensure the mining operation can be conducted with minimal impact on the receiving environment and therefore not have a detrimental effect and can go ahead.	X	Part A Table 20-1
Archeological	Four sites dating to the Stone Age (Sites 1, 3, 4 & 7) were recorded. Three of these were either single or small scatters of MSA & LSA stone tools and flakes, while Site 1 contains a dense scatter of formal tools, waste-flakes and flake-tools. Although these were the only visible sites there is a possibility that more could be located in the area – especially in sections covered by red Aeolian (Kalahari) sands.	X	Part A Table 20-1
	Site 1 is located on top of a hill with large boulders. These large boulders provide some shelter and it seems as if the material found here is the result of stone knapping (manufacture of tools) activities around these boulders and sheltered area. From the hill there is a good view of the entire area below. The number of artifacts found here warrants further investigation and the site is rated of Medium to High Heritage	X	Part A Table 20-1

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	Significance. The site is located within the proposed iron opencast pit footprint and as a result will be negatively impacted. The following mitigation measures are therefore recommended:		
	Detailed mapping and recording of Site 1 and potentially other sites located around the hill.	X	Part A Table 20-1
	Surface sampling of material from the site and the hill.	X	Part A Table 20-1
	Three recent historical sites (Sites 2, 5 & 6) were recorded in the area during the assessment. Site 2 consists of the remains of recently constructed mining related structures that have been abandoned and Site 5 is an existing farmstead dating to the 1970's that is currently utilized as offices. Both these sites have no Heritage Significance.	X	Part A Table 20-1
	Site 6 is a cemetery containing 10 graves of the Kotze (previous farm owner) and Jacobs families. Although the graves are not older than 60 years of age graves always carry a High Significance Rating from a Heritage perspective. The cemetery is located close to the current Site Offices and is properly fenced in and will not be impacted by any mining activities. A 30m buffer zone within which no development will be allowed needs to be adhered to.	X	Part A Table 20-1
	From an Archaeological/Cultural Heritage point of view it is recommended that the proposed development actions should be allowed to continue, but that the recommended mitigation measures for Site 1 should be undertaken before any work here is undertaken.	X	Part A Table 20-1
	Finally, it should be noted that although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.	X	Part A Table 20-1
Ecological	The desktop flora assessment indicates that two hundred and fifty-five (255) plant species have previously been recorded in the area. Fifty-two (52) plant species listed for the area are classified as species of conservation concern (SCC) according to their endemism (32 species), the NFA (1 species) and the NCNCA (21 species). None of the plant species recorded for the area queried are listed in terms of the ToPS list and Red Data list. Twelve (12) species were found to possibly occur on site that have medicinal uses. Five (5) plant species not indigenous to South Africa were listed for the project area, however none of these species are listed as Alien Invasive Plant (AIP) species in terms of the NEMBA.	X	Part A Table 20-1
	The majority of the proposed project footprint (and most of the Mining Right Area) is still covered by natural veld in relatively good condition. The vegetation on site was rather homogenous as was the surrounding terrain.	X	Part A Table 20-1
	The most noteworthy environmental features of the site are:	X	Table 20-1
	• The presence of quite a number of medium sized Camel thorn and Shepherd's trees. Should they have to be removed they will be compromised as both these species rarely (if ever) survives transplantation;	X	Part A Table 20-1
	• The fact that the site is located within the Griqualand West Centre of Endemism;	X	Part A Table 20-1

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	• Two trees protected in terms of the NFA were identified on the project footprint, namely Boscia albitrunca (Shepherd's tree) and Vachellia erioloba (Camel thorn). Shepherd's tree is also protected in terms of the NCNCA;	X	Part A Table 20-1
	• The vegetation composition of the study area was found to have a heterogenous vegetation composition, with low to moderate floral species diversity;	X	Part A Table 20-1
	• No watercourses or wetlands were observed on the project footprint; and	X	Part A Table 20-1
	• No invasive alien plant species were observed in natural areas.	X	Part A Table 20-1
	The following broad classification of Vegetation Units (VU) were found to occur on the proposed project footprint: Natural thornveld (VU1); and Degraded and transformed areas (VU2).	X	Part A Table 20-1
	A total of twenty-eight (28) faunal species have been found during the field assessment. None have a National or Global red listed status. The Northern Cape Nature Conservation Act No. 9 Of 2009 specifically lists Schedule 1 (Specially Protected Species) and Schedule 2 (Protected Species). Many species sighted are protected in terms of Schedule 2, which includes many animal species naturally occurring and all indigenous birds unless otherwise listed. No National or Globally protected species have been recorded during the survey and the reptiles sighted are not listed Provincially (as opposed to the other species all being locally listed).	X	Part A Table 20-1
	The majority of the project site is located on areas categorised as Ecological Support Areas, with the remainder located on areas categorised as "Other Natural Areas".	X	Part A Table 20-1
	The project site falls within the Kuruman Thornveld and Kuruman Mountain Bushveld vegetation type. Neither of the vegetation types are listed in the National List of Threatened Ecosystems.	X	Part A Table 20-1
	The natural thornveld vegetation unit (VU1) was rated as having a High sensitivity, based on the relatively undisturbed condition of the vegetation, the presence of species of conservation concern and that the vegetation unit is situated in the Griqualand West Centre of Endemism (GWC). The vegetation itself is not considered vulnerable, but the larger site shows good connectivity with surrounding ecosystems (e.g., rocky outcrops of the Kuruman Mountain Bushveld). Transformed areas (VU2) are totally disturbed and cannot be considered sensitive. Therefore, a low sensitivity was assigned to this vegetation unit. It is the opinion of the specialist that the development may continue without severe ecological impacts in terms of the faunal and floral species identified in the framework of the study.	X	Part A Table 20-1
Geotechnical	The recommended founding option is spread foot foundations located on the yellow green shale bedrock at 1.0m below surface.	X	Part A Table 20-1
	Provision for adequate site drainage should be made on this flat topography.	X	Part A Table 20-1
	From a geotechnical perspective, the proposed Mag-Sep plant location is also suitable for the construction of the plant infrastructure.	X	Part A Table 20-1
	It is recommended that the spread foot foundations be founded on the shale/quartzite bedrock. Where the bedrock is less than 600m below surface the spread foot foundations should be pinned to the bedrock to counter possible lateral movement.	X	Part A Table 20-1

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	Potential scenarios were conceptualized for the future proposed construction and operational phases with the output of the modelling exercise indicating a potential noise impact of low to low-medium significance (mainly for night-time activities). While not critically required, mitigation is proposed to minimise the registration of possible complaints about noise. Mitigation would include the development and implementation of an active noise monitoring programme for the future mining activities.	X	Part B Section 8
	While the proposed activities may have a slight noise impact on the surrounding NSD, the implementation of appropriate mitigation measures could reduce the probability of surrounding receptors considering the noise to be disturbing (or a noise nuisance). The projected significance of the noise impacts is considered low and it is recommended that the proposed Salene Manganese project be authorized (from a noise impact perspective).	X	Part A Table 20-1
Paleontological	Based on the site visit survey and observations and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the Ghaap Group limestones or soils and loose sands of the Quaternary. There is a very small chance that fossils may occur in the limestones so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.	X	Part A Table 20-1
Socio-Economic	The Socio-Economic Impact Assessment on Maremane settlement and Postmasburg has focused strongly on the demographic profile, the settlement and infrastructure, economics activities, employment status as well as the educational background of the households in the village.	X	Part A Table 20-1
	The study indicates that a majority of the households are comprised of core family. It may be a custom for the majority of semi-urban informal settlements to live as single-family units with parents and their children. Communal living is not a standard practice. Even though large margins of the household members are unemployed, most of them bring income through social grants and the rest of the unemployed individuals are either trading or receive cash gifts. Agricultural activities are very minimal in the Maremane area. Amongst the employed, a small number has received formal education therefore bring in minimal wages.	X	Part A Table 20-1
	Almost all households have made their residences temporary and more than half of them live in corrugated iron shacks that they own. Based on the analysed data, it is evident that most of these households depend on public taps to get water. Only a small amount has piped water in their households.	X	Part A Table 20-1
	The informal settlement falls outside the Tsantsabane Municipal boundary for services, therefore do not have services such as rubbish removal, sewage reticulation, and access roads/streets. Sanitation facilities are pit or septic tank methods. This poses further risk of underground water pollution which is the main source of potable water for the communities.	X	Part A Table 20-1
	There is a very high unemployment rate – especially amongst young people who have completed matric certificate. These young people can be further trained in various skills that may be required by Salene Mine and the expansion project. The mine will, somewhat, alleviate the unemployment problem, though it will not eradicate it completely.	X	Part A Table 20-1

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	Social unrest and crime are expected to be relatively high in Maremane settlement due to its informal nature. This is likely to change and increase due to the Salene Mine and its proposed expansion activities and result in influx of foreigners in the settlement, therefore policing plans must be development in conjunction with the respective settlement.	X	Part A Table 20-1
	Salene Mine and proposed expansion project will add to the economic development of Tsantsabane Local Municipality in terms of capital investment, job creation, infrastructure development, services and foreign exchange. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop due the Salene Mine activities. The Environmental Authorisation (EA) is expected to be for 25-30 years, which translate to 30 years of economic activity in the region and improved way of life.	X	Part A Table 20-1
Surface Water	All mining activities should as far as possible be located outside the 1 in 100-year flood and the 32 m buffer whichever is the furthest.	X	Part A Table 20-1
	As the northern part of the iron opencast is located on a watershed flood line determination will not be possible.	X	Part A Table 20-1
	A detailed mine works plan for the opencast area needs to be developed to ensure that active pit areas start upstream and move downstream (with regards to surface water flow direction across the site) to assist with rehabilitation. In addition, the time frame allocated to active pits and the sequence of active pits should be developed. This should assist in keeping the dirty storm water catchment area as small as possible.	X	Part A Table 20-1
	The management measures as outlined in this report must be implemented.	X	Part A Table 20-1
	A river diversion and storm water management infrastructure must be implemented as needed at the opencast areas.	X	Part A Table 20-1
	The correct liner system for the waste to be disposed together with a leakage detection system must be implemented as per the NEMWA regulations.	N/A	A Type D liner system will be implemented
	Monitoring as proposed must be implemented.	X	Part B Section 8.8
	Before the iron opencast northern section expand into the 32 m buffer, a detailed riparian assessment needs to be done to ensure that red data plant species are removed as per the permit. If the management measures and recommendation as outlined in this report is implemented it is recommended that the proposed mining right be approved.	X	Part A Table 20-1
Groundwater	The environmental impacts associated with the mining activities are limited provided that the proposed mitigation is implemented.	X	Part A Table 20-1
	Current information suggest that the mining operations will not intersect the groundwater table and therefore no dewatering or cone of depression is expected.	X	Part A Table 20-1
	The impact zone during the operational phase in terms of a possible contamination plume is less than 220 m in extent and the plume is not expected to exceed 500 m from the potential source areas at 100 years post closure.	X	Part A Table 20-1

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	The maximum simulated plume concentration at 100 years post closure is also not expected to exceed more than 50% of the original concentration at the source.	X	Part A Table 20-1
	This simulation is worst-case scenario with the contamination simulated as continuous in the pit areas post-closure.	X	Part A Table 20-1
	No known groundwater user exists within the simulated worst-case impact zone.	X	Part A Table 20-1
	No surface water features are expected to be impacted on in terms of base flow reduction or quality.	X	Part A Table 20-1
Vibrations	As a blast design was not available when this report was assessed, it is highly recommended that this report be reviewed if the borehole (blasthole) diameter is more than 171 mm, or if the bench height is more than 10 m. Blasting risks are low and no blasting monitoring is recommended.	X	Part A Table 20-1
	At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. Even with the best measures, blasting related impacts will be perceived and the community members may complain. It is therefore in the best interest of the mine to continually monitor and manage the blast in an effort to improve and minimise potential blasting effects. It is highly recommended that the mine conduct a detailed photographic survey at selected brick and cement structure (that does not belong to the applicant) located within 1,000 m from the mine (from the opencast boundary limit) before any mining activities start (before the construction phase start). This should include a survey of all water boreholes and cement dams to determine the status of these structures.	X	Part B Section 8
	It is concluded that, if the mine considers the recommendations in this report (incorporated in the Environmental Management Plan), that blasting risks do not constitute a fatal flaw. It is, therefore, the recommendation that the Salene Manganese Project be authorized (from a blasting impact perspective) subject to compliance with the conditions of the EMP.	X	Part A Table 20-1
Visual	The construction and operation phase of the proposed Salene Manganese project related activities and its associated infrastructure will have a MODERATE visual impact on the natural scenic resources and the topography. However, with the correct mitigation measures the impact might decrease to a point where the visual impact can be seen as less significant. The moderating factors of the visual impact of the proposed mining operations in close range are the following:		
	Number of human inhabitants located in the area;	X	Part A Table 20-1
	Natural topography and vegetation;	X	Part A Table 20-1
	Mitigation measures that will be implemented such as the establishment of barriers or screens;	X	Part A Table 20-1
	The size of the operation; and	X	Part A Table 20-1
	Medium absorption capacity of the landscape.	X	Part A Table 20-1
Soil and Agricultural Potential	The land capability and soil quality of land affected by the surface footprint of mining activities will be compromised and the anticipated impacts include soil erosion, soil compaction, soil pollution as well as a loss of the grazing land capability.	X	Part A Table 20-1

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	Furthermore, if soil management measures are followed as outlined in this report and the land be rehabilitated to the highest standard possible, livestock and game farming will be possible on rehabilitated land, except for the area covered by waste rock dumps that may remain in perpetuity.	X	Part A Table 20-1
	It is therefore of my opinion that the activity may be an acceptable change to the current land use of the property, should the project be authorised. It follows that the recommendations and monitoring requirements as set out in this report should form part of the conditions of the environmental authorisation for the project.	X	Part B Section 8.7
	Type 3 waste may only be disposed of at a Class C landfill designed in accordance with Section 3(1) and 3(2), or, subject to Section 3(4), may be disposed of at a landfill site designed and operated in accordance with the requirements for a GLB+ landfill as specified in the Minimum Requirements for Waste Disposal by Landfill (2nd Ed., DWAF, 1998). Both samples have a non-acid generating potential.	X	Part A Table 20-1
	None of the samples have a leachate concentration exceeding the LCT0 limits. Considering the results as summarized above, it may be motivated to the relevant Department to make use a Class D liner instead.	X	Table 20-1
Civil Engineering	It is recommended that a risk-based approach for protection of the quality of water resources from the proposed Salene Manganese Waste Rock Dumps rather than a formulaic application of the Norms and Standards be applied. t is recommended that relief be sought from the requirements of NEM:WA as envisaged in Notice 1006 of the 14th of November 2014 : Proposed Regulations to Exclude a Waste Stream or a Portion of a Waste Stream from the Definition of Waste. The assessment of the pollution potential associated with the dump be discussed and agreed with the relevant authorities, specifically in the context of confirming that the installation of containment barrier systems, as envisaged in the recently promulgated legislation, is not appropriate.	X	Part A Section 6.1.5
	It is recommended that “A dolomite risk management plan should be implemented to ensure that the area is properly monitored and reported on to minimize the potential for sinkholes and subsidence’s to develop.” (Bear GeoConsultants (Pty) Ltd, 2021)	X	Part B Section 6.3
	It is recommended also that the potential for pollution arising from the WRD’s be monitored through the installation of a series of groundwater monitoring boreholes guided by the potential pollution plume migration pattern which can, if necessary, be used as abstraction wells	X	Part B Section 8.5
	The development of the dump be carried out so as to encourage collection, containment and retention of runoff from the facility, in so doing limiting the potential for infiltration and groundwater contamination.	X	As per Design report
	The post closure configuration of the dumps be confirmed with the authorities to comprise: The shaping and compaction of the dump to reduce the potential for infiltration. The establishment of a vegetative or rock cladding cover to control erosion from the side slopes. The configuration of the height and slopes of the dump so as to limit its erosion potential.	X	As per design report
	A program of sampling and testing to monitor the environmental impacts of the dump be agreed with the authorities to include: Sampling and testing of groundwater samples. Dust monitoring.	X	Part B Section 8

Specialist Studies	Recommendations and Conclusion	Specialist recommendation	Applicable Section
	Periodic confirmation of the waste / stockpiled materials geochemistry and waste classification. Monitoring that maintenance and repairs to the surface water control works takes place.		
	The dumps be constructed strictly in accordance with the guidelines for their development as described. It is specifically recommended that the footprint of the deposits be properly prepared by ripping and recompacting the insitu soils.	X	As per design report
	The footprint of the facility be properly defined and delineated so as to prevent their expanding beyond the reach of the prepared footprint and their surface water management infrastructure	X	As per design report
	The requirements for the construction, operation and closure of the deposits be incorporated into contractually binding agreements with the contractors responsible for each phase of their development.	X	As per design report
	A management structure is implemented for the deposits whereby the performance of the contractor against the specified performance criteria is reviewed at regular intervals.	X	As per design report

19. ENVIRONMENTAL IMPACT STATEMENT

19.1. Summary of Key Findings of the Environmental Impact Assessment

Based on the specialist assessments conducted in 2020 for the proposed expansion the following key findings were noted:

- Archaeological:
  - A number of sites and features of cultural heritage (archaeological and/or recent historical) origin and significance were identified and recorded in the area during the assessment. These included sites dating to the Stone Age (open-air surface scatters and single artifacts), recent historical structures and a cemetery.
  - Four sites dating to the Stone Age (Sites 1, 3, 4 & 7) were recorded. Three of these were either single or small scatters of MSA & LSA stone tools and flakes, while Site 1 contains a dense scatter of formal tools, waste-flakes and flake-tools. Although these were the only visible sites there is a possibility that more could be located in the area – especially in sections covered by red Aeolian (Kalahari) sands.
  - Site 1 is located on top of a hill with large boulders. These large boulders provide some shelter and it seems as if the material found here is the result of stone knapping (manufacture of tools) activities around these boulders and sheltered area. From the hill there is a good view of the entire area below. The amount of artifacts found here warrants further investigation and the site is rated of Medium to High Heritage Significance. The site is located within the proposed iron opencast pit footprint and as a result will be negatively impacted. The following mitigation measures are therefore recommended:
    - Detailed mapping and recording of Site 1 and potentially other sites located around the hill; and
    - Surface sampling of material from the site and the hill.
  - Three recent historical sites (Sites 2, 5 & 6) were recorded in the area during the assessment. Site 2 consists of the remains of recently constructed mining related structures that have been abandoned and Site 5 is an existing farmstead dating to the 1970's that is currently utilized as offices. Both these sites have no Heritage Significance.
  - Site 6 is a cemetery containing 10 graves of the Kotze (previous farm owner) and Jacobs families. Although the graves are not older than 60 years of age graves always carry a High Significance Rating from a Heritage perspective. The cemetery is located close to the current Site Offices and is properly fenced in and will not be impacted by any mining activities. A 30m buffer zone within which no development will be allowed needs to be adhered to.
  - From an Archaeological/Cultural Heritage point of view it is recommended that the proposed development actions should be allowed to continue, but that the recommended mitigation measures for Site 1 should be undertaken before any work here is undertaken
  - Finally, it should be noted that although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.
- Air Quality:
  - For the unmitigated Daily PM10 concentrations it was predicted to be higher than the 75 µg/m³ limit for all of the sensitive receptors. When comparing the Daily Mitigated PM10 modelled concentrations, the sensitive receptors exceeding the 75 µg/m³ limit dropped to 3 of the identified sensitive receptors
  - The identified sensitive receptors are predicted to exceed the monthly dust fallout for the highest month residential limit of 600 mg/m²/day.
- Biodiversity:
  - The natural thornveld vegetation unit (VU1) was rated as having a High sensitivity, based on the relatively undisturbed condition of the vegetation, the presence of species of conservation concern and that the vegetation unit is situated in the Griqualand West Centre of Endemism (GWC). The vegetation itself is not considered vulnerable, but the larger site shows good connectivity with surrounding ecosystems (e.g. rocky outcrops of the Kuruman Mountain Bushveld).
  - Transformed areas (VU2) are totally disturbed and cannot be considered sensitive. Therefore, a low sensitivity was assigned to this vegetation unit.

- Noise: While the proposed activities may have a slight noise impact on the surrounding NSD, the implementation of appropriate mitigation measures could reduce the probability of surrounding receptors considering the noise to be disturbing (or a noise nuisance).
- Soil, land use and land capability: if soil management measures are followed as outlined in the specialist report and the land be rehabilitated to the highest standard possible, livestock and game farming will be possible on rehabilitated land, except for the area covered by waste rock dumps that may remain in perpetuity
- Surface water: From the site visit it is confirmed that the nearby watercourses are ephemeral in nature. The proposed activities, especially the proposed iron opencast northern section will have a significant impact on the surface water resource especially should these take place within the watercourse or within the 32 m buffer and this impact cannot be fully mitigated due to the invasive nature of the activity. Management measures are however proposed and these should be implemented.
- Visual: The construction and operation phase of the proposed Salene Manganese project related activities and its associated infrastructure will have a MODERATE visual impact on the natural scenic resources and the topography.
- Geohydrological: The impact zone during the operational phase in terms of a possible contamination plume is less than 220 m in extent and the plume is not expected to exceed 500 m from the potential source areas at 100 years post closure.
- Socio economic:
    - The study indicates that a majority of the households are comprised of core family.It may be a custom for the majority of semi-urban informal settlements to live as single family units with parents and their children. Communal living is not astandard practice. Even though large margins of the household members are unemployed, most of them bring income through social grants and the rest of the unemployed individuals are either trading or receive cash gifts. Agricultural activities are very minimal in the Maremane area. Amongst the employed, a small number has received formal education therefore bring in minimal wages.
    - Almost all households have made their residences temporary and more than half of them live in corrugated iron shacks that they own. Based on the analysed data, itis evident that most of these households depend on public taps to get water. Only a small amount has piped water in their households.
    - The informal settlement falls outside the Tsantsabane Municipal boundary forservices, therefore do not have services such as rubbish removal, sewage reticulation, and access roads/streets. Sanitation facilities are pit or septic tank methods. This poses further risk of underground water pollution which is the main source of potable water for the communities.
    - There is a very high unemployment rate – especially amongst young people who have completed matric certificate. These young people can be further trained in various skills that may be required by Salene Mine and the expansion project. The mine will, somewhat, alleviate the unemployment problem, though it will not eradicate it completely.
    - Social unrest and crime are expected to be relatively high in Maremane settlement due to its informal nature. This is likely to change and increase due to the Salene Mine and its proposed expansion activities and result in influx of foreigners in the settlement, therefore policing plans must be development in conjunction with the respective settlement.
    - Salene Mine and proposed expansion project will add to the economic developmentof Tsantsabane Local Municipality in terms of capital investment, job creation, infrastructure development, services and foreign exchange. Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop due the Salene Mine activities. The Environmental Authorisation (EA) is expected to be for 25-30 years, which translate to 30 years of economic activity in the region and improved way of life.
    - Social well-being and social justice are meant to create a positive outcome meaningful for people and societies. Well-being and improved way of life should beconsidered as the main areas of protection to assess social impacts of operations such as mining. In addition, equity and equality need to be addressed in terms of social justice to ensure a fair and ethic society.
    - Various cause-effect-chains that may arise, due to Salene Manganese Mine, developed based on the environmental and social life cycleassessment principles. Correspondingly, social indicators throughout direct impacts to midpoint and endpoint categories are defined. Three endpoint categories are included (economic welfare, damage to human health and environmental stability) to address social well-being and social justice.

19.2. Final Site Map

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

Please refer to Appendix 4: Site Layout and other Layout Maps.

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

No site alternatives were considered for the proposed Macarthy mining expansion operation. The Identified activities have no alternatives proposed.

Postive aspects as relating to the project is continued employment operrtunites created by the mining activities not inly in terms of direct employment but also directly through the employment of service providers and contractors.

Negative impacts relating to the project are outlined in Section 19.1.

20. PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

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

From the approved EMPr dated 2013 which included the objectives of the previous approved EMPr as well as the specialist studies conducted in 2020 the following management objectives and outcomes were identified. A detailed outline of the management aspects and mitigation measures to be implemented is provided in Part B, Section 6.

Table 20-1: Management objectives and outcomes

Aspect affected	Management Objectives	Compliance with Standards
Flora	• To minimise the impact on rare plant species by preventing the needless loss of or damage to flora particularly with regard to protected, endemic and species of conservation concern. • Prevent significant alteration to the ecosystems in the area. • To control the spread of, and to eradicate invasive alien flora that could outcompete indigenous vegetation on the whole of the mine site and adjacent areas of the Salene. The aim will be to rehabilitate towards naturally sustainable vegetation and habitat as was present before the implementation of the project. • To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining. • To demonstrate that the re-vegetated areas have become self-sustaining. • To ensure that rehabilitated land becomes self-maintaining. • Properly assess and determine final land-use and ensure Closure and Rehabilitation Plan is formal, feasible and site specific.	Design will be compliant with SANS standards and applicable legislation and be approved by the DWS. Compliance with legislation relating to the protection of Endagneried species.
Flora	• To control the spread of, and to eradicate invasive alien flora that could outcompeted indigenous vegetation on the whole of the mine site and adjacent areas of the Salene Manganese. The aim will be to rehabilitate towards naturally sustainable vegetation and habitat as was present before the implementation of the project.	No alien invasive plants on site.
Flora	• To minimise the impact on rare plant species by preventing the needless loss of or damage to flora particularly with regard to protected, endemic and species of conservation concern.	Identify SCC and relocate once permit is received.
Fauna	• To minimise the adverse effects of mining on indigenous fauna, by preventing the needless death, injury or hindrance to fauna particularly with regard to protected, endemic and species of conservational concern.	Comply with Requirements of the EMPr
Surface water	• To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Resource water quality objectives as set by the DWS and compliance with licence requirements Compliance with EMPr recommendations and management measures
Groundwater	• To limit long term groundwater impacts quality.	Resource water quality objectives as set by the DWS and compliance with licence requirements
Groundwater	• To gather data that will allow a predictive understanding of the groundwater environment and how it will be affected by surface activities.	Resource water quality objectives as set by the DWS and compliance with licence requirements

Aspect affected	Management Objectives	Compliance with Standards
Groundwater	• To limit long term groundwater impacts quality.	Resource water quality objectives as set by the DWS and compliance with licence requirements
Visual	• To reduce the visual impact of the mining activity and associated equipment and infrastructure.	Compliance with EMPr recommendations and management measures
Air Quality	• To comply with legislated limits for air quality parameters.	Regional Air Quality objectives if set, otherwise national objectives Good practises Complaince with EMPr
Heritage and Culture	• To ensure full compliance with the National Heritage Resources Act • To reduce the impact resulting from the destruction of, or damage to, archaeological remains. • To ensure that employment policies s are implemented. • To ensure that the SLP projects are suitable. • To promote community consultation.	SANS Permit
Socio-Economy	• To ensure that employment policies are implemented. • To ensure that the SLP projects are suitable. • To promote community consultation.	Adherance to Mining charter
Socio-Economy	• As per Noise impacts Identified	As per Noise impacts Identified
Socio-Economy	• As per Air Quality Impacts Identified	As per Air Quality Impacts Identified
Socio-Economy	• As per visual Impacts identified	As per visual Impacts identified
Noise	• To reduce noise impacts of the mining activities on residential areas and nearby land owners	N/A
Soil	• To facilitate the sustainable and productive use of rehabilitated land. • To ensure the continued fitness of the natural areas that is still to be mined, or which lies outside of the mining footprint. • To limit the adverse effects of mining on the post mining land use capability	As above
Soil	• Describe soil stripping and stockpiling methods that will reduce the loss of topsoil.	As above
Soil	• Address the prevention, minimisation and management of erosion, compaction and chemical soil pollution during construction, operations, decommissioning and closure;.	As above
Land Capability	• As Above	Compliance with EMPr recommendations and management measures
Topography	• To reinstate a landform that is similar to the pre-mining environment. The post mining landform must be free draining. This needs to be done as the topography is altered as a result of the construction of surface infrastructure and opencast mining areas as well as waste dumps and water infrastructure.	Water free flowing

21. FINAL PROPOSED ALTERNATIVES

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

Macarthy is an operational mine and this provided limited options for the development of the new infrastructure areas forming part of this amendment. The location of the three proposed openpits is based on the location of the identified ore body during exploration phase. The proposed access roads was considered based on accessibility to all the new openpits and connectivity to the proposed and existing infrastructures.

Groundwater abstraction to supplement the water supply from Sedibeng in the event of water supply issues.

A Type D liner will be implement for the residue stockpile areas.

22. ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORISATION

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

All aspects have been identified and included in the EMPr.

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

(Which relate to the assessment and mitigation measures proposed)

The following assumptions, uncertainties and gaps were identified in the specialist studies conducted for this project Appendix 6.

23.1. Air Quality

Uncertainties with regards to the modelling was noted and this could affect the impacts as identified and thus the proposed management measures.

23.2. Archaeological and Heritage

Although all efforts were made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

23.3. Terrestrial Biodiversity

The desktop study was conducted with up to date resources. It might however be possible that additional information become available in time, because environmental impact assessments deal with dynamic natural ecosystems. It is therefore important that the report be viewed and acted upon with these limitations in mind.

The results, typical flora, herpetofauna, avifauna and mammalian communities found within the study should/can therefore only be used as a general guideline.

In order to obtain a comprehensive understanding of the dynamics of the ecology of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this fauna and flora survey was conducted in one season.

Species flowering only during specific times of the year could be confused with a very similar species of the same genus and some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.

No scientific data was collected or analysed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigator.

The site verification was undertaken during the end of the summer months (March). Climatic and site conditions were suitable for the terrestrial ecology site survey to be undertaken. The general condition and species composition of the site could be established.

Limitations should always be kept in mind and therefore management should focus on pro-active measures and the implementation of the precautionary principle.

The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

23.4. Geohydrological

- The LOM scheduling was not available for the study. It was only known that the LOM will be over a period of 30 years. The numerical model should be updated once this information becomes available.
- No information on the status of the neighbouring mining activities were available. The impacts and inter-mine interactions can therefore not be determined for future.
- No known groundwater users exist in the current impact zone of the mining activities. Should mining activities intersect the water table, the impact on potential users should be investigated. It is proposed that users in the impact zones be compensated for their loss if any loss is present.
- The extend and the impact of the dolomite area.

23.5. Noise

Limitations due to environmental acoustical measurements include the following:

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced a measurement using the reading result at the end of the measurement. Therefore, trying to define ambient sound levels using the result of one 10-minute measurement can be inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement. When singular measurements are used, a precautious stance must be adopted (this report only report long-term measurements collected over a 2-night period).
- Ambient sound levels are dependent not only on time of day and meteorological conditions but also change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal conditions for propagation of noise. Many faunal species are more active during warmer periods than colder periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals .
- It is assumed that the measurement locations represent other residential dwellings in the area (similar environment), yet, in practice, this can be highly erroneous as there are numerous factors that can impact on ambient sound levels, including:
    - the distance to closest trees, number and type of trees as well as the height of trees;
    - distance to roads, construction material of the road, the traffic volumes on that road as well as the average speeds on this road;
    - available habitat and food for birds and other animals;
    - distance to residential dwelling, type of equipment used at dwelling (compressors, air-con);
    - general maintenance condition of house (especially during windy conditions); and
    - number and type of animals kept in the vicinity of the measurement locations (typical land use taking place around the dwelling).

- Measurements over wind speeds of 3 -5 m/s could provide data influenced by wind-induced noises;
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high due to faunal activity, which can dominate the sound levels around the measurement point (specifically during summertime, rainfall event or during the dawn chorus of bird songs). This generally is still considered naturally quiet and accepted as features of the natural baseline, and in various cases sought after and pleasing. Using this data to define the ambient sound level will result in a higher rating level, and data collected close to such measurement locations will not be considered;
- Considering one or more sound descriptor or equivalent can improve an acoustical assessment. Parameters such as LAMin, LAeq, LAMax, LA10, LA90 and spectral analysis forms part of the many variables that can be considered. However, South African legislation requires consideration of the impulse-weighted LAeq setting that will be considered when measuring ambient sound levels;
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation, wetlands and external noise sources will influence measurements. It may determine whether you are measuring anthropogenic sounds from a receptor dwelling, or measuring environmental ambient baseline contributors of significance (faunal, roads traffic, railway traffic movement etc.); and
- As a residential area develops, the presence of people will result in increased dwelling-related sounds. These are generally a combination of traffic noises, voices, animals and equipment (including TVs and radios). The result is that ambient sound levels will increase as an area matures.

Calculating noise emissions – Adequacy of predictive methods
Limitations due to the calculations of the noise emissions into the environment include the following:

- Many sound propagations models do not consider sound characteristics as calculations are based on an equivalent level (with the appropriate correction implemented e.g., tone or impulse). These other characteristics include intrusive sounds or amplitude modulation;
- Sound propagation models do not consider refraction through the various temperature layers (specifically relevant during the night-times);
- Most sound propagation models do not consider the low frequency range (third octave 16 Hz – 31.5 Hz). This would be relevant to facilities with a potentially low frequency issue;
- Many environmental models consider sound to propagate in hemi-spherical way. Certain noise sources (e.g., a speaker, exhausts, fans) emit sound power levels in a directional manner;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify;
- Many environmental models are not highly suited for close proximity calculations; and
- Acoustical characteristics of the ground are over-simplified, with ground conditions accepted as uniform. Ground conditions will not be considered in this assessment.

Due to these assumptions, modelling generally could be out with as much as +10 dBA, although realistic values ranging from 3 dBA to less than 5 dBA are more common in practice.

Adequacy of Underlying Assumptions

- Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.
- As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor but to calculate a noise rating level that is used to identify potential issues of concern.

Uncertainties associated with mitigation measures

- Any noise impact can be mitigated to have a low significance; however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of an NSD). These mitigation measures may be engineered, technological or due to management commitment.
- For the purpose of the determination of the significance of the noise impact mitigation measures were selected that is feasible, mainly focussing on management of noise impacts using rules, policy and require a management commitment. This, however, does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management).
- It was assumed the mitigation measures proposed for the construction phase will be implemented and continued during the operational phase.

Uncertainties of Information Provided

- While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels), it is difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. The assumptions include the following:
    - This assessment did not include a noise audit to identify all potential noise sources nor to define the sound power emission levels of these activities (and equipment) within the focus area, but used aerial images to identify potential noise generating activities. These noise generating activities was used to develop the noise contours to illustrate the impact from existing activities.
    - It is technically difficult and time-consuming to improve the measurement of spectral distribution of large equipment in an industrial setting. This is due to the many correction factors that need to be considered (e.g. other noise sources active in the area, adequacy of average time setting, surrounding field non-uniformity etc. as per SANS 9614-3:2005);
    - That octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of these processes and equipment. The determination of octave sound power levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
    - Sound power emission levels from processes and equipment changes depending on the load the process and equipment are subject to. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load (work required from the engine or motor to perform action). Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario;
    - As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely be over-estimated;
    - Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;
    - The XYZ topographical information is derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global DEM data, a product of Japan's Ministry of Economy, Trade, and Industry (METI) and the National Aeronautical and Space Administration (NASA). There are known inaccuracies and artefacts in the data set, yet this is still one of the most accurate data sets to obtain 3D-topographical information;
    - The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
    - Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. Fifty per cent (50%) soft ground conditions will be modelled as the area where the construction activities are proposed is well vegetated and sufficiently uneven to allow the consideration of soft ground conditions.

23.6. Soil, land use and land capability

The following assumptions were made during the assessment and reporting phases:

- The assessment of the anticipated impacts assumes that the proposed surface footprint of the project will stay within the confines as depicted in the layout maps in this report.
- It was assumed that the layout will consist of the components stipulated in the final project layout and description that was provided by the applicant.

Assumptions regarding the impacts of the proposed infrastructure were made and based on the author's knowledge of the nature and extent of the planned infrastructure.

23.7. Surface water

- This report and the assessment are based on available information as provided by Salene Manganese and as outlined.
- No detailed design drawings of the proposed mining operations and associated infrastructure were available during the surface water assessment compilation. In addition, no detail mine works plan for the opencast section was provided, i.e. outline of active pit sections per month or locations thereof.

23.8. Visual

Assumptions:

- The core study area can be defined as an area with a radius of not more than 10 km from the structures and a total study area with a radius of 15 km from the structures. This is because the visual impact of structures beyond a distance of 10 km would be so reduced that it can be considered negligible even if there is direct line of sight.
- It is assumed that there are no alternative locations for the structures and that the visual assessment, therefore, assessed only the proposed site.
- The height of the VIA is based on the heights as stipulated in Table 6.
- Geographic location within the mining boundary of infrastructure.
- The assessment was undertaken during the planning stage of the project and is based on the information available at that time.

Limitations:

- Visual perception is by nature a subjective experience, as it is influenced largely by personal values. For instance, what one-viewer experiences as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. In order to limit such subjectivity, a combination of quantitative and qualitative assessment methods was used. A high degree of reliance has been placed on GIS-based analysis viewshed, visibility analysis, and on making transparent assumptions and value judgements, where such assumptions or judgements are necessary.
- The viewshed generated in GIS cannot be guaranteed as 100% accurate. Some viewpoints, which are indicated on the viewshed as being inside of the viewshed, can be outside of the viewshed. This is due to the change of the natural environment by surrounding activities as well as natural vegetation that play a significant role and can have a positive or negative influence on the viewshed.

23.9. Socio Economic

Due to Covid-19 epidemic restrictions and regulations the prepared questionnaire was not distributed to the affected communities.

23.10. Civil Engineering

During the drafting of this report the detailed civil engineering design reports have not been finalised as yet. The information relating to the residue stockpiles and storm water management infrastructure is thus based on the conceptual information provided to Prescali by the appointed engieners:

- EPOCH: Waste rock dump design and liner systems; and
- EcoElementum: Storm water management,

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

24.1. Reasons why the activity should be authorized or not

Macarthy mining operations has assessed all potential impacts that could occur as a result of the existing and the proposed new activities and comprehensive management measures has been identified for implementation to reduce the impact rating of the identified impacts as far as possible. Taking the current economic climate of the country in to consideration as well as the positive socio economic impacts that the current and the proposed activities will ensure for the foreseeable future and the impact rating after the implementation of the management measures it is believed that the balance between environment, social and economics will be maintained and thus the activities should be authorised.

24.2. Conditions that must be included in the authorisation

24.2.1. Specific conditions to be included into the compilation and approval of EMPr

- The existing activities are (based on the transitional arrangements) considered to be authorised in terms of the National Environmental Management Act, 1998 and the National Environmental Management Waste Act, 2008.

- Recommendations made by specialist needs to be implemented as far as practical and possible.
- The geohydrological assessment needs to be updated at least every 5 years.
- Monitoring and audits as outlined in the EMPr needs to be conducted as per the locations, aspects and frequencies specified.
- A detailed Dolomite and risk assessment report needs to be compiled and a Dolomite management plan drafted for inclusion and implementation into the approved EMPr.
- The Dolomite assessment report needs to be forwarded to the Coucill for Geoscience for their inputs and recommendations.

24.2.2. Rehabilitation requirements

- Continuous rehabilitation of all available areas (including backfilled opencast sections) needs to be done and a schedule should be drafted for backfilling, topsoiling and vegetation of rehabilitated areas.

24.3. Period for which the Environmental Authorisation is required.

The environmental authorisation is required for the maximum period of 20 years and will need to be extended in future.

For the activities to which a construction phase only is applicable e.g. roads, storm water infrastructure, and crushing and screening plant a timeframe of 5 years is proposed.

25. 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.

Undertakings by the EAP and Applicant is included in Part C of this document.

26. FINANCIAL PROVISION

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

The existing financial provisioning as determined in November 2020 is provided in the Table below. The anticipated additional provisioning for the amendment is provided in Table 26-2. The combind total from the existing provision and the new activities is R39 965 540,29 Including VAT.

Table 26-1: November 2020 provisioning for existing infrastructures

CALCULATION OF THE QUANTUM								
Mine:	Macarthy Mining Project			Location:	Remainder of Portion 2, Portions 3, 4 and 5 of the Farm Macarthy 559			
Evaluators :	E van der Linde			Date:	Nov-20			
				A	B	C	D	E=A*B*C*D
No	Description		Unit	Quantity	Master rate	Multiplication factor	Weighting factor 1	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 powerlines)		m^3	10664,4	16,14	1	1	R 172 144,51
2 (A)	Demolition of steel buildings and structures (including floor slabs)		m^2	11	224,85	1	1	R 2 473,37
2 (B)	Demolition of reinforced concrete buildings and structures		m^2	476,68	331,36	1	1	R 157 952,80
3	Rehabilitation of access roads		m²	69174	40,24	1	1	R 2 783 326,69
	Non Production	3974 7		27818				
	Production	2954 14		41356				
4 (A)	Demolition and rehabilitation of electrified railway lines		m	0	390,53	1	1	R 0,00
4 (B)	Demolition and rehabilitation of non-electrified railway lines		m	0	213,02	1	1	R 0,00
5	Demolition of housing and facilities (including floor slabs)		m²	0	449,70	1	1	R 0,00
6	Opencast rehabilitation (including final voids and ramps)		ha	11,4758	228875,26	1	1	R 2 626 526,69
7	Sealing of shafts, adits and inclines (including concrete cap)		m²	0	120,71	1	1	R 0,00
8 (A)	Rehabilitation of overburden and spoils		ha	2,852371	157159,43	1	1	R 448 277,01
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-		ha	0	195739,23	1	1	R 0,00
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic,		ha	0	568519,51	1	1	R 0,00
9	Rehabilitation of subsided areas		ha	0	131597,36	1	1	R 0,00
10	General surface rehabilitation, including grassing of all denuded areas		ha	16,156274	124496,78	1	1	R 2 011 404,08
11	River diversions		ha	0	124496,78	1	1	R 0,00
12	Fencing - to be removed		m	773	142,01	1	1	R 109 774,92
13	Water management (Separating clean and dirty water, managing polluted water and managing the impact on groundwater, including treatment, when required)		ha	0	47337,18	1	1	R 0,00
14	2 to 3 years of maintenance and aftercare		ha	16,156274	16568,01	1	1	R 267 677,35
15 (A)	Specialist study		Sum					R 0,00
15 (B)	Specialist study		Sum					R 0,00
Sub Total 1 (Sum of item s 1 to 15)								R 8 579 557,41
1	Preliminary and General	6% of Subtotal 1			R 514 773,44	Weighting factor 2		
		12% of Subtotal 1			R 1 029 546,89	1,05		R 1 081 024,23
2	Contingency	10% of Subtotal 1						R 857 955,74
Sub Total 2 (Subtotal 1 plus s um of management and contingency)								R 10 518 537,38
VAT (15%)								R 1 577 780,61
GRAND TOTAL (Subtotal 3 plus V AT)								R 12 096 317,99

Table 26-2: Additional provisioning to be provided as a result of the amendmend

CALCULATION OF THE QUANTUM								
Mine:	Macarthy Mining Project			Location:	Remainder of Portion 2, Portions 3, 4 and 5 of the Farm Macarthy 559			
Evaluators :	P Erasmus			Date:	Sep-21			
				A	B	C	D	E=A*B*C*D
No	Description		Unit	Quantity	Master rate	tiplication fa	ighting facto	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		m^3					
2 (A)	Demolition of steel buildings and structures (including floor slabs)		m^2					
2 (B)	Demolition of reinforced concrete buildings and structures		m^2					
3	Rehabilitation of access roads		m^2	80000	40,24	1	1	R 3 218 928,14
4 (A)	Demolition and rehabilitation of electrified railway lines		m					
4 (B)	Demolition and rehabilitation of non-electrified railway lines		m					
5	Demolition of housing and facilities (including floor slabs)		m^2					
6	Opencast rehabilitation (including final voids and ramps)		ha	35,93638	228875,26	1	1	R 8 224 948,25
	Iron pit	48,7749		9,75498				
	Manganese pit North	55,1022		11,02044				
	Manganese pit South	42,691		8,5382				
	Existing pit	33,1138		6,62276				
7	Sealing of shafts, adits and inclines (including concrete cap)		m^2					
8 (A)	Rehabilitation of overburden and spoils		ha	50,93	157159,43	1	1	R 8 004 129,90
	Waste rock dump North	12,96		12,96				
	Waste rock dump South	19,7		19,7				
	Waste Dump West	18,27		18,27				
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-		ha					
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (acidic		ha					
9	Rehabilitation of subsided areas		ha					
10	General surface rehabilitation, including grassing of all denuded areas		ha					
11	River diversions		ha					
12	Fencing - to be removed		m					
13	Water management (Separating clean and dirty water, managing polluted water and managing the		ha	1,08	47337,18	1	1	R 51 124,15
	PCD A	0,49		0,49				
	PCD 1	0,19		0,19				
	PCD 2	0,19		0,19				
	PCD 3	0,21		0,21				
14	2 to 3 years of maintenance and aftercare		ha	16,156274	16568,01	1	1	R 267 677,35
15 (A)	Specialist study		Sum					R 0,00
15 (B)	Specialist study		Sum					R 0,00
Sub Total 1 (Sum of item s 1 to 15)								R 19 766 807,79
1	Preliminary and General	6% of Subtotal 1			R 1 186 008,47	Weighting factor 2		
		12% of Subtotal 1			R 2 372 016,93		1,05	R 2 490 617,78
2	Contingency	10% of Subtotal 1						R 1 976 680,78
Sub Total 2 (Subtotal 1 plus s um of management and contingency)								R 24 234 106,35
VAT (15%)								R 3 635 115,95
GRAND TOTAL (Subtotal 3 plus V AT)								R 27 869 222,30

26.1. Explain how the aforesaid amount was derived

The 2005 Guideline as published by the DMR was used in determining the financial provisioning (DMR, 2005).

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

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

It is confirmed that the financial provisioning amount will be available through operating costs and is provided for the in the mine works programme.

27. DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

27.1. Deviations from the methodology used in determining the significance of potential environmental impacts and risks

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

The DMS Plant has been removed from the proposed infrastructure as originally indicated in the application forms and Draft Scoping Report.

27.2. Motivation for the deviation

The applicant deemed it not critical at this stage and will reconsider it for future development.

28. OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24(3)(a) and (7) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) the EIA report must include the: -

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

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

Salene Manganese Pty (Ltd) is the mineral rights holder on the affected property where the proposed expansion will be located thus no impacts are expected on the company other than if the project does not go ahead it may have serious implications on the mine in terms of employment opportunities and continuation of their core business.

Existing arrangements with land owners will remain for the continuation of mining activities.

A detailed Socio-Economic Impact Assessment was done in 2020 (Gudani Consulting, 2021) and the result of the assessment as well as the identified management measures are outlined in Table 20-1 Part A and Table 4-1 Part B.

28.2. IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

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

A number of sites and features of cultural heritage (archaeological and/or recent historical) origin and significance were identified and recorded in the area during the assessment. These included sites dating to the Stone Age (open-air surface scatters and single artifacts), recent historical structures and a cemetery. A Heritage Report will be submitted to the department during the EIA stage. Macarthy mine has however to go – ahead with a Phase 2 application to SAHRA to determine the extent and excavate the areas of importance as identified by the archaeological assessment done in 2020. (Pelser, A., 2020)

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

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

Section 24 (4) (b) (i) states the following: “Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment – (b) must include, with respect to every application for an environmental authorisation and where applicable— (i) investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;”

A full impact assessment was conducted for the previously approved EMPrs and the information is included in this report.

A number of alternatives with regards to location of the new activities were investigated – there for no motivation is required for deviation in terms of sub-regulation 22(2) h.

-END OF PART A-

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. DETAILS OF THE EAP

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

The information is provided in Section 1.1 of Part A.

2. DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

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

The information is provided in Section 3 of Part A.

3. 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)

Please refer to map provided in Appendix 4: Site Layout and other Layout Maps.

4. DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

4.1. Determination of Closure Objectives

(ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

Closure objectives were determined as per the approved EMPr and are outlined in Part B Section 5. In summary the main closure objective is to leave the mining area in a state than are environmentally sustainable with a limited residual impact on environmental aspect so that the surface can be used suitable for grazing and wilderness land.

4.2. The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

Issue	Phase	Management Objectives	Mitigation measures
Flora			
Possible loss of identified ecological support areas or ecological corridors. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Construction and operational	To minimise the impact on rare plant species by preventing the needless loss of or damage to flora particularly with regard to protected, endemic and species of conservation concern Prevent significant alteration to the ecosystems in the area To control the spread of, and to eradicate invasive alien flora that could outcompete indigenous vegetation on the whole of the mine site and adjacent areas of the Salene. The aim will be to rehabilitate towards naturally sustainable vegetation and habitat as was present before the implementation of the project. To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining. To demonstrate that the re-vegetated areas have become self-sustaining To ensure that rehabilitated land becomes self-maintaining. Properly assess and determine final land-use and ensure Closure and Rehabilitation Plan is formal, feasible and site specific	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads. The operational area should be fenced in in order to reduce human and vehicle traffic to areas outside of the demarcated mining area. The vegetation removal during the construction phase should be controlled and very specific. Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should be prioritised.
Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas.	Construction and operational	To control the spread of, and to eradicate invasive alien flora that could outcompeted indigenous vegetation on the whole of the mine site and adjacent areas of the Salene Manganese. The aim will be to rehabilitate towards naturally sustainable vegetation and	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.

Issue	Phase	Management Objectives	Mitigation measures
		habitat as was present before the implementation of the project.	
Development and related activities may impact on the sensitive habitats related to the watercourses situated in close proximity to the development footprint	Construction and operational	To minimise the impact on rare plant species by preventing the needless loss of or damage to flora particularly with regard to protected, endemic and species of conservation concern	All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas.
		To ensure that rehabilitated land becomes self-maintaining.	If any SCC are encountered within the subject property in the future, the following should be ensured:
		Prevent significant alteration to the ecosystems in the area	If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property.
		Properly assess and determine final land-use and ensure Closure and Rehabilitation Plan is formal, feasible and site specific	All rescue and relocation plans should be overseen by a suitably qualified specialist.
		To demonstrate that the re-vegetated areas have become self-sustaining	Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed.
		To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining.	Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.
Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining	Closure/post-closure	To minimise the impact on rare plant species by preventing the needless loss of or damage to flora particularly with regard to protected, endemic and species of conservation concern Prevent significant alteration to the ecosystems in the area To establish vegetation on mined out and rehabilitated areas and ensure that it becomes self-sustaining. To demonstrate that the re-vegetated areas have become self-sustaining To ensure that rehabilitated land becomes self-maintaining. Properly assess and determine final	A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase. Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase. Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied. Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified

Issue	Phase	Management Objectives	Mitigation measures
		land-use and ensure Closure and Rehabilitation Plan is formal, feasible and site specific	specialist deems the monitoring to no longer be necessary. A report should be written and stored and should be available at all times
Fauna			
Construction will result in an increase of potentially destructive movement within the designated area. Destruction of habitat and other specialised animal species that are currently finding refuge within the area will migrate to other more favourable areas	Construction and operational	To minimise the adverse effects of mining on indigenous fauna, by preventing the needless death, injury or hindrance to fauna particularly with regard to protected, endemic and species of conservational concern	The construction area should be well demarcated and construction workers should not enter adjacent areas. Permits should be obtained for the remainder of the SCC known to occur on site. The exact location of these plants should be recorded and permits obtained. phase of the development, a specialist should be consulted and it could also be reported to the Animal Demographic Unit (ADU - Mammal Map) as an updated record for their database. Adhere to all management and mitigation measures as prescribed within the Environmental Management Programme (EMP) report. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction and utilised during operation. This will entail the spreading of topsoil, revegetation and management of invasive species in areas where it will be required.
The construction activities might result in impacts on sensitive areas or large-scale destruction (opencast or new stockpile areas) including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey	Construction and operational	To minimise the adverse effects of mining on indigenous fauna, by preventing the needless death, injury or hindrance to fauna particularly with regard to protected, endemic and species of conservational concern	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within the Environmental Management Programme (EMP) report. Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. Dispose of waste and contaminated soil properly. Prevent impacts from reaching downstream water resources by ensuring proper water management,

Issue	Phase	Management Objectives	Mitigation measures
(smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.			especially in the event of rains, since the area has very low rainfall. Continuous rehabilitation of the area should occur in accordance with the EA/WUL, as well as monitoring as prescribed. Ensure proper storm water management and designs are complied with. Storm water management will prevent impacts reaching the natural environment.
The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area	Operational	To minimise the adverse effects of mining on indigenous fauna, by preventing the needless death, injury or hindrance to fauna particularly with regard to protected, endemic and species of conservational concern	Fencing the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a controlled environment. It was observed during the field assessment that site access control has already been implemented and main fences around the zone of influence has been erected. Animals may get used to movement by people in designated areas if it is a predictable situation. If movement is allowed into natural areas on a regular basis and the smell and sound of humans are found outside the demarcated development zones, it may result in animals moving away from the area and those that have specialised niches may flee and starve due to limited range and adaptability. Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase is speedily managed and restored. This includes erosion and the management of Invasive plant species that may decrease the integrity of the vegetation types as a specialised habitat for animals. Noise impacts should be monitored and kept in accordance to the regulated standard prescribed for the zoning of the area. Prevent impacts and waste from reaching the water environment outside of the dirty footprint area. Waste that is not managed correctly may enter the environment or contaminate the river systems and therefore the aquatic ecosystems of the river during a rain event. This should be prevented by storing hazardous waste in bunded areas. Domestic waste and other waste should be managed in the appropriate

Issue	Phase	Management Objectives	Mitigation measures
			manner and apply good housekeeping practices that will aid this issue. Strict rules and punishment should be adhered to offenders entering the natural environment outside of the footprint, hunting or utilising firewood from the surrounds.
Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Plan (EMP) and Final Rehabilitation programme compiled for the specific mining area.	Closure and Rehabilitation	To minimise the adverse effects of mining on indigenous fauna, by preventing the needless death, injury or hindrance to fauna particularly with regard to protected, endemic and species of conservational concern	Active rehabilitation of degraded landscapes should commence and be done concurrently during the operational phase. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas. When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas, especially for larger mammalian species within the area. Impacts will begin to subside and move towards a positive scale (ideally).
Surface water			
The location of the opencast pits in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the proposed iron opencast pit which is of concern as it is located on a watershed area	Construction	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Use the terrain to shield the opencast pits from sensitive areas. Hilltop sites should be avoided as they impact adjacent catchments
Rainwater captured in the opencast pits will reduce sheet flow to nearby watercourses and may be contaminated and needs	Construction and operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly	Pump rainwater and groundwater that collects in the opencast pits and store for use as process water or dust suppression. Prevent the formation of shallow dams in rehabilitated areas. Develop post mining environments

Issue	Phase	Management Objectives	Mitigation measures
to be pumped to the pollution control dam to prevent impacts on water quality downstream that in turn could impact on the habitat and biota.		with regard to aquatic habitat that may be present downstream.	that recreate habitats where possible or structure altered landscapes to be compatible with regional habitats.
It is not expected that it would be possible to backfill the opencast pits 100% due to insufficient material being available thereby creating a permanent sink for water if not diverted around the opencast pits	Decommissioning	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Consolidate development areas and develop multi- use options or infrastructure corridors for roads, pipelines, power and communication links. Clear invasive alien vegetation and re-establish diverse indigenous species during on-going rehabilitation. Implement habitat rehabilitation. Disturbance of catchment or reduction in catchment discharge requires a license from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations. Discharge only treated water meeting legal standards into watercourse to supplement clean runoff. Remain within catchment discharge parameters determined from pre-mining analysis.
The location of the WRD in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the existing WRD and its proposed expansion which is of concern as it is located on / near a watershed area	Construction	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Clear invasive alien vegetation and re-establish diverse indigenous species during on-going rehabilitation. Develop post mining environments that recreate habitats where possible or structure altered landscapes to be compatible with regional habitats.
Run-off from the WRD could be contaminated (to be confirmed by leachate test) and this could result in water quality impacts downstream if not contained in a pollution control dam	Construction, Operation and Decommissioning	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Implement habitat rehabilitation. Disturbance of catchment or reduction in catchment discharge requires a licence from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations. Discharge only treated water meeting legal standards into watercourse to supplement clean runoff. Remain within catchment discharge parameters determined from pre-mining analysis

Issue	Phase	Management Objectives	Mitigation measures
Chemical or fuel spillages from equipment used in the all the mining related activities could contaminate the soil profile	Construction and Operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Drip tray (or suitable alternative) and drum to store excavated spill affected soil for disposal at a registered facility
Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff that if not managed and captured correctly could reach surface water resources during rainfall events.	Construction, Operation and Decommissioning	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Install oil traps to capture run-off from service areas.
Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in nearby watercourses	Construction, Decommissioning	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Implement dust suppression in the area Ensure that sufficient storm water management is in place to capture run-off and remove silt from the water before being discharged to the environment Implement on-going habitat rehabilitation Only clear areas that will be mined and rehabilitate areas as soon as mining has been finished.
If not managed correctly the topsoil heap could fail and result in increased siltation in watercourses.	Construction and Operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Implement soil conservation measures.
Depending on the waste classification and leachate generated by the overburden / Waste rock run-off from these areas could result in poor quality water entering the watercourses.	Operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Integrate disturbed area to most appropriate land use to ensure long-term stability of restored topsoil.
Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.	Rehabilitation	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Vegetate topsoil stockpile to prevent erosion from the stockpile. Conduct a once of waste classification of the stockpiles to determine potential impacts on the surface water resource. Drip tray (or suitable alternative) and drum to store excavated spill affected soil for disposal at a registered facility.

Issue	Phase	Management Objectives	Mitigation measures
			Implement dust suppression on roads.
Concentrated storm runoff from the opencast pits surrounds and infrastructure areas could be erosive, causing sheet, rill and donga erosion features.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Implement storm water diversion and contour berms to separate clean and contaminated water systems around the pit and infrastructure areas. Ensure that the system is design taking into consideration the runoff for the soil type and slope gradient.
Dirty storm water from the opencast pits could impacts on the water quality of downstream surface water areas.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Disturbance of catchment or reduction in catchment discharge requires a licence from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations.
Should water be allowed to be captured in the opencast pits it could result in less water to the downstream surface water area.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Discharge only treated water which meets legal standards into a watercourse to supplement clean runoff.
Altered storm water runoff response due to large impervious areas (hardened surfaces) and concentrated runoff in drainage systems.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Optimise residue stockpile and deposit slope length and gradient to reduce erosion effect of storm runoff.
Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Place residue stockpiles outside the 1:100 year flood line on any watercourse or dam or 100 m from a watercourse or borehole.
Contaminated runoff or leachate concentrated in mined out opencast pits can decant or contaminate through controlled discharge of partially treated water into natural systems. Opencast pit sump	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Before dumping overburden in worked out pit levels that may be submerged ensure that it will not pollute or degrade over time to produce poor quality leachates.
Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked out pit and	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly	As Above

Issue	Phase	Management Objectives	Mitigation measures
can lead to increased groundwater recharge and potential regional impact of low quality water.		with regard to aquatic habitat that may be present downstream.	
Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	As Above
Stockpiling of these materials could result in salinization, mineralisation and toxic contamination of soils beneath them.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Analyse soils, treat it to ameliorate salinity or contamination and dispose of untreatable soils at an approved disposal site.
Leachate from these materials could result in poor quality water entering the surface water resource which could impact on the health of the system.	Operational and Post Closure	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Optimise residue stockpile and deposit slope length and gradient to reduce erosion effect of storm runoff. Place stockpile areas outside the 1:100 year flood line on any watercourse or dam or 10m from a wetland, watercourse or borehole. Before dumping waste material in worked out pit levels that may be submerged ensure that it will not pollute or degrade over time to produce poor quality leachates. Capture run-off from stockpile areas in a suitably designed and constructed dam. Ensure that stockpile areas are bunded and that the area is lined as per the NEMWA regulations for the applicable waste type to prevent ingress into groundwater resource. Conduct waste classification on all residue deposits.
Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff.	Operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Implement minimum distance of 100 m from a water resource and design adequate pollution control structures around sites and ensure effective reaction measures to control emergency spills.
Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.	Operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	If septic tanks are used keep record of the safe disposal of the sewage by the appointed contractor. Ensure that the sump at the workshop is maintained and cleaned as needed.

Issue	Phase	Management Objectives	Mitigation measures
Dust generation from the beneficiation processes, product and waste transport routes, residue stockpiles or deposits and un-rehabilitated areas can impair aquatic vegetation photosynthesis and could potentially impact on water quality depending on the constituents.	Operational	To minimise the adverse effects of mining on surface water, by preventing the needless death, injury particularly with regard to aquatic habitat that may be present downstream.	Dust suppression by spraying water or non-contaminating liquids in pit during operations, spraying haul roads, crusher and screening plant. Prevent dust from transported product by washing vehicles and covering loads. Ensure that site is protected from prevailing winds.
Groundwater			
Increase in surface run-off and therefore decrease in aquifer recharge.	Construction	To limit long term groundwater impacts quality	Re-vegetate disturbed areas.
Spills from construction vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Construction	To limit long term groundwater impacts quality	Clean any hydrocarbon spills in the appropriate manner.
Contamination may be expected in terms of nitrate from explosives.	Operational	To limit long term groundwater impacts quality	Should a contamination plume be detected, groundwater abstraction or other measures should be implemented to contain plume.
Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Operational	To limit long term groundwater impacts quality	Clean any hydrocarbon spills in the appropriate manner.
A plume can begin to migrate downgradient since dewatering of the pit is not expected to be conducted	Operational	To gather data that will allow a predictive understanding of the groundwater environment and how it will be affected by surface activities	Abstraction of groundwater to contain the contamination plume.
Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality.	Closure and Rehabilitation	To limit long term groundwater impacts quality	Remove all surface infrastructure as soon as mining has ceased. This will eliminate the impact on the groundwater regime.
A plume may continue to migrate further downgradient of the rehabilitated opencast pits.	Post Closure	To gather data that will allow a predictive understanding of the groundwater environment and how it will be affected by surface activities	Should a contamination plume be detected, groundwater abstraction or other measures should be implemented to contain plume.
Visual			

Issue	Phase	Management Objectives	Mitigation measures
Impacts on viewpoints that had a visual exposure during construction phase	Construction	To reduce the visual impact of the mining activity and associated equipment and infrastructure	The visual impact can be minimized creating visual barriers. The construction area will be cleared as soon as construction of the infrastructure is finished
Permanent visual impact of the structures on users of roads and land owners	Operational	To reduce the visual impact of the mining activity and associated equipment and infrastructure	Dust from Stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust. The visual impact can be minimized by the creation of visual barriers. Planting indigenous vegetation. Clearing only vegetation as required. Rehabilitating any disturbed areas as soon as possible.
Air Quality			
A number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction	Construction	To comply with legislated limits for air quality parameters	Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere. Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur. Topsoil should be re-vegetated to reduce exposure areas. During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised. Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads. When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads. Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form. Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect. Any crusting of the surface binds the erodible material. All stockpiles to be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation)..

Issue	Phase	Management Objectives	Mitigation measures
Construction of access roads, pipes, storm water diversion berms, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust)	Construction	To comply with legislated limits for air quality parameters	Blasting should also not take place when poor atmospheric dispersion is expected i.e. early morning and late evening. Material need to be removed to dedicated stockpiles to be used during rehabilitation. This hauling of materials should take place on roads which is being watered and/or sprayed with dust suppressant. To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers. Constricting the areas and time of exposure of pre-strip clearing in advance of construction to limit exposed soil surfaces.
Transportation of workers and materials in and out of the mine site will result in the production of fugitive dust (containing TSP, as well as PM10 and PM 2.5) due to suspension of friable materials from earth roads	Construction	To comply with legislated limits for air quality parameters	Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant. To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers. Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion. The drop heights should be minimised when depositing materials to the ground. Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily.
Use and maintenance of access road, dust and material handling, Haul roads, and wind erosion from stockpile	Operational	To comply with legislated limits for air quality parameters	See Construction Phase mitigation measures.
Demolition of buildings, foundations, and removal of rubbles, cleaning up of workshops, fuel reagents , removal of power supply and removal of haul and access roads will generate fugitive dust similar	Decommissioning	To comply with legislated limits for air quality parameters	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase. The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. Speed restrictions should be imposed and enforced.

Issue	Phase	Management Objectives	Mitigation measures
to impacts during construction phase.			Cabs of machines should be swept or vacuumed regularly to remove accumulated dust. Exhaust pipes of vehicles should be directed so that they do not raise dust. Engine cooling fans of vehicles should be shrouded so that they do not raise dust. Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust. Dust suppression of roads being used during rehabilitation should be enforced.
Topsoil reshaping and restructuring of the landscape. Incorrect rehabilitation will cause permanent damage to the surface infrastructure	Decommissioning	To comply with legislated limits for air quality parameters	Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion. Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings. The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion. Spreading of soil must be performed on less windy days. The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation. Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels. Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks. The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall. Speed restrictions should be imposed and enforced. Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.

Issue	Phase	Management Objectives	Mitigation measures
			Exhaust pipes of vehicles should be directed so that they do not raise dust. Engine cooling fans of vehicles should be shrouded so that they do not raise dust. Hard surfaced haul roads or standing areas to be washed down and swept to remove accumulated dust. Dust suppression of roads being used during rehabilitation should be enforced. It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion. These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.
Heritage and Culture			
Potential impact on artefacts.	Construction, Operational and Decommissioning	To ensure full compliance with the National Heritage Resources Act To reduce the impact resulting from the destruction of, or damage to, archaeological remains	Conduct detailed mapping of the TWF1 area and the related erosion donga in order to determine the extent of the archaeological deposit and sites located here. Collect samples / excavation of surface features of material dating to the Stone Age and Iron Age once approval is received from SAHRA.
Potential impact on artefacts.	Construction, Operational, and Decommissioning	To ensure full compliance with the National Heritage Resources Act To reduce the impact resulting from the destruction of, or damage to, archaeological remains	Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either of the wrong kind to contain fossils in the case of the Kuruman and Gamagara Formations, or no trace fossils were found in this site, in the case of the Ghaap Group. Furthermore, the material to be targeted is not in the limestones of the Ghaap Group. Since there is an extremely small chance that trace fossils from the nearby Ghaap Group limestones may be disturbed, a Fossil Chance Find Protocol has been added to this report.
Development and related activities may impact on the sensitive habitats related to the gravesite and other heritage sensitive area situated in close proximity to the development	Construction, Operation and Decommissioning	To ensure that employment policies s are implemented To ensure that the SLP projects are suitable To promote community consultation	Salene Manganese Mine will form part of the history of the local area. Some mine infrastructure may be preserved as local heritage resources. Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist.

Issue	Phase	Management Objectives	Mitigation measures
footprint may be affected by the proposed development.			Burial remains should not be disturbed or removed until inspected by an archaeologist; Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in order to verify the presence or absence of any such material; Any graves in the vicinity of the mining operations that will or not be directly affected must be documented and monitored for damage.
Socio Economics			
Influx of foreigners and job seekers and increase in disposable income for local people may have negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Construction, Operation and Decommissioning	To ensure that employment policies s are implemented To ensure that the SLP projects are suitable To promote community consultation	Labour should be sourced from the local settlement areas to prevent influx of foreigners who are likely to disrupt the social fabric, values and norms of the village people. Through the SLP and day-to-day training and awareness programmes, pandemics such as HIV and Covid-19 can be managed and minimized. The Salene mine must also have an HIV and Covid-19 awareness outreach programme in conjunction with local health centres and clinics to extend awareness and knowledge about the diseases to the broader communities affected by the mine activities and proposed extension. Visible policing and community policing forums must be established to curb incidents of crime in the communities. This option must be implemented in conjunction with existing municipal processes to manage crime and illegal activities.
Cumulative: Possible loss of Life and Covid Pandemic spread.	Construcion and Operational	To ensure that employment policies s are implemented To ensure that the SLP projects are suitable To promote community consultation	

Issue	Phase	Management Objectives	Mitigation measures
Land capability of the affected area will be permanently be affected especially the open pit area. The proposed expansion will increase loss of grazing land, restricted access and loss of cultural or traditional practices.	Construction, Operation and Decommissioning	To ensure that employment policies s are implemented To ensure that the SLP projects are suitable To promote community consultation	Rehabilitate the land to as close as possible to its wilderness and grazing land state during and after the mining activities are concluded. Re-vegetation should be with indigenous plant species that are able to sustain the regional climate and soil conditions. The farm where the current mining activities are taking place, is already a restricted/controlled access, therefore the Salene Mine proposed activities will not reduce availability of natural resources and land to local communities.
Cumulative: Further changes in land use due to secondary industries that may be developed around the area.		To ensure that employment policies s are implemented To ensure that the SLP projects are suitable To promote community consultation	As per Land us and land capability management measures
The proposed Salene Mine activities will not raise noise levels significantly. Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active	Construction, Operation and Decommissioning	As per Noise impacts Identified	Measures such as ensuring all vehicles and equipment are in good working order, and that any faulty exhaust- and/or intake silencers are replaced timorously, will reduce the severity and significance of the impact. The noise generating aspects and equipment must be confined to the mining area approved by the DMRE under the mining right authorization. Drilling and blasting is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. Personnel working within the plant must wear ear protection gear. A complete blasting schedule and timeframes must be compiled and communicated with the adjacent communities and farm homesteads to ensure that they are notified in advance prior to blasting taking place. Operators must wear ear protection at all times when operating the earth moving equipment and machinery to prevent noise induced hearing loss. Noise pollution must be monitored monthly, and recorded throughout the life of mine.
Cumulative: The noise impacts of the proposed Salene Mine expansion projects and exiting	Operational	As per Noise impacts Identified	As per noise management measures identified.

Issue	Phase	Management Objectives	Mitigation measures
Maremane settlement activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.			
Excessive dust may have an impact on surrounding vegetation and an indirect impact on animals that feed on the vegetation as well as any nearby communities or farm homesteads. Dust will be generated from the Salene Mine activities, access roads to and from the opencast pits and waste rock dumps.	Air quality	As per Air Quality Impacts Identified	Wetting of the access roads with water periodically to suppress the dust will greatly reduce the impact of dust. This wetting with water must be done daily during dry and windy seasons. Dust and smoke monitoring will be conducted during the life of mine to determine the prominent wind directions and dust / smoke levels at various points around the mining site. In term of the requirements of the Mine Health and Safety Act, 1996 Salene Mine must provide protective clothing and equipment for all its employees, and must periodically conduct risk assessments to analyse and monitor the effects of dust and smoke on the staff members and the surrounding environment. Concurrent rehabilitation and re-vegetation of the mining site will also reduce surfaces that are exposed to wind generated dust.
Cumulative: Expansion activities may add to the annual PM10 concentrations in the area,	Construction and Operational	As per Air Quality objectives	As per Air quality management measures identified
The proposed Salene Manganese mine waste rock dumps, opencast pits activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine is visible from R325 main road.	Construction, Operational, Closure and post closure	As per visual Impacts identified	Concurrent rehabilitation should be implemented throughout the life of the mine to minimize and return the environment to - as much as possible – the original status. Screening with vegetation (trees) should also be implemented to mask the mine and the other mine infrastructure from the main road, various settlement viewpoints and soften the visual impacts. The visual impact of the waste rock and surface infrastructure sites can be reduced by doing the following: Filling up the mining site to match the surrounding

Issue	Phase	Management Objectives	Mitigation measures
			landscape as closely as possible in the final phase of rehabilitation; Planting trees on the available fill material at a high density in the first phase of rehabilitation to match the "texture" of the surrounding landscape; Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e.. grey vs reddish brown). To reduce the impact of the Salene Mine on the topography and restore the landscape character to closely resemble the conditions prior to the open pits and waste rock the following is recommended: Studying the contour map of the site and mimicking the surrounding areas on the final earthworks plan as closely as possible without excessive cost as part of the final phase of rehabilitation; Stabilising the substrate/backfill material by means of a variety of dry weather tolerant grasses, shrubs and trees; Screening the road as far as possible with indigenous trees, grasses and shrubs.
Cumulative: The proposed additional mining infrastructure at Salene Mine may form part of the "sense of place" in the long term, even after operations cease.	Construction, Operational, Closure and post closure	AS per Visual objectives	A per Visual management measures
Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The adjacent community (Maremane) in terms of skills training, local economic development projects, and improved infrastructure. This is a requirement in terms of Section 22 and Regulation 42 of the MPRDA, 2002. Increase in disposable income may create negative social impacts such as	Construction, Operation and Decommissioning	To ensure that employment policies s are implemented To ensure that the SLP projects are suitable To promote community consultation	Promotion of manganese beneficiation within the Kathu/Postmasburg area to improve the quality and value of the product being mined, and create further economic activity. Subject to economic modelling and feasibility study, a concentrator plant in the vicinity of Salene Mine can further stimulate significantly the economic activity in Tsantsabane Municipality, and the surrounding region. Labour should be sort from the local settlement areas to prevent influx of foreign people and job seekers who are likely to disrupt the social fabric, values and norms of the village people. Currently Salene Mine employs 147

Issue	Phase	Management Objectives	Mitigation measures
crime, alcoholism and prostitution in and around the project area.			persons – inclusive of permanent and contract employees.
Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation.	Construction, Operation and Decommissioning	As above	As Above
Noise			
Noise caused by multiple construction activities during daytime Noise caused by multiple construction activities during night time	Construction	To reduce noise impacts of the mining activities on residential areas and nearby land owners	The mine should construct berms between mining areas and identified NSD; The mine must ensure that noise levels are less than 52 dBA at night at all NSD; The mine must include a component covering environmental noise in the Health and Safety Induction to sensitize all employees and contractors about this subject, especially those employees and contractors that have to travel past receptors at night or might be required to do work within 1 000 m from NSD at night. Establish complaints register with an open line to a relevant person that can act if there is a noise complaint. It is recommended that a noise monitoring programme is developed and implemented.
Noise caused by multiple operational activities during daytime such as haul truck movement and processing plant Noise caused by multiple operational activities during night time such as haul truck movement and processing plant	Operational		
Impacts on surrounding communities caused by vibrations during blasting activities	Construction and Operational	To reduce noise impacts of the mining activities on residential areas and nearby land owners	The potential vibration levels should be discussed with the manager at Boskop mine to warn the security of potential blast vibration levels once blasts are to take place closer than 1,250 m from this BSR The developer should erect clear signs indicating blast dates and times on the R325
Social Economic			
Damage to residential structures within the area	Construction and Operational	To limit impacts on residential structures	Blasts vibration levels to be calculated for each blast to take place within 1,250 m from any occupied structure.

Issue	Phase	Management Objectives	Mitigation measures
			The blast should be controlled (charge per delay) to ensure a vibration level less than 2.54 mm/s at these structures;
Damage to tar roads and railway line close to the mine	Construction, Operation and Decommissioning	To Limit impacts on public enterprises and government infrastructures	No mitigation is required to reduce vibration levels at the road and railway line.
Topography			
Air blast impact for a 924kg blast (Worst case)	Operational	To reinstate a landform that is similar to the pre-mining environment. The post mining landform must be free draining. This needs to be done as the topography is altered as a result of the construction of surface infrastructure and opencast mining areas as well as waste dumps and water infrastructure.	• Reprofile replaced hard and soft overburden material to mined out pit areas. Ensure that the reprofiled landform is in keeping with the adjacent un-mined land surface. • At the contact between pit and un-mined land, ensure slope of ground does not exceed five percent (5%). • Shape so that the topography is free draining. Reshaped areas of arable land capability must not have a final slope greater than four percent (4%). • Replace topsoil to achieve required pre-mining land capability. • Revegetate rehabilitated areas.
Socio Economics			
Risk of fly rock hitting adjacent road users, neighbouring properties, humans and fauna	Operational	To limit impacts on residential structures	Mine should initiate a forum to inform the close residents about the likely vibration and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast as well as a warning to residents that, when they are indoors during a blast, vibration of windows and ceilings may appear excessive. - Mine to erect blasting notice boards in the area with blasting dates and times highlighted. - Mine to prevent blasting in adverse meteorological conditions where possible (overcast conditions, strong wind blowing in direction of local community, early in the mornings or late in the afternoon).
Soils			
During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles.	Construction	To facilitate the sustainable and productive use of rehabilitated land To ensure the continued fitness of the natural areas that is still to be mined, or which lies outside of the mining	Using appropriate methods of excavating that are in accordance with regulatory requirements and industrial best practices procedures

Issue	Phase	Management Objectives	Mitigation measures
Soil particles are removed from the area through dust transportation or in surface water run-off.		footprint To limit the adverse effects of mining on the post mining land use capability	Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces Using drainage control measures and culverts to manage the natural flow of surface runoff.
Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project.	Construction	Describe soil stripping and stockpiling methods that will reduce the loss of topsoil;	Minimise the footprint of the infrastructure expansion- All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase.
Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	Construction	Address the prevention, minimisation and management of erosion, compaction and chemical soil pollution during construction, operations, decommissioning and closure;	Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained by using a drip tray with plastic sheeting filled with absorbent material; Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area; Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste; Containing potentially contaminating fluids and other wastes Cleaning up areas of spillage of potentially contaminating liquids and solids.
Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of	Construction	To prevent dust from roads	The moisture content of access road surface layers must be maintained through routine spraying or the use of an appropriate dust suppressant. Access roads must be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary,

Issue	Phase	Management Objectives	Mitigation measures
the A horizon and B horizons and often the underlying parent material is part of the mixture			culverts will be installed to permit free drainage of existing water courses.
Land Capability			
Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	Construction, Decommissioning	To return land capability to pre-mining as far as possible	The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site.
Soils			
Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion.	Operational	To prevent soil erosions	Construction Management measures must still be applied during operational phase. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams. Routine monitoring will be required in and around the sites
Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Operational	To prevent reduction of soil quality	Construction Management measures must still be applied during operational phase. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted

Issue	Phase	Management Objectives	Mitigation measures
			water to pollution control dams. Routine monitoring will be required in and around the sites
Infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution	Operational	To prevent the reduction of soil quality	Construction Management measures must still be applied during operational phase. Stockpiles are managed so they do not become contaminated and then need additional handling or disposal; A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled; Processing areas should be contained and systems designed to effectively manage and dispose of contained storm water, effluent and solids; Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater; Equipment, and vehicle maintenance and wash-down areas, are contained and appropriate means provided for treating and disposing of liquids and solids; Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems); Solids and slurries are disposed of in a manner consistent with the nature of the material and avoids contamination; and Effluent and processing drainage systems avoid leakage to ground.
All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	Decommissioning	To prevent erosion from rehabilitated areas	Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible.

Issue	Phase	Management Objectives	Mitigation measures
Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Decommissioning	To prevent erosion from rehabilitated areas	Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible.
Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution.	Decommissioning	To prevent the reduction of soil quality	Losses of fuel and lubricants from the oil sumps of vehicles and equipment should be contained using a drip tray with plastic sheeting and filled with absorbent material; Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids and recovering contaminated soils and treating them off-site; Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste; Containing potentially contaminating fluids and other wastes; and Cleaning up areas of spillage of potentially contaminating liquids and solids.
Land capability			
Decommissioning will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time.	Decommissioning	To improve land capability to near pre-mining conditions	All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site. Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (sloped) in order to approximate the pre-project aspect and contours The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles. frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gullies have developed. In the event that vegetation has not re-established and erosion gullies have developed, remedial action should be taken.

4.3. Potential risk of Acid Mine Drainage

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

Acid base accounting (Eco E, 2021) ABA tests were conducted for the Macarthy Mine on the two samples submitted to Waterlab in Pretoria. According to the results of the ABA tests, the samples from the mine are **not potentially acid** generating unless significant preferential exposure of sulphides occur along fractures or extremely reactive sulphides are present together with insufficiently reactive NP.

4.4. Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.

A complete waste classification was done on Waste Rock and soil by Eco Elementum (Eco Elementum, 2021) which adopted the approach prescribed by the:

- GNR 634 (Waste Classification and Management Reguations)
- GN635 (National Norms and Standards for the Assessment of Waste for Landfill Disposal)
- GNR 636 (National Norms and Standards for disposal of waste to landfill)

Laboratory analysis of the samples was undertaken by Waterlab, a South Africa National Accreditation System (SANAS) accredited laboratory in Pretoria. The analysis of the test materials included Total Trace elements, Water leaching, major and minor elements,, Acid-base accounting, Sulphur speciation, and XRD.

4.5. Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

There is no need for engineering designs to address acid mine drainage as it is not a concern.

4.6. Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Though not expected suitable liner systems (if possible) will be implemented at all residue deposits as per the designs as approved by the DWS during the water use licence application process.

There is no need for additional measures as acid mine drainage is not a concern.

4.7. Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Based on the preliminary indications, the mine would have needed 300 m3 of water per day if the DMS plant were to be constructed and operated. To be on the safe side and to assure that sufficient water is available for dust suppression and potential future expansion this volume is still applicable.

4.8. Has a water use licence has been applied for?

A water Use License application is currently being undertaken with an e-wula reference: Salene Manganese Macarthy Water Use Licence Application (WU19381).

4.9. Impacts to be mitigated in their respective phases

Table 4-1: Measures to rehabilitate the environment affected by the undertaking of any listed activity

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads.	Design will be compliant with SANS standards and applicable legislation and be approved by the DWS. Compliance with legislation relating to the protection of Endagneried species.	During the planning and construction phase. Monitor vegetation and alien invasive species annually.
				The operational area should be fenced in in order to reduce human and vehicle traffic to areas outside of the demarcated mining area.		
				The vegetation removal during the construction phase should be controlled and very specific.		
				Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should be prioritised.		
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.	No alien invasive plants on site	Life of mine

[14] Opencast: ~147 Ha; New road: 10 km; Waste Rock Dump: ~51 Ha; Topsoil Dump: ~3.7 Ha; Storm water management: 1 Ha; Cumulative and detailed infrastructure: 859 Ha

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas.	Identify SCC and relocate once permit is received	Before construction commence
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	If any SCC are encountered within the subject property in the future, the following should be ensured:	As above	As above
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property.	As above	As above
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	All rescue and relocation plans should be overseen by a suitably qualified specialist.	As above	As above
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed.	As above	As above
Expansion activities	Refer to Footnote 14	Flora	Construction and operational	Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.	As above	As above
Expansion activities	Refer to Footnote 14	Flora	Closure/post-closure	A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase.	Mine health and Safety	Post closure
Expansion activities	Refer to Footnote 14	Flora	Closure/post-closure	Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase.	As above	As Above
Expansion activities	Refer to Footnote 14	Flora	Closure/post-closure	Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled	As above	As Above

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				with the use of a specialist and the correct seeding techniques and mixtures should be applied.		
Expansion activities	Refer to Footnote 14	Flora	Closure/post-closure	Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary. A report should be written and stored and should be available at all times	As above	As Above
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	The construction area should be well demarcated and construction workers should not enter adjacent areas.	Comply with Requirements of the EMPr	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Permits should be obtained for the remainder of the SCC known to occur on site. The exact location of these plants should be recorded and permits obtained.	Permits for relocation in place	As needed
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	phase of the development, a specialist should be consulted and it could also be reported to the Animal Demographic Unit (ADU - Mammal Map) as an updated record for their database.	N/A	Continually
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Adhere to all management and mitigation measures as prescribed within the Environmental Management Programme (EMP) report.	Comply with Requirements of the EMPr	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continually

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction and utilised during operation. This will entail the spreading of topsoil, revegetation and management of invasive species in areas where it will be required.	Pre-impact vegetation	Continually
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.	Comply with Requirements of the EMPr	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Adhere to all management and mitigation measures as prescribed within the Environmental Management Programme (EMP) report.	Comply with Requirements of the EMPr	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. Dispose of waste and contaminated soil properly.	As above	As Above
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Prevent impacts from reaching downstream water resources by ensuring proper water management, especially in the event of rains, since the area has very low rainfall.	Comply with Requirements of the EMPr and the Water Use Licence	Continually
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Continuous rehabilitation of the area should occur in accordance with the EA/WUL, as well as monitoring as prescribed.	Pre-impact vegetation	Continually
Expansion activities	Refer to Footnote 14	Fauna	Construction and operational	Ensure proper storm water management and designs are complied with. Storm water management will prevent impacts reaching the natural environment.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Operational	Fencing the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a	Comply with Requirements of the EMPr	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				controlled environment. It was observed during the field assessment that site access control has already been implemented and main fences around the zone of influence has been erected. Animals may get used to movement by people in designated areas if it is a predictable situation. If movement is allowed into natural areas on a regular basis and the smell and sound of humans are found outside the demarcated development zones, it may result in animals moving away from the area and those that have specialised niches may flee and starve due to limited range and adaptability.		
Expansion activities	Refer to Footnote 14	Fauna	Operational	Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase is speedily managed and restored. This includes erosion and the management of Invasive plant species that may decrease the integrity of the vegetation types as a specialised habitat for animals.	Pre-impact vegetation	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Operational	Noise impacts should be monitored and kept in accordance to the regulated standard prescribed for the zoning of the area.	As per Noise impacts identified	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Operational	Prevent impacts and waste from reaching the water environment outside of the dirty footprint area. Waste that is not managed correctly may enter the environment or contaminate the river systems and therefore the aquatic ecosystems of the river during a rain event. This should be prevented by storing hazardous waste in	Norms and standards for waste management activities as promulgated in terms of NEMWA	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				bunded areas. Domestic waste and other waste should be managed in the appropriate manner and apply good housekeeping practices that will aid this issue.		
Expansion activities	Refer to Footnote 14	Fauna	Operational	Strict rules and punishment should be adhered to offenders entering the natural environment outside of the footprint, hunting or utilising firewood from the surrounds.	N/A	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Closure and Rehabilitation	Active rehabilitation of degraded landscapes should commence and be done concurrently during the operational phase.	Pre-impact vegetation	Life of mine
Expansion activities	Refer to Footnote 14	Fauna	Closure and Rehabilitation	To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continually
Expansion activities	Refer to Footnote 14	Fauna	Closure and Rehabilitation	Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas.	As above	As Above
Expansion activities	Refer to Footnote 14	Fauna	Closure and Rehabilitation	When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas, especially for larger mammalian species within the area.	As above	As Above
Expansion activities	Refer to Footnote 14	Fauna	Closure and Rehabilitation	Impacts will begin to subside and move towards a positive scale (ideally).	As above	As Above
Operation and establishment of the opencast pits	Refer to Footnote 14	Surface water	Construction	Use the terrain to shield the opencast pits from sensitive areas. Hilltop sites	Resource water quality objectives as set by the DWS	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				should be avoided as they impact adjacent catchments	and compliance with licence requirements	
Operation and establishment of the opencast pits	Refer to Footnote 14	Surface water	Construction and operational	Pump rainwater and groundwater that collects in the opencast pits and store for use as process water or dust suppression. Prevent the formation of shallow dams in rehabilitated areas. Develop post mining environments that recreate habitats where possible or structure altered landscapes to be compatible with regional habitats.	Compliance with EMPr recommendations and management measures	Life of mine
Operation and establishment of the opencast pits	Refer to Footnote 14	Surface water	Decommissioning	Consolidate development areas and develop multi- use options or infrastructure corridors for roads, pipelines, power and communication links. Clear invasive alien vegetation and re-establish diverse indigenous species during on-going rehabilitation. Implement habitat rehabilitation. Disturbance of catchment or reduction in catchment discharge requires a license from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations. Discharge only treated water meeting legal standards into watercourse to supplement clean runoff. Remain within catchment discharge parameters determined from pre-mining analysis.	Compliance with EMPr recommendations and management measures	Life of mine
Operation and establishment of the waste rock dumps	Refer to Footnote 14	Storm water	Construction	Clear invasive alien vegetation and re-establish diverse indigenous species during on-going rehabilitation. Develop post mining environments that recreate habitats where possible or structure	As per Closure plan	After closure

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				altered landscapes to be compatible with regional habitats.		
Operation and establishment of the waste rock dumps	Refer to Footnote 14	Storm water	Construction, Operation and Decommissioning	Implement habitat rehabilitation. Disturbance of catchment or reduction in catchment discharge requires a licence from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations. Discharge only treated water meeting legal standards into watercourse to supplement clean runoff. Remain within catchment discharge parameters determined from pre-mining analysis	As per Closure plan	After closure
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Refer to Footnote 14	Storm water	Construction and Operational	Drip tray (or suitable alternative) and drum to store excavated spill affected soil for disposal at a registered facility	Compliance with EMPr recommendations and management measures	Life of mine
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Refer to Footnote 14	Storm water	Construction, Operation and Decommissioning	Install oil traps to capture run-off from service areas.	Compliance with EMPr recommendations and management measures	Life of mine
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the	Refer to Footnote 14	Storm water	Construction, Decommissioning	Implement dust suppression in the area	Compliance with EMPr recommendations and management measures	Life of mine
				Ensure that sufficient storm water management is in place to capture run-off and remove silt from the water before being discharged to the environment		Life of mine
				Implement on-going habitat rehabilitation		Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
run of mine and other activities				Only clear areas that will be mined and rehabilitate areas as soon as mining has been finished.		Life of mine
Removal of topsoil and overburden/waste rock and stockpiling	Refer to Footnote 14	Surface water	Construction and Operational	Implement soil conservation measures.	Compliance with EMPr recommendations and management measures	Life of mine
				Integrate disturbed area to most appropriate land use to ensure long-term stability of restored topsoil.		Life of mine
				Vegetate topsoil stockpile to prevent erosion from the stockpile.		Life of mine
				Conduct a once of waste classification of the stockpiles to determine potential impacts on the surface water resource.		Life of mine
Establishment of an access route as the opencast pits expands, mobilisation of equipment and preparation of area for mining	Refer to Footnote 14	Surface water	Construction and Operational	Drip tray (or suitable alternative) and drum to store excavated spill affected soil for disposal at a registered facility.	Compliance with EMPr recommendations and management measures	Life of mine
				Implement dust suppression on roads.		Life of mine
Storm water Management	Refer to Footnote 14	Surface water	Construction, Operational and Post Closure	Implement storm water diversion and contour berms to separate clean and contaminated water systems around the pit and infrastructure areas. Ensure that the system is design taking into consideration the runoff for the soil type and slope gradient.	Compliance with EMPr recommendations and management measures	Life of mine
				Disturbance of catchment or reduction in catchment discharge requires a licence from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations.		Life of mine
				Discharge only treated water which meets legal standards into a watercourse to supplement clean runoff.		Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Optimise residue stockpile and deposit slope length and gradient to reduce erosion effect of storm runoff.		Life of mine
				Place residue stockpiles outside the 1:100 year flood line on any watercourse or dam or 100 m from a watercourse or borehole.		Life of mine
				Before dumping overburden in worked out pit levels that may be submerged ensure that it will not pollute or degrade over time to produce poor quality leachates.		Life of mine
Operation and generation of Residue deposits (Waste rock dumps)	Refer to Footnote 14	Surface water	Construction and Operational	Analyse soils, treat it to ameliorate salinity or contamination and dispose of untreatable soils at an approved disposal site.	Compliance with EMPr recommendations and management measures	Life of mine
				Optimise residue stockpile and deposit slope length and gradient to reduce erosion effect of storm runoff.		Life of mine
				Place stockpile areas outside the 1:100 year flood line on any watercourse or dam or 10m from a wetland, watercourse or borehole.		Life of mine
				Before dumping waste material in worked out pit levels that may be submerged ensure that it will not pollute or degrade over time to produce poor quality leachates.		Life of mine
				Capture run-off from stockpile areas in a suitably designed and constructed dam.		Life of mine
				Ensure that stockpile areas are bunded and that the area is lined as per the NEMWA regulations for the applicable waste type to prevent ingress into groundwater resource.		Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Conduct waste classification on all residue deposits.		Life of mine
Sewage generation, workshop operations	Refer to Footnote 14	Surface water	Construction and Operational	Implement minimum distance of 100 m from a water resource and design adequate pollution control structures around sites and ensure effective reaction measures to control emergency spills.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
				If septic tanks are used keep record of the safe disposal of the sewage by the appointed contractor.		Life of mine
				Ensure that the sump at the workshop is maintained and cleaned as needed.		Life of mine
Dust Generation	Refer to Footnote 14	Surface water	Construction and Operational	Dust suppression by spraying water or non-contaminating liquids in pit during operations, spraying haul roads, crusher and screening plant.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
				Prevent dust from transported product by washing vehicles and covering loads.		Life of mine
				Ensure that site is protected from prevailing winds.		Life of mine
Surface clearing and preparation.	Refer to Footnote 14	Groundwater	Construction	Re-vegetate.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Hydrocarbon spills.	Refer to Footnote 14	Groundwater	Construction	Clean any hydrocarbon spills in the appropriate manner.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
ROM stockpiling & Waste Rock Dump.	Refer to Footnote 14	Groundwater	Operational	Should a contamination plume be detected, groundwater abstraction or	Resource water quality objectives as set by the DWS	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				other measures should be implemented to contain plume.	and compliance with licence requirements	
Hydrocarbon spills.	Refer to Footnote 14	Groundwater	Operational	Clean any hydrocarbon spills in the appropriate manner.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Opencast Mining.	Refer to Footnote 14	Groundwater	Operational	Abstraction of groundwater to contain the contamination plume.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Infrastructure removal.	Refer to Footnote 14	Groundwater	Closure and Rehabilitation	Remove all surface infrastructure as soon as mining has ceased. This will eliminate the impact on the groundwater regime.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Opencast Pits	Refer to Footnote 14	Groundwater	Post Closure	Should a contamination plume be detected, groundwater abstraction or other measures should be implemented to contain plume.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Overall construction	Refer to Footnote 14	Visual	Construction	The visual impact can be minimized creating visual barriers. The construction area will be cleared as soon as construction of the infrastructure is finished	Compliance with EMPr recommendations and management measures	Life of mine
				Dust from Stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust.		Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				The visual impact can be minimized by the creation of visual barriers.		As Above
				Planting indigenous vegetation.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
				Clearing only vegetation as required.		
				Rehabilitating any disturbed areas as soon as possible.		
Site clearing, removal of topsoil and vegetation	Refer to Footnote 14	Air Quality	Construction	Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
				Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur.	N/A	Life of mine
				Topsoil should be re-vegetated to reduce exposure areas.	N/A	As needed
				During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised.	N/A	Continually
				Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads.	N/A	As needed
				When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads.	N/A	Continually
				Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form.	N/A	Continually
				Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect.	N/A	As needed
				Any crusting of the surface binds the erodible material.	N/A	As needed

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				All stockpiles to be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation)..	N/A	As needed
Construction of surface infrastructure	Refer to Footnote 14	Air Quality	Construction	Blasting should also not take place when poor atmospheric dispersion is expected i.e. early morning and late evening.	Good practises	Continually
				Material need to be removed to dedicated stockpiles to be used during rehabilitation.	Compliance with EMPr	Continually
				This hauling of materials should take place on roads which is being watered and/or sprayed with dust suppressant.	Good practises	Continually
				To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	Good practises	As needed
				Constricting the areas and time of exposure of pre-strip clearing in advance of construction to limit exposed soil surfaces.	Compliance with EMPr	Life of mine
General transportation, hauling and vehicle movement on site	Refer to Footnote 14	Air Quality	Construction	Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
				To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	As per Air quality impacts identified	As needed
				Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.	N/A	As needed

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				The drop heights should be minimised when depositing materials to the ground.	As above	As needed
				Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily.	As above	Continually
Overall operational activities	Refer to Footnote 14	Air Quality	Operational	See Construction Phase mitigation measures.	N/A	Continually
Demolition & Removal of all infrastructure (incl. transportation off site)	Refer to Footnote 14	Air Quality	Decommissioning	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase.	Good practises	Life of mine
				The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
				Speed restrictions should be imposed and enforced.	N/A	As needed
				Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	Continually
				Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Continually
				Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	Best practises	Life of mine
				Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust.	N/A	Life of mine
				Dust suppression of roads being used during rehabilitation should be enforced.	As above	As Above
Rehabilitation (spreading of soil, revegetation & profiling/contouring).	Refer to Footnote 14	Air Quality	Decommissioning	Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option.	N/A	Life of mine
				Plants with roots that bind the soil, and vegetation cover should be used that	N/A	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				breaks the impact of falling raindrops, thus preventing wind and water erosion.		
				Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings.	N/A	Life of mine
				The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
				Spreading of soil must be performed on less windy days.	N/A	Life of mine
				The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation.	N/A	Life of mine
				Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels.	N/A	Life of mine
				Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks.	N/A	Life of mine
				The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall.	N/A	Life of mine
				Speed restrictions should be imposed and enforced.	N/A	Life of mine
				Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	Life of mine
				Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	N/A	Life of mine
				Hard surfaced haul roads or standing areas to be washed down and swept to remove accumulated dust.	N/A	Life of mine
				Dust suppression of roads being used during rehabilitation should be enforced.	N/A	Life of mine
				It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion.	N/A	Life of mine
				These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.	N/A	Life of mine
Site clearing, removal of topsoil and vegetation	Refer to Footnote 14	Heritage and Culture	Construction, Operational and Decommissioning	Conduct detailed mapping of the TWF1 area and the related erosion donga in order to determine the extent of the archaeological deposit and sites located here. Collect samples / excavation of surface features of material dating to the Stone Age and Iron Age once approval is received from SAHRA.	SANS Permit	Before construction begins
				Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either of the wrong kind to contain fossils in the case of the Kuruman and Gamagara Formations, or no trace fossils were found in this site, in the case of the Ghaap Group. Furthermore, the material to be targeted is not in the limestones of the Ghaap Group. Since there is an extremely small chance that	SANS Permit	Before construction begins

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				trace fossils from the nearby Ghaap Group limestones may be disturbed, a Fossil Chance Find Protocol has been added to this report.		
Overall construction and operational activities	Refer to Footnote 14	Heritage and Culture	Construction, Operation and Decommissioning	Salene Manganese Mine will form part of the history of the local area. Some mine infrastructure may be preserved as local heritage resources. Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist; Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in order to verify the presence or absence of any such material; Any graves in the vicinity of the mining operations that will or not be directly affected must be documented and monitored for damage.	As above	As above
Crime. Health, HIV and Covid-19	Refer to Footnote 14	Socio-Economy	Construction, Operation and Decommissioning	Labour should be sourced from the local settlement areas to prevent influx of foreigners who are likely to disrupt the social fabric, values and norms of the village people.	Adherane to mining charter	Continually

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Through the SLP and day-to-day training and awareness programmes, pandemics such as HIV and Covid-19 can be managed and minimized. The Salene mine must also have an HIV and Covid-19 awareness outreach programme in conjunction with local health centres and clinics to extend awareness and knowledge about the diseases to the broader communities affected by the mine activities and proposed extension. Visible policing and community policing forums must be established to curb incidents of crime in the communities. This option must be implemented in conjunction with existing municipal processes to manage crime and illegal activities.		
Land tenure, use and capability	Refer to Footnote 14	Socio-Economy	Construction, Operation and Decommissioning	Rehabilitate the land to as close as possible to its wilderness and grazing land state during and after the mining activities are concluded. Re-vegetation should be with indigenous plant species that are able to sustain the regional climate and soil conditions. The farm where the current mining activities are taking place, is already a restricted/controlled access, therefore the Salene Mine proposed activities will not reduce availability of natural resources and land to local communities.	As above	As above
Noise	Refer to Footnote 14	Socio-Economy	Construction, Operation and Decommissioning	MITIGATION: Measures such as ensuring all vehicles and equipment are in good working	As per Noise impacts Identified	As per Noise impacts Identified

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				order, and that any faulty exhaust- and/or intake silencers are replaced timorously, will reduce the severity and significance of the impact. The noise generating aspects and equipment must be confined to the mining area approved by the DMRE under the mining right authorization. Drilling and blasting is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. Personnel working within the plant must wear ear protection gear. A complete blasting schedule and timeframes must be compiled and communicated with the adjacent communities and farm homesteads to ensure that they are notified in advance prior to blasting taking place. Operators must wear ear protection at all times when operating the earth moving equipment and machinery to prevent noise induced hearing loss. Noise pollution must be monitored monthly, and recorded throughout the life of mine.		
Air Pollution	Refer to Footnote 14	Socio-Economy	Construction and Operational	Wetting of the access roads with water periodically to suppress the dust will greatly reduce the impact of dust. This wetting with water must be done daily during dry and windy seasons. Dust and smoke monitoring will be	As per Air Quality Impacts Identified	As per Air Quality Impacts Identified

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				conducted during the life of mine to determine the prominent wind directions and dust / smoke levels at various points around the mining site. In term of the requirements of the Mine Health and Safety Act, 1996 Salene Mine must provide protective clothing and equipment for all its employees, and must periodically conduct risk assessments to analyse and monitor the effects of dust and smoke on the staff members and the surrounding environment. Concurrent rehabilitation and re-vegetation of the mining site will also reduce surfaces that are exposed to wind generated dust.		
Light and Visual	Refer to Footnote 14	Socio-Economy	Construction and Operational	Concurrent rehabilitation should be implemented throughout the life of the mine to minimize and return the environment to - as much as possible – the original status. Screening with vegetation (trees) should also be implemented to mask the mine and the other mine infrastructure from the main road, various settlement viewpoints and soften the visual impacts. The visual impact of the waste rock and surface infrastructure sites can be reduced by doing the following: Filling up the mining site to match the surrounding landscape as closely as possible in the final phase of rehabilitation; Planting trees on the available fill	As per visual Impacts identified	As per visual Impacts identified

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				material at a high density in the first phase of rehabilitation to match the "texture" of the surrounding landscape; Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e.. grey vs reddish brown). To reduce the impact of the Salene Mine on the topography and restore the landscape character to closely resemble the conditions prior to the open pits and waste rock the following is recommended: Studying the contour map of the site and mimicking the surrounding areas on the final earthworks plan as closely as possible without excessive cost as part of the final phase of rehabilitation; Stabilising the substrate/backfill material by means of a variety of dry weather tolerant grasses, shrubs and trees; Screening the road as far as possible with indigenous trees, grasses and shrubs.		
Economic opportunities, infrastructure development and employment	Refer to Footnote 14	Socio-Economy	Construction, Operation and Decommissioning	Promotion of manganese beneficiation within the Kathu/Postmasburg area to improve the quality and value of the product being mined, and create further economic activity. Subject to economic modelling and feasibility study, a concentrator plant in the vicinity of Salene Mine can further stimulate significantly the economic activity in Tsantsabane Municipality, and the surrounding region.	N/A	Continually

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Labour should be sort from the local settlement areas to prevent influx of foreign people and job seekers who are likely to disrupt the social fabric, values and norms of the village people. Currently Salene Mine employs 147 persons – inclusive of permanent and contract employees.		
Daytime construction	Refer to Footnote 14	Noise	Construction	The mine should construct berms between mining areas and identified NSD; The mine must ensure that noise levels are less than 52 dBA at night at all NSD; The mine must include a component covering environmental noise in the Health and Safety Induction to sensitize all employees and contractors about this subject, especially those employees and contractors that have to travel past receptors at night or might be required to do work within 1 000 m from NSD at night. Establish complaints register with an open line to a relevant person that can act if there is a noise complaint. It is recommended that a noise monitoring programme is developed and implemented.	N/A	As needed before mining start
Nighttime construction	Refer to Footnote 14	Noise	Construction	See above Noise mitigation measures	N/A	As needed before mining start
Daytime overall operational activities	Refer to Footnote 14	Noise	Operational	See above Noise mitigation measures	N/A	As needed before mining start
Nightime overall operational activities	Refer to Footnote 14	Noise	Operational	See above Noise mitigation measures	N/A	As needed before mining start

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Ground vibration	Refer to Footnote 14	Social	Construction and Operational	The potential vibration levels should be discussed with the manager at Boskop mine to warn the security of potential blast vibration levels once blasts are to take place closer than 1,250 m from this BSR The developer should erect clear signs indicating blast dates and times on the R325	As per noise and socio-economy impacts identified	As per noise and socio-economy impacts identified
Ground vibration	Refer to Footnote 14	Social	Construction and Operational	Blasts vibration levels to be calculated for each blast to take place within 1,250 m from any occupied structure. The blast should be controlled (charge per delay) to ensure a vibration level less than 2.54 mm/s at these structures;	As Above	As Above
Ground vibration	Refer to Footnote 14	Socio-Economy	Construction, Operation and Decommissioning	No mitigation is required to reduce vibration levels at the road and railway line.	As Above	As Above
Air Blast	Refer to Footnote 14	Topography	Operational	• Reprofile replaced hard and soft overburden material to mined out pit areas. Ensure that the reprofiled landform is in keeping with the adjacent un-mined land surface. • At the contact between pit and un-mined land, ensure slope of ground does not exceed five percent (5%). • Shape so that the topography is free draining. Reshaped areas of arable land capability must not have a final slope greater than four percent (4%). • Replace topsoil to achieve required pre-mining land capability. • Revegetate rehabilitated areas.	As Above	As Above
Fly rock	Refer to Footnote 14	Socio-Economy	Operational	Mine should initiate a forum to inform the close residents about the likely vibration	As Above	As Above

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast as well as a warning to residents that, when they are indoors during a blast, vibration of windows and ceilings may appear excessive. - Mine to erect blasting notice boards in the area with blasting dates and times highlighted. - Mine to prevent blasting in adverse meteorological conditions where possible (overcast conditions, strong wind blowing in direction of local community, early in the mornings or late in the afternoon).		
Overall construction and operational activities	Refer to Footnote 14	Soil	Construction	Using appropriate methods of excavating that are in accordance with regulatory requirements and industrial best practices procedures	As above	Compliance with EMPr recommendations and management measures
				Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces	As above	As above
				Using drainage control measures and culverts to manage the natural flow of surface runoff.	As above	As above
Overall construction and operational activities	Refer to Footnote 14	Soil	Construction	Minimise the footprint of the infrastructure expansion- All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase.	As above	As above

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained by using a drip tray with plastic sheeting filled with absorbent material;	As above	As above
				Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area;	As above	As above
				Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;	As above	As above
				Containing potentially contaminating fluids and other wastes	As above	As above
				Cleaning up areas of spillage of potentially contaminating liquids and solids.	As above	As above
Overall construction and operational activities	Refer to Footnote 14	Soil	Construction	The moisture content of access road surface layers must be maintained through routine spraying or the use of an appropriate dust suppressant. Access roads must be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts will be installed to permit free drainage of existing water courses.	As above	As above
Overall construction and operational activities	Refer to Footnote 14	Land Capability	Construction, Decommissioning	The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction	Compliance with EMPr recommendations and management measures	Life of mine

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				workers to the clearly defined limits of the construction site.		
Overall construction and operational activities	Refer to Footnote 14	Soil	Operational	Construction Management measures must still be applied during operational phase. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams. Routine monitoring will be required in and around the sites	As above	As above
Overall construction and operational activities	Refer to Footnote 14	Soil	Operational	Construction Management measures must still be applied during operational phase. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams. Routine monitoring will be required in and around the sites	As above	As above

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Overall construction and operational activities	Refer to Footnote 14	Soil	Operational	Construction Management measures must still be applied during operational phase. Stockpiles are managed so they do not become contaminated and then need additional handling or disposal;	As above	As above
				A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled;	As above	As above
				Processing areas should be contained and systems designed to effectively manage and dispose of contained storm water, effluent and solids;	As above	As above
				Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater;	As above	As above
				Equipment, and vehicle maintenance and wash-down areas, are contained and appropriate means provided for treating and disposing of liquids and solids;	As above	As above
				Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems);	As above	As above
				Solids and slurries are disposed of in a manner consistent with the nature of the material and avoids contamination; and	As above	As above
				Effluent and processing drainage systems avoid leakage to ground.	As above	As above

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
Overall construction and operational activities	Refer to Footnote 14	Soil	Decommissioning	Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible.	As above	As above
				Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible.	As above	As above
				Losses of fuel and lubricants from the oil sumps of vehicles and equipment should be contained using a drip tray with plastic sheeting and filled with absorbent material;	As above	As above
				Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids and recovering contaminated soils and treating them off-site;	As above	As above
				Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;	As above	As above
				Containing potentially contaminating fluids and other wastes; and	As above	As above
				Cleaning up areas of spillage of potentially contaminating liquids and solids.	As above	As above
Overall construction and operational activities	Refer to Footnote 14	Land Capability	Decommissioning	All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site.	As above	As above
				Once the site has been cleared of infrastructure and potential	As above	As above

Activity/Receptor	Size and Scale of disturbance	Aspects affected	Phase	Mitigation measures	Compliance with Standards	Time period for implementation
				contamination, the slope must be re-graded (sloped) in order to approximate the pre-project aspect and contours		
				The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles.	As above	As above
				frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gullies have developed. In the event that vegetation has not re-established and erosion gullies have developed, remedial action should be taken.	As above	As above

5. IMPACT MANAGEMENT OUTCOMES

Table 5-1: (A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
Expansion activities	Possible loss of identified ecological support areas or ecological corridors. As a result of the construction activities fragmentation, degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	Flora	Construction and operational	Control Planning Rehabilitation	Design will be compliant with SANS standards and applicable legislation and be approved by the DWS.
Expansion activities	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas.	Flora	Construction and operational	Control Monitoring	No alien invasive plants on site

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
Expansion activities	Development and related activities may impact on the sensitive habitats related to the watercourses situated in close proximity to the development footprint	Flora	Construction and operational	Control Planning Removal Monitoring	Identify SCC and relocate once permit is received
Expansion activities	Rehabilitation could be ineffective if measures are not appropriately complied to or rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining	Flora	Closure/post-closure	Planning Monitoring Control	Mine health and Safety
Expansion activities	Construction will result in an increase of potentially destructive movement within the designated area. Destruction of habitat and other specialised animal species that are currently finding refuge within the area will migrate to other more favourable areas	Fauna	Construction and operational	Planning Education Removal Rehabilitation	Comply with Requirements of the EMPr
Expansion activities	The construction activities might result in impacts on sensitive areas or large-scale destruction (opencast or new stockpile areas) including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.	Fauna	Construction and operational	Planning Education Removal Rehabilitation	Comply with Requirements of the EMPr
Expansion activities	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area	Fauna	Operational	Planning rehabilitation Noise control Light control	Comply with Requirements of the EMPr
Expansion activities	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Plan (EMP) and Final Rehabilitation programme compiled for the specific mining area.	Fauna	Closure and Rehabilitation	Planning rehabilitation Noise control Light control	Pre-impact vegetation
Operation and establishment of the opencast pits	The location of the opencast pits in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the	Surface water	Construction	Planning and Management	Resource water quality objectives as set by the DWS and compliance with licence requirements

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
	proposed iron opencast pit which is of concern as it is located on a watershed area				
	Rainwater captured in the opencast pits will reduce sheet flow to nearby watercourses and may be contaminated and needs to be pumped to the pollution control dam to prevent impacts on water quality downstream that in turn could impact on the habitat and biota.	Surface water	Construction and operational	Planning and Management	Compliance with EMPr recommendations and management measures
	It is not expected that it would be possible to backfill the opencast pits 100% due to insufficient material being available thereby creating a permanent sink for water if not diverted around the opencast pits	Surface water	Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
Operation and establishment of the waste rock dumps	The location of the WRD in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the existing WRD and its proposed expansion which is of concern as it is located on / near a watershed area	Storm water	Construction	Planning and Management	As per Closure plan
	Run-off from the WRD could be contaminated (to be confirmed by leachate test) and this could result in water quality impacts downstream if not contained in a pollution control dam	Storm water	Construction, Operation and Decommissioning	Planning and Management	As per Closure plan
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Chemical or fuel spillages from equipment used in the all the mining related activities could contaminate the soil profile	Storm water	Construction and Operational	Planning and Management	Compliance with EMPr recommendations and management measures
	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff that if not managed and captured correctly could reach surface water resources during rainfall events.	Storm water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the	Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in nearby watercourses	Storm water	Construction, Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
run of mine and other activities					
Removal of topsoil and overburden/waste rock and stockpiling	If not managed correctly the topsoil heap could fail and result in increased siltation in watercourses.	Surface water	Construction, Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Depending on the waste classification and leachate generated by the overburden / Waste rock run-off from these areas could result in poor quality water entering the watercourses.	Surface water	Construction, Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.	Surface water	Construction, Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
Storm water Management	Concentrated storm runoff from the opencast pits surrounds and infrastructure areas could be erosive, causing sheet, rill and donga erosion features.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Dirty storm water from the opencast pits could impacts on the water quality of downstream surface water areas.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Should water be allowed to be captured in the opencast pits it could result in less water to the downstream surface water area.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Altered storm water runoff response due to large impervious areas (hardened surfaces) and concentrated runoff in drainage systems.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Contaminated runoff or leachate concentrated in mined out opencast pits can decant or contaminate through controlled discharge of partially treated water into natural systems. Opencast pit sump	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked out pit and can lead to increased groundwater recharge and potential regional impact of low quality water.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
	Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
Operation and generation of Residue deposits (Waste rock dumps)	Stockpiling of these materials could result in salinization, mineralisation and toxic contamination of soils beneath them.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
	Leachate from these materials could result in poor quality water entering the surface water resource which could impact on the health of the system.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Compliance with EMPr recommendations and management measures
Sewage generation, workshop operations	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Comply with Requirements of the EMPr and the Water Use Licence
	Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.	Surface water	Construction, Operation and Decommissioning	Planning and Management	Comply with Requirements of the EMPr and the Water Use Licence
Dust Generation	Dust generation from the beneficiation processes, product and waste transport routes, residue stockpiles or deposits and un-rehabilitated areas can impair aquatic vegetation photosynthesis and could potentially impact on water quality depending on the constituents.	Surface water	Construction and Operational	Planning and Management	Comply with Requirements of the EMPr and the Water Use Licence
Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Groundwater	Construction	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Hydrocarbon spills.	Spills from construction vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater	Construction	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
ROM stockpiling & Waste Rock Dump.	Contamination may be expected in terms of nitrate from explosives.	Groundwater	Operational	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Hydrocarbon spills.	Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Groundwater	Operational	Monitoring	Resource water quality objectives as set by the

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
					DWS and compliance with licence requirements
Opencast Mining.	A plume can begin to migrate downgradient since dewatering of the pit is not expected to be conducted	Groundwater	Operational	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Infrastructure removal.	Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality.	Groundwater	Closure and Rehabilitation	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Opencast Pits	A plume may continue to migrate further downgradient of the rehabilitated opencast pits.	Groundwater	Post Closure	Monitoring	Resource water quality objectives as set by the DWS and compliance with licence requirements
Overall construction	Impacts on viewpoints that had a visual exposure during construction phase	Visual	Construction	Management	Compliance with EMPr recommendations and management measures
	Permanent visual impact of the structures on users of roads and land owners	Visual	Operational	Planning Management Rehabilitation	Compliance with EMPr recommendations and management measures
Site clearing, removal of topsoil and vegetation	A number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction	Air Quality	Construction	Planning Management Rehabilitation	Regional Air Quality objectives if set, otherwise national objectives
Construction of surface infrastructure	Construction of access roads, pipes, storm water diversion berms, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust)	Air Quality	Construction	Dust management Planning Rehabilitation	Good practises
General transportation, hauling and vehicle movement on site	Transportation of workers and materials in and out of the mine site will result in the production of fugitive dust (containing TSP, as well as PM10 and PM 2.5) due to suspension of friable materials from earth roads	Air Quality	Construction	As Above	Regional Air Quality objectives if set, otherwise national objectives

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
Overall operational activities	Use and maintenance of access road, dust and material handling, Haul roads, and wind erosion from stockpile	Air Quality	Operational	As Above	N/A
Demolition & Removal of all infrastructure (incl. transportation off site)	Demolition of buildings, foundations, and removal of rubbles, cleaning up of workshops, fuel reagents , removal of power supply and removal of haul and access roads will generate fugitive dust similar to impacts during construction phase.	Air Quality	Decommissioning	As Above	Good practises
Rehabilitation (spreading of soil, revegetation & profiling/contouring).	Topsoil reshaping and restructuring of the landscape. Incorrect rehabilitation will cause permanent damage to the surface infrastructure	Air Quality	Decommissioning	As Above	N/A
Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Heritage and Culture	Construction, Operational and Decommissioning	Collection and preservation of artefacts	SANS Permit
Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Heritage and Culture	Construction, Operational, and Decommissioning	As Above	SANS Permit
Overall construction and operational activities	Development and related activities may impact on the sensitive habitats related to the gravesite and other heritage sensitive area situated in close proximity to the development footprint may be affected by the proposed development.	Heritage and Culture	Construction, Operation and Decommissioning	Implementing Policies and plans Community participation	As above
Crime. Health, HIV and Covid-19	Influx of foreigners and job seekers and increase in disposable income for local people may have negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Socio-Economy	Construction, Operation and Decommissioning	Implementing Policies and plans Community participation	N/A
Crime. Health, HIV and Covid-19	Cumulative: Possible loss of Life and Covid Pandemic spread.	Socio-Economy	Construction, Operation and Decommissioning	As Above	N/A
Land tenure, use and capability	Land capability of the affected area will be permanently be affected especially the open pit area. The proposed expansion will increase loss of grazing land, restricted access and loss of cultural or traditional practices.	Socio-Economy	Construction, Operation and Decommissioning	As Above	As above
Land tenure, use and capability	Cumulative: Further changes in land use due to secondary industries that may be developed around the area.	Socio-Economy	Construction, Operation and Decommissioning	As Above	As above

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
Noise	The proposed Salene Mine activities will not raise noise levels significantly. Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active	Socio-Economy	Construction, Operation and Decommissioning	As per Noise impacts Identified	As per Noise impacts Identified
Noise	Cumulative: The noise impacts of the proposed Salene Mine expansion projects and exiting Maremane settlement activities in the area do not overlap, therefore the cumulative impacts to noise sensitive areas are negligible, and remain of low negative significance as per the current ambient noise levels.	Socio-Economy	Construction, Operation and Decommissioning	As Above	As per Noise impacts Identified
Air Pollution	Excessive dust may have an impact on surrounding vegetation and an indirect impact on animals that feed on the vegetation as well as any nearby communities or farm homesteads. Dust will be generated from the Salene Mine activities, access roads to and from the opencast pits and waste rock dumps.	Socio-Economy	Construction, Operation and Decommissioning	As per Air Quality Impacts Identified	As per Air Quality Impacts Identified
Air Pollution	Cumulative: Expansion activities may add to the annual PM10 concentrations in the area,	Socio-Economy	Construction, Operation and Decommissioning	As Above	As per Air Quality Impacts Identified
Light and Visual	The proposed Salene Manganese mine waste rock dumps, opencast pits activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine is visible from R325 main road.	Socio-Economy	Construction, Operation and Decommissioning	As per visual Impacts identified	As per visual Impacts identified
	Cumulative: The proposed additional mining infrastructure at Salene Mine may form part of the “sense of place” in the long term, even after operations cease.	Socio-Economy	Construction, Operation and Decommissioning	As Above	As per visual Impacts identified
Economic opportunities, infrastructure development and employment	Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The adjacent community (Maremane) in terms of skills training, local economic development projects, and improved infrastructure. This is a requirement in terms of Section 22 and Regulation 42 of the MPRDA, 2002. Increase in disposable income may	Socio-Economy	Construction, Operation and Decommissioning	Implementing Policies and plans Community participation	N/A

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
	create negative social impacts such as crime, alcoholism and prostitution in and around the project area.				
	Cumulative impacts of socio-economic change include increase in crime, alcohol abuse, prostitutions, HIV and AIDS, Covid-19 and other transmitted diseases, influx of foreign people and change in social fabric of the community. Improved way of life due to job creation.	Socio-Economy	Construction, Operation and Decommissioning	As Above	N/A
Daytime construction	Noise caused by multiple construction activities during daytime	Noise	Construction	Control Planning Removal Monitoring	N/A
Nighttime construction	Noise caused by multiple construction activities during night time	Noise	Construction	As Above	N/A
Daytime overall operational activities	Noise caused by multiple operational activities during daytime such as haul truck movement and processing plant	Noise	Operational	As Above	N/A
Nightime overall operational activities	Noise caused by multiple operational activities during night time such as haul truck movement and processing plant	Noise	Operational	As Above	N/A
Ground vibration	Impacts on surrounding communities caused by vibrations during blasting activities	Social	Construction and Operational	As per noise and socio-economy impacts identified	As per noise and socio-economy impacts identified
Ground vibration	Damage to residential structures within the area	Social	Construction and Operational	As Above	As Above
Ground vibration	Damage to tar roads and railway line close to the mine	Socio-Economy	Construction, Operation and Decommissioning	As Above	As Above
Air Blast	Air blast impact for a 924kg blast (Worst case)	Topography	Operational	As Above	As Above
Fly rock	Risk of fly rock hitting adjacent road users, neighbouring properties, humans and fauna	Socio-Economy	Operational	As Above	As Above
Overall construction and operational activities	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil	Soil	Construction	Management Rehabilitation Planning	As above

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
	particles are removed from the area through dust transportation or in surface water run-off.				
Overall construction and operational activities	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project.	Soil	Construction	Management Rehabilitation Planning	As above
Overall construction and operational activities	Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure and this waste may increase the risk of soil pollution.	Soil	Construction	Management Rehabilitation Planning	As above
Overall construction and operational activities	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture	Soil	Construction	Management Rehabilitation Planning	As above
Overall construction and operational activities	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	Land Capability	Construction, Decommissioning	Management Rehabilitation Planning	Compliance with EMPr recommendations and management measures
Overall construction and operational activities	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or vegetation, will be susceptible to soil erosion.	Soil	Operational	Management Rehabilitation Planning	As above
Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Soil	Operational	Management Rehabilitation Planning	As above

Activity/Receptor	Potential Impacts	Aspects affected	Phase	Mitigation Type	Compliance with Standards
Overall construction and operational activities	Infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution	Soil	Operational	Management Rehabilitation Planning	As above
Overall construction and operational activities	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.	Soil	Decommissioning	Management Rehabilitation Planning	As above
Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Soil	Decommissioning	Management Rehabilitation Planning	As above
Overall construction and operational activities	vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution.	Soil	Decommissioning	Management Rehabilitation Planning	As above
Overall construction and operational activities	Decommissioning will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time.	Land Capability	Decommissioning	As Above	As above

6. IMPACT MANAGEMENT ACTIONS

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

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
Expansion activities	Possible loss of identified ecological support areas or ecological corridors. As a result of the construction activities fragmentation,	A control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also vital that no additional fragmentation occurs and that all roads are clearly demarcated and kept to without any	Design will be compliant with SANS standards and applicable legislation and be	During the planning and construction phase. Monitor vegetation and

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	degradation or compression may occur if heavy construction vehicles are not kept to the demarcated roads.	exceptions. No vehicles or personnel are permitted outside of these demarcated roads.	approved by the DWS.	alien invasive species annually.
		The operational area should be fenced in in order to reduce human and vehicle traffic to areas outside of the demarcated mining area.	As Above	As Above
		The vegetation removal during the construction phase should be controlled and very specific.	As Above	As Above
		Continuous rehabilitation of the area should occur during construction, where re-vegetation practices should be prioritised.	As Above	As Above
Expansion activities	Construction, human and vehicle movement and introduction of foreign material e.g. soils may lead to the introduction of alien invader species, impacting on the floral characteristics of the project site and adjacent natural areas.	A management plan for the control of invasive and exotic plant species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance.	No alien invasive plants on site	Life of mine
Expansion activities	Development and related activities may impact on the sensitive habitats related to the watercourses situated in close proximity to the development footprint	All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas.	Identify SCC and relocate once permit is received	Before construction commence
		If any SCC are encountered within the subject property in the future, the following should be ensured:	As above	As above
		If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property.	As above	As above
		All rescue and relocation plans should be overseen by a suitably qualified specialist.	As above	As above
		Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within the proposed development area that will be destroyed.	As above	As above
		Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.	As above	As above
Expansion activities	Rehabilitation could be ineffective if measures are not appropriately complied to or	A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the mining closure phase.	Mine health and Safety	Post closure

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	rehabilitation is not planned well in advance. Without the necessary mitigation measures, rehabilitation will be unsuccessful and the environment will not be self-sustaining	Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase.	As above	As Above
		Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied.	As above	As Above
		Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary. A report should be written and stored and should be available at all times	As above	As Above
Expansion activities	Construction will result in an increase of potentially destructive movement within the designated area. Destruction of habitat and other specialised animal species that are currently finding refuge within the area will migrate to other more favourable areas	The construction area should be well demarcated and construction workers should not enter adjacent areas.	Comply with Requirements of the EMPr	Life of mine
		Permits should be obtained for the remainder of the SCC known to occur on site. The exact location of these plants should be recorded and permits obtained.	Permits for relocation in place	As needed
		phase of the development, a specialist should be consulted and it could also be reported to the Animal Demographic Unit (ADU - Mammal Map) as an updated record for their database.	N/A	Continually
		Adhere to all management and mitigation measures as prescribed within the Environmental Management Programme (EMP) report.	Comply with Requirements of the EMPr	Life of mine
		To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continually
		Continuous rehabilitation of the area should occur, immediate closure and rehabilitation of any areas dug during the construction and utilised during operation. This will entail the spreading of topsoil, revegetation and management of invasive species in areas where it will be required.	Pre-impact vegetation	Continually
Expansion activities	The construction activities might result in impacts on sensitive areas or large-scale	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary.	Comply with Requirements of the EMPr	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	destruction (opencast or new stockpile areas) including increased movement, traffic and construction personnel to the area. Destruction of habitat and other specialised animal species including possible birds of prey that could likely inhabit the natural areas may be compromised and/or the prey (smaller animals and reptiles) that is currently finding refuge will migrate to other more favourable areas.	Adhere to all management and mitigation measures as prescribed within the Environmental Management Programme (EMP) report.	Comply with Requirements of the EMPr	Life of mine
		Keep spill kits and hazmat prevention kits on-site to remediate any spill immediately before reaching the natural environment. Dispose of waste and contaminated soil properly.	As above	As Above
		Prevent impacts from reaching downstream water resources by ensuring proper water management, especially in the event of rains, since the area has very low rainfall.	Comply with Requirements of the EMPr and the Water Use Licence	Continually
		Continuous rehabilitation of the area should occur in accordance with the EA/WUL, as well as monitoring as prescribed.	Pre-impact vegetation	Continually
		Ensure proper storm water management and designs are complied with. Storm water management will prevent impacts reaching the natural environment.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
Expansion activities	The operational activities might result in impacts to the natural environment due to prolonged activity and movement to and from the area	Fencing the footprint area will prevent movement into the natural veld areas and keep the impacts regulated within a controlled environment. It was observed during the field assessment that site access control has already been implemented and main fences around the zone of influence has been erected. Animals may get used to movement by people in designated areas if it is a predictable situation. If movement is allowed into natural areas on a regular basis and the smell and sound of humans are found outside the demarcated development zones, it may result in animals moving away from the area and those that have specialised niches may flee and starve due to limited range and adaptability.	Comply with Requirements of the EMPr	Life of mine
		Continuous rehabilitation of the area should occur to ensure all impacts identified during operational phase is speedily managed and restored. This includes erosion and the management of Invasive plant species that may decrease the integrity of the vegetation types as a specialised habitat for animals.	Pre-impact vegetation	Life of mine
		Noise impacts should be monitored and kept in accordance to the regulated standard prescribed for the zoning of the area.	As per Noise impacts identified	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
		Prevent impacts and waste from reaching the water environment outside of the dirty footprint area. Waste that is not managed correctly may enter the environment or contaminate the river systems and therefore the aquatic ecosystems of the river during a rain event. This should be prevented by storing hazardous waste in bunded areas. Domestic waste and other waste should be managed in the appropriate manner and apply good housekeeping practices that will aid this issue.	Norms and standards for waste management activities as promulgated in terms of NEMWA	Life of mine
		Strict rules and punishment should be adhered to offenders entering the natural environment outside of the footprint, hunting or utilising firewood from the surrounds.	N/A	Life of mine
Expansion activities	Increased activity and traffic within a shorter timeframe (closure phase) may degrade the area if adherence is not in-line with the Environmental Management Plan (EMP) and Final Rehabilitation programme compiled for the specific mining area.	Active rehabilitation of degraded landscapes should commence and be done concurrently during the operational phase.	Pre-impact vegetation	Life of mine
		To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees.	N/A	Continually
		Ensure that an acceptable aesthetic scenario is created post closure. This will be reached through adequate rehabilitation practices by restoring damaged and degraded habitat areas.	As above	As Above
		When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas, especially for larger mammalian species within the area.	As above	As Above
		Impacts will begin to subside and move towards a positive scale (ideally).	As above	As Above
Operation and establishment of the opencast pits	The location of the opencast pits in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the proposed iron opencast pit which is of concern as it is located on a watershed area	Use the terrain to shield the opencast pits from sensitive areas. Hilltop sites should be avoided as they impact adjacent catchments	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	Rainwater captured in the opencast pits will reduce sheet flow to nearby watercourses and may be contaminated and needs to be pumped to the pollution control dam to prevent impacts on water quality downstream that in turn could impact on the habitat and biota.	Pump rainwater and groundwater that collects in the opencast pits and store for use as process water or dust suppression. Prevent the formation of shallow dams in rehabilitated areas. Develop post mining environments that recreate habitats where possible or structure altered landscapes to be compatible with regional habitats.	Compliance with EMPr recommendations and management measures	Life of mine
	It is not expected that it would be possible to backfill the opencast pits 100% due to insufficient material being available thereby creating a permanent sink for water if not diverted around the opencast pits	Consolidate development areas and develop multi- use options or infrastructure corridors for roads, pipelines, power and communication links. Clear invasive alien vegetation and re-establish diverse indigenous species during on-going rehabilitation. Implement habitat rehabilitation. Disturbance of catchment or reduction in catchment discharge requires a license from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations. Discharge only treated water meeting legal standards into watercourse to supplement clean runoff. Remain within catchment discharge parameters determined from pre-mining analysis.	Compliance with EMPr recommendations and management measures	Life of mine
Operation and establishment of the waste rock dumps	The location of the WRD in the landscape can impact on runoff by capturing inflow from upstream areas resulting in less water reaching the downstream surface water resource, it is especially the location of the existing WRD and its proposed expansion which is of concern as it is located on / near a watershed area	Clear invasive alien vegetation and re-establish diverse indigenous species during on-going rehabilitation. Develop post mining environments that recreate habitats where possible or structure altered landscapes to be compatible with regional habitats.	As per Closure plan	After closure
	Run-off from the WRD could be contaminated (to be confirmed by leachate test)	Implement habitat rehabilitation. Disturbance of catchment or reduction in catchment discharge requires a licence from DWS and is subject to investigation of the 'human needs reserve' and the	As per Closure plan	After closure

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	and this could result in water quality impacts downstream if not contained in a pollution control dam	'ecological reserve' to sustain the water needs of these populations. Discharge only treated water meeting legal standards into watercourse to supplement clean runoff. Remain within catchment discharge parameters determined from pre-mining analysis		
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Chemical or fuel spillages from equipment used in the all the mining related activities could contaminate the soil profile	Drip tray (or suitable alternative) and drum to store excavated spill affected soil for disposal at a registered facility	Compliance with EMPr recommendations and management measures	Life of mine
	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff that if not managed and captured correctly could reach surface water resources during rainfall events.	Install oil traps to capture run-off from service areas.	Compliance with EMPr recommendations and management measures	Life of mine
Operation and establishment of the opencast pits, residue deposit stockpiles, workshop, beneficiation of the run of mine and other activities	Vegetation clearance could lead to increased erosion that in turn could lead to increased siltation in the watercourses. Dust generated as a result of the vegetation clearance could impact on aquatic biota and plants in nearby watercourses	Implement dust suppression in the area	Compliance with EMPr recommendations and management measures	Life of mine
		Ensure that sufficient storm water management is in place to capture run-off and remove silt from the water before being discharged to the environment	Compliance with EMPr recommendations and management measures	Life of mine
		Implement on-going habitat rehabilitation	Compliance with EMPr recommendations and management measures	Life of mine
		Only clear areas that will be mined and rehabilitate areas as soon as mining has been finished.	Compliance with EMPr recommendations and management measures	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
Removal of topsoil and overburden/waste rock and stockpiling	If not managed correctly the topsoil heap could fail and result in increased siltation in watercourses.	Implement soil conservation measures.	Compliance with EMPr recommendations and management measures	Life of mine
	Depending on the waste classification and leachate generated by the overburden / Waste rock run-off from these areas could result in poor quality water entering the watercourses.	Integrate disturbed area to most appropriate land use to ensure long-term stability of restored topsoil.	Compliance with EMPr recommendations and management measures	Life of mine
	Erosion of restored topsoil due to inadequate erosion control measures could impact on water resources.	Vegetate topsoil stockpile to prevent erosion from the stockpile.	Compliance with EMPr recommendations and management measures	Life of mine
		Conduct a once of waste classification of the stockpiles to determine potential impacts on the surface water resource.	Compliance with EMPr recommendations and management measures	Life of mine
Establishment of an access route as the opencast pits expands, mobilisation of equipment and preparation of area for mining	Contamination of surface and groundwater resources due to spillage of vehicle movement.	Drip tray (or suitable alternative) and drum to store excavated spill affected soil for disposal at a registered facility.	Compliance with EMPr recommendations and management measures	Life of mine
		Implement dust suppression on roads.	Compliance with EMPr recommendations and management measures	Life of mine
Storm water Management	Concentrated storm runoff from the opencast pits surrounds and infrastructure areas could be erosive,	Implement storm water diversion and contour berms to separate clean and contaminated water systems around the pit and infrastructure areas. Ensure that the system is design taking into consideration the runoff for the soil type and slope gradient.	Compliance with EMPr recommendations and management measures	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	causing sheet, rill and donga erosion features.			
	Dirty storm water from the opencast pits could impacts on the water quality of downstream surface water areas.	Disturbance of catchment or reduction in catchment discharge requires a licence from DWS and is subject to investigation of the 'human needs reserve' and the 'ecological reserve' to sustain the water needs of these populations.	Compliance with EMPr recommendations and management measures	Life of mine
	Should water be allowed to be captured in the opencast pits it could result in less water to the downstream surface water area.	Discharge only treated water which meets legal standards into a watercourse to supplement clean runoff.	Compliance with EMPr recommendations and management measures	Life of mine
	Altered storm water runoff response due to large impervious areas (hardened surfaces) and concentrated runoff in drainage systems.	Optimise residue stockpile and deposit slope length and gradient to reduce erosion effect of storm runoff.	Compliance with EMPr recommendations and management measures	Life of mine
	Increased erosion, dust generation and potential chemical contaminants reduce surface water quality or result in discharge that exceeds the maximum concentrations permitted by the National Water Act.	Place residue stockpiles outside the 1:100 year flood line on any watercourse or dam or 100 m from a watercourse or borehole.	Compliance with EMPr recommendations and management measures	Life of mine
	Contaminated runoff or leachate concentrated in mined out opencast pits can decant or contaminate through controlled discharge of partially treated water into natural systems. Opencast pit sump	Before dumping overburden in worked out pit levels that may be submerged ensure that it will not pollute or degrade over time to produce poor quality leachates.	Compliance with EMPr recommendations and management measures	Life of mine
	Drainage of benches and concentration of rainfall leads to creation of large volume open water bodies in worked	As Above	Compliance with EMPr recommendations	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	out pit and can lead to increased groundwater recharge and potential regional impact of low quality water.		and management measures	
	Pumping of process water from the pit sump can discharge poor quality water exceeding minimum standards.	As Above	Compliance with EMPr recommendations and management measures	Life of mine
Operation and generation of Residue deposits (Waste rock dumps)	Stockpiling of these materials could result in salinization, mineralisation and toxic contamination of soils beneath them.	Analyse soils, treat it to ameliorate salinity or contamination and dispose of untreatable soils at an approved disposal site.	Compliance with EMPr recommendations and management measures	Life of mine
	Leachate from these materials could result in poor quality water entering the surface water resource which could impact on the health of the system.	Optimise residue stockpile and deposit slope length and gradient to reduce erosion effect of storm runoff.	Compliance with EMPr recommendations and management measures	Life of mine
		Place stockpile areas outside the 1:100 year flood line on any watercourse or dam or 10m from a wetland, watercourse or borehole.	Compliance with EMPr recommendations and management measures	Life of mine
		Before dumping waste material in worked out pit levels that may be submerged ensure that it will not pollute or degrade over time to produce poor quality leachates.	Compliance with EMPr recommendations and management measures	Life of mine
		Capture run-off from stockpile areas in a suitably designed and constructed dam.	Compliance with EMPr recommendations and management measures	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
		Ensure that stockpile areas are bunded and that the area is lined as per the NEMWA regulations for the applicable waste type to prevent ingress into groundwater resource.	Compliance with EMPr recommendations and management measures	Life of mine
		Conduct waste classification on all residue deposits.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
Sewage generation, workshop operations	Vehicle wash bays and workshop facilities produce petrochemical and solvent contaminated runoff.	Implement minimum distance of 100 m from a water resource and design adequate pollution control structures around sites and ensure effective reaction measures to control emergency spills.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
	Sanitary conveniences, fuel depots or storage facilities of potentially polluting substances can contaminate surface water.	If septic tanks are used keep record of the safe disposal of the sewage by the appointed contractor.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
		Ensure that the sump at the workshop is maintained and cleaned as needed.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
Dust Generation	Dust generation from the beneficiation processes, product and waste transport routes, residue stockpiles or deposits and un-rehabilitated areas can impair aquatic vegetation photosynthesis and could potentially impact on water quality depending on the constituents.	Dust suppression by spraying water or non-contaminating liquids in pit during operations, spraying haul roads, crusher and screening plant.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
		Prevent dust from transported product by washing vehicles and covering loads.	Comply with Requirements of the EMPr and the Water Use Licence	Life of mine
		Ensure that site is protected from prevailing winds.	Comply with Requirements of	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
			the EMPr and the Water Use Licence	
Surface clearing and preparation.	Increase in surface run-off and therefore decrease in aquifer recharge.	Re-vegetate.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Hydrocarbon spills.	Spills from construction vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Clean any hydrocarbon spills in the appropriate manner.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
ROM stockpiling & Waste Rock Dump.	Contamination may be expected in terms of nitrate from explosives.	Should a contamination plume be detected, groundwater abstraction or other measures should be implemented to contain plume.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Hydrocarbon spills.	Spills from mining vehicles can infiltrate to the aquifer and cause a down gradient plume migration.	Clean any hydrocarbon spills in the appropriate manner.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Opencast Mining.	A plume can begin to migrate downgradient since dewatering of the pit is not expected to be conducted	Abstraction of groundwater to contain the contamination plume.	Resource water quality objectives as set by the DWS and compliance with	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
			licence requirements	
Infrastructure removal.	Removal of potential contamination sources will have positive impact on the groundwater regime in terms of quality.	Remove all surface infrastructure as soon as mining has ceased. This will eliminate the impact on the groundwater regime.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Opencast Pits	A plume may continue to migrate further downgradient of the rehabilitated opencast pits.	Should a contamination plume be detected, groundwater abstraction or other measures should be implemented to contain plume.	Resource water quality objectives as set by the DWS and compliance with licence requirements	Life of mine
Overall construction	Impacts on viewpoints that had a visual exposure during construction phase	The visual impact can be minimized creating visual barriers. The construction area will be cleared as soon as construction of the infrastructure is finished	Compliance with EMPr recommendations and management measures	Life of mine
	Permanent visual impact of the structures on users of roads and land owners	Dust from Stockpile areas, roads and other activities must be managed by means of dust suppression to prevent excessive dust.	Compliance with EMPr recommendations and management measures	Life of mine
		The visual impact can be minimized by the creation of visual barriers.	As above	As Above
		Planting indigenous vegetation.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
		Clearing only vegetation as required.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified
		Rehabilitating any disturbed areas as soon as possible.	As per Fauna and Flora impacts identified	As per Fauna and Flora impacts identified

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
Site clearing, removal of topsoil and vegetation	A number of operations take place such as land clearing, topsoil removal, loading of material, hauling, grading, stockpiling, bulldozing and compaction	Topsoil should not be removed during windy months (August to January) due to associated wind erosion heightening dust levels in the atmosphere.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
		Area of disturbance to be kept to a minimum and no unnecessary clearing of vegetation to occur.	N/A	Life of mine
		Topsoil should be re-vegetated to reduce exposure areas.	N/A	As needed
		During the loading of topsoil onto trucks or stockpiles, the dropping heights should be minimised.	N/A	Continually
		Water or binding agents such as (petroleum emulsions, polymers and adhesives) can be used for dust suppression on earth roads.	N/A	As needed
		When using bulldozers and graders, minimise travel speed and distance and volume of traffic on the roads.	N/A	Continually
		Stockpiles should not be left for prolonged periods as wind energy generates erosion and causes more dust to form.	N/A	Continually
		Emissions generated by wind are dependent on the frequency of disturbance of erodible surfaces and by covering the stockpiles with vegetation would reduce the negative erosion effect.	N/A	As needed
		Any crusting of the surface binds the erodible material.	N/A	As needed
		All stockpiles to be damped down, especially during dry weather or re-vegetated (hydro seeding is a good option for slope revegetation)..	N/A	As needed
Construction of surface infrastructure	Construction of access roads, pipes, storm water diversion berms, drilling, blasting and development of box cut for mining, etc. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended	Blasting should also not take place when poor atmospheric dispersion is expected i.e. early morning and late evening.	Good practises	Continually
		Material need to be removed to dedicated stockpiles to be used during rehabilitation.	Compliance with EMPr	Continually
		This hauling of materials should take place on roads which is being watered and/or sprayed with dust suppressant.	Good practises	Continually
		To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	Good practises	As needed
		Constricting the areas and time of exposure of pre-strip clearing in advance of construction to limit exposed soil surfaces.	Compliance with EMPr	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	particulate, giving rise to nuisance impacts as fallout dust)			
General transportation, hauling and vehicle movement on site	Transportation of workers and materials in and out of the mine site will result in the production of fugitive dust (containing TSP, as well as PM10 and PM 2.5) due to suspension of friable materials from earth roads	Hauling of materials and transportation of people should take place on roads which is being watered and/or sprayed with dust suppressant.	Regional Air Quality objectives if set, otherwise national objectives	Life of mine
		To reduce the amount of dust being blown from the load bin in the haul roads, the material being transported can be watered or the back of the vehicles can be covered with plastic tarpaulin covers.	As per Air quality impacts identified	As needed
		Application of wetting agents or application of dust suppressant to bind soil surfaces to avoid soil erosion.	N/A	As needed
		The drop heights should be minimised when depositing materials to the ground.	As above	As needed
		Encourage car-pool and bulk delivery of materials in order to reduce the number of trips generated daily.	As above	Continually
Overall operational activities	Use and maintenance of access road, dust and material handling, Haul roads, and wind erosion from stockpile	See Construction Phase mitigation measures.	N/A	Continually
Demolition & Removal of all infrastructure (incl. transportation off site)	Demolition of buildings, foundations, and removal of rubbles, cleaning up of workshops, fuel reagents , removal of power supply and removal of haul and access roads will generate fugitive dust similar to impacts during construction phase.	Demolition should not be performed during windy periods (August, September and October), as dust levels and the area affected by dust fallout will increase.	Good practises	Life of mine
		The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
		Speed restrictions should be imposed and enforced.	N/A	As needed
		Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	Continually
		Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Continually
		Engine cooling fans of vehicles should be shrouded so that they do not raise dust.		Life of mine
		Hard surfaced haul roads or standing areas should be washed down and swept to remove accumulated dust.	N/A	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
		Dust suppression of roads being used during rehabilitation should be enforced.	As above	As Above
Rehabilitation (spreading of soil, revegetation & profiling/contouring).	Topsoil reshaping and restructuring of the landscape. Incorrect rehabilitation will cause permanent damage to the surface infrastructure	Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option.	N/A	Life of mine
		Plants with roots that bind the soil, and vegetation cover should be used that breaks the impact of falling raindrops, thus preventing wind and water erosion.	N/A	Life of mine
		Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings.	N/A	Life of mine
		The area of disturbance must be kept to a minimum, as demolition should be done judiciously avoid the exposure of larger areas to wind erosion.	N/A	Life of mine
		Spreading of soil must be performed on less windy days.	N/A	Life of mine
		The bare soil will be prone to erosion and therefore there is need to reduce the velocity near the surface of the soil by re-vegetation.	N/A	Life of mine
		Leaving the surface of soil in a coarse condition reduces wind erosion and ultimately reduces dust levels.	N/A	Life of mine
		Additional mitigation measures include keeping soil moist using sprays or water tanks, using wind breaks.	N/A	Life of mine
		The best time to re-vegetate the area must be linked to the distribution and reliability of rainfall.	N/A	Life of mine
		Speed restrictions should be imposed and enforced.	N/A	Life of mine
		Cabs of machines should be swept or vacuumed regularly to remove accumulated dust.	N/A	Life of mine
		Exhaust pipes of vehicles should be directed so that they do not raise dust.	N/A	Life of mine
		Engine cooling fans of vehicles should be shrouded so that they do not raise dust.	N/A	Life of mine
		Hard surfaced haul roads or standing areas to be washed down and swept to remove accumulated dust.	N/A	Life of mine
		Dust suppression of roads being used during rehabilitation should be enforced.	N/A	Life of mine
		It is recommended that the rehabilitation by vegetating should begin during the operational phase already as the objective is to minimise the erosion.	N/A	Life of mine

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
		These measures should be aimed to reduce the potential for fugitive dust generation and render the impacts on ambient air quality negligible.	N/A	Life of mine
Site clearing, removal of topsoil and vegetation	Potential impact on artefacts.	Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either of the wrong kind to contain fossils in the case of the Kuruman and Gamagara Formations, or no trace fossils were found in this site, in the case of the Ghaap Group. Furthermore, the material to be targeted is not in the limestones of the Ghaap Group. Since there is an extremely small chance that trace fossils from the nearby Ghaap Group limestones may be disturbed, a Fossil Chance Find Protocol has been added to this report.	SAHRA Permit	Before construction begins
Overall construction and operational activities	Development and related activities may impact on the sensitive habitats related to the gravesite and other heritage sensitive area situated in close proximity to the development footprint may be affected by the proposed development.	Salene Manganese Mine will form part of the history of the local area. Some mine infrastructure may be preserved as local heritage resources. Should any human remains be disturbed, exposed or uncovered during mining activities, these should immediately be reported to an accredited archaeologist. Burial remains should not be disturbed or removed until inspected by an archaeologist; Mining activities must also be monitored for the occurrence of any other archaeological material (Stone Age tools, Iron Age artefacts, historic waste disposal sites etc.) and similar hidden/buried chance finds and an archaeologist should be asked to inspect the area when this has reached an advanced stage in order to verify the presence or absence of any such material; Any graves in the vicinity of the mining operations that will or not be directly affected must be documented and monitored for damage.	As above	As above
Crime. Health, HIV and Covid-19	Influx of foreigners and job seekers and increase in disposable income for local people may have negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Labour should be sourced from the local settlement areas to prevent influx of foreigners who are likely to disrupt the social fabric, values and norms of the village people. Through the SLP and day-to-day training and awareness programmes, pandemics such as HIV and Covid-19 can be managed and minimized. The Salene mine must also have an HIV and Covid-19 awareness outreach programme in conjunction with local health centres and clinics to extend awareness and knowledge about the diseases to the broader communities affected by the mine	N/A	Continually

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
		activities and proposed extension. Visible policing and community policing forums must be established to curb incidents of crime in the communities. This option must be implemented in conjunction with existing municipal processes to manage crime and illegal activities.		
Land tenure, use and capability	Land capability of the affected area will be permanently be affected especially the open pit area. The proposed expansion will increase loss of grazing land, restricted access and loss of cultural or traditional practices.	Rehabilitate the land to as close as possible to its wilderness and grazing land state during and after the mining activities are concluded. Re-vegetation should be with indigenous plant species that are able to sustain the regional climate and soil conditions. The farm where the current mining activities are taking place, is already a restricted/controlled access, therefore the Salene Mine proposed activities will not reduce availability of natural resources and land to local communities.	As above	As above
Noise	The proposed Salene Mine activities will not raise noise levels significantly. Movement of tipper trucks, excavators and other mining equipment/machinery will create some noise – especially during day time when operations are active	MITIGATION: Measures such as ensuring all vehicles and equipment are in good working order, and that any faulty exhaust- and/or intake silencers are replaced timorously, will reduce the severity and significance of the impact. The noise generating aspects and equipment must be confined to the mining area. approved by the DMRE under the mining right authorization. Drilling and blasting is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. Personnel working within the plant must wear ear protection gear. A complete blasting schedule and timeframes must be compiled and communicated with the adjacent communities and farm homesteads to ensure that they are notified in advance prior to blasting taking place. Operators must wear ear protection at all times when operating the earth moving equipment and machinery to prevent noise induced hearing loss. Noise pollution must be monitored monthly, and recorded throughout the life of mine.	As per Noise impacts Identified	As per Noise impacts Identified
Air Pollution	Excessive dust may have an impact on surrounding vegetation and an indirect impact on animals that feed	Wetting of the access roads with water periodically to suppress the dust will greatly reduce the impact of dust. This wetting with water must be done daily during dry and windy seasons. Dust and smoke monitoring will be conducted during the life of mine	As per Air Quality Impacts Identified	As per Air Quality Impacts Identified

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	on the vegetation as well as any nearby communities or farm homesteads. Dust will be generated from the Salene Mine activities, access roads to and from the opencast pits and waste rock dumps.	to determine the prominent wind directions and dust / smoke levels at various points around the mining site. In term of the requirements of the Mine Health and Safety Act, 1996 Salene Mine must provide protective clothing and equipment for all its employees, and must periodically conduct risk assessments to analyse and monitor the effects of dust and smoke on the staff members and the surrounding environment. Concurrent rehabilitation and re-vegetation of the mining site will also reduce surfaces that are exposed to wind generated dust.		
Light and Visual	The proposed Salene Manganese mine waste rock dumps, opencast pits activities and surface infrastructure will further change the aesthetic character of surrounding area by a permanently changed landscape and the development associated with the mining operation. The mine is visible from R325 main road.	Concurrent rehabilitation should be implemented throughout the life of the mine to minimize and return the environment to - as much as possible – the original status. Screening with vegetation (trees) should also be implemented to mask the mine and the other mine infrastructure from the main road, various settlement viewpoints and soften the visual impacts. The visual impact of the waste rock and surface infrastructure sites can be reduced by doing the following: Filling up the mining site to match the surrounding landscape as closely as possible in the final phase of rehabilitation; Planting trees on the available fill material at a high density in the first phase of rehabilitation to match the “texture” of the surrounding landscape; Keeping the stockpiled topsoil over until the final finishing is done to match the existing soil colour, since the rock below is markedly different in colour (i.e.. grey vs reddish brown). To reduce the impact of the Salene Mine on the topography and restore the landscape character to closely resemble the conditions prior to the open pits and waste rock the following is recommended: Studying the contour map of the site and mimicking the surrounding areas on the final earthworks plan as closely as possible without excessive cost as part of the final phase of rehabilitation; Stabilising the substrate/backfill material by means of a variety of dry weather tolerant grasses, shrubs and trees; Screening the road as far as possible with indigenous trees, grasses and shrubs.	As per visual Impacts identified	As per visual Impacts identified

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
Economic opportunities, infrastructure development and employment	Local business will also benefit by providing supplies and services to the mine. Secondary industries are also likely to develop. The adjacent community (Maremane) in terms of skills training, local economic development projects, and improved infrastructure. This is a requirement in terms of Section 22 and Regulation 42 of the MPRDA, 2002. Increase in disposable income may create negative social impacts such as crime, alcoholism and prostitution in and around the project area.	Promotion of manganese beneficiation within the Kathu/Postmasburg area to improve the quality and value of the product being mined, and create further economic activity. Subject to economic modelling and feasibility study, a concentrator plant in the vicinity of Salene Mine can further stimulate significantly the economic activity in Tsantsabane Municipality, and the surrounding region. Labour should be sort from the local settlement areas to prevent influx of foreign people and job seekers who are likely to disrupt the social fabric, values and norms of the village people. Currently Salene Mine employs 147 persons – inclusive of permanent and contract employees.	N/A	Continually
Daytime construction	Noise caused by multiple construction activities during daytime	The mine should construct berms between mining areas and identified NSD; The mine must ensure that noise levels are less than 52 dBA at night at all NSD; The mine must include a component covering environmental noise in the Health and Safety Induction to sensitize all employees and contractors about this subject, especially those employees and contractors that have to travel past receptors at night or might be required to do work within 1 000 m from NSD at night. Establish complaints register with an open line to a relevant person that can act if there is a noise complaint. It is recommended that a noise monitoring programme is developed and implemented.	N/A	As needed before mining start
Nighttime construction	Noise caused by multiple construction activities during night time	See above Noise mitigation measures	N/A	As needed before mining start
Daytime overall operational activities	Noise caused by multiple operational activities during daytime such as haul truck	See above Noise mitigation measures	N/A	As needed before mining start

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	movement and processing plant			
Nightime overall operational activities	Noise caused by multiple operational activities during night time such as haul truck movement and processing plant	See above Noise mitigation measures	N/A	As needed before mining start
Ground vibration	Impacts on surrounding communities caused by vibrations during blasting activities	The potential vibration levels should be discussed with the manager at Boskop mine to warn the security of potential blast vibration levels once blasts are to take place closer than 1,250 m from this BSR The developer should erect clear signs indicating blast dates and times on the R325	As per noise and socio-economy impacts identified	As per noise and socio-economy impacts identified
Ground vibration	Damage to residential structures within the area	Blasts vibration levels to be calculated for each blast to take place within 1,250 m from any occupied structure. The blast should be controlled (charge per delay) to ensure a vibration level less than 2.54 mm/s at these structures;	As Above	As Above
Ground vibration	Damage to tar roads and railway line close to the mine	No mitigation is required to reduce vibration levels at the road and railway line.	As Above	As Above
Air Blast	Air blast impact for a 924kg blast (Worst case)	Mitigation not required, although it should be noted that: Mine should initiate a forum to inform the close residents about the likely vibration and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast as well as a warning to residents that, when they are indoors during a blast, vibration of windows and ceilings may appear excessive. - Mine to erect blasting notice boards in the area with blasting dates and times highlighted. - Mine to prevent blasting in adverse meteorological conditions where possible (overcast conditions, strong wind blowing in direction of local community, early in the mornings or late in the afternoon).	As Above	As Above
Fly rock	Risk of fly rock hitting adjacent road users, neighbouring properties, humans and fauna	Mine should initiate a forum to inform the close residents about the likely vibration and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast as well as a warning to residents that, when they are indoors during a blast, vibration of windows and ceilings may appear excessive. - Mine to erect blasting notice boards in the area with blasting dates	As Above	As Above

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
		and times highlighted. - Mine to prevent blasting in adverse meteorological conditions where possible (overcast conditions, strong wind blowing in direction of local community, early in the mornings or late in the afternoon).		
Overall construction and operational activities.	During construction, vegetation is removed from the soil surface and the bare soil surface is exposed to raindrops and wind which can lead to erosion of soil particles. Soil particles are removed from the area through dust transportation or in surface water run-off.	Using appropriate methods of excavating that are in accordance with regulatory requirements and industrial best practices procedures	As above	Compliance with EMPr recommendations and management measures
		Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces	As above	As above
		Using drainage control measures and culverts to manage the natural flow of surface runoff.	As above	As above
Overall construction and operational activities	Vehicle and equipment movement over the soil surfaces will result in soil compaction. Soil compaction reduce the infiltration rate of water into the soil profiles that increase surface run-off and can increase the risk of soil erosion. Soil compaction in the deeper soil layers are often an undetected issue that prevent root establishment of vegetation during the rehabilitation phase of a project.	Minimise the footprint of the infrastructure expansion- All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase.	As above	As above
Overall construction and operational activities	Vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. In addition, waste will be generated during the construction of infrastructure	Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained by using a drip tray with plastic sheeting filled with absorbent material;	As above	As above
		Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area;	As above	As above

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	and this waste may increase the risk of soil pollution.	Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;	As above	As above
		Containing potentially contaminating fluids and other wastes	As above	As above
		Cleaning up areas of spillage of potentially contaminating liquids and solids.	As above	As above
Overall construction and operational activities	Once topsoil stripping commences, the in-situ soil profiles are disturbed and the original soil horizon organisation destroyed. Although the topsoil is stockpiled, it will be a mixture of the A horizon and B horizons and often the underlying parent material is part of the mixture	The moisture content of access road surface layers must be maintained through routine spraying or the use of an appropriate dust suppressant. Access roads must be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts will be installed to permit free drainage of existing water courses.	As above	As above
Overall construction and operational activities	Construction activities include vegetation removal and disturbance of soil profiles. This will change the current land capability from the current mixture of grazing and wilderness to industrial/active mining. Although land must be rehabilitated once mining has ceased, complete restoration of the area is a lengthy process and it may take several years before the land capability has been restored.	The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site.	Compliance with EMPr recommendations and management measures	Life of mine
Overall construction and operational activities	Wherever soil surfaces are stripped of vegetation, soil will be prone to soil erosion, especially during heavy rainstorms. Also, topsoil stockpiles that are not protected by geotextiles or	Construction Management measures must still be applied during operational phase. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and	As above	As above

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	vegetation, will be susceptible to soil erosion.	to convey any potentially polluted water to pollution control dams. Routine monitoring will be required in and around the sites		
Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Construction Management measures must still be applied during operational phase. The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust). Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams. Routine monitoring will be required in and around the sites	As above	As above
Overall construction and operational activities	Infrastructure areas, vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution. Dust suppression of haul roads with marginal quality water, may also result in soil pollution.	Construction Management measures must still be applied during operational phase. Stockpiles are managed so they do not become contaminated and then need additional handling or disposal;	As above	As above
		A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled;	As above	As above
		Processing areas should be contained and systems designed to effectively manage and dispose of contained storm water, effluent and solids;	As above	As above
		Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater;	As above	As above
		Equipment, and vehicle maintenance and wash-down areas, are contained and appropriate means provided for treating and disposing of liquids and solids;	As above	As above
		Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems);	As above	As above
		Solids and slurries are disposed of in a manner consistent with the nature of the material and avoids contamination; and	As above	As above
		Effluent and processing drainage systems avoid leakage to ground.	As above	As above
Overall construction and operational activities	All areas where infrastructure will be decommissioned will be prone to erosion until vegetation growth has	Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible.	As above	As above

Activity/Receptor	Potential Impacts	Mitigation measures	Compliance with Standards	Time period for implementation
	established successfully on the bare surfaces. Wherever vegetation struggles to establish, geotextiles must be used to protect soil surfaces against erosion.			
Overall construction and operational activities	Soil will remain susceptible to soil compaction wherever heavy vehicles and equipment move over the soil surfaces, especially when soil moisture levels are high	Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible.	As above	As above
Overall construction and operational activities	vehicles and equipment will traverse the site and may result in oil or fuel spills on the soil surface. Daily activities on site will result in waste generation that needs to be managed to avoid soil pollution.	Losses of fuel and lubricants from the oil sumps of vehicles and equipment should be contained using a drip tray with plastic sheeting and filled with absorbent material;	As above	As above
		Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids and recovering contaminated soils and treating them off-site;	As above	As above
		Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;	As above	As above
		Containing potentially contaminating fluids and other wastes; and	As above	As above
		Cleaning up areas of spillage of potentially contaminating liquids and solids.	As above	As above
Overall construction and operational activities	Decommissioning will result in improved soil conditions over time, permitting that the rehabilitation efforts are efficient and successful. This may increase the land capability over time.	All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site.	As above	As above
		Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (sloped) in order to approximate the pre-project aspect and contours	As above	As above
		The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles.	As above	As above
		frequent visual observations should be undertaken to confirm if vegetation has re-established and if any erosion gullies have developed. In the event that vegetation has not re-established and erosion gullies have developed, remedial action should be taken.	As above	As above

In addition to the requirements in the table above the following specific plans were developed by the specialists.

6.1. Soil, land use and land capability management plan

The purpose of the Soil Management Plan (SMP) is to ensure the protection of soils and maintenance of the terrain of the Macarthy Mine footprint expansion during the construction, operations, decommissioning and closure phases. The plan contains methods that will be used to prevent adverse effects as well as a monitoring plan to assess potential effects during construction, operation, decommissioning and closure.

The objectives of the SMP are to:

- Address the prevention, minimisation and management of erosion, compaction and chemical soil pollution during construction, operations, decommissioning and closure;
- Describe soil stripping and stockpiling methods that will reduce the loss of topsoil;
- Define requirements and procedures to guide the Project Management Team and other project contractors;
- Define monitoring procedures.

6.1.1. Soil management during the construction phase

From the perspective of conserving the soil properties that will aid rehabilitation during the closure phase, the key factors to consider during the preparation for the construction phase are to minimise the area affected by the development, minimise potential future contact of toxic or polluting materials with the soil environment and to maximise the recovery and effective storage of soil material that will be most useful during the rehabilitation process after operation of the opencast mine is completed. Some of these measures will minimise a combination of impacts simultaneously while other measures are specific to one impact.

6.1.1.1. Minimise the footprint of the infrastructure expansion

The existing pre-construction layout and design of infrastructure are aiming to minimise the area to be occupied by mine infrastructure to as small as practically possible. All footprint areas should also be clearly defined and demarcated and edge effects beyond these areas clearly defined. This measure will significantly reduce areas to be compacted by heavy construction vehicles and regular activities during the operational phase.

6.1.1.2. Management and supervision of construction teams

The activities of construction contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict construction work and construction workers to the clearly defined limits of the construction site. In addition, compliance to these instructions must be monitored.

6.1.1.3. Terrain stability to minimise erosion potential

Management of the terrain for stability by using the following measures will reduce the risk of erosion significantly:

- Using appropriate methods of excavating that are in accordance with regulatory requirements and industrial best practices procedures;
- Reducing slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; and
- Using drainage control measures and culverts to manage the natural flow of surface runoff.

6.1.1.4. Management of access and service roads

Existing established roads will be used wherever possible. The moisture content of access road surface layers must be maintained through routine spraying or the use of an appropriate dust suppressant. Access roads must be designed with a camber to avoid ponding and to encourage drainage to side drains; where necessary, culverts will be installed to permit free drainage of existing water courses. The side drains on the roads to be

used must be protected with sediment traps and/or gabions to reduce the erosive velocity of water during storm events and where necessary geo-membrane lining can be used.

6.1.1.5. Prevention of soil contamination

During the construction phase, chemical soil pollution should be minimised as follows:

- Losses of fuel and lubricants from the oil sumps and steering racks of vehicles and equipment should be contained by using a drip tray with plastic sheeting filled with absorbent material;
- Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids, recovering contaminated soils and treating them off-site, and securely storing dried waste mud by burying it in a purpose-built containment area;
- Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;
- Containing potentially contaminating fluids and other wastes; and
- Cleaning up areas of spillage of potentially contaminating liquids and solids.

6.1.2. Soil management during the operational phase

Soil management should be an on-going strategy through the operational phase as soil disturbing activities will continue in areas where operation of the mine continues and new areas are developed through operation activities.

Disturbed sites must be rehabilitated as soon as they have reached the end of their life. During operations, soil will continue to be removed from newly developed areas and stockpiled for later use. Topsoil stripping and stockpiling should follow the guidelines as stipulated under the construction phase above.

Stockpiles should be re-vegetated immediately to prevent erosion and resulting soil losses from these stockpiles. It is recommended that vegetation removed during land clearance be composted (after seed was harvested to serve as a seed bank for the indigenous vegetation present) during the operational phase and that this compost be used as a soil ameliorant for soil rehabilitation purposes.

All above soil management measures explained under the Construction Phase should be maintained for similar activities during the Operational Phase. In addition to this, the following Soil Management Measures are recommended:

- The vegetative (grass) cover on the soil stockpiles (berms) must be continually monitored in order to maintain a high basal cover. Such maintenance will limit soil erosion by both the mediums of water (runoff) and wind (dust).
- Drains and intercept drains must be maintained so that they continue to redirect clean water away from the operating areas, and to convey any potentially polluted water to pollution control dams.
- Routine monitoring will be required in and around the sites.

6.1.2.1. Management of potential soil contamination during the operational phase

The following management measures will either prevent or significantly reduce the impact of soil chemical pollution on site during the operation phase:

- Stockpiles are managed so they do not become contaminated and then need additional handling or disposal;
- A low process or storage inventory must be held to reduce the potential volume of material that could be accidentally released or spilled;
- Processing areas should be contained and systems designed to effectively manage and dispose of contained storm water, effluent and solids;
- Storage tanks of fuels, oils or other chemicals stored are above ground, preferably with inspectable bottoms, or with bases designed to minimise corrosion. Above-ground (rather than in-ground) piping systems should be provided. Containment bunds should be sealed to prevent spills contaminating the soil and groundwater;

- Equipment, and vehicle maintenance and washdown areas, are contained and appropriate means provided for treating and disposing of liquids and solids;
- Air pollution control systems avoid release of fines to the ground (such as dust from dust collectors or slurry from scrubbing systems);
- Solids and slurries are disposed of in a manner consistent with the nature of the material and avoids contamination; and
- Effluent and processing drainage systems avoid leakage to ground.

6.1.3. Soil management during the decommissioning phase

At decommissioning any excavated areas will be backfilled and covered with a layer of topsoil. Some re-grading and re-contouring will be carried out. Soil management in the decommissioning phase will include the following:

6.1.3.1. Management and supervision of decommissioning teams

The activities of decommissioning contractors or employees will be restricted to the planned areas. Instructions must be included in contracts that will restrict decommissioning workers to the areas demarcated for decommissioning. In addition, compliance to these instructions must be monitored.

6.1.3.2. Infrastructure removal

All buildings, structures and foundations not part of the post-closure land use plan must be demolished and removed from site.

6.1.3.3. Site preparation

Once the site has been cleared of infrastructure and potential contamination, the slope must be re-graded (sloped) in order to approximate the pre-project aspect and contours. The previous infrastructure footprint area must be ripped a number of times in order to reduce soil compaction. The area must then be covered with topsoil material from the stockpiles.

6.1.3.4. Seeding and re-vegetation

Once the land has been prepared, seeding and re-vegetation will contribute to establishing a vegetative cover on disturbed soil as a means to control erosion and to restore disturbed areas to beneficial uses as quickly as possible. The vegetative cover reduces erosion potential, slows down runoff velocities, physically binds soil with roots and reduces water loss through evapotranspiration. Indigenous species will be used for the re-vegetation, the exact species will be chosen based on research available and then experience as the further areas are re-vegetated.

6.1.3.5. Prevention of soil contamination

During the decommissioning phase, chemical soil pollution should be minimised as follows:

- Losses of fuel and lubricants from the oil sumps of vehicles and equipment should be contained using a drip tray with plastic sheeting and filled with absorbent material;
- Using biodegradable hydraulic fluids, using lined sumps for collection of hydraulic fluids and recovering contaminated soils and treating them off-site;
- Avoiding waste disposal at the site wherever possible, by segregating, trucking out, and recycling waste;
- Containing potentially contaminating fluids and other wastes; and
- Cleaning up areas of spillage of potentially contaminating liquids and solids.

6.1.4. Soil management during the closure phase

During the closure phase activities include the maintenance and aftercare of final rehabilitated land. In this regard, frequent visual observations should be undertaken to confirm if vegetation has re-established and if any

erosion gullies have developed. In the event that vegetation has not re-established and erosion gullies have developed, remedial action should be taken.

6.2. Ecological Management Plan

6.2.1. Pre-Construction Phase

Relevant Authorisations needed for all protected species, in terms of NEMBA (ToPS List), the NCNCA and the NFA, will be required if any SCC species will be impacted by the development. No animal species should be harmed, hunted, relocated or caught during the development without a permit. Therefore, it is recommended that the new areas be fenced and animals should be allowed to freely move away to ensure that they are not harmed and not require specialist relocation. If relocation or intervention is required, a specialist should be consulted to ensure the correct path of action is chosen.

6.2.2. Construction and Operational Phases

- Prevent the needless loss of or damage to fauna and flora particularly with regard to protected, endemic and species of conservation concern.
- Prevent the needless death, injury or hindrance to fauna particularly with regard to protected species.
- Prevent significant alteration to the ecosystems in the area.

Mitigation and Management measures	Responsible person and timeframe for implementation
Adhere to mitigation measures as prescribed above to prevent and mitigate impacts to terrestrial ecology.	ECO /SHEQ Officer Ongoing throughout LoM
Responsible persons from the staff members/workers should be identified to ensure that the necessary mitigation measures are implemented and established. These personnel should also enforce the collaboration of other staff members, contractors and visitors to comply with these mitigation measures.	Mine manager / ECO / SHEQ Officer Ongoing throughout LoM
Ensure adequate stormwater management as to ensure that potentially polluted water do not enter the natural environment surrounding the footprint area.	Mine manager / ECO / SHEQ Officer Ongoing throughout LoM
A management plan for the control of invasive/alien weed species needs to be implemented. Specialist advice should be used in this regard. This plan should include pre-treatment, initial treatment and follow-up treatment and should be planned and budgeted for in advance. The cleared areas after removal should be re-vegetated with indigenous naturally occurring species to decrease large patches of bare soil. The best mitigation measure in this regard is avoiding invasive and/or exotic species from being established. This should not only be conducted within the direct location of the operational area but also into surrounding area which may be impacted by the project. It is vital that the control of alien invasive species is ongoing.	ECO / SHEQ Officer Annually throughout LoM
Adequate waste storage and disposal must be implemented at the development. Littering must be prevented and regularly cleaned up and form part of good housekeeping practices to be implemented around site.	Mine manager / ECO Ongoing throughout LoM
Ensure awareness amongst all staff, contractors and visitors to site to not needlessly harm or hinder animals or damage flora.	ECO /SHEQ Officer Ongoing throughout LoM
It is also vital that no additional fragmentation occur and that all roads are clearly demarcated and kept to a minimum without any exceptions and within the proposed footprints where possible.	Mine manager / ECO /SHEQ Officer Ongoing throughout LoM
All footprint areas should remain as small as possible.	Mine manager Ongoing throughout LoM
Activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act 71 of 1962) and NCNCA.	ECO /SHEQ Officer Ongoing throughout LoM
The vegetation removal (and associated fauna) should be controlled and should be very specific.	ECO /SHEQ Officer Ongoing throughout LoM

Mitigation and Management measures	Responsible person and timeframe for implementation
Priority species, specifically nests if encountered, should be identified first and a management plan should be established for each of the priority species if these are encountered during any phase of the activity.	ECO /SHEQ Officer Ongoing throughout LoM
It is vital that if any endemic, rare or vulnerable species occurs on the proposed site that these species should be protected and/or left undisturbed. Only as an exception can these species be relocated to favourable sites with the use of a specialist prior to vegetation and habitat removal. If at any point any SCC is encountered, a specialist should be consulted as to determine the best way forward and a permit should be obtained if any intervention is required.	Mine manager / ECO /SHEQ Officer Ongoing throughout LoM

6.2.3. Decommissioning and Closure

- Properly assess and determine final land-use and ensure Closure and Rehabilitation Plan is formal, feasible and site specific.
- Prevent needless loss of or damage to natural vegetation and animals particularly regarding protected and endemic species if encountered during any phase of the development.
- Prevent death, injury or hindrance to fauna particularly regarding protected species.
- Prevent alien invasive flora and fauna species introduction that could outcompete naturally occurring species. The aim will be to rehabilitate towards naturally sustainable vegetation and habitat as was present before the implementation of the project.

Mitigation and Management measures	Responsible person and timeframe for implementation
The activity area should be well demarcated and workers should not enter adjacent areas.	ECO / SHEQ Officer Ongoing during rehabilitation and the decommissioning phase
Depending on final land use, the surfaces need to be prepared to be able to re-establish vegetation on bare areas.	Mine manager / ECO / SHEQ Officer Prior to revegetation throughout LoM
Alien Invasive species will need to be managed to prevent newly rehabilitated areas becoming invested with invasive species.	ECO / SHEQ Officer Annually during rehabilitation and the decommissioning phase
Ensure that an acceptable aesthetic scenario is created post closure.	Mine manager During rehabilitation and the decommissioning phase
When closure is considered successful and rehabilitation complete, unnecessary fences/barriers should be lifted to restore larger foraging areas.	Mine manager Once rehabilitation has been concluded
Monitoring of terrestrial ecology to ensure that ecology is restored and self-sustaining.	ECO / SHEQ Officer Annually during rehabilitation and the decommissioning phase
Ensure awareness amongst all staff, contractors and visitors to the site to not needlessly damage flora.	ECO / SHEQ Officer Ongoing during rehabilitation and the decommissioning phase
Re-vegetation of all degraded areas and bare patches is advised to speed recovery to natural, self-sustaining state as soon as possible (if this is aligned with the final landform described in the EMP).	ECO / SHEQ Officer During the rehabilitation and the decommissioning phase. To be undertaken when necessary during the wet season.

6.3. Dolomite management plan

It is recommended that a detailed dolomite plan be drafted as part of the detailed dolomite assessment as proposed. In the interim the following is proposed:

- A full dolomite stability study, including borehole drilling, should be carried out for Sump Pump PCD-B and Sump Pump PCD-C. Based on this preliminary assessment, the sump pump foundations should be designed assuming that a 5 m loss of support will occur as some point in the future. All water bearing pipes through this area, and especially where pipes are close to infrastructure should be constructed using HDPE pipes as stipulated in SANS1936 Parts 3 and 4. The standards given in these same documents are also applicable to the construction and backfilling of all trenches. All areas should be landscaped so that no ponding of water occurs after rainfall. Consideration should be given to constructing a double lining and/or installing leak detection systems for the sumps.
- Submission of the detailed Dolomite assessment report to the Councill of Geoscience for their input and recommendations.

7. FINANCIAL PROVISION

7.1. Determination of the amount of Financial Provision

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

The closure objectives are outlined in Part B, Sections 4.1 and 5. The objectives includes statements on how the impacted area will be managed to align the rehabilitated area to the baseline environment as far as possible.

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

The closure objectives were made available to I&APs when the documentation was made available for comment as per Part A, Section 7. As the land owner, Salene Manganese (Pty) Ltd undertakes to adhere to the objectives and requirements of the EMPr as per Part C of this report.

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

Based on the available information it is anticipated that there will be an opencast pit area that will not be backfilled during the closure phase. As far as possible (unless an agreement with the property owners or occupiers are reached) all infrastructures will be removed and the areas rehabilitated. Based on this the following is anticipated to remain on site after closure:

- Pollution Control Dams – 1 Ha;
- Waste rock dumps 51 Ha; and
- Opencast pit 180 Ha.

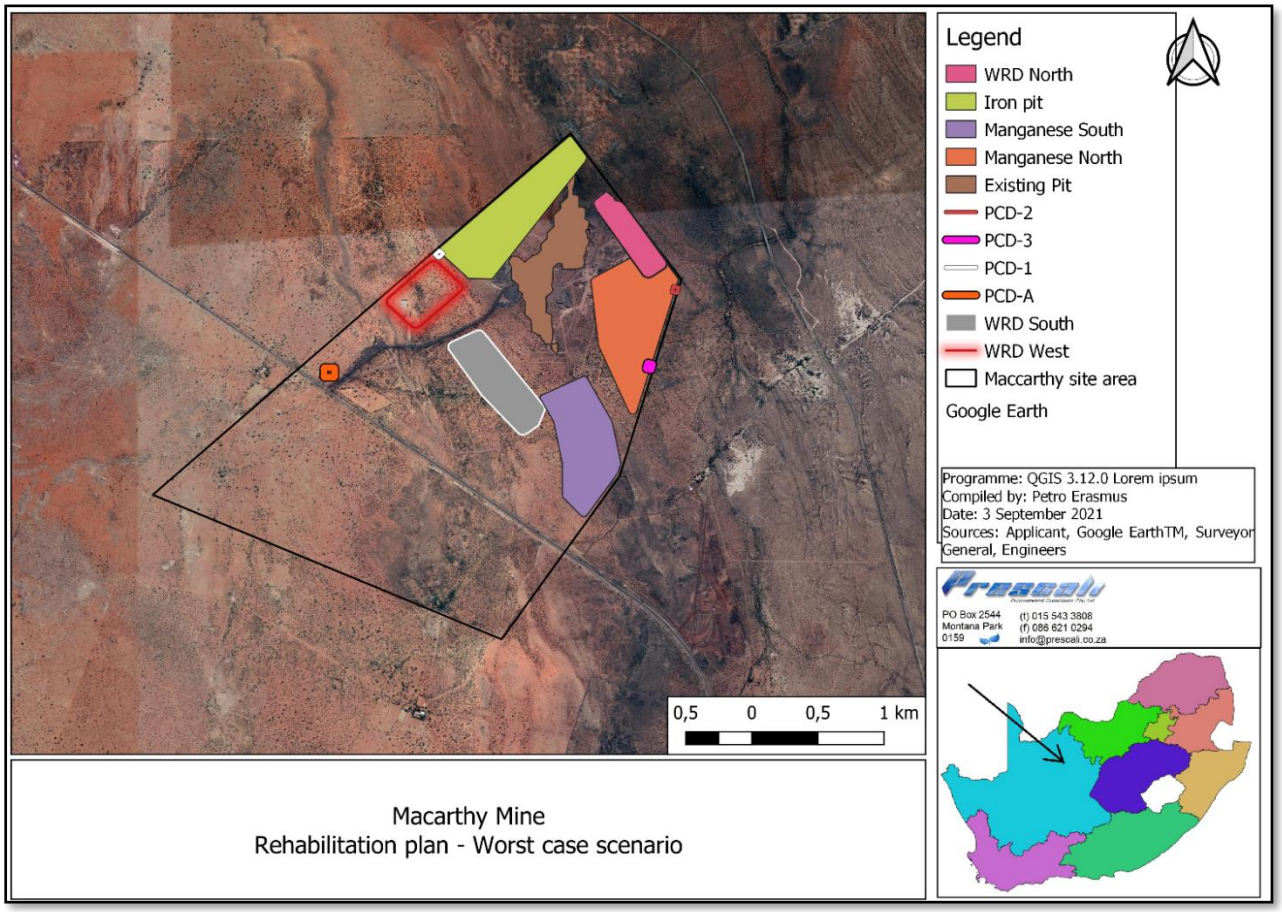


Figure 7-1: Infrastructures and voids to remain on site after closure (worst case scenario)

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

The closure and rehabilitation of the Macarthy mine existing and new activities were considered during all phases of the development including the following aspects:

- Post-closure land use.
- Risk identification and addressing / mitigating the risks.
- Progressive closure.
- Implementation and monitoring.
- Social transition.

Based on the above and the closure objectives as outlined in this report it is believed that the final closure plan is a true reflection.

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

Please refer to Part A, Section 26.1.

7.1.6. Confirm that the financial provision will be provided as determined.

The financial provision will be provided as determined, please also refer to the Undertaking by the application in Part C of this report.

8. MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON, INCLUDING

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

Source activity	**Impacts requiring monitoring programmes**	**Functional requirements for monitoring**	**Roles and responsibilities (for the execution of the monitoring Programmes)**	**Monitoring and reporting frequency and time periods for implementing impact management actions**
All activities as identified	Air quality impacts as identified relating to dust,PM10 and PM2.5	Part B, Section 8.1	SHEQ	Time periods for implementing management actions are outlined in Part B, Section 6 and Part A, Section 20
Waste generating activities	Quantities of waste generated	Part B, Section 8.1.1	SHEQ	Part B, Section 8.1.1
All activities as identified	Terrestrial biodiversity	Part B, Section 8.4	SHEQ	Time periods for implementing management actions are outlined in Part B, Section 6 and Part A, Section 20
All activities as identified	Terrestrial biodiversity	Part B, Section 8.4	SHEQ	
All activities as identified	Geohydrological	Part B, section 8.5	SHEQ	
All activities as identified	Surface water	Part B, Section 8.8	SHEQ	
All activities as identified	Noise	Part B, Section 8.6	SHEQ	
All activities as identified	Soil	Part B, Section 8.7	SHEQ	
All activities as identified	Socio Economic aspects	Part B, Section 8.10	Human Resources SHEQ	
All activities as identified	Paleontology	Part B, Section 8.10	SHEQ	

8.1. Air quality monitoring plan

8.1.1. Current Monitoring Programme

The proposed monitoring locations are indicated in Part B Figure 8-1.

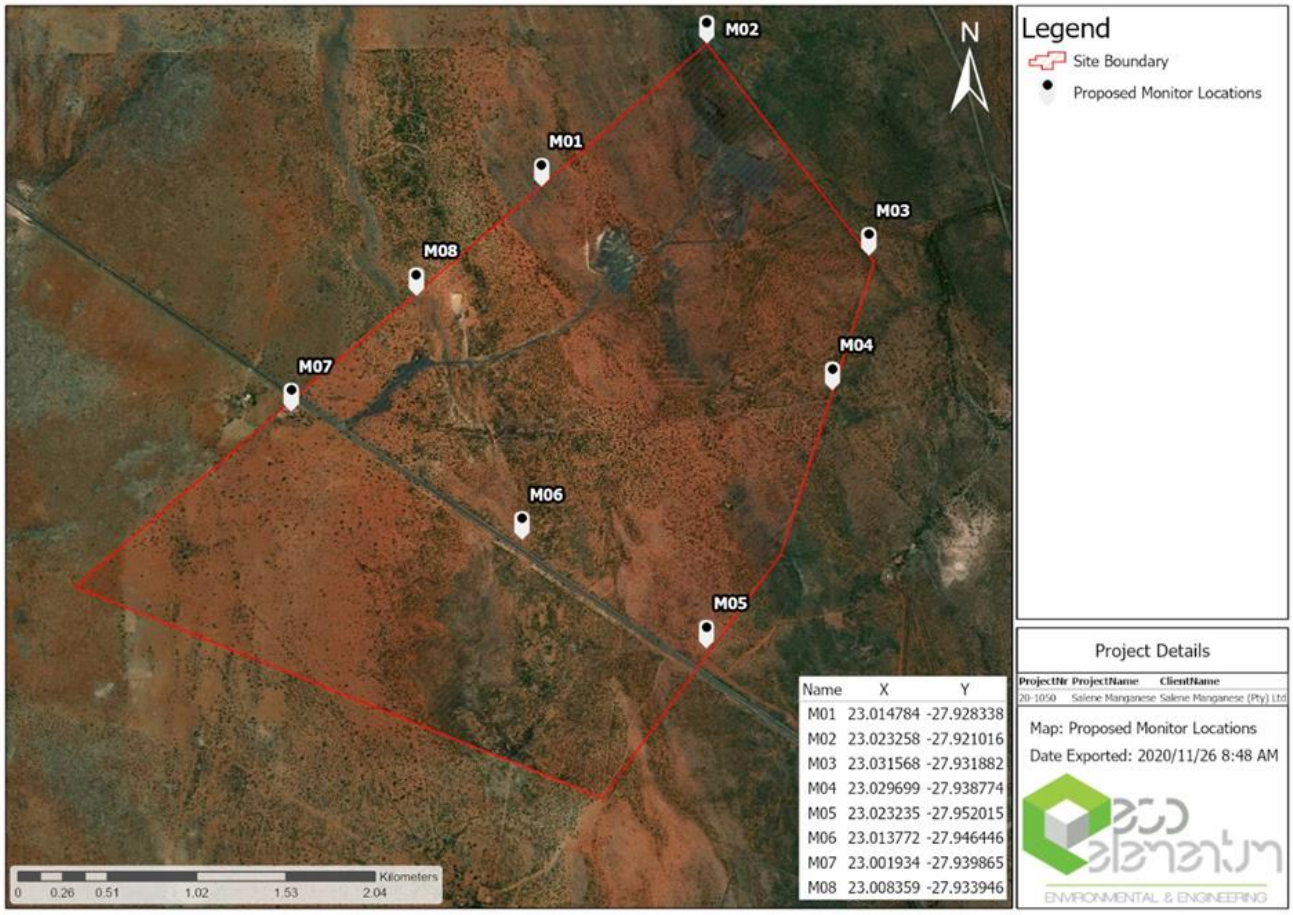


Figure 8-1: Proposed monitoring Locations

The following will be monitored:

- Gravimetrical dust fall out: Samples will be collected after a 1 month running period (+-30 day's exposure). After sample collection, the samples are taken to a SANAS accredited laboratory as required. A visual site investigation is done where after correlations are drawn and findings are identified and reported on.
- Particulate Matter PM10 (Monthly 8 Samples): It is recommended that the client should establish a fine particulate monitoring programme, which should include one particulate instrument to monitor PM10 and preferably PM2.5 specifically at the problem areas shown by the passive sampling campaign at the residential areas.

8.2. Waste monitoring plan

- No monitoring requirements were identified. However, it is recommended that the following be monitored:
- General waste removed from site;
- Hazardous waste removed from site;
- Waste rock generated and disposed to the WRDs;
- Sewage removed from site.

8.3. Archaeological monitoring plan

No monitoring requirements were identified.

8.4. Terrestrial biodiversity monitoring plan

An ECO or appropriately appointed person must ensure that all impacts remain within the approved footprint and remains in compliance with the approved EMPr.

Monitoring of the terrestrial ecology should be done on an annual basis to assess whether there are any concerns regarding the flora. Monitoring of the flora should start as soon as the construction phase of the development commences. The **monitoring should include the following**:

- Annual visual monitoring by the appointed ECO to determine if vegetation in undisturbed areas is being impacted. Photographic record of monitoring sites should be kept for comparison between monitoring events.
- Annual alien invasive plant monitoring, eradication and control programme. It is recommended that AIP removal be undertaken annually after the first rains (November), but prior to seed dispersal.
- Implement an Observe and Report approach which will enable employees to report any disturbance of fauna or degradation that they encounter during the operational phase.
- Monitor the ecological characteristics, rehabilitation and recovery after Decommissioning until it is self-sustaining and a closure certificate is obtained.

8.5. Geohydrological Monitoring plan

The proposed groundwater monitoring plan are outlined in the figure below and the these boreholes were placed in locations where pollution plumes may be migrating towards. They are placed downgradient of the mining infrastructure expected to possibly have an impact on the groundwater quality. EUB-1 is an existing borehole at the mine and should also be included in the monitoring program. It is recommened that quarterly groundwater samples be collected and submitted to a SANAS accredited laboratory for parameters normally associated with manganese and iron ore mining activities.

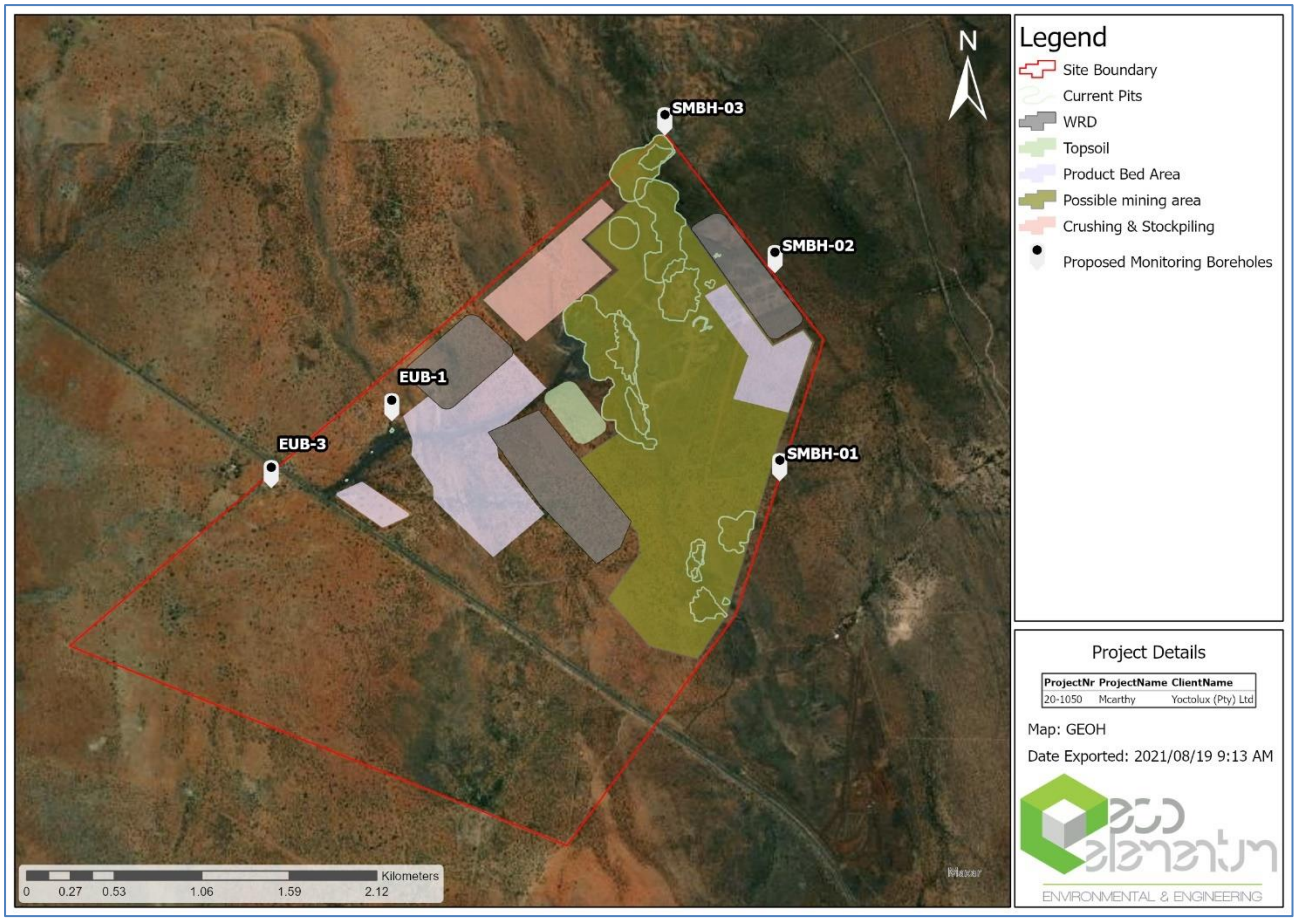


Figure 8-2: Positions of the proposed monitoring boreholes to be drilled and form part of the monitoring programme at Macarthy mine area

The following parameters are proposed for the Macarthy mine monitoring program:

- The pH, EC, Ca, Mg, Na, K, Cl, SO4, N, NO4 and F, and Al, Fe, Mn, Alkalinity and TDS.

Water levels in the boreholes should be monitored on a monthly basis.

8.6. Noise

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active monitoring – the measurement of noise levels at identified locations.

Considering the developmental character of the area, external parties may classify the area as rural and propose zone sound levels typical of a rural noise district. With a recommended acceptable rating level of 35 dBA, noise levels exceeding 42 dBA may be considered disturbing. As such it is recommended that the developer develop a database of existing ambient sound levels to confirm the pre-mining ambient sound levels. This active monitoring should continue during the operational phase to define the actual noise levels.

In addition, should a reasonable and valid noise complaint be registered, the mine should investigate the noise complaint as per the guidelines below. These guidelines should be used as a rough guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

8.6.1. Measurement Localities and Procedures

8.6.1.1. Measurement Localities and Frequency

Six-monthly noise measurements are recommended at representative locations around the mine, including measurements at NSD 1/2 and 4/6 before mining activities are to take place. The location(s) and frequency for future noise measurements can be recommended by an acoustic consultant.

Should there be a noise complaint, once-off noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument can be deployed at the mine (close to the source of noise) during the measurement.

8.6.1.2. Measurement and Procedures

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day- (06:00 – 22:00) and night-time (22:00 – 06:00) period. Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

8.7. Soil

Soil,land use and land capability plan as outlined in the (Terra, 2021) must be implemented including the proposed monitoring plans.

8.8. Surface water

Effective surface water management and monitoring is essential for the long term sustainability and protection of the receiving water environment. There is a legal obligation on the water user to establish a monitoring programme on the site that needs to be registered on the National Monitoring System administered by D: RQS. This would enable the mine and the DWA to collect data and information necessary to assess:

- Quantity, quality and use of water in the surrounding rivers;
- Compliance with RQO;
- Status of the aquatic health system; and
- Atmospheric conditions which may influence water resources in the area

Table 8-1: Proposed Monitoring Programme

Location	Aspect	Parameters	Frequency
Upstream of iron opencast in watercourse at watershed area	Groundwater quality	Electrical conductivity Sodium Sulphate Chemical oxygen Demand Chloride Nitrate Ammonia Manganese Iron	Every 3 months
	Surface water quality when flowing		Monthly
Downstream of iron opencast in watercourse at watershed area	Groundwater quality		Every 3 months
	Surface water quality when flowing		Monthly
Backfilled iron opencast in watercourse at watershed area	Connectivity of upstream and downstream	Is a river bed and banks formed?	Annually
	Erosion	Has the material that was backfilled moved and is it resulting in siltation downstream?	Annually
	Vegetation establishment	Vegetation cover and species composition	Annually
Storm water dam / Return water dam	Overflow Water quality	Electrical conductivity Sodium Sulphate Chemical oxygen Demand Chloride Nitrate Ammonia Manganese Iron	Daily
	Water levels	Free board	Daily
	Overflow volume	Volume	Daily
Residue deposits and associated infrastructure	Rainfall		Daily
	Water balance		Monthly
	Toe seepage Quality	Electrical conductivity Sodium Sulphate Chemical oxygen Demand Chloride Nitrate Ammonia Manganese Iron	Monthly
	Toe seepage volume	Volume	Monthly
	Water infiltration of waste	Volume	Monthly

8.9. Visual

No monitoring is proposed.

8.10. Socio-Economic

Monitoring for environmental aspects that could impact on the socio economic environment as outlined in the preceding sections. The following is also recommended for monitoring by Human Resources annually:

- The number of people sourced from the local communities that is employed by Macarthy mine;
- Implementation of the SLP; and
- Minutes of meetings with the Community leaders and liaisons.

9. INDICATE THE FREQUENCY OF THE SUBMISSION OF THE PERFORMANCE ASSESSMENT REPORT

Regulation 26(e) of GN326 of 2016 indicate that “the frequency of auditing of compliance with the conditions of the environmental authorisation and of compliance with the approved EMPr, and where applicable the closure

plan, in order to determine whether such EMPr and closure plan continuously meet mitigation requirements and addresses environmental impacts, taking into account processes for such auditing prescribed in terms of these Regulations: provided that the frequency of the auditing of compliance with the conditions of the environmental authorisation and of compliance with the EMPr may not exceed intervals of 5 years"

Macarthy will conduct external performance assessments on the EMPr every 2 years, these reports will be submitted to the DMR within a month of being completed.

10. ENVIRONMENTAL AWARENESS PLAN

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

Macarthy mine must developed formal procedures for environmental awareness as documented in their ISO 14000 system. This procedure will define the process for identifying and planning environmental training and awareness. It pertains to all employees and contractors whose work may create a significant impact upon the environment. Personnel performing the tasks, which can cause significant environmental impacts shall be competent on the basis of appropriate education, training and/or experience.

This environmental awareness is relevant to all areas and department within Macarthy mining operations.

Training records and Needs Analysis Matrix must be completed and maintained to identify the level of instruction needed by personnel whose jobs may create a significant impact on the environment.

Environmental awareness must be implemented as specified in Macarthy circular SHE-E009: Environmental Communication and Complaint Handling Procedure.

Environmental awareness must be part of the induction programme that is compulsory to all new, part-time and transferred employees, as well as onsite contractors.

Three basic categories of training are required. The first is induction training, the second is environmental awareness training and the third is technical training. All people entering the site are required to complete the induction training.

Environmental awareness training are further divided into Level 0 (Contractors), Level 1 (C-Lower grade to A grade) and Level 2 (C-Upper up to E-grade). Environmental training is divided into Level 3 (Operational Training), Level 4 (Specialist training – ISO 14001 auditing course), Level 5 (Internal auditors – external companies) and Level 6 (Strategic and Risk Management Training).

- Level 0 training levels includes: Team briefings; General environmental awareness covering specific do's and don'ts; Monthly topics.
- Level 1: Induction training to all Salene staff.
- Level 2: The environmental policy of Macarthy; Impacts that Macarth may have on the environment; Roles and responsibilities in achieving conformance with the Environmental policy; the training is in the form of a video and team briefings.
- Level 3: Awareness training covers the principles, legislation and reasons for an Environmental System and the requirements of the ISO 14001 standard; Short training sessions for senior personnel.
- Level 4: Technical training given to operational personnel whose activities have a direct influence on significant environmental aspects; Training based on the relevant controls as per the Aspect Register.
- Level 5: Course given by an external training organization; Training material is examinable and will cover the Environmental Management Systems Auditing relevant to the internal auditors (EMS).
- Level 6: Strategic and Risk Management Training.

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

All the risks identified (i.e. impacts that could occur) will be managed and prevented in accordance with the management and mitigation measures as outlined in the EMPr.

11. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

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

The financial provisions must be reviewed and updated in accordance with the applicable legislation as promulgated and updated from time to time. Current requirements is that the provisioning will be updated on an annual basis and Macarthy mine will implement this requirement.

No additional information has been requested.

- End of Part B -

PART C
UNDERTAKING

1. EAP UNDERTAKING

The EAP herewith confirms

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

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

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

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed;

Name of EAP: ……....

Date: ……....

Signature: ……

2. APPLICANT UNDERTAKING

I, ……, the undersigned and duly authorised thereto hereby:

a) Confirm that the financial provision as required will be available; and

b) Undertake to adhere to the requirements and to the conditions as set out in the EMPR submitted to the Director: Mineral Development and approved on ……

Signed at.....on this..... day…….

Signature of applicant …….

Designation ……

- END OF PART C -

PART D
REFERENCES AND APPENDICES

1. REFERENCES

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2. APPENDICES

Appendix 1: Qualification of EAP

Appendix 2: Experience of the EAP

Appendix 3: Locality Maps

Appendix 4: Site Layout and other Layout Maps

Appendix 5: Public Participation Documentation

Public Participation sreport - with

- Content of Newspaper Advertisement and Site notices
- Newspaper Advertisement
- Background Information Document
- Photographs of Site Notices

Appendix 6: Specialist reports