NAME OF APPLICANT: IMERYS (SOUTH AFRICA) (PTY) LTD – ANREF ANDALUSITE OPERATION

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FILE REFERENCE NUMBER: NW 30/5/1/2/2/522 MR

SHANGONI
Management Services (Pty) Ltd

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

BASIC ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

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IMERYS
TRANSFORM TO PERFORM

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, 2017, 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 (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

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

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

OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

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

(a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
(b) identify the alternatives considered, including the activity, location, and technology alternatives;
(c) describe the need and desirability of the proposed alternatives,
(d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine:
    (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
    (ii) the degree to which these impacts—
        (aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be managed, avoided or mitigated;

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

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

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

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

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REFERENCES

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PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1. Contact Person and correspondence address

1.1 Details of the EAP

Name of the Practitioner: Shangoni Management Services: Anika van Vuuren

Tel No.: (012) 807 7036

Fax No. : (012) 807 1014

e-mail address: anika@shangoni.co.za

1.2 Expertise of the EAP

The qualifications of the EAP

NAME	QUALIFICATIONS
Anika van Vuuren	B.Sc. (Hons): Geography and Environmental Management
Jan Nel	M.Sc. Environmental Management (UFS)

Summary of the EAP's past experience.

NAME	SUMMARY OF EXPERIENCE
Anika van Vuuren	Anika studied at the University of North West where she graduated Cum Laude with a B.Sc degree in Environmental and Biological Sciences, with majors in Geography and Botany. In 2013 she obtained her B.Sc. Honours degree Cum Laude in Environmental Sciences from the North-West University (Potchefstroom) specialising in Environmental Management. Anika is part of the Closure and rehabilitation department and is involved in the completion of Financial Provision calculations and reports, and the compilation of Closure Plans, Rehabilitation Plans and Rehabilitation Strategies and Implementation programmes (RSIP's). She also has experience in implementing and managing Environmental Management Systems (ISO 14001).
Jan Nel	Jan Nel has been actively involved for the past 16 years in environmental management within the mining industry, providing assistance with EMP Compliance, Environmental Impact Assessments (EIA), Financial Provision Calculations, Closure Plans, Rehabilitation Plans, Environmental Management Programme Reports (EMP) and EMP Performance Assessments. Jan is the Technical Director: Rehabilitation and Closure at Shangoni.

2. Location of the overall Activity.

Farm Name:	Portions 12, 13 and the remainders of Portion 8 & 11 of the Farm Kleinfontein 260 JP, Portion 1 and the former Portions 24, 39, 41, 42 and 44 of the Farm Driefontein 259 JP and the remainder of Portion 9 and the Mineral Area 2 of the Farm Wonderfontein 258 JP
Application area (Ha)	68 Ha
Magisterial district:	Ramotshere Moiloa Magisterial District
Distance and direction from nearest town	6.5 km west of Groot Marico (North West Province)
21-digit Surveyor General Code for each farm portion	TOJP0000000000260000011 TOJP0000000000260000012 TOJP0000000000260000013 TOJP0000000000260000008 T0JP0000000000259000001 T0JP0000000000259000024 T0JP0000000000259000039 T0JP0000000000259000041 T0JP0000000000259000042 T0JP0000000000259000044 T0JP0000000000258000009

3. Locality map

Figure 1: Locality of Anref Andalusite Mine

4. Description of the scope of the proposed overall activity.

4.1 Listed and specified activities

NAME OF ACTIVITY	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GN R 327, GN R 325 or GN R 324) *As amended April 2017*
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, and • Opencast quarries.	68 Ha	X	GN R 327 of 7 April 2017: Activity 22 (i)

Anref Mine - Mining activities

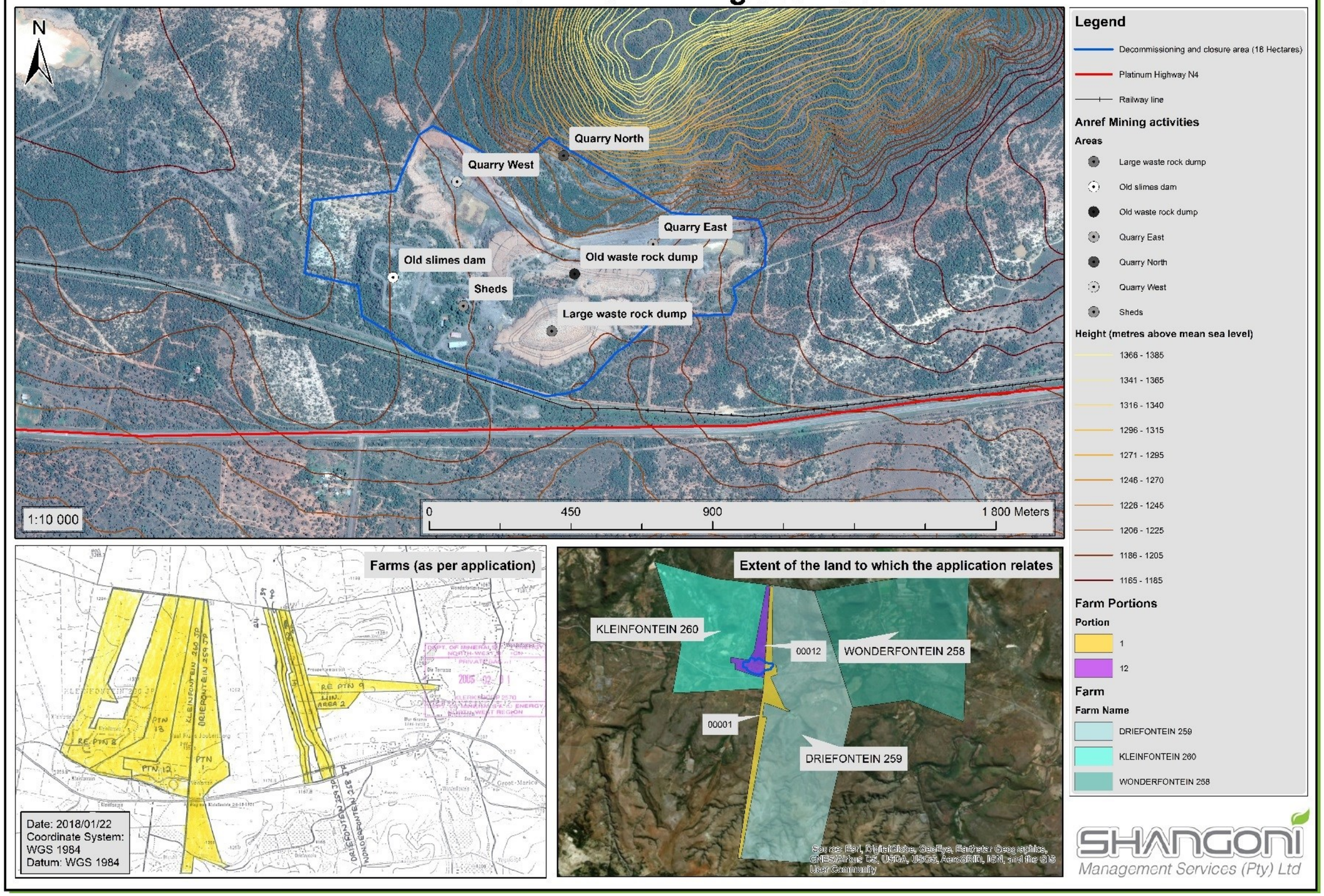


Figure 2: Mine activities (layout)

4.2 Description of the activities to be undertaken

Anref was an Andalusite mine situated west from the town of Groot Marico, which is 25 km east of Zeerust in the North-West Province. The mine has not been operational since 2008. No drilling or blasting took place. There was no plant; the ore was transported from the site by haul truck to Rhino Minerals in Thabazimbi. The waste rock dumps (WRD) have been shaped and seeded, while vegetation established on the slimes dam. There are access roads on the area to and from the quarries and mine residue. There are two sheds at the mine entrance used by a farmer for agricultural activities. The majority of rehabilitation activities were completed in 2017. Financial provision is available for the rehabilitation of access roads that will not be utilised post-closure, as well as for post-closure monitoring and maintenance in 2018/19, or until a closure certificate has been issued.

Concurrent rehabilitation has been implemented since operations ceased and all rehabilitation completed, and the mine plans to commence with decommissioning after the necessary Environmental Authorisations have been received.

Decommissioning and closure of the Anref mine includes the following biophysical areas:

- Waste rock dumps,
- Slimes dam,
- Access roads, and
- Opencast quarries.

5. Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process	**REFERENCE WHERE APPLIED** (i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)	**HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT?** (E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)
The Constitution of the Republic of South Africa, 1996.	Throughout this document	Anref mine is in possession of a mine right to mine mineral resources, DMR file reference Number: NW 30/5/1/2/2/522 MR. The purpose of this BAR is to consolidate all the existing and updated information into one document. The Basic Assessment process will run parallel with the closure application in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002, No. 28 of 2002.
The Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)		
The Mineral and Petroleum Resources Development Regulations, 2004, Regulations R.562 dated April 2004).		
The National Environmental Management Act, 1998 (Act No. 107 of 1998).		
The Environmental Impact Assessment Regulations, as amended by GN. R. 326 dated April 2017.		
The Environmental Impact Assessment Regulations, as amended by GN. R. 326 dated April 2017.	Refer to Section 4.1 (Part A) of this BAR	The decommissioning and closure activity at Anref mine must be approved in terms of the Environmental Impact Assessment Regulations, as amended by GN. R. 326 dated April 2017.
Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010. Government Notice 891 of 2017.	Section 6 (Part A) of this BAR	The need and desirability of the mine closure is discussed in Section 6 below in terms of the required format contained in the Guideline on Need and Desirability (GN 891 of 2017). It should however be noted that Anref Mine has ceased all mining activities and proposes to decommission and close.
Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector.	Chapters E, F and M of Section 7.4.1 (Part A) of this BAR	In terms of the requirement regarding the management of biodiversity, the Mining and Biodiversity Guideline:

		Mainstreaming biodiversity into the mining sector was consulted.
The National Water Act, 1998 (Act No. 36 of 1998).	Chapters G, H and I of Section 7.4.1 (Part A) of this BAR	Anref Mine does not have an approved water use license.
Government Notice (GN) 704, dated 1999 under the NWA, 1998.	Chapter G of Section 7.4.1 (Part A) of this BAR	
The National Environmental Management: Biodiversity Act (NEM:BA), 2004 (Act No. 10 of 2004).	Chapter E, F and M of Section 7.4.1 (Part A) of this BAR	Impacts and mitigation / management measures relevant to biodiversity and conservation are provided in Sections 9; 10; 11; 12 of Part A and Sections 1.4; 1.5 and 1.6 of Part B of this BAR.
NEM:BA Threatened or Protected Species (ToPS) Regulations, 2013.		
Environmental Conservation Act, 1989 (Act No 73 of 1989).		
National Forests Act, 1998 (Act No 84 of 1998)		
National Veld and Forest Fire Act, 1998 (Act No 101 of 1998)		
Alien and Invasive Species Regulations published in the Government Gazette No. 37886, dated 01 August 2014	Chapter E, F and M of Section 7.4.1 (Part A) of this BAR	Impacts and mitigation / management measures relevant to biodiversity and conservation are provided in Sections 9; 10; 11; 12 of Part A and Sections 1.4; 1.5 and 1.6 of Part B of this BAR.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)		
National Environmental Management: Protected Areas Act (NEM:PAA) (Act No 57 of 2003).		
NEM:BA National Threatened Terrestrial Ecosystems list, December 2011.		
National Biodiversity Strategy and Action Plan (NBSAP)		
Government Gazette, 32816, General Notice 1210, National Ambient Air Quality Standards, in terms of the National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004), Department of Environmental Affairs, 24 December 2009.	Chapter J of Section 7.4.1 (Part A)	Apart from this mine and the nearby town, there is no identifiable source of air pollution within the vicinity of the mine. All mining activities have ceased.
Government Gazette, 35463, General Notice 486, National Ambient Air Quality Standard for Particulate Matter with Aerodynamic Diameter less than 2.5 Micron Meters (PM2.5), in terms of the National Environmental Management: Air Quality Act, 2003 (Act No. 39 of 2004), Department of Environmental Affairs, 29 June 2012.	Chapter J of Section 7.4.1 (Part A), Section 9 (Part A) of this BAR.	

Government Gazette 36974, General Notice 827, National Dust Control Regulations, in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), Department of Environmental Affairs, 01 November 2013.		
SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.	Chapter K of Section 7.4.1 (Part A) of this BAR	Farm vehicles active on the mining site are the most significant sources of noise pollution. All mining activities have ceased.
SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments		
National Environmental Management: Waste Act (Act No 59 of 2008), as amended.	Section 12 (Part A) of this BAR	All mining activities have ceased. The waste rock dumps have been sloped and vegetated. These dumps will not be remined or utilised by a third party.
National Heritage Resources Act (Act No. 25 of 1999), as amended.	Chapter N of Section 7.4.1 (Part A) of this BAR	No heritage resources were identified on the impacted area that require rehabilitation.
DMR Guideline for Consultation with communities and Interested and Affected Parties. As required in terms of Sections 16(4)(b) or 27(5)(b) of the Mineral and Petroleum Resources Development Act (Act 28 of 2002), and in accordance with the standard directive for the compilation thereof as published on the official website of the DMR.	Sections 7.2, 7.3 and 11 of Part A this BAR	Public Participation relevant to this process was undertaken in accordance with the relevant Guideline(s) and EIA Regulations, dated December 2014.
Integrated Environmental Management Information Series. Criteria for determining alternatives in EIA.	Sections 7.1, 7.4, 7.7 and 7.9 of this BAR	Alternatives have been assessed.
Government Gazette 39425. Government Notice R.1147 dated 2015, "*Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations*".	Section 18 (part 1) and Section 1.7 (Part B) of this BAR Annexure A	The Closure Cost Assessment (financial provision) report, as well as the Rehabilitation Plan and Schedule and Final Closure- and Decommissioning Plan were compiled for Anref Mine in terms of the mentioned Regulations.
NEMA requirements (EIA Regulations as amended & GN 1147) and MPRDA requirement (Reg 62).	Annexure B	The table in Annexure B serves as a comparison between NEMA and MPRDA minimum requirements for a closure plan.

6. Need and desirability of the proposed activities.

On the 20th of October 2014, the Department of Environmental Affairs published a Guideline on Need and Desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010, in Government Notice 891 of 2014. This guideline was updated by the Department of Environmental Affairs in 2017. The following table indicates on how the guideline requirement were considered in this BAR.

The need and desirability for the Anref mine closure and decommissioning project is described in this chapter. An application for a closure certificate will be applied for as mining has ceased and it is a regulatory requirement to close the mine.

Table 1: Need and desirability of Anref Mine

Requirement	Part where requirement is addressed / response
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?[1]	Anref mine closure and decommissioning will not have an impact on the ecological integrity of the area. The rehabilitation is focussed on improving the ecology integrity by establishing flora communities supporting improved ecology. No information is available indicating threatened, sensitive or vulnerable ecosystems.
1.1 How were the following ecological integrity considerations taken into account?	
1.1.1 Threatened Ecosystems.[2]	
1.1.2 Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.[3]	
1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").	Anref mine closure and decommissioning activities will not have an impact on the CBA's and ESA's.
1.1.4 Conservation targets.	
1.1.5 Ecological drivers of the ecosystem.	
1.1.6 Environmental Management Framework.	No specific Environmental Management Framework (EMF) is defined for the Ngaka Modiri Molema District Municipality or the Ramotshere Moiloa local municipality. According to the North West Environmental Implementation Plan (2015 – 2020), no framework will be developed for this area between 2015 and 2020.

[1] Section 24 of the Constitution and section 2(4) (a) (vi) of NEMA refer.

[2] Must consider the latest information including the notice published on 9 December 2011 (Government Notice No. 1002 in Government Gazette No. 34809 of 9 December 2011 refers) listing threatened ecosystems in terms of Section 52 of National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

[3] Section 2(4)(r) of NEMA refers.

Requirement	Part where requirement is addressed / response
1.1.7 Spatial Development Framework.	The Ngaka Modiri Molema District Municipality Spatial Development Framework (SDF) 2006, indicates that the region is predominantly rural in character, and so in addition to its SDF (under review 2016/2017), it will develop a rural development strategy. The Ramotshere Moiloa Spatial Development Framework (2014/2015) states that more than 90% of the municipal area consists of natural vegetation, with the next highest category as Agriculture (5.3%). Built-up areas constitute 2.1% of the municipal area while mining takes up only 0.1%. Additionally, water and wetlands take up 1.3% of the municipal area. Anref mine falls within the mining development framework.
1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).[4]	The activities related to the closure and decommissioning will have insignificant contribution towards global and international impacts with regards to the environment. Imerys has set objectives with regards to environmental management, climate change, energy management, resource efficiency and biodiversity as part of their Environmental Focus driving Imerys' Sustainable Development Initiative.
1.2 How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[5]	The development will not disturb any ecosystems, as part of the decommissioning and closure the quarries will be made safe and water allowed to accumulate, the waste rock dumps will be revegetated, the old tailings dam will be sloped and revegetated, and infrastructure will be used by the farmers.
1.3 How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[6]	Anref mine closure and decommissioning will not pollute and or degrade the biophysical environment It is focussed on improving the impact of the old mining activities on the environment.

[4] Section 2(4) (n) of NEMA refers.

[5] Section 24 of the Constitution and Sections 2(4) (a) (i) and 2(4) (b) of NEMA refer.

[6] Section 24 of the Constitution and Sections 2(4) (a) (ii) and 2(4)(b) of NEMA refer.

Requirement		Part where requirement is addressed / response
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?[7]	The development will create waste if infrastructure is demolished. The only infrastructure present on site are two sheds that are used by a farmer for agricultural activities. The two existing buildings will be used by farmers. Therefore, the decommissioning will not involve the demolishing of buildings or structures.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[8]	The activities related to decommissioning and closure will have no impact on any cultural heritage.
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?[9]	The decommissioning and closure will not impact on non-renewable natural resources.
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?[10]	The decommissioning and closure will not use renewable natural resources.
1.7.1	*Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires*	Not applicable.

[7] Section 24 of the Constitution and Sections 2(4)(a)(iv) and 2(4)(b) of NEMA refer.

[8] Section 24 of the Constitution and Sections 2(4)(a)(iii) and 2(4)(b) of NEMA refer.

[9] Section 24 of the Constitution and Sections 2(4)(a)(v) and 2(4)(b) of NEMA refer.

[10] Section 24 of the Constitution and Sections 2(4)(a)(vi) and 2(4)(b) of NEMA refer.

Requirement		Part where requirement is addressed / response
	that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)	
1.7.2	*Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?)*	The decommissioning and closure will use limited natural resources i.e. diesel and electricity.
1.7.3	*Do the proposed location, type and scale of development promote a reduced dependency on resources?*	Not applicable.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts?[11]	Anref mine closure and decommissioning will not have any negative ecological impacts. The entire rehabilitation and decommissioning activity is focussed on improving the ecology on the mining area.
1.8.1	*What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?*	No specialist studies such as a land capability / biodiversity assessment was conducted to verify that the vegetation that has established is sufficient for the final land use, which is grazing.
1.8.2	*What is the level of risk associated with the limits of current knowledge?*	The current knowledge gaps pose no significant level of risk to the decommissioning and closure of the mine.
1.8.3	*Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?*	Rehabilitation was conducted in line with the approved EMPr and rehabilitation plan.
How will the ecological impacts resulting from this development impact on people's environmental right in terms following:[12]		
1.8.4	*Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?*	Refer to section 7.5 and 8 of the BAR for impacts associated with the decommissioning and closure.
1.8.5	*Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?*	Refer to section 7.5 and 8 of the BAR for impacts associated with the decommissioning and closure.

[11] Section 24 of the Constitution and Section 2(4)(a)(vii) of NEMA refer.

[12] Section 24 of the Constitution and Sections 2(4)(a)(viii) and 2(4)(b) of NEMA refer.

Requirement		Part where requirement is addressed / response
1.9	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to section 7.5 and 8 of the BAR for impacts associated with the decommissioning and closure.
1.10	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	Refer to section 7.5 and 8 of the BAR for impacts associated with the decommissioning and closure.
1.11	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?[13]	Refer to section 7.5 and 8 of the BAR for impacts associated with the decommissioning and closure.
1.12	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?[14]	Refer to section 7.5 and 8 of the BAR for impacts associated with the decommissioning and closure.
What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?:		
2.1.1	*The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,*	The key objectives of the Ngaka Modiri Molema District Municipality are set out in its 2012-2016 Integrated Development Plan (IDP). In order to achieve the vision and mission, the municipality will strive to achieve the objectives below, which are categorized under local government key performance areas as follows: • Municipal Transformation and Institutional Development: o Promotion of Planning and Performance Management; o Improve Technology Efficiencies; o Achieve Employment Equity; o Promote Innovation, Learning and Growth; o Recruitment and Retention of Skilled Employees; and o Achieve a Positive Employee Climate.

[13] Section 2(4)(b) of NEMA refer.

[14] Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.

Requirement	Part where requirement is addressed / response

	• Financial Viability:
	  ○ Enhance Revenue Collection;
	  ○ Promote Financial accountability;
	  ○ Achieve clean audit; and
	  ○ Improve Asset management.
	• Good governance and community participation:
	  ○ Promote Accountable, efficient and transparent administration;
	  ○ Promote community participation; and
	  ○ Improve Communication.
	• Local Economic Development:
	  ○ Promote and support local economic development and agriculture.
	• Spatial Rationale:
	  ○ Promote Spatial Planning;
	  ○ Improve District Transport Planning;
	  ○ Enhance Integrated Rural Development;
	  ○ Improve IDP Coordination and support;
	  ○ Facilitate integrated Social development;
	  ○ Promote Economic Development Planning; and
	  ○ Promote Intergovernmental Relations.
	• Basic Services and Infrastructure Investment:
	  ○ Provide water;
	  ○ Provide sanitation;
	  ○ Facilitate the provision of electricity;
	  ○ Build and maintain roads;
	  ○ Provide Storm Water Management;
	  ○ Facilitate the provision of housing; and
	  ○ Facilitate the provision of community infrastructure.
	
	The sector plans as defined in the Ramotshere Moiloa Local Municipal IDP defines the following objectives for the SDF:
	• To promote the creation of sustainable human settlement in Ramotshere Moiloa Local Municipal Area;
	• To encourage rural Urban Integration
	• To establish and promote good and functional land use Management;

Requirement	Part where requirement is addressed / response
	• To unlock the development potential of identified development zones • To unlock the potential of Lehurutshe Commercial and administrative hub; • To unlock the potential of Dinokana as a heritage site; • To unlock the potential of Groot Marico as Tourism destination; and • To unlock the potential of Tlokweng border.
2.1.2 Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	This is not applicable as the Anref mine is applying for closure of the mine.
2.1.3 Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	This is not applicable as the Anref mine is applying for closure of the mine.

2.1.4 Municipal Economic Development Strategy ("LED Strategy").	The Ramotshere Moiloa Local Municipality's Integrated Development Plan (IDP) indicates that the municipality's LED strategy is aimed at growing the local economy and creating jobs. The strategy has identified the following sectors as key in the local economy:
	• Trade;
	• Utilities and construction;
	• Government services; and
	• small, medium and micro-enterprises (SMME).
	A further assessment of the local economy also identified agriculture and tourism as the two main sectors with the highest potential for growth in the municipality.
	
	An analysis of the local economy has identified 6 main thrusts or drivers of the local economy which serve as the starting points for building the local economy. These thrusts, with their respective initiatives are listed below:
	• Thrust 1: Institutional Development:
	  ○ Formulation of a Development Agency;
	  ○ Updating of agricultural, tourism and transport plans; and
	  ○ Review of local LED Plans.
	• Thrust 2: Agriculture and Agro-processing Development:
	  ○ Establishment of an Agro-Processing Hub;

Requirement	Part where requirement is addressed / response
	○ Accelerate implementation of the Provincial CRDP programme; ○ Develop a distribution network for small-scale farmers; ○ Facilitate partnership and collaboration to assist small-scale farming enterprises; ○ Establishment of a Fresh Produce Market; ○ Encourage small-scale farmers to produce niche products; ○ Focus on niche and speciality products when encouraging greater agricultural exports; ○ Develop a distribution network for agricultural export produce; ○ Assist producers with meeting export/processing standards and regulations; and ○ Link producers to the relevant export council. • Thrust 3: Tourism Development: ○ Revise/Develop Tourism Marketing Strategy; ○ Create a tourism website; ○ Improve the tourism information providers; ○ Undertake a provincial marketing/advertising campaign; ○ Develop signage along major routes; ○ Compile a portfolio of attraction sites; and ○ Host an annual event or festival. • Thrust 4: SMME and Trade Development: ○ Allocate specific areas for rural SMMEs to operate; ○ Prepare rural business plans; ○ Design incentive packages to attract SMMEs; ○ Conduct an audit of the cost to business; ○ Create an LED Forum; ○ Update and implement a CBD Development Plan for towns such as Zeerust;

Requirement	Part where requirement is addressed / response
	○ Develop a SMME Policy; ○ Partner with local stakeholders; ○ Undertake a review of the policy and regulatory framework in terms of informal business; ○ Introduce one-stop-shops in townships and create mobile/temporary small business support units for other informal areas; and ○ Develop formal trading stalls to house street traders. • Thrust 5: Transport and Logistics; ○ Develop major and internal roads (in wards such as Maetla and Phale), especially those leading to tourist sites; ○ Facilitate the expansion of service accessibility; and ○ Establish logistics facilities that procure and distribute specialised products. • Thrust 6: Quality of Life Improvement: ○ Provide rural sanitation; ○ Provide housing (RDP houses); ○ Establish clinics and health centres; ○ Establish information facilities (such as libraries); and ○ Establish certified primary schools and ensure staff are qualified. The successful implementation of the strategy is dependent on the commitment and cooperation of all stakeholders in the municipality. The LED strategy should therefore not be viewed as a separate plan, but rather as part of the municipality's integrated development initiatives.
2.2 Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	It is not anticipated that Anref mine's will have any socio-economic impacts. of the mine.
2.2.1 Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	With the mine applying for closure, it is not anticipated that it will compliment the local socio-economic initiatives or skills development programs.

Requirement	Part where requirement is addressed / response
2.3 How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?[15]	This is not applicable as the Anref mine is applying for closure of the mine.
2.4 Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long term?[16] Will the impact be socially and economically sustainable in the short- and long-term?	This is not applicable as the Anref mine is applying for closure of the mine.
In terms of location, describe how the placement of the proposed development will:[17]	
2.4.1 result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	This is not applicable as the Anref mine is applying for closure of the mine and therefore, there will be no creation of new residential and employment opportunities.
2.4.2 reduce the need for transport of people and goods,	This is not applicable as the Anref mine is applying for closure of the mine and therefore the need for transport of people and goods is not required.
2.4.3 result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	This is not applicable as the Anref mine is applying for closure of the mine and will not result in access of public transport.
2.4.4 compliment other uses in the area,	Mining forms part of the spatial development framework of the municipality. However, with the mine applying for closure, this will not compliment other uses in the area.
2.4.5 be in line with the planning for the area,	As the Anref mine is applying for closure, and the end land use for the area is cattle or game grazing/farming and livestock watering. This is in line with the planning of the area.
2.4.6 for urban related development, make use of underutilised land available with the urban edge,	Not applicable as this development is not urban related.
2.4.7 optimise the use of existing resources and infrastructure,	This is not applicable as the Anref mine is applying for closure of the mine.
2.4.8 opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.4.9 discourage "urban sprawl" and contribute to compaction/densification,	This is not applicable as the Anref mine is applying for closure of the mine.

[15] Section 2(2) of NEMA refers.

[16] Sections 2(2) and 2(4)(c) of NEMA refers.

[17] Section 3 of the Development Facilitation Act, 1995 (Act No. 67 of 1995) ("DFA") and the National Development Plan refer.

Requirement	Part where requirement is addressed / response
2.4.10 contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	This is not applicable as the Anref mine is applying for closure of the mine.
2.4.11 encourage environmentally sustainable land development practices and processes,	This is not applicable as the Anref mine is applying for closure of the mine.
2.4.12 take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	This is not applicable as the Anref mine is applying for closure of the mine.
2.4.13 the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	This is not applicable as the Anref mine is applying for closure of the mine.
2.4.14 impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	This is not applicable as the Anref mine is applying for closure of the mine. A heritage assessment was conducted in October 2011, no items of cultural or historical significance were found within the mining area.
2.4.15 in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	This is not applicable as the Anref mine is applying for closure of the mine.
2.5 How were a risk-averse and cautious approach applied in terms of socio-economic impacts?:	A decommissioning and closure plan was compiled by Shangoni Management Services which highlights all the risk-averse socio-economic impacts related to closure of the mine.
2.5.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?[18]	The current knowledge gaps pose no level of risk to the decommissioning and closure of the mine.
2.5.2 What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	The current knowledge gaps pose no level of risk to the decommissioning and closure of the mine.
2.5.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	There is no level of risk to the decommissioning and closure of the mine associated with the limits of current knowledge gaps.
2.6 How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.6.1 Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	On mine closure, the mine must ensure that all employees and contractors undergo exit medical examinations. Additionally, they must be able to prove that they have the means to diagnose and

[18] Section 24(4) of NEMA refers.

Requirement	Part where requirement is addressed / response
	report occupational diseases and injuries, ensure continuity of care for occupational and non-occupational diseases and injuries sustained by employees whilst in their employ, ensure sustainability of health care programs already implemented and ensures adequate environmental management in order to prevent the effects of mine processes on the surrounding communities.
2.6.2 Positive impacts. What measures were taken to enhance positive impacts?	The following positive impacts were identified: • The two buildings on site can be utilised after closure for other uses except for mining
2.7 Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	During the active phases of the mine, only a limited amount of people was employed, who did not reside on site. It is not anticipated that socioeconomic impacts related to mine closure will result in any ecological impacts.
2.8 What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?[19]	This is not applicable as the Anref mine is applying for closure of the mine.
2.9 What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)?[20] Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	This is not applicable as the Anref mine is applying for closure of the mine.
2.10 What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?[21]	This is not applicable as the Anref mine is applying for closure of the mine.
2.11 What measures were taken to ensure that the responsibility for the environmental health and safety consequences of	This is not applicable as the Anref mine is applying for closure of the mine.

[19] Section 2(4)(b) of NEMA refers.

[20] Section 2(4)(c) of NEMA refers.

[21] Section 2(4)(d) of NEMA refers.

Requirement	Part where requirement is addressed / response
the development has been addressed throughout the development's life cycle?[22]	
2.12 What measures were taken to:	The public participation process for this project will be conducted by Shangoni Management Services in terms of: • The procedures and provisions in terms of the NEMA; • Chapter 6 of the 2017 EIA Regulations; • GN 807 of 2012; Public Participation Guideline; and • Other relevant legislation such as the Promotion of Access to Information Act (PAIA), 2000. Refer to section 7.2 of the BAR for public participation. As part of the closure plan public consultation took place with all relevant parties.
2.12.1 ensure the participation of all interested and affected parties,	
2.12.2 provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,[23]	
2.12.3 ensure participation by vulnerable and disadvantaged persons,[24]	
2.12.4 promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,[25]	
2.12.5 ensure openness and transparency, and access to information in terms of the process,[26]	
2.12.6 ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge[27], and	
2.12.7 ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?[28]	
2.13 Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?[29]	This is not applicable as the Anref mine is applying for closure of the mine.

[22] Section 2(4)(e) of NEMA refers.
[23] Section 2(4)(f) of NEMA refers.
[24] Section 2(4)(f) of NEMA refers.
[25] Section 2(4)(h) of NEMA refers.
[26] Section 2(4)(k) of NEMA refers.
[27] Section 2(4)(g) of NEMA refers.
[28] Section 2(4)(q) of NEMA refers.
[29] Section 2(4)(g) of NEMA refers.

Requirement	Part where requirement is addressed / response
2.14 What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?[30]	This is not applicable as the Anref mine is applying for closure of the mine.
2.15 Describe how the development will impact on job creation in terms of, amongst other aspects:	This is not applicable as the Anref mine is applying for closure of the mine.
2.15.1 the number of temporary versus permanent jobs that will be created,	
2.15.2 whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.15.3 the distance from where labourers will have to travel,	
2.15.4 the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	
2.15.5 the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
2.16 What measures were taken to ensure:	
2.16.1 that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and	All applicable environmental legislation was considered and adhered to during the basic assessment process. Refer to Annexure B for the applicable legislation of the BAR.
2.16.2 that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	N/A
2.17 What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?[31]	All mitigation measures proposed as part of the final decommissioning, rehabilitation and closure plan (refer to Annexure A) focussed on minimising the potential impacts associated with the decommissioning and closure activities.
2.18 Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?[32]	It is believed that the mitigation measures (further actions required defined in section 8.3 of the final decommissioning, rehabilitation and closure plan –

[30] Section 2(4)(j) of NEMA refers.

[31] Section 2(4)(o) of NEMA refers.

[32] Section 240(1)(b)(iii) of NEMA and the National Development Plan refer.

Requirement		Part where requirement is addressed / response
		Attached in Annexure A) are practical and realistic. No long-term environmental legacy and managed burden will be left after closure, as all final rehabilitation has been implemented.
2.19	What measures were taken to ensure that he costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?[33]	As part of the NEMA requirements, financial provision has been calculated for closure. A decommissioning and closure plan has been developed to ensure closure objectives will be achieved. The actions are focussed on minimising the post closure impacts.
2.20	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?[34]	Refer to section 7.1 and Annexure C on alternatives considered in the BAR.
2.21	Describe the positive and negative cumulative socio-economic impacts bearing in mind. the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?[35]	Anref mine is applying for closure of the mine. This will have the following impacts on socio-economic: • Possible weakening of the local economy, The "weakening of the local economy" will be influenced by losses in the mine's contribution to Gross domestic product (GDP), production and employment, developments in the mining sector, structure of the local economy and growth potential in other sectors.

7. Motivation for the overall preferred site, activities and technology alternative including a full description of the process followed to reach the proposed preferred alternatives within the site.

7.1 Details of the development footprint alternatives considered.

As per Annexure C, a detailed investigation and comparative assessment of the alternative options for the Anref mine decommissioning and closure activities were undertaken, including the positive and negative implications

[33] Section 2(4)(p) of NEMA refers.

[34] Section 2(4)(b) of NEMA refers.

[35] Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.

of the proposed activity and identified alternatives. Below is a summary of the various alternatives considered, as well as the preferred alternative.

Alternatives have been identified for the project. These include:

a) Decommissioning and Closure

The mine stops mining, and processing of ore and begin with the physical removal of mining infrastructure and rehabilitation of the mining area. The decision followed as all mining has been completed, and also as a result of certain contributing factors, that include:

- Decrease in demand for the product (andalusite).
- Feasibility of mining in the area (specifically capital costs required with regards to transport of material to Rhino Andalusite Mine in Thabazimbi for processing).

The main aim of the decommissioning and closure plan is to provide the measures and time lines to rehabilitate the land, which was disturbed by mining activities, as practicably possible, to a land use which conforms generally to the principles of sustainable development.

b) The option of not implementing the activity, which is also referred as the no-go option will be to recommence with mining, which is not economically viable considering the decreased demand for andalusite and the challenges surrounding mining in the area (with regards to capital costs required to transport material to Rhino Andalusite Mine in Thabazimbi and that lack of material left to be mined). In addition, the fact that all the disturbed areas have already been rehabilitated reduces the incentive to continue or recommence mining (from an environmental perspective).

c) Care and Maintenance, an additional alternative which could have been considered is to place the mine under care and maintenance for a specified period of time. It has however been considered by the mine but was found to be inappropriate as all evidence points to that fact that the mine cannot be economically viable if mined in the future. This option is further impacted by the fact that the mining area has already been rehabilitated.

7.2 Details of the Public Participation Process Followed

A public participation process has been undertaken, as contained in Annexure D. The Public Participation Process followed included:

- Placement of an advertisement in the local newspaper,
- Placement of a site notices,
- Sending out letters of notification,
- Consultation with the relevant authorities,
- Registration of Interested and Affected Parties (I&APs) and key stakeholders,
- Access and opportunity to comment by I&APs (30-day comment on the draft BAR & EMPr, and appendices), and
- Creating a comments and response report (Annexure D).

7.3 Summary of issues raised by I&APs

The table below provides a summary of the comments and issues raised and reaction to those responses.

Table 2: Comments and issues raised by I&AP's

Interested and affected parties	Date	Method of comment	Issues raised	EAP's response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
Riaan Koekemoer (Environmental Co-Ordinator) Afrisam	02/07/18	Email	Re: ANREF Andalusite mine Mr Koekemoer requested to register as an I&AP. He expressed his difficulty regarding accessing the relevant technical documents of the Shangoni Website.	Noted. The notification letter and comment form was sent through to Mr Koekemoer and he has been included as an I&AP for the proposed project. Access to the Website has been resolved and Mr Koekemoer confirmed access to the technical reports on the Shangoni Website. *Please refer to Appendix D6.*	Not Applicable – No information to be incorporated.
Riaan Koekemoer (Environmental Co-Ordinator) Afrisam	11/07/18	Email	Mr Koekemoer submitted the I&AP comment forms; the following comments were received regarding the following: • Quantifies of actual reserves at the mine • Quality of the remaining minerals • Is the minerals winnable from the WRDS.	Noted, Mr Koekemoer request has been communicated to the client and will be addressed internally.	Not Applicable – No information to be incorporated.
Etienne van der Lith (Environmental Consultant) Bakwena N4 Platinum Toll Highway	24/08/18	Email	Re: Closure Application - Imerys Refractory Minerals. A request was made to register as an I&AP for the proposed project as the proposed project could impact on traffic. A request was made for access to the BAR as Bakwena would like to add input.	Noted. A letter of notification detailing the proposed project activities as well as the details of the public participation process and access to the technical documents has been provided to Mr Van Der Lith. A request for the completion of the comment form	Not Applicable – No information to be incorporated.

				has been provided to Mr Van Der Lith. The comment form has been completed and submitted to Shangoni , no comments or issues were raised. Shangoni has registered Bakwena as an I&ap (Please refer to Appendix D2-I&AP database). All correspondence between Bakwena and Shangoni forms part of *Appendix D6 (I&AP correspondence)* .	
Natasha Higgitt South African Heritage Resources Agency (SAHRA	24/08/18	(SAHRA Website)	Re: Closure Application - Imerys Refractory Minerals. The following comments were received: Additionally, the mine is located within an area of high palaeontological sensitivity as per the SAHRIS Palaeo Sensitivity map. The closure of certain areas such as the opencast quarries may impact significant palaeontological resources. As such, an assessment of palaeontological resources must be conducted as part of the EA application process. The report must be completed by a qualified palaeontologist and must comply with the SAHRA 2012 Minimum Standards: Palaeontological Component of Heritage Impact Assessments (see www.palaeontologicalsociety.co.za for qualified paleontologists). Further comments will be issued upon receipt of the above. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.	Noted, due to the request for the palaeontological resources assessment a request to DMR for the extension of timeframes for the submission of the Final BAR has been submitted to the department and subsequently approved. A Palaeontological Impact Assessment (PIA): Phase 1: Field, conducted by Dr. H Fourie, dated October 2018 has been conducted as requested. The study forms part of the Final BAR submission and has been uploaded on the SAHRA website for comment.	Recommendations from PIA included in the following sections: • Section 7.4.1 – Chapter N. • Section 10. • Section 12.

7.4 The Environmental attributes associated with the alternatives. A baseline environment.

7.4.1 Type of environment affected by the proposed activity.

Chapter A: Geology

Anref is situated on Andesite and Shale associated with the Transvaal Supergroup. The mining right area is located on the south-eastern limb of the Bushveld Complex. The farms all contain rocks from the Pretoria Group and the stratigraphy from south to north is as follows:

- Timeball Hill Formations: Contains shale and the andalusite bearing hornfels.
- Boshoek Formation: this formation of quartzites overlay the Timeball Hill formation and forms a prominent ridge in the area

The crystal sizes of the Anref deposit carries fine grained crystals that will deliver a final product of 0 – 1 mm size fraction. The gang material is exceptionally soft and lends itself towards physical beneficiation with a high yield.

Chapter B: Climate

The climate of the North-West Province is characterized by well-defined seasons with hot summers and cool sunny winters. The rainy season usually occurs from October to March. The mean annual rainfall (MAR) for the area is between 400-600 mm in some areas and 600-800 mm in other areas of the site. Mean maximum temperature for the area is 31-33^0 C and mean minimum is 2.1-4^0 C. The maximum summer temperature is 29.3-31^0 C, maximum winter temperature is 21.9-24^0 C, minimum summer temperature is 15.3-17.4^0 C and minimum winter temperature is 7.5-10^0 C surrounding the Groot Marico River and 5.6-7.4^0 C away from the river. The average long-term temperature is 18-21^0 C. Evaporation for the area is moderately high with 2,001-2,200 mm/a. Frost appears between May and September. The area is classified as a semi-arid zone. Moisture availability is moderate and moderate to severe.

Chapter C: Topography

The area in general is described as low hills or ridges for northern part of the site and rolling or broken plains or plateaus with low relief for the southern part of the site. The topography of the site steepens north-west and lowers where the Groot Marico River is situated. This coincides with the slope index of 13% or more in the north-west, 3% to 5% on the most part of the site and an even lower slope index where the Groot Marico River is situated. The topography has been changed by the quarry activities, creating a depression and the waste rock dumps (WRDs) and slimes dam creating convex areas.

Chapter D: Soil

The information contained in this section of the report was taken from the following source:

- Rehabilitation Plan, Shangoni Management Services, 2013.

The area is divided into three general soil patterns. Part 1 is described as LP2; Soils with minimal development, usually shallow on hard or weathering rock, with or without intermittent diverse soils. Part 2 is described as CM; Red, massive or weakly structured soils with high base status. Part 3 is described as NT; Deep, well drained,

dark reddish soils having a pronounced shiny, strong blocky structure (nutty), usually fine (red structured soils). In addition, one or more of vertic and melanic soils may be present. The area disturbed by mining activities falls mostly within the soil patter described as CM, with the area north of the quarries described as LP2. The whole site has approximately 450 mm deep soil. Water-holding capacity for is a low 21-40 mm and north of the quarries a medium 41-60 mm.

Rainfall erosivity over the whole site is a moderate 301-400 mm. The site has mostly a very low predicted soil loss with some patches having a low predicted soil loss. The area is moderate susceptible to water erosion, with an increase in erosion susceptibility north of the quarries. The area has loamy sands present with 15-30% clays, and is therefore moderately susceptible to wind erosion.

Swelling clays are low to moderate. The swelling clays as a group have relatively high natural fertility and resilience against nutrient depletion, particularly members with high swell-shrink potential. These cracking clays take in water readily when dry but exhibit high runoff when wet and expanded. They retain water very strongly and release it to plant roots very slowly. The swelling clays are covered by sealing topsoils, though naturally fertile, suffer from susceptibility to surface sealing, slow water infiltration, drought and susceptibility to erosion.

The site has no saline or sodic soils. In saline soils, the restricting effect of the osmotic pressure of the salts on water uptake by plant roots may affect the growth of non-salt tolerant plants. Sodicity results in adverse structure in soils.

The natural structure of topsoils generally provides an indication of the susceptibility to surface sealing, unfavourable water intake characteristics and low aggregate stability. Subsoil structure generally provides an indication of permeability to water, air and roots. These effects may be enhanced or modified by topsoil clay content and thickness of the materials. The area has soils with structure somewhat favourable to arable land use if climate permits.

There are no beneficial water-retaining layers in the root zone. This group of soils with impeded drainage has the advantage that the impeding layer is situated below a relatively deep rooting zone. The rooting zone commonly has favourable physical properties, allowing penetration and exploitation by plant roots. As a result, these soils have importance to agriculture.

The site has a moderate natural soil organic carbon content of 0.6 to 1 mm. Soil organic carbon is a simple measure of the complex phenomenon of soil organic matter content. The latter is a complex combination of the humified remains of plants, microbes and other soil fauna. Soil organic matter commonly enhances almost the complete range of desirable soil properties, e.g. crumb structure, aggregate stability, water-holding capacity, resilience against crusting and compaction, cation exchange capacity and nutrient status, particularly N availability and soil biological activity. Soil carbon stands in relation to soil nitrogen, the ratio between C and N being an important determinant of the build-up or decomposition of carbon.

The natural soil pH is 5.5 to 6.4, somewhat acid. Soil acidity is a detrimental chemical condition of the soil, reducing crop growth and yield. It is commonly measured on the pH scale. Strongly acid soils have pH (H_2O)

values below 5.5. A pH (H_2O) determination only measures active acidity, or the intensity of soil acidity, and not the reserve or total amount of acidity. Low pH conditions lead to poor nutrient status: nutrients such as calcium and magnesium (cations) are replaced by acid components and leached out; other nutrients such as phosphate and molybdate (anions) are rendered unavailable through fixation; the cation exchange capacity is lowered; root growth is restricted; nutrient cycling by soil microbes may be reduced.

The area has a moderately susceptible to acidification soil sub-dominant. The leaching status of soils is a factor in natural fertility, susceptibility to nutrient depletion, secondary acidification, agricultural input costs and rangeland nutrition and palatability. The area falls within the class Calcareous; which are non-apedal soils reacting with 10% hydrochloric acid.

Chapter E: Vegetation

The area falls within the vegetation unit classified by Mucina and Rutherford (2006) as Zeerust Thornveld (SVcb 3) and north of the quarries as Dwarsberg-Swartruggens Mountain Bushveld (SVcb 4). The area is contained within the Savanna Biome. The Zeerust Thornveld vegetation is described as deciduous, open to dense short thorny woodland, dominated by Acacia species with herbaceous layer of mainly grasses. The Dwarsberg-Swartruggens Mountain Bushveld is described as having variable vegetation structure depending on the slope, exposures, aspect and local habitat with various trees and shrub layers often with dens grass layer.

Chapter F: Fauna

Cattle belonging to the local farmers are found on site. No endangered or rare species have been observed near the mine. A survey was conducted as part of the prospecting permit application, animals noted on the site are:

- Porcupine;
- Impala;
- Kudu;
- Mountain rhebuck;
- Grey rhebuck;
- Bushbuck;
- Common duiker;
- Warthog;
- Brown hyena; and
- Jackal.

Chapter G: Surface Water

The information contained in this section of the report was taken from the following source:

- Rehabilitation Plan, Shangoni Management Services, 2013; and
- eWISA website.

Anref is located in the quaternary catchment area A31E and A31B, a part of the Crocodile (west) Marico Water Management Area. The Crocodile River is a major tributary of the Limpopo River. The Pienaars, Apies, Moretele, Hennops, Jukskei, Magalies and Elands rivers are the major tributaries of the Crocodile River. The upper portion

of the catchment, south east of Hartbeespoort Dam, is located in the Gauteng Province. The north and north-east corners lie in the Limpopo Province whereas the central or western sections fall within the North West Province. The total area of the Crocodile River Catchment is 29 400 km².

For the Marico area, the Marico and Crocodile Rivers form the headwaters of the Limpopo at their confluence. The flow in the Marico River (MAR 126 million m³/year) is highly variable and intermittent. There are two major storage reservoirs that regulate the flow in the Marico River, namely the Marico Bosveld Dam in the upper catchment and the Molatedi Dam further down-stream. There are several other dams, such as the Klein Maricopoort and Sehujwane Dams, from which water is mainly used for irrigation along the Marico River, particularly downstream of Marico Bosveld Dam. The Ngotwane River (MAR 14 million m³/year) is a tributary of Limpopo River. It flows into Botswana before turning and joining the Limpopo River.

For the Crocodile area, the natural surface Mean Annual Runoff (MAR) is approximately 646 million m³/annum. Stream-flow reduction due to invasive alien vegetation has not been considered to have a large impact on water availability in this catchment. More survey work in co-operation with Working for Water would need to be conducted to confirm this assumption. The Crocodile River system is regulated by 9 major dams, which are the Rietvlei, Hartbeespoort and Roodekopjes dams in the Crocodile, Roodeplaat and Klipvoor dams in the Apies/Pienaars, Olifantsnek, Bospoort, Lindleyspoort and Vaalkop dams in the Elands River area.

Chapter H: Wetlands and other surface water features

According to the South African National Biodiversity Institute (SANBI) BGIS Atlas, the closest wetland is located roughly 1 km to the north west of Anref mine, and is classified as a Central bushveld group 2 channelled valley-bottom wetland (Figure 3 refers).

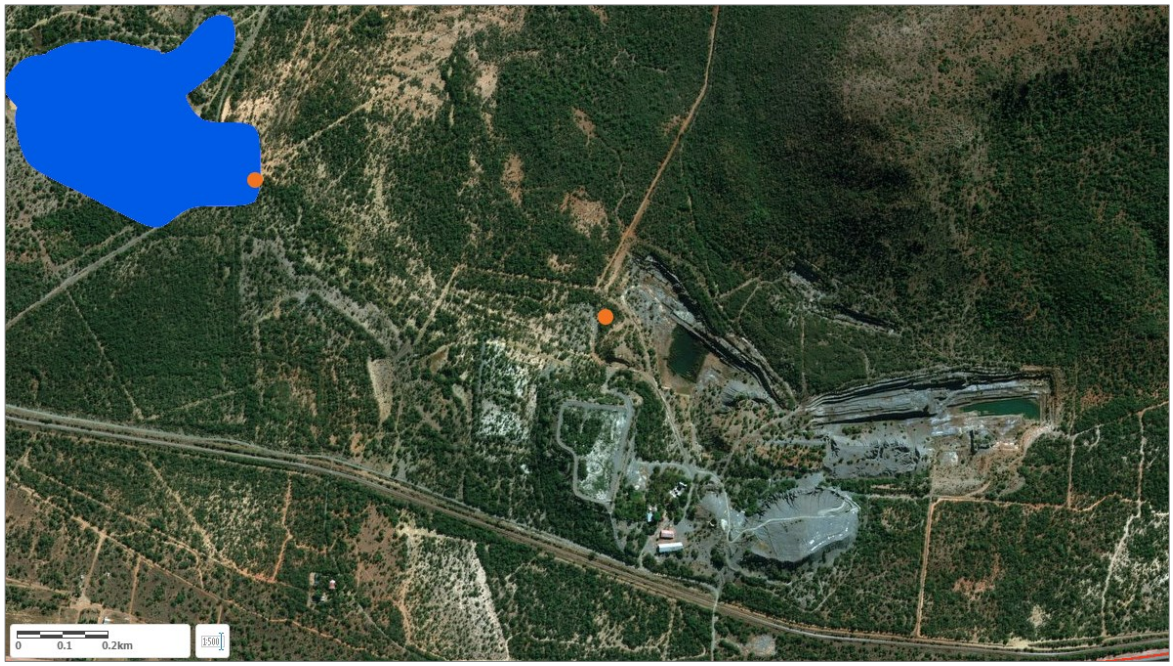


Figure 3: Channelled Valley bottom wetland
(Source: SANBI BGIS Atlas, 2018)

Chapter I: Groundwater

The information was taken from the eWISA Website.

The Crocodile (west)/Marico Water Management Area (Marico)

Groundwater in Marico & Upper Ngotwane area is an abundant source of water because of the geology. Groundwater is important at two levels, that is there are high yielding dolomitic aquifers and local groundwater sources are available for rural water supplies. Overall, the available groundwater resources within the catchment are under-utilised, although this clearly depends both on the groundwater occurrence and the demand. Even weaker groundwater occurrence areas can often provide more than 25 litres per person per day. Groundwater is the main source for rural water supplies.

The Crocodile (west)/Marico Water Management Area (Crocodile)

Groundwater resources are available throughout the entire catchment, but in varying quantities depending upon the hydrogeological characteristics of the underlying aquifer. Globally it is estimated the overall groundwater recharge to the catchment amounts to some 260 million m/annum assuming recharge of approximately 2% of the mean annual rainfall of approximately 450 mm. Some 125 million m3 of groundwater is used annually, theoretically therefore, up to 135 million m^3/annum of annual recharge is still available for exploitation. Away from the urban areas of Johannesburg and Pretoria many parts of the Crocodile West catchment are heavily populated and widespread rural communities are a feature of the area, in particular the districts of Moretele I, Odi I and Odi II north and NW of Pretoria, Bafokeng and Mankwe north of Rustenburg. Groundwater is the main source of water supply to the rural communities except for the Odi I and Moretele I where reticulated supplies are available for the more densely populated southern parts of the districts. There is extensive use of the groundwater resources of the dolomite aquifer NE of Johannesburg, south of Pretoria and NW of Krugersdorp where large abstraction for irrigation, domestic, industrial and municipal supply is practised.

The depth of the groundwater table has not been determined. Neighbouring farmers utilise groundwater via boreholes for irrigation, however, no further information is available regarding volumes and quality, as the mine did not impact on groundwater.

Chapter J: Air Quality

Apart from this mine and the nearby town, there is no identifiable source of air pollution within the vicinity of the mine. Heavy vehicles do hauling of the mining product to the market. The use of dirt roads during the winter months is a source of dust pollution, but due to the infrequency and low volume of traffic pollution levels are limited.

Further dust particle pollution can be caused by abnormally strong winds. Air pollution due to fires does not normally occur, but may temporary cause pollution in case of a serious fire.

Chapter K: Noise

Vehicles active on the mining site are the most significant sources of noise pollution. Vehicles moving on the main road are a normal occurrence and therefore no added significant impact in this regard is experienced. No complaints from neighbours in this regard have been received in the past.

Chapter L: Visual

The waste rock dump is visible from the N4.

Chapter M: Protected areas and conservation planning

The information contained in this section of the report was taken from the following source:

- South African National Biodiversity Institute (SANBI) BGIS Altas,

According to the South African National Biodiversity Institute (SANBI) BGIS Altas, a National Protected Area Expansion Strategy (NPAES) focus area, known as the NW/Gauteng Bushveld is located to the north of Anref mine. Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas.

The conservation planning related to the area was also extracted using the BGIS Atlas (SANBI, 2018). The 2008 North West Biodiversity Conservation Assessment (BCA) was assessed and indicated that the area falls within a type 2 Critical Biodiversity Area (CBA). Critical Biodiversity Areas are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of CBA's and/or in delivering ecosystem services. CBA's and ESA's may be terrestrial or aquatic.

The atlas was also utilised to assess the area in terms of the 2015 North West Biodiversity Sector plan. According to this plan, the area contains the following terrestrial CBA's and ESA's: CBA 1, ESA 1 as well as these aquatic CBA's and ESA's: ESA 1 and ESA 2.

Chapter N: Cultural Heritage

The information contained in this section of the report was taken from the following sources:

- Rehabilitation Plan, Shangoni Management Services, 2013;
- Heritage impact assessment (Phase 1), 2011; and
- Palaeontological impact assessment (Phase 1 – field study), 2018.

The phase 1 heritage impact assessment conducted for Anref mine in 2011 (Miller), indicated that heritage remains were found outside the impact area. Owing to the environment of Groot Marico, it has been a preferred place of settlement of people from early times to the historical period. During the site investigation, Iron Age sites were identified. Furthermore, several historical period sites were identified. No Stone Age period sites or rock art sites were identified. No heritage resources were identified on the impacted area that will be rehabilitated. Refer to Annexure G for the full Heritage impact assessment report.

The Palaeontological impact assessment (PIA) (Fourie, 2018) provided the following information regarding palaeontological resources on site, summarised below. Refer to Annexure H for the full impact assessment report. The mine is situated on the Time Ball Hill Formation of the Pretoria Group, Transvaal Supergroup. Faulting is present close to the property. The Pretoria Group consists predominantly of quartzite and shale,

together with a prominent volcanic unit, minor conglomerate, chemical and volcanic members. It comprises the Hekpoort Andesite, Dullstroom Basalt, Time Ball Hill, Silverton, and Magaliesberg Quartzite Formations as well as several smaller formations (in total 15) and overlies the Chuniespoort Group. The Time Ball Hill shale Formation is known to contain 'algal microfossils' diagenetic in origin. Stromatolites as they are known are preserved in the subordinate carbonate rocks. The Pretoria Group is clastic sedimentary in nature. The pile of sedimentary rocks, mainly mudstones and quartzites with some basalt can collectively reach a thickness of up to 5 km. Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of sedimentary rocks the palaeontological sensitivity can generally be low to very high, and here locally high for the Pretoria Group. The Time Ball Hill Formation is present here in the rehabilitation area. Nixon et al. (1988) described the black shales south-west of Potchefstroom as consisting of overlapping laminated basal mounds which are stromatolitic as well as spheroidal possible planktonic fossil algae. These can range in size from 3.5 - 17 mm in height and up to 10 mm in diameter and can be present in the development area. Stromatolites are likely to be present in the area. They are the result of algal growth in shallow water, indicating a very rich growth that would have caused an enrichment in the amount of oxygen in the atmosphere.

Chapter O: Regional socio-economic structures

Social structure

Ngaka Modiri Molema District Municipality had a total population of 842 698 in 2011 (Stats. S.A. Census). the population of the district is made up of African, 0.9% Asian, 1.6% Coloured, while whites make up 3.7%, and other 0.2%.

Approximately 61% of the population of Ngaka Modiri Molema District Municipality is made up of people aged from 15 to 64 years. This group represents the economically active section of the population. About 33% of the population is made up of children aged 14 and less, while 6% is made up of the older generation, who are aged 65 and above.

51% of the population of Ngaka Modiri Molema District Municipality is made of females while males make up 49%. In terms of actual numbers, there were 413 399 males and 429 300 females in the district in 2011.

Water supply

Molatedi-Gabarone Water Supply scheme is located in the extreme northern parts of the Zeerust Local Municipality. This scheme provides water to the Derdepoort and Kopfontein border post communities through local water treatments at both these settlements. It also supplies water to Gabarone in Botswana.

Ngotwane Water Supply scheme is located in the Ramotshere Moiloa Local Municipality within the NMMDM. This scheme provides water to the communities of Ga-Seane, Lobatleng, Makgwanana, (Rietgat), Tsholofelo and Driefontein. The total number of households serviced by this water scheme is approximately 2000.

Motswedi Water Supply scheme is located in the Ramotshere Moiloa Local Municipality. It abstracts water from the Sehujwane Dam thereafter water is treated at the Motswedi water treatment works. This scheme supplies water to the communities of Reagile, Borakolalo, Motswedi, Gopane East, Gopane West and Sebalagane. The total number of households serviced by this water supply scheme is approximately 4 480.

Economic profile

Finance and business services are the largest contributors to the economy of the district at 7.6% and 6.6% respectively. Furthermore, mining and community/social infrastructure only contribute 3% and 5.1% respectively to the economy of the district.

The major structural issues that have contributed to high unemployment and poverty in the area include persistent low economic growth, retrenchments from mining due decline in mining and insufficient diversification of the economy.

7.4.2 Description of the current land uses.

The land was used for grazing prior to any mining activities and is currently use for grazing.

Agricultural capability

According to the rehabilitation plan (Shangoni Management Services, 2013), the area has a high agricultural potential. The Agricultural Land Demarcation is applicable to this area. The area has a marginal potential for arable land. The grazing capacity ranges from 11 ha/AU (moderately high) to 25 ha/AU (moderately low) for the area. Around the Groot Marico River to the east of the site, the grazing capacity is more than 100 ha/AU due to transformed rangelands. Irrigated land is only applicable around the Groot Marico River. The site itself has mostly a grazing potential for especially cattle.

The theoretical agriculture potential (based on the soil structure) of the area is somewhat favourable to arable land use if climate permits. There are no beneficial water-retaining layers in the root zone. This group of soils with impeded drainage has the advantage that the impeding layer is situated below a relatively deep rooting zone. The rooting zone commonly has favourable physical properties, allowing penetration and exploitation by plant roots. As a result, these soils have importance to agriculture

Land use and development at the site

Prior to mining the area, the site was used to graze mostly cattle. The Ramotshere Moiloa Spatial Development Framework (2014/2015) states that more than 90% of the municipal area consists of natural vegetation, with the next highest category as Agriculture (5.3%). Built-up areas constitute 2.1% of the municipal area while mining takes up only 0.1%. Additionally, water and wetlands take up 1.3% of the municipal area. Anref mine falls within the mining development framework.

The area has a high agricultural potential and marginal potential for arable land. The main structures on the mining area prior to mining were two farming related structures. These structures were not used as part of the mining activities but utilised by farmers. No additional structures were constructed on site.

7.4.3 Description of specific environmental features and infrastructure on the site.

The only infrastructure present on site are two structures that are used by a farmer for agricultural activities.

The following bio-physical elements have been identified on site:

- Quarries,
- Waste rock dumps (WRD's),
- One slimes dam, originating from historical mining activities, and
- Access roads between the quarries and WRD's.

7.4.4 Environmental and current land use map.

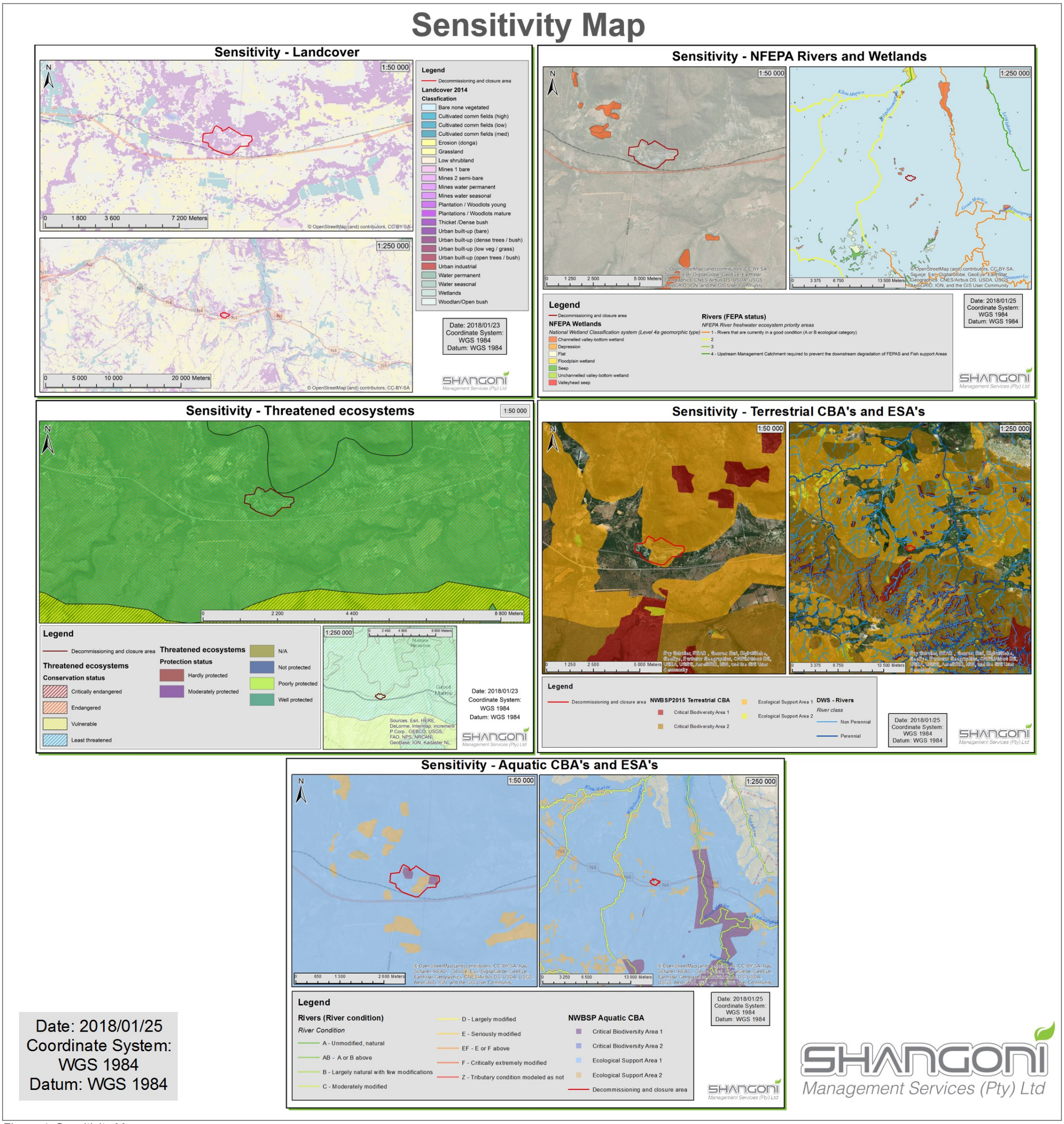


Figure 4: Sensitivity Map

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

A detailed risk assessment has been undertaken, as contained below. Refer to the full risk assessment report attached to the final rehabilitation, decommissioning and closure plan (Annexure A). The following table contains all the potential impacts identified for the activities described in the initial site layout.

Table 3: Impacts and Risks Identified

NO.	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT		TIMEFRAME IN WHICH RISK IS LIKELY TO MANIFEST	DURATION OF IMPACT	SIGNIFICANCE (If not mitigated)			MITIGATION TYPE	MITIGATION MEASURES (include monitoring)	SIGNIFICANCE (If mitigated)			ACCEPTABLE RISK (Y/N)	COST (LINK TO FINANCIAL PROVISIONING, WHETHER MONITORING OR MITIGATION COSTS)
		whether listed or not listed	Impact description	Specialist study reference			Probability	Magnitude	Significance	(modify, remedy, control, or stop) through e.g. noise control measures)		Probability	Magnitude	Significance		
1	Geology	Mining activities - Quarries	Mining of the material leads to the extraction of the ore body; therefore, the impact on the geology will be permanent. The extraction of ore took place from the various areas as described in the mining method.	Rehabilitation Plan, 2013	Operational phase	Permanent	5	3	H	Control	• Only mine within the approved mining right area. • Mining has ceased and rehabilitation has been completed, subsequently the impact will not expand.	5	3	H	Y	n/a
2	Topography	Mining activities	Topography of the affected mining area is affected by three main mining activities: Extraction of ore, WRDs and process slimes dam. There are three quarries where extraction of ore took place, resulting in local depressions with banked high walls to the north. WRDs and the slimes dam create unnatural elevated heaps that significantly alter the topography.	Rehabilitation Plan, 2013	Operational phase	Permanent	5	4	H	Remedy	• During the decommissioning phase all slopes need to be finished to the prescribed 1:3 slope. • Reduce the visual impact of the altered topography by a process of sloping, benching and rehabilitation.	3	3	M	Y	Included in maintenance cost No. 6 below
3	Surface and ground water	Mining activities	Various activities on the mine could have resulted in soil, surface water and groundwater pollution. The significant activities sources of pollution will be due to seepage and surface water run-off from the slimes dam and the WRDs. The mine has no available surface water or groundwater quality data; therefore, the extent of this pollution (if any) cannot be determined.	Rehabilitation Plan, 2013	Operational, decommissioning phase	Short term	4	3	H	Control & Remedy	• The re-introduction of the topsoil will return the land to its previous land capability and result in the water runoff to be deemed as clean water thus minimising the impact on surface water and ground water quality. • Remove contaminated soil as necessary. • Implement erosion control measures on slimes dam as identified in the rehabilitation plan.	4	3	H	Y	n/a

NO.	ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT		TIMEFRAME IN WHICH RISK IS LIKELY TO MANIFEST	DURATION OF IMPACT	SIGNIFICANCE			MITIGATION TYPE	MITIGATION MEASURES (include monitoring)	SIGNIFICANCE			ACCEPTABLE RISK (Y/N)	COST (LINK TO FINANCIAL PROVISIONING, WHETHER MONITORING OR MITIGATION COSTS)
							If not mitigated					If mitigated				
		whether listed or not listed	Impact description	Specialist study reference			Probability	Magnitude	Significance	(modify, remedy, control, or stop) through e.g. noise control measures)		Probability	Magnitude	Significance		
4	Surface and ground water	Ponding of rainwater on rehabilitated areas	Ponding of water in the quarries as well as on the WRDs and slimes dam will occur. This may lead to seepage of minerals into the groundwater, and affect the stability of the side slopes, which in turn can impact vegetation establishment in these areas and may lead to erosion.	Rehabilitation Plan, 2013	Post closure	Medium term	4	2	M	Control	• Water in the quarries will remain for use by the farmer. • Paddocks should be constructed on top of the old tailings dam and the waste rock dump. These paddocks should assist in retaining surface runoff to promote vegetation growth as well as to prevent erosion down the side slopes. Rocky bunding in the concentrated drainage areas should decrease the velocity of the runoff to prevent erosion threatening siltation of the water resources.	3	2	M	Y	n/a
5	Land capability and use	Mining activities - Quarries	The main impact on the land capability is the quarries that will not be rehabilitated and with no proposed land use. Surrounding land use will not be affected significantly; however, the mining activities will have impacted on the landscape character.	Rehabilitation Plan, 2013	Post closure	Permanent	5	2	M	Control	• Due to cessation of mining activities, the footprint of the quarries will not increase. • The quarries are utilised by a local farmer as drinking source for cattle.	3	1	L	Y	n/a
6	Vegetation	Disturbance of indigenous vegetation and alien vegetation establishment	Vegetation is completely destroyed in the quarries and the footprint of the WRDs. Some vegetation that was established on the slimes dam was removed during re-mining of the slimes. Compacted soil areas where infrastructure is located as well as access roads are poorly vegetated. Bare areas, disturbed during mining activities will be prone to weed and invader establishment. The increase of weeds and invasive plant may lead to the decrease in indigenous vegetation numbers.	Rehabilitation Plan, 2013	Post closure	Medium term	3	2	M	Control & Remedy	• Re-seeding bare areas and implementation of alien eradication programme. • Implementation of berms to allow for vegetation establishment and surface water management. • Erosion control measures to be implemented on slimes dam as per rehabilitation plan.	2	1	L	Y	R 254 851.94
7	Visual	Mining activities	Abandoned quarries may impact on the visual quality of the area. The large WRD to the south creates a visual impact when driving past on the N4 highway. Visibility is mainly due to the height of the WRD and absence of vegetation cover.	Rehabilitation Plan, 2013	Post closure	Permanent	5	3	H	Remedy	• Implementation of the rehabilitation program, including re-vegetation of the WRDs.	3	2	L	Y	n/a

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

The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

Impact assessments should be conducted based on a methodology that includes the following:

- Clear processes for impact identification, predication and evaluation;
- Specification of the impact identification techniques;
- Criteria to evaluate the significance of impacts;
- Design of mitigation measures to lessen impacts;
- Definition of the different types of impacts (indirect, direct or cumulative); and
- Specification of uncertainties.

After all impacts have been identified, the nature and scale of each impact can be predicted. The impact prediction will take into account physical, biological, socio-economic and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim to provide a basis from which the significance of each impact can be determined and appropriate mitigation measures can be developed.

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to Figure 5 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – *Impact Prediction*).

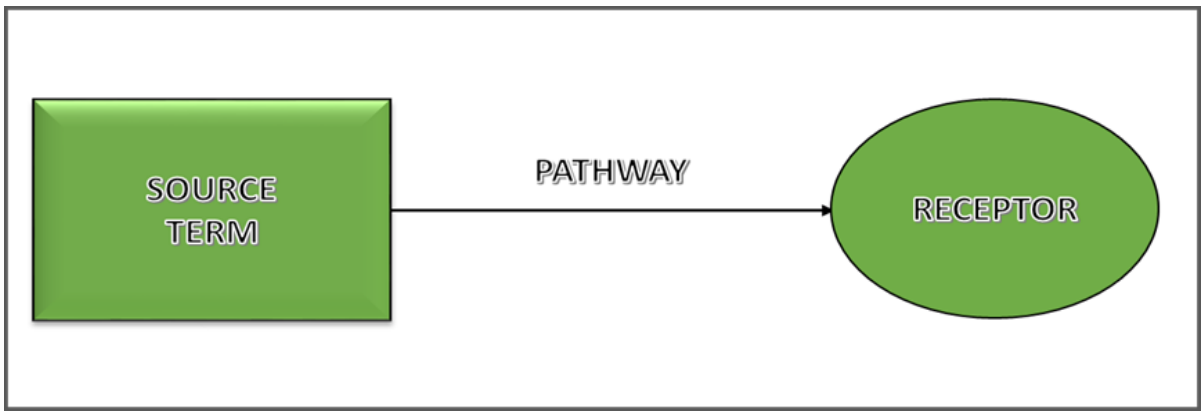


Figure 5: Impact prediction model

Table 4 and Table 5 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 6 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

Table 4: Determination of Probability of impact

Frequency of Aspect / Unwanted Event / Wanted (positive) Event	Score	Availability of pathway from the source to the receptor	Score	Availability of receptor	Score
Never known to have happened, but may happen	1	A pathway to allow for the impact (negative / positive) to occur is never available	1	The receptor is never available	1
Known to happen in industry	2	A pathway to allow for the impact (negative / positive) to occur is almost never available	2	The receptor is almost never available	2
< once a year	3	A pathway to allow for the impact (negative / positive) to occur is sometimes available	3	The receptor is sometimes available	3
Once per year to up to once per month	4	A pathway to allow for the impact (negative / positive) to occur is almost always available	4	The receptor is almost always available	4
Once a month - Continuous	5	A pathway to allow for the impact (negative / positive) to occur is always available	5	The receptor is always available	5

***Step 1**: Determine the **PROBABILITY** of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor.*

Table 5: Determination of Magnitude of impact

SOURCE								RECEPTOR			
Duration of impact	**Score**	**Extent**	**Score**	**Volume / Quantity / Intensity**	**Score**	**Toxicity / Destruction Effect**	**Score**	**Reversibility**	**Score**	**Sensitivity of environmental component**	**Score**
Lasting days to a month	1	Effect limited to the site. (metres);	1	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	1	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	1	Bio-physical and/or social functions and/or processes will remain unaltered.	1	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity	1
Lasting 1 month to 1 year	2	Effect limited to the activity and its immediate surroundings. (tens of metres)	2	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	2	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	2	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	2	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.	2
Lasting 1 – 5 years	3	Impacts on extended area beyond site boundary (hundreds of metres)	3	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	3	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	3	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	3	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).	3
Lasting 5 years to Life	4	Impact on local scale /	4	Very large quantities / volumes /	4	Toxic (e.g. diesel & Sodium Hydroxide)	4	Bio-physical and/or social functions and/or processes	4	Current environmental component(s) are in a natural state.	4

SOURCE								RECEPTOR			
Duration of impact	**Score**	**Extent**	**Score**	**Volume / Quantity / Intensity**	**Score**	**Toxicity / Destruction Effect**	**Score**	**Reversibility**	**Score**	**Sensitivity of environmental component**	**Score**
of Organisation		adjacent sites (km's)		intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)				might be considerably altered or enhanced / potentially irreversible		Environmentally sensitive environment / receptor (endangered species / habitats etc.).	
Beyond life of Organisation / Permanent impacts	5	Extends widely (nationally or globally)	5	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	5	Highly toxic (e.g. arsenic or TCE)	5	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	5	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)	5

*Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors above.*

Table 6: Determination of Severity of impact

ENVIRONMENTAL IMPACT RATING / PRIORITY					
	MAGNITUDE				
PROBABILITY	**1 Minor**	**2 Low**	**3 Medium**	**4 High**	**5 Major**
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Step 3: Determine the SEVERITY of the impact by plotting the averages that were obtained above for Probability and Magnitude

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

In general, the expected environmental impacts from the decommissioning and closure operation of the mine do not indicate that the proposed activities would have irreversible detrimental effects on the receiving environment.

The positive and negative implications of each alternative are also described in Table 7 below. A comparison is done below to assess the positive and negative implications of the proposed activities compared with the no-go alternative. This should provide a fundamental consideration of the feasibility of the project.

Table 7: Comparison of the proposed preferred activities and the no-go option

	Decommissioning and Closure	**No-go Option (recommence mining)**
Positive impacts	The mine will be rehabilitated, and the end land use will be cattle or game farming/grazing and livestock watering.	There will be limited social and economic benefits to the communities and economy if mining continues. This is however very limited due to the difficulty in mining the mineral and lack of processing – also limited economic advantage due to andalusite market needs changing continuously and small volumes that can be mined.
Negative impacts	There will be no social and economic benefits to the communities and the economy.	There will be continued environmental impacts on the environment.

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

No issues and concerns were raised by affected parties, therefore no changes have been made to the mitigation measures and the level of risk, as indicated in section 7.5 of this report. The Palaeontological impact assessment contained no mitigation measures to be included in this report.

7.9 Motivation where no alternative sites were considered.

This section is not applicable as discussed in section 7.1. Refer to Annexure C for the Alternatives report.

Alternatives have been identified for the project. These include:

a) Decommissioning and Closure

b) The option of not implementing the activity, which is also referred as the no-go option will be to continue or recommence mining, which is not economically viable considering the current economic climate, the fact that all disturbed areas have already been rehabilitated and the little material for mining remains.

7.10 Statement motivating the alternative development location within the overall site.

Evaluating the alternatives, through evaluating the risks pertaining to the various options, and the concerns as raised by the affected parties and the mitigation measures or site alternatives, the preferred options are:

Table 8: Preferred alternative motivation

Preferred alternative	Motivation
Decommissioning and Closure	The mine stops mining, and processing of ore and begin with the physical removal of mining infrastructure and rehabilitation of the mining area. The decision followed as all mining has been completed, and also as a result of certain contributing factors, that include: • Decrease in demand for the product (andalusite). • Feasibility of mining in the area (specifically capital costs required with regards to transport of material to Rhino Andalusite Mine in Thabazimbi for processing). The main aim of the decommissioning and closure plan is to provide the measures and time lines to rehabilitate the land, which was disturbed by mining activities, as practicably possible, to a land use which conforms generally to the principles of sustainable development. Given the location of the land and the relevant environmental and socio-economic considerations in the area, it was determined to use the area for cattle or game grazing/farming and livestock watering, being the most appropriate use of the rehabilitated land. The preferred alternative will have the following impacts on the risk as identified, in addition, the mitigation measures to be implemented during this process are also listed: 1) Geology: **Impacts:** Mining of the material has led to the extraction of ore, and a resultant permanent change in the topography. **How the preferred option will mitigate this impact (relevant mitigation measures):** The preferred alternative will entail the cessation of all mining and finalisation of all rehabilitation actions subsequently the impact will not expand. 2) Topography & Visual: **Impacts:** Mining activities have impacted on the topography through the extraction of ore (creation of quarries) leading to local depressions with banked high walls and the creation of WRD's and the process slime dam, which are unnatural elevated heaps that alter the topography. In addition to impacting the topography, these structures will also have a visual impact. The large WRD to the south is visible from the N4, mainly due to its height and the lack of vegetation cover. **How the preferred option will mitigate this impact (relevant mitigation measures):** By implementing the decommissioning and closure process, the impact that mining had on the topography and visual aspect of the area will be lowered. This process will entail the slope levelling of all slopes to 1:3, and will be accompanied by the process of benching and rehabilitation (including the re-vegetation of the WRDs) to reduce the visual impact.

	3) Surface and groundwater (impact due to mining): **Impacts:** Mining may result in significant impacts due to seepage and run-off from the WRDs and slimes dam. This is amplified by the lack of monitoring data. **How the preferred option will mitigate this impact (relevant mitigation measures):** The implementation of a decommissioning and closure process will entail the re-introduction of topsoil and the removal of contaminated soil. This will assist in lower the significant of the impact on the water. In addition to the above, paddocks should be constructed on the old slimes dam and WRDs to assist in retaining surface water runoff and promote vegetation growth and prevent erosion and subsequent siltation of water resources. Rocky bunding in the concentrated drainage areas should decrease the velocity of the runoff to prevent erosion and the ensuing siltation of the water resources. 4) Surface and groundwater (ponding of rainwater on rehabilitated areas): **Impacts:** Ponding of rainwater may occur in the quarries and on the WRDs and slimes dam, this could lead to seepage into the groundwater, that in turn can affect the stability of the side slope. This in turn could impact vegetation establishment and ultimately lead to erosion. **How the preferred option will mitigate this impact (relevant mitigation measures):** The water contained in the quarries will be utilised by the farmer. Paddocks should be constructed on the old slimes dam and WRDs to assist in retaining surface water runoff and promote vegetation growth and prevent erosion and subsequent siltation of water resources. Rocky bunding in the concentrated drainage areas should decrease the velocity of the runoff to prevent erosion and the ensuing siltation of the water resources. 5) Land capability and use (impact due to mining): **Impacts:** The quarries are not rehabilitated (but left as is) and no planned end land use is defined for them. In addition, mining activities have a general impact on the landscape character. **How the preferred option will mitigate this impact (relevant mitigation measures):** During decommissioning and closure, cessation implies that the footprints of the quarries will not be expanded on. In addition, the rainwater captured in the quarries, will be utilised by the farmer to provide drinking water for his cattle. 6) Vegetation: **Impacts:** The vegetation on the original quarry and WRD footprints has been destroyed. Some vegetation established on the slimes dam was destroyed through re-mining the slimes. The placement of infrastructure also contributed to compacted areas, while the access roads are poorly vegetated. These bare areas stimulated weed and invader establishment, which may lead to the suppression of indigenous vegetation growth. **How the preferred option will mitigate this impact (relevant mitigation measures):** Throughout the decommissioning and closure process the bare areas will be re-seeded and an alien eradication programme will be implemented. The implementation of the “no-go” option, will imply that mining should recommence, which is firstly not possible due to reasons discussed under section 7.1, but that will also lead to an increase in the extent and possibly the severity of the impacts discussed here. Given the above assessment, it is anticipated that the implementation of a decommissioning and closure process

	at Anref mine would result in the lowest risk to the environmental and the surrounding affected parties.

8. 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.

All impacts and risks as identified are contained within Section 7.5 of this report. As further provided is 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 methodology applied in assessing and ranking the impacts and risks on the preferred activity is described in Section 7.6.

The results of this assessments are provided below, with the detailed impact assessment contained in Appendix 1 of Annexure A.

9. Assessment of each identified potentially significant impact and risk

Refer to Table 3 (risk assessment extract) and Table 8 above and the Risk Assessment Report (Appendix 1 of Annexure A).

10. Summary of specialist reports.

Two specialist reports are submitted alongside this report, a phase 1 Heritage impact assessment report conducted in 2011 and a phase 1 Palaeontological impact assessment report conducted in 2018.

The Heritage impact assessment report (Miller, 2011) indicated that heritage impact in the impact area is of no significance due to the mining method employed and the disturbed area. Although this study was focused inside the old mine footprint, anything identified outside was seen as a bonus and also indicated in the report. No mitigation measures were presented in the report.

The Palaeontological Impact Assessment: Phase 1: Field Study was undertaken in October in the summer in dry and hot conditions (Appendix 6 of Act, 1(d)), and the following is reported:

The mine is situated on the Time Ball Hill Formation of the Pretoria Group, Transvaal Supergroup. Faulting is present close to the property. The site has mine infrastructure on it, but is vacant at present. Some rehabilitation has already taken place with material found on site. The rehabilitation process will not use material from outside the boundaries of the fence of the mine property.

The Transvaal Supergroup fills an east-west elongated basin in the south-central part of the old Transvaal (now North – West, Gauteng and Mpumalanga) as far south as Potchefstroom. It is Vaalian in age, approximately 2600 Ma to 2100 Ma. A maximum thickness of the Transvaal Supergroup reaches 2000 m in the north-eastern

section. The east-west elongated basin is filled with clastic, volcanic and chemical sedimentary rocks. Three groups based on lithological differences have been established: they are the Rooiberg, Pretoria and Chuniespoort Groups as well as other smaller groups (Kent 1980, Snyman 1996). It is the Bushveld Complex that is responsible for the tilting of the Transvaal sediments and the heat of its intrusion having created andalusite crystals (Norman and Whitfield 2006). This Supergroup is underlain by the Ventersdorp, Witwatersrand and Pongola Supergroups, and the Dominion Group. Three prominent ridges are present from the oldest to the youngest, the Time Ball Hill, Daspoort and Magaliesberg Formations (Norman and Whitfield 2006).

The Pretoria Group consists predominantly of quartzite and shale, together with a prominent volcanic unit, minor conglomerate, chemical and volcanic members. It comprises the Hekpoort Andesite, Dullstroom Basalt, Time Ball Hill, Silverton, and Magaliesberg Quartzite Formations as well as several smaller formations (in total 15) and overlies the Chuniespoort Group (Kent 1980). Both the shale and quartzite of the Pretoria Group are utilised in the building industry (Snyman 1996). The Time Ball Hill shale Formation is known to contain 'algal microfossils' diagenetic in origin. Stromatolites as they are known are preserved in the subordinate carbonate rocks (Kent 1980). The Pretoria Group is clastic sedimentary in nature (Eriksson 1999). The pile of sedimentary rocks, mainly mudstones and quartzites with some basalt can collectively reach a thickness of up to 5 km (Visser 1989).

Andalusite (Al_2SiO_5) crystals occur in hornfels. These anhydrous aluminium silicates are used in the field of neutral refractories and electrical purposes. They are found in nearly all rocks that have suffered intrusion by large igneous masses, or in the oldest sedimentary rocks that have been altered by heat and pressure. Large exposures of andalusite-bearing slates are known, particularly in the Marico district (Department of Mines 1936). Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of sedimentary rocks the palaeontological sensitivity can generally be LOW to VERY HIGH, and here locally HIGH for the Pretoria Group (SG 2.2 SAHRA APMHOB, 2012).

The following concerns/ threats were noted:

1. Threats are earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, digging of foundations, the sealing-in, disturbance, damage or destruction of the fossils by development, vehicle traffic and human disturbance.
2. The overburden and inter-burden must be surveyed for fossils during construction. Special care must be taken during the digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden during construction not to intrude fossiliferous layers.

The following recommendations were made:

1. Mitigation will not be necessary.
2. No consultation with parties is necessary.
3. Alternatives will not be feasible.
4. The rehabilitation and closure may go ahead, it is not likely that a fossil will be found.
5. There is no objection (see Recommendation 6) to the development, and it is not necessary to request a Phase two Palaeontological Impact Assessment: Mitigation to determine whether the development will affect fossiliferous outcrops. The palaeontological sensitivity is high, but caution is not recommended. A Phase 2 Palaeontological Mitigation will not be required as fossils will not be found during rehabilitation.

6. This project may benefit the economy, the growth of the community and social development in general.
7. Preferred choice: The impact on the palaeontological heritage is high.
8. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting SAHRA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

The report also indicated that no permit from the South African Heritage Resources Agency (SAHRA / PHRA) is required.

11. Environmental impact statement

11.1 Summary of the key findings of the environmental impact assessment

This final BA Report has served to identify the potential impacts associated with the activities of the associated project. In accordance with the relevant environmental legislation, reasonable measures to mitigate the potential impacts arising from the proposed activities have been assessed and the significance of each of these impacts under both the pre- and post-mitigation scenarios identified and detailed.

The methodology utilised to undertake the impact assessment has incorporated, amongst other skills, professional experience, specialist knowledge, relevant literature and local knowledge of the site and surrounding area.

Based on findings of the impact assessment, in conjunction with the proposed mitigation measures, no unmanageable adverse impacts are expected to occur.

It is the EAP's opinion that based on the process that has been followed and the findings of the impact assessment, in conjunction with the proposed mitigation measures, that no unmanageable adverse impacts are expected to occur. As such it is recommended that the proposed activities are permitted.

11.2 Final Site Map

Refer to Figure 6 for the final site map indicating the planned end land use and the current land cover. This figure should be viewed alongside the sensitivity map included as Figure 4. The entire 68 hectares of the mine will be decommissioned, and closure will be applied for.

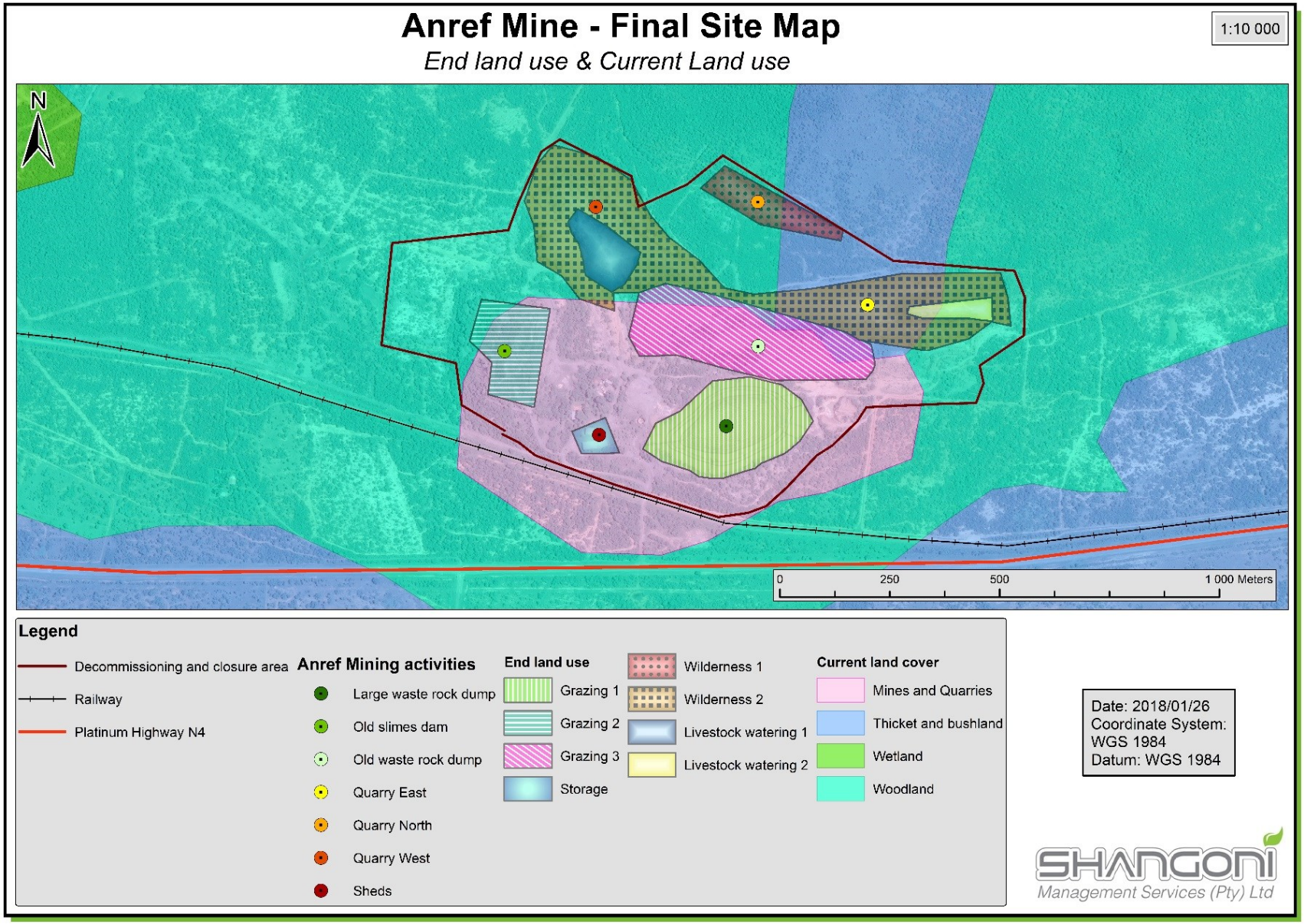


Figure 6: Final Site Map

11.3 Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives

Table 9: Summary of significant environmental impacts (negative), after mitigation.

GEOLOGY	
Mine activities - quarries: Mining of the material leads to the extraction of the ore body; therefore, the impact on the geology will be permanent.	H
SURFACE AND GROUNDWATER	
Mine activities: Various activities on the mine could have resulted in soil, surface water and groundwater pollution. The significant activities sources of pollution will be due to seepage and surface water run-off from the slimes dam and the WRDs. The mine has no available surface water or groundwater quality data; therefore, the extent of this pollution (if any) cannot be determined.	H

The project will result in a few positive impacts that relate primarily to economic growth and job creation as reflected in the table below.

Table 10: Summary of environmental impacts (positive), after mitigation.

ENVIRONMENTAL	
Rehabilitation and decommissioning: The decommissioning, rehabilitation and closure of Anref mine signifies that the disturbances caused by mining activities will cease, and all areas disturbed because of mining will be rehabilitated to return the area to a sustainable land use.	Positive

12. Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

Table 11: Impact management objectives and the impact management outcomes

Environmental aspect	Objective	Summary of impact management outcome
Topography	Minimise impacts on the topography of the area	All slopes will be finished to the prescribed 1:3 slope during the decommissioning phase. The visual impact of the altered topography will be reduced by a process of sloping, benching and rehabilitation.
Surface and groundwater	Minimise impacts on ground and surface water	The reintroduction of topsoil, along with the removal of contaminated soil will work towards returning the land to its previous land capability. The constructions of paddocks on top of the tailings dam and

		waste rock dump should assist in retaining runoff and promote vegetation growth.
Land capability and use	Minimise impacts on the land capability and land use	Cessation of mining activities will ensure that the footprints of the quarries and WRDs will not expand any further. In addition, the rainwater gathering in the quarries will be utilised by the farmer for his livestock.
Vegetation	Maximise the revegetation of the mine	Re-seeding of all bare areas and the implementation of an alien eradication programme.
Visual	Minimise impacts on the visual character of the area	A rehabilitation programme will be implemented, including the re-vegetation of the WRD's.
Palaeontological	Minimise the impact on palaeontological resources	Ensure that potential palaeontological resources are not disturbed.

13. Aspects for inclusion as conditions of Authorisation.

Should the DMR grant authorisation for this project, it should be subject to the following conditions:

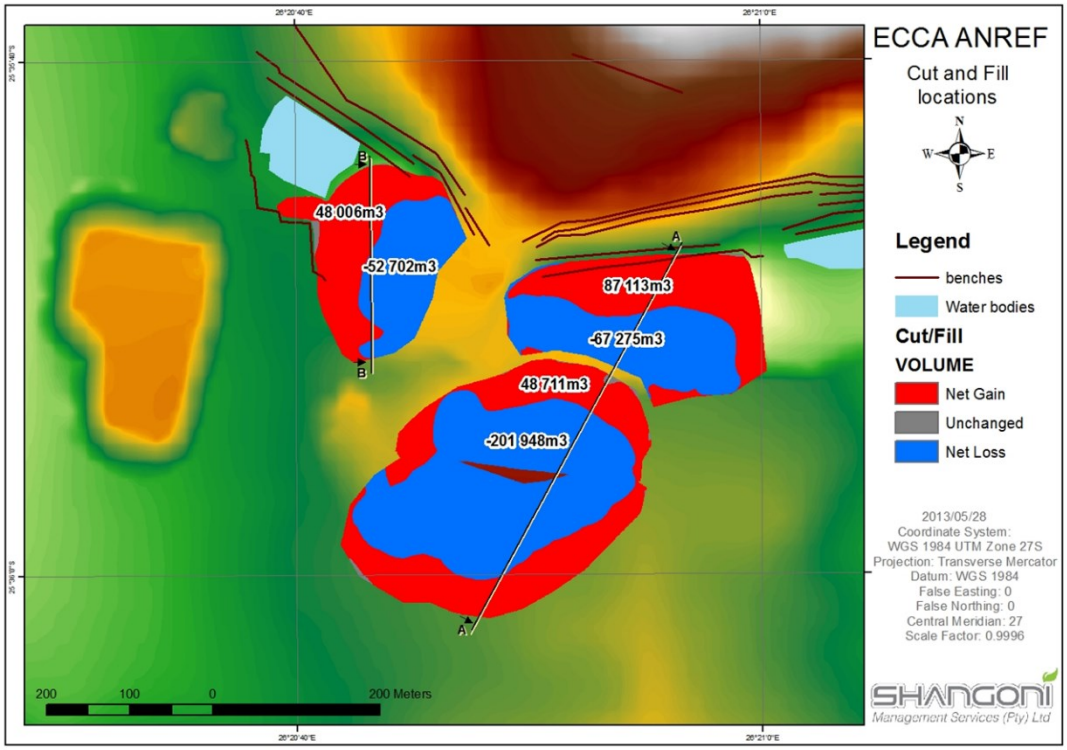
- The company should conduct a land function analysis (LFA) on the slimes dam and waste rock dumps to verify whether the rehabilitation actions that have been implemented was successful.
- The current land occupant (farmer) is satisfied with the rehabilitation measures that have been implemented.

14. Description of any assumptions, uncertainties and gaps in knowledge.

In terms of the amended EIA Regulations GN. R. 326 Appendix 1, 3 (1) paragraph (o), the Environmental Impact Assessment Practitioner (EAP) must provide a description of any assumptions, uncertainties and gaps in knowledge upon which the impact assessment has been based. The table below provides the assumptions and limitations applicable to the impact assessments.

Table 12: Assumptions and limitations

Unknown / Assumption	**Description**
Lack of baseline data	The mine has no available background water quality data. Data must be collected as part of the rehabilitation plan. In addition, no specialist studies such as a land capability / biodiversity assessment was conducted to verify that the vegetation that has established is sufficient for the final land use, which is grazing.
Cut and Fill strategy / model:	Surveying information was used to re-slope the east and west quarry, as well as the waste rock dump. Areas were identified where the slope is more than 18 degrees. A cut and fill algorithm was utilised to reshape the topography of selected areas to the desired slope. The process was manually adjusted to exclude areas where disturbance should be avoided, and where no distinction was made between the

Unknown / Assumption	Description
	use of waste rock vs. topsoil. The final surface was compared to the original survey to analyse the approximate volumes and area of cut and fill. A slope analysis was done using the available elevation data and displayed in the map below. The benches were not surveyed and is therefore not displayed correctly in the slope analysis. Representation of the hill slope to the north of the tailings dam is distorted due to a lack of quality elevation data beyond the site activities. After sloping the surface areas the volumes of cut and fill operations were calculated by comparing elevation models of the before and after sloping scenarios. Calculations were limited to main sloping areas by masking out the rest of the site. This is done to limit standard deviations of potential elevation inaccuracies on the rest of the site. The cut and fill activities are represented in Figure 7, also reflecting the approximate volumes of material to be cut/ filled. Note that this is only an approximate volume for earth moving activities as the final micro sloping should remove crests and provide paddocks as part of the drainage objectives. The use of topsoil at the various construction areas will also influence the volumes required to be moved.  *Figure 7: Cut and fill locations and volumes* *Rehabilitation plan (Shangoni Management Services, 2013).*
Latent impacts	Potential latent impacts (Impacts that result after closure and the subsequent issuing of a closure certificate) were identified in the rehabilitation plan. As latent impact can only be projected based on specialist knowledge and common practice in the mining industries, these latent impacts are mentioned below:

Unknown / Assumption	Description
	• Topography: The quarries, WRD and slimes dam can after a period of time have slope stability issues. Rock fall could occur from the quarries and slumping from the WRD and slimes dam. • Soil: Soil erosion could occur from the WRD and slimes dam if re-vegetation is not adequate. • Land capability: An impact the mine has on the land capability is safety of the areas that are not rehabilitated, specifically referring to the high walls of the quarries and steep slopes of the WRDs. All mining areas where there are no vegetation cover impacts on the grazing capability. • Animal life: It is a probability that the quarries will be a safety hazard to animals roaming in the area. If the area is used for grazing after closure, these quarries as well as the WRDs and slimes dam may be a safety hazard to cattle or game. Apart from the safety hazard, steep slopes will also cause access constraints for cattle and game farming. • Surface water: Local farmers will use the quarry as livestock watering resource. There is no surface water quality data to determine whether this water falls within the target water quality guidelines for livestock limits for cattle. • Visual: In the event of any slope instability occurring, this will also lead to changes in the visual aspect of the area. • Community: The mine area is at present fenced off. After closure, local residents may remove some fencing that may pose safety risks, e.g. injury or drowning risks.

The impact assessments have assumed that all specialist assessments are essentially correct.

15. Reasoned opinion as to whether the proposed activity should or should not be authorised

15.1 Reasons why the activity should be authorized or not.

In accordance with the amended EIA Regulations GN. R. 326 Appendix 1, 3 (1) paragraph (p), the Environmental Impact Assessment Practitioner (EAP) must provide an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation must be stated.

An impact assessment has been undertaken that has incorporated extensive consultation with and participation of interested and affected parties. Applying the hierarchical approach to impact management, alternatives were firstly considered to avoid negative impacts, but where avoidance was not possible, to better mitigate and manage negative impacts. Where impacts were found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed.

In terms of collectively considering ecological, social and economic impacts it is important to remember that while there might be some trade-offs between the considerations, in South Africa all development must in terms

of Section 24 of the Constitution be ecologically sustainable, while economic and social development must be justifiable. There are therefore specific "trade-off" rules that apply. Environmental integrity may never be compromised and the social and economic development must take a certain form and meet certain specific objectives in order for it to be considered justifiable.[36]

This basic assessment process has been carried out in accordance with the NEMA and the Regulations there under. Appropriate mitigation measures will assist in minimising the potential impacts on the surrounding environment during the decommissioning and closure phases of the project.

Based on the above-mentioned information and the identification of the potential environmental impacts as a result of the proposed decommissioning and closure, it is concluded that mine closure may be authorised.

15.2 Conditions that must be included in the authorisation

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

Should the DMR grant authorisation for this project, it should be subject to the following conditions:

- The company should conduct a land function analysis (LFA) on the slimes dam and waste rock dumps to verify whether the rehabilitation actions that have been implemented was successful.
- The current land occupant (farmer) is satisfied with the rehabilitation measures that have been implemented.
- Implementation of maintenance as per the rehabilitation plan for a period of 2 years post-closure.

15.2.2 Rehabilitation requirements

As part of concurrent rehabilitation unused and unwanted structures were demolished prior to closure. The end land use is grazing. The rehabilitation schedule is incorporated into the financial provision of the mine to ensure sufficient budget for the planned annual actions. The main activities are:

- Biophysical – sloping, moonscaping, planting and making safe of areas is scheduled to continue from the concurrent rehabilitation that was done during mining, to completed rehabilitation in 2017.
- Transition management – monitoring will continue during the decommissioning and rehabilitation, until 2018, after which the DMR may issue a closure certificate or request further monitoring or rehabilitation measures to be taken.

Most of the rehabilitation activities were completed in 2017. Financial provision is available for the rehabilitation of access roads that will not be utilised post-closure, as well as for post-closure monitoring and maintenance in 2018/19, or until a closure certificate has been issued.

The rehabilitation requirements can be summarised in the following steps, as abstracted from the Rehabilitation plan compiled for Anref mine (Shangoni Management Services, 2013):

1. **Concurrent and final rehabilitation (site preparation):**
    a. Sloping of quarries, WRD's and slimes dam walls,

[36] Guideline on need and desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2017.

b. Removal of old fences,
c. General site clean-up, and
d. Establishment of a test area.

Aim: Contours, whale-back tops on slopes, soil placement and natural draining patterns.

2. **Initial alien control:**
    a. Removal of alien vegetation though:
        i. Mechanical Control, or
        ii. Spray herbicides,
    b. Disposal of waste alien vegetation material.
3. **Soil preparation:**
    a. Loosen soil, and
    b. Apply fertilizers.
4. **Vegetation establishment:**
    a. Make barrier lines, and
    b. Plant grass species.
5. **Follow-up alien control:**
    a. Remove low-medium dense regrowth:
        i. Cut plant followed by the application of herbicide, or
        ii. Remove by hand.
    b. Remove dense regrowth:
        i. Spray herbicides.
6. **Monitoring:**
    a. Vegetation monitoring will be conducted as follows
        i. Phase 1 – initial / first season monitoring (Year 1: December / January and Year 2: October / November),
        ii. Phase 2 – second season monitoring (Year 2: December / January),
        iii. Phase 3 – maintenance monitoring (Year 3: January / March, Year 4: January / March and Year 5: January / March)

    Vegetation monitoring for each of these phases will focus on the percentage of vegetation cover present during that time. If the vegetation cover is less than 50% during phase 1 and 2, the area will be replanted. Areas with vegetation cover of more than 70% at the end on phase 2, will be subjected to further maintenance monitoring during phase 3 (year 3). If during this stage it is found that the vegetation cover is less than 70% and that the vegetation composition is dominated by Perennials, the area will be replanted. If the vegetation cover is more than 70% and the vegetation composition is dominated by Perennial, maintenance monitoring will continue during year 4 and 5, the rehabilitation will be considered to be complete.

16. Period for which the Environmental Authorisation is required.

The total period for which authorisation is required, is 3 years, with a breakdown as provided in the table below. It should be noted that decommissioning has already been completed at Anref Mine.

Table 13: Timeframes for authorisation

Stages of operation	Timeframe (Years)
Maintenance and aftercare	2 (2018 / 2019)
Issuing of closure certificate	1 (2020)
Total Period	**3**

17. Undertaking

The undertaking by the EAP is provided in Part 2 of Section B (Environmental Management Programme) below. This undertaking confirms: the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&APs, the inclusion of inputs and recommendations from the specialist reports where relevant and the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

18. Financial Provision

The preliminary estimate for rehabilitation cost which includes biophysical and post closure monitoring is R 841, 785.81, excluding VAT.

18.1 Explain how the aforesaid amount was derived.

An assessment was conducted of all the infrastructure and activities taking place on site that fall within the responsibility of Anref. The infrastructure was classified in accordance with the tariffs list and the surface areas of the infrastructure were calculated to determine the volume or surface requiring rehabilitation or demolition.

The financial provision for premature closure was calculated in March 2016 to the amount of R 4 469 717.77, including P&G and contingency, but excluding VAT. The financial provision according to the previous quantum calculation, completed in June 2017, is R 841,785.81, including P&G and contingency, but excluding VAT. The result is a decrease of R 3 627 931.96.

Reasons for the significant decrease in rehabilitation liability from March 2016 include:

- Rehabilitation of the mine has been completed, as illustrated in “Appendix A: rehabilitation completed” of Appendix 2 of Annexure A of this report. The liability that remains is for monitoring and maintenance for the next year, as well as for the rehabilitation of access roads that are currently still in use as part of maintenance.

As part of the calculation of the closure cost, certain assumptions need to be made. The assumptions supporting the costing are the following:

- The review of the quantum has been based on existing information and measurement from the general surface plan, provided by the mine.
- The provision was determined considering all the successfully completed concurrent rehabilitation. Maintenance was included for all rehabilitated areas.

- No additional structures are planned for the mining site. The two existing buildings will be used by farmers. Therefore, the decommissioning will not involve the demolishing of buildings or structures.
- All the roads on the mining area will be ripped and re-vegetated.

A summary of the 2017 closure cost assessment is detailed in the table below (refer Table 14).

Table 14: Summary of closure cost calculation

No.	Main area	Description	Rate category	Number / other/ factor	Total Size	Rates	Final cost
1	Waste dumps	Waste dumps & tailings	DMR 8(b)		0	R 177 308.40	R -
2	Topsoil spreading	Eastern side	Dump levelling: Grader	1	0	R 41.23	R -
3	Topsoil spreading	Middle	Dump levelling: Grader	1	0	R 41.23	R -
4	Roads	Access roads	Ripping	1	15000	R 15.78	R 236 751.00
5	Roads	Access roads	Seeding	1	15000	R 12.67	R 190 005.00
6	Mine wide	Maintenance	DMR maintenance		18	R 14 158.44	R 254 851.94
Subtotal							R 681 607.94
Preliminary & General costs (13.5%)							R 92 017.07
Contingency (10%)							R 68 160.79
Grand total							**R 841 785.81**

The 2017 financial provision report, as conducted by Shangoni Management Services has been attached as an appendix to the final rehabilitation, decommissioning and closure plan (Appendix 2 of Annexure A).

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

The amount is provided for as part of the financial guarantee for the rehabilitation of land disturbed by mining activities (Refer to PART B – section 1.7.6 and Annexure F). The current financial guarantee available (TRN No. M447998-002) amounts to R 1 004 257.00, dated June 2013. It is therefore evident that the remaining guarantee available is adequate to provide for the implementation of the financial provision calculated in June 2017.

19. Specific Information required by the competent Authority

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

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

It is not anticipated that the closure and decommissioning of Anref mine will have any impact on the socio-economic conditions of any directly affected persons (in this case the farmer currently using the mining area for livestock watering and grazing. After the completion of the public participation process, a letter will be sent to the farmer, to confirm acceptance of all rehabilitation and closure actions implemented. A copy of this letter has been attached to the final revision of this report (refer to Annexure D – Appendix 6, attachment 10. .

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

N/A

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

Refer to the Alternatives Assessment Report, Annexure C.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. Draft environmental management programme.

1.1 Details of the EAP

The requirements for the provision of the detail and expertise of the EAP are included in PART A, Section 1.1 and 1.2.

1.2 Description of the Aspects of the Activity

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, Section 8.

1.3 Composite Map

Refer to Figure 8 and Figure 9 for a map that superimposes the proposed activity (Refer to Figure 6 in section 11.2 of PART A), its associated structures and infrastructures on the environmental sensitivities of the preferred sites, also indicating any areas that should be avoided, including buffers.

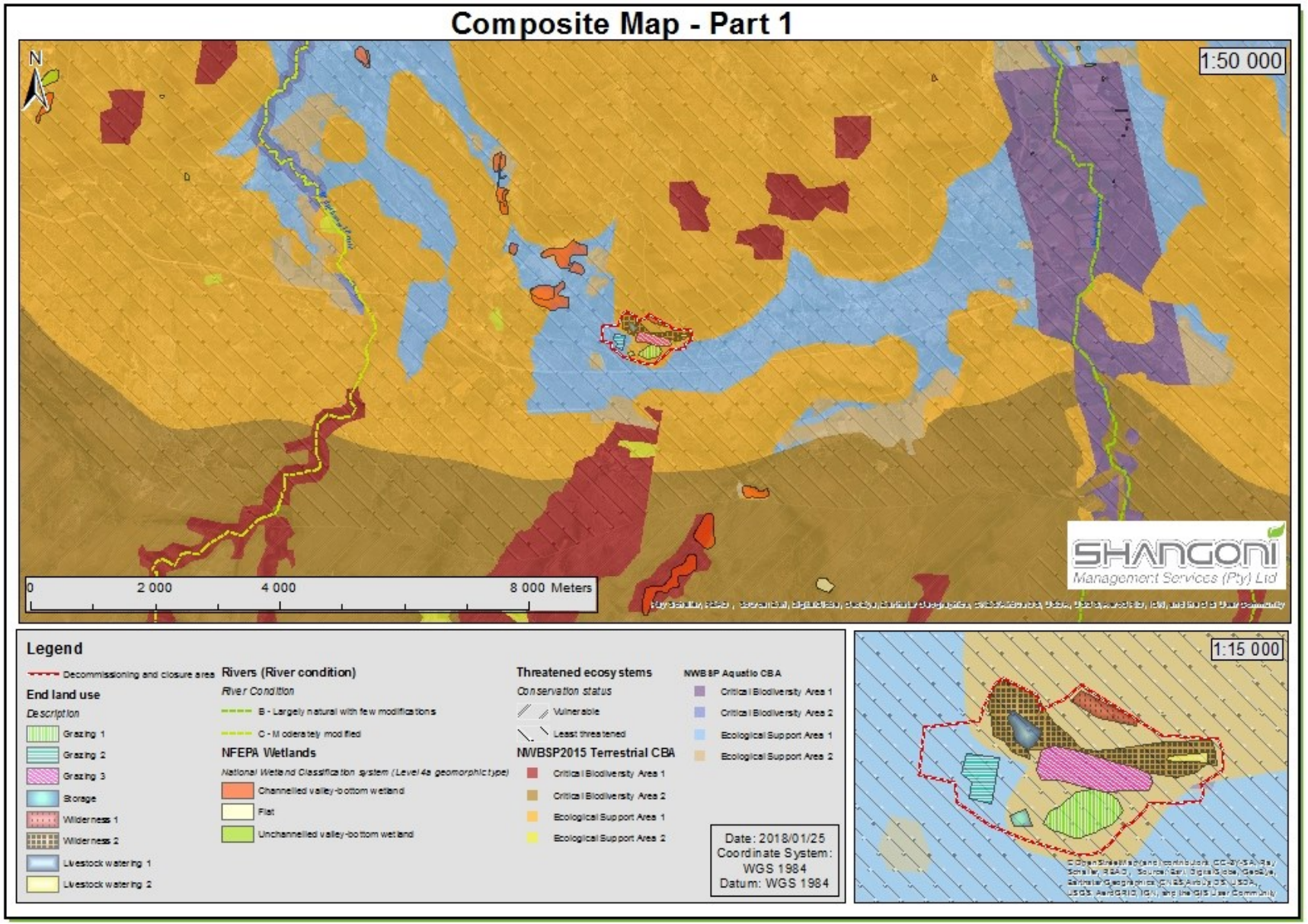


Figure 8: Composite map - Part 1 (post closure land use and sensitivities)

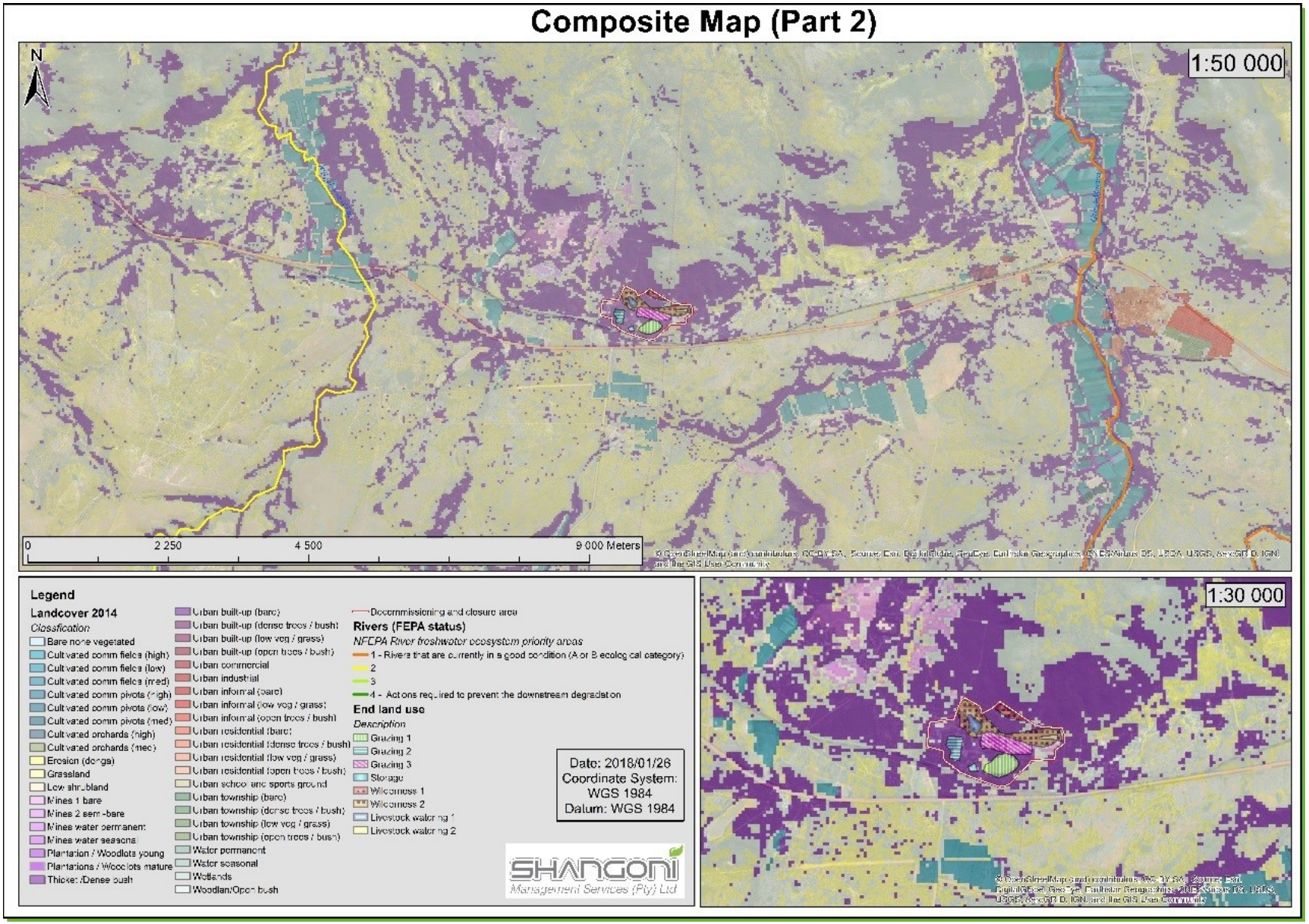


Figure 9: Composite map - Part 2 (post closure land use and sensitivities)

1.4 Description of Impact management objectives including management statements

1.4.1 Determination of closure objectives.

The closure objectives as contained in the final decommissioning, rehabilitation and closure plan (Annexure A) have been summarised in Table 15 below.

Table 15: Closure objectives

Environmental Specific Closure Objectives	
Topography	1) During the decommissioning phase, all slopes need to be finished to the prescribed 1:3 slope. 2) Reduce the visual impact of the altered topography by a process of sloping, benching and rehabilitation.
Soils	1) The re-introduction of the topsoil will return the land to its previous land capability. 2) Remove contaminated soil.
Land capability and land use	1) The land will be returned to cattle/game farming and livestock watering or utilised for other purposes that may become viable in the time of operation. 2) The decommissioning process must take the final use into account in order to achieve a sustainable use.
Natural vegetation	1) During the decommissioning phase, the final portions of the mined area must be vegetated and care should be taken to investigate the total area previously mined to identify areas where the progressive rehabilitation and vegetation has not been totally successful. 2) Special care should be given to: (i) Quality of vegetation; (ii) Any noxious plants and exotic plants that have established themselves and that have to be removed; and (iii) Any signs of erosion. (iv) Corrective measures need to be taken depending on the problems identified.
Animal life	1) Animal life will start returning throughout the process of continuous rehabilitation and it is important that disturbance in rehabilitated areas be limited to the minimum.
Surface water	1) Landscaping should facilitate surface runoff and result in free draining areas.
Air quality	1) To remove any forms of dust generation due to mining activities.
Specific Mining Area Closure Objectives	
Old slimes dam	1) Although the slimes dam walls are very steep, it is already well vegetated and further disturbance will not add value.
Large waste rock dump	1) Visually, the southern side wall is the most significant as it is visible from the national road. The objective is to decrease the height and reduce the slope in order to successfully re-vegetate. 2) Material from the waste rock dump will also be used to fill the depression to the north of the WRD and the eastern quarry. 3) The mine may also consider selling some of the waste rock material to use during construction or upgrading of roads.
Topsoil stockpiles east and west	1) Material from the topsoil stockpiles will mainly be used for final sloping and cover to promote vegetation growth. Unused topsoil will be sloped into low lying cavities to allow gradual topography with free drainage.
Quarry east	1) Benches will be sloped using cut and fill techniques.

Environmental Specific Closure Objectives	
	2) The water body to the east will remain intact while the floor to the west of this quarry will be filled with material from the north and south slopes. 3) Rocky contours are proposed within main drainage lines to reduce runoff velocity and prevent siltation of the water body.
Quarry west	1) Benches will be sloped using cut and fill techniques. 2) The water body will remain intact with sloping of the surrounding high walls limited to the current footprint of the water body. 3) Prevention of siltation is again proposed using rocky bund walls within the main drainage lines towards the water body. 4) Final slopes around both quarries should allow at least one section with safe and easy access for animals to reach the water.
Quarry north	1) The only objective for the northern quarry is to make it safe by sloping the benches using cut and fill techniques.

1.4.2 Volumes and rate of water use required for the operation.

N/A

1.4.3 Has a water use licence has been applied for?

No authorisation in terms of the National Water Act (Act No 36 of 1998) is required for the decommissioning and closure of Anref mine, and subsequently no water use license application was submitted.

1.4.4 Impacts to be mitigated in their respective phases

Table 16: Measures to rehabilitate the environment affected by the undertaking of any listed activity

Environmental Component	Activities	Phase: *Decommissioning, closure or post-closure.*	Size and Scale of Disturbance *(Volumes, Tonnages and Hectares or m²)*	Mitigation Measures	Compliance with Standards	Time Period for Implementation
Geology	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Decommissioning and closure	Total extent of mining rights area (in terms of farm portions): 68 hectares	Mining has ceased, and rehabilitation has been completed, subsequently the impact will not expand.	In compliance with the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning
Topography	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Decommissioning	Total extent of mining rights area (in terms of farm portions): 68 hectares Quarries area: 16.37 ha WRD's: 11.11 ha Slimes dam: 4.70 ha	During the decommissioning phase all slopes need to be finished to the prescribed 1:3 slope (Including the remaining topsoil stockpiles).	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning and post-closure (must be initiated at the earliest opportunity)
				In-filling of erosion gulley's that may appear after the storm event. Reshape, rip and seed areas.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning
				Reduce the visual impact of the altered topography by a process of sloping, benching and rehabilitation.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning (must be initiated at the earliest opportunity)
				Maintenance and aftercare: Infilling and re-seeding affected areas on rehabilitated waste rock dumps and slimes dam.	In compliance with the updated rehabilitation plan (Shangoni Management Services, 2018) as part of the Final rehabilitation, decommissioning and closure plan (Appendix 3 of Annexure A)	Decommissioning and post-closure (must be initiated at the earliest opportunity)
				Vegetation monitoring (monthly): During the decommissioning phase the final portions of the mined area must be vegetated and care should be taken to investigate the total area previously mined to identify areas where the progressive rehabilitation and vegetation has not been totally successful.	In compliance with the updated rehabilitation plan (Shangoni Management Services, 2018) as part of the Final rehabilitation, decommissioning and closure plan (Appendix 3 of Annexure A)	Decommissioning and post-closure
				Erosion monitoring (monthly of after heavy rainfall): Landscaping should facilitate surface runoff and result in free draining areas.	In compliance with the updated rehabilitation plan (Shangoni Management Services, 2018) as part of the Final rehabilitation, decommissioning and closure plan (Appendix 3 of Annexure A)	Decommissioning and post-closure
Surface and groundwater	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam,	Decommissioning and closure	Total extent of mining rights area (in terms of farm portions): 68 hectares Quarries area: 16.37 ha	The re-introduction of the topsoil will return the land to its previous land capability and result in the water runoff to be deemed as clean water thus minimising the impact on surface water and ground water quality.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Operational (concurrent rehabilitation) and decommissioning (must be initiated at the earliest opportunity)

	• Access roads, • Opencast quarries.		WRD's: 11.11 ha Slimes dam: 4.70 ha	Remove contaminated soil (where necessary) in order to decrease the potential for soil, surface water and groundwater pollution. Implement erosion control measures on slimes dam as identified in the rehabilitation plan.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Operational (concurrent rehabilitation) and decommissioning
		Post-closure	Total extent of mining rights area (in terms of farm portions): 68 hectares Quarries area: 16.37 ha WRD's: 11.11 ha Slimes dam: 4.70 ha	Planned future use for the quarries (as they will not be fully rehabilitated): Water in the quarries will remain for use by the farmer (livestock watering).	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Post-closure
				Paddocks should be constructed on top of the old tailings dam and the waste rock dump. These paddocks should assist in retaining surface runoff to promote vegetation growth as well as to prevent erosion down the side slopes.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Operational (concurrent rehabilitation) and decommissioning
				Rocky bunding in the concentrated drainage areas (of the old tailings dam and WRD's) should decrease the velocity of the runoff to prevent erosion threatening siltation of the water resources.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Operational (concurrent rehabilitation) and decommissioning
Land capability and use	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Post-closure	Total extent of mining rights area (in terms of farm portions): 68 hectares Quarries area: 16.37 ha WRD's: 11.11 ha Slimes dam: 4.70 ha	Due to cessation of mining activities, the footprint of the quarries will not increase.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning
				Planned future (and current) use for the quarries (as they will not be fully rehabilitated): The quarries are utilised by a local farmer as drinking source for cattle.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning and post-closure
Vegetation	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Decommissioning and post-closure	Total extent of mining rights area (in terms of farm portions): 68 hectares Quarries area: 16.37 ha WRD's: 11.11 ha Slimes dam: 4.70 ha	Re-seeding bare areas: Re-seed the large waste rock dump, as seeds that were sowed was washed away during March 2017 storm. After completion of this step, monitoring will be conducted until the end of 2018 to verify establishment of vegetation.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning (must be initiated at the earliest opportunity)
				Conduct a Biodiversity survey to verify that adequate vegetation cover has been achieved and that the balance between indigenous and alien species is acceptable.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A - Section 9.4).	Decommissioning and post-closure
				Implementation of berms to allow for vegetation establishment and surface water management.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A - Section 9.4).	Decommissioning
				Mitigate areas where erosion is visible through redirecting storm water (specifically with regards to the slimes dam).	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A - Section 9.4).	Decommissioning and post-closure (must be initiated at the earliest opportunity)
				Implementation of alien eradication programme in order to control alien vegetation growth and facilitate indigenous vegetation growth.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A - Section 9.4).	Decommissioning and post-closure

Visual	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries	Post-closure	Total extent of mining rights area (in terms of farm portions): 68 hectares Quarries area: 16.37 ha WRD's: 11.11 ha Slimes dam: 4.70 ha	Implementation of the rehabilitation program, including re-vegetation of the WRDs in order to decrease the visibility of the WRD from the road (N4).	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.	Decommissioning (must be initiated at the earliest opportunity)

1.5 Impact Management Outcomes

Table 17: Impact management outcomes, identifying the stand of impact management required for the identified aspects

Aspects Affected	Activity	Potential Impact	Phase: *Operational, decommissioning Rehabilitation, Closure, Post Closure.*	Mitigation Type	Standard to be Achieved
Geology	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Mining of the material leads to the extraction of the ore body; therefore, the impact on the geology will be permanent.	Decommissioning and closure	Control	Control through only mining in the approved mine right area and implementing rehabilitation actions.
Topography	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Topography of the affected mining are is affected by three main mining activities: • Extraction of ore (creation of quarries), • Creation of Waste Rock Dumps (WRD's), and • Creation of process slimes dam. There are three quarries where extraction of ore took place, resulting in local depressions with banked high walls to the north. The WRDs and the slimes dam create unnatural elevated heaps that significantly alter the topography.	Decommissioning	Remedy Remedy Remedy Control Control	Remedy through finishing all slopes to the prescribed 1:3 slope. Remedy erosion gullies through in-filling, subsequent reshaping, ripping and seeding. Remedy the visual impact of the altered topography through a process of sloping, benching and rehabilitation. Control the impact of mining activities on the topography through the implementation of maintenance and aftercare actions, (for example, in-filling and seeding areas if necessary). Control the impact through vegetation and erosion monitoring.
Surface and groundwater	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Various activities on the mine could have resulted in soil, surface water and groundwater pollution. The significant activities sources of pollution will be due to seepage and surface water run-off from the slimes dam and the WRD's. The mine has no available surface water and groundwater quality data, therefore the extent of this pollution (if any) cannot be determined.	Decommissioning and closure	Remedy Remedy Remedy	The impact will be remedied through the re-introduction of topsoil which will result in the water runoff being deemed as clean water and thus minimising the impact on surface and ground water quality. Remedy the impact through the removal of all contaminated material, as necessary. In addition, the impact will be remedied through the implementation of erosion control measures on the slimes dam as identified in the rehabilitation plan.
		Ponding of water in the quarries as well as on the WRD's and slimes dam will occur. This may lead to seepage of minerals into the groundwater, and affect the stability of the side slope, which in turn can impact vegetation establishment in these areas and may lead to erosion.	Post-closure	Control Control	Control the impact through the management of the quarries (and the water contained within) after the closure of the mine. Control the impact through the construction of paddocks on top of the old tailings dam and the waste rock dump.

Aspects Affected	Activity	Potential Impact	Phase: *Operational, decommissioning Rehabilitation, Closure, Post Closure.*	Mitigation Type	Standard to be Achieved
				Control	Control the impact through the placement of rocky bunding, in order to decrease the runoff velocity.
Land capability and use	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	The main impact on the land capability is the quarries that will not be rehabilitated and with no proposed land use. Surrounding land use will not be affected significantly, however, the mining activities will have impacted on the landscape character.	Post-closure	Control Control	Control through ensuring that mining ceases and no increase in the quarry footprints take place. Control the impact through the management of the quarries (and the water contained within) after the closure of the mine.
Vegetation	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Vegetation is destroyed in the quarries and the footprint of the WRD's. Some vegetation that was established on the slimes dam was removed during re-mining of the slimes. Compacted soil areas where infrastructure was located as well as poorly vegetated access roads also occur. Bare areas disturbed during mining activities will be prone to weed and invader establishment. The increase of wees and invasive plants may lead to a decrease in indigenous vegetation growth.	Decommissioning and post-closure	Remedy Control Remedy Control Control	Remedy through re-seeding all the bare areas, and subsequently implementing monitoring until the end of 2018 to ensure that vegetation has established. Control through conducting a biodiversity survey to verify that adequate vegetation cover has been achieved. Remedy areas showing erosion through redirecting storm water (implementation of erosion control measures specifically with regards to the slimes dam). Control through the implementation of berms to allow for vegetation establishment and surface water management. Control through the implementation of an alien eradication programme.
Visual	Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Abandoned quarries may impact on the visual quality of the area. The large WRD to the south creates a visual impact when driving past on the N4 highway. Visibility is mainly due to the height of the WRD and absence of vegetation cover.	Post-closure	Control	Control through the implementation of the rehabilitation programme (which includes the re-vegetation of the WRD's).

1.6 Impact Management Actions

Table 18: Impact management actions, identifying the manner in which the impact management objectives and outcomes will be achieved.

Activity	Potential Impact	Mitigation Type	Time Period for Implementation	Compliance with Standards
Geology				
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Mining of the material leads to the extraction of the ore body; therefore, the impact on the geology will be permanent.	Control through only mining in the approved mine right area and implementing rehabilitation actions.	Decommissioning	In compliance with the Mining Right issued in terms of the MPRDA (2002) and the EMPr. In compliance with the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.
Topography				
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Topography of the affected mining are is affected by three main mining activities: • Extraction of ore (creation of quarries), • Creation of Waste Rock Dumps (WRD's), and • Creation of process slimes dam. There are three quarries where extraction of ore took place, resulting in local depressions with banked high walls to the north. The WRDs and the slimes dam create unnatural elevated heaps that significantly alter the topography.	Remedy through finishing all slopes to the prescribed 1:3 slope. Remedy erosion gullies through in-filling, subsequent reshaping, ripping and seeding. Remedy the visual impact of the altered topography through a process of sloping, benching and rehabilitation. Control the impact of mining activities on the topography through the implementation of maintenance and aftercare actions, (for example, in-filling and seeding areas if necessary). Control the impact through vegetation and erosion monitoring.	Decommissioning and post-closure (rehabilitation actions must be initiated at the earliest opportunity).	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives. In compliance with the updated rehabilitation plan (Shangoni Management Services, 2018) as part of the Final rehabilitation, decommissioning and closure plan (Appendix 3 of Annexure A)
Surface and groundwater				
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Various activities on the mine could have resulted in soil, surface water and groundwater pollution. The significant activities sources of pollution will be due to seepage and surface water run-off from the slimes dam and the WRD's. The mine has no available surface water and groundwater quality data, therefore the extent of this pollution (if any) cannot be determined.	The impact will be remedied through the re-introduction of topsoil which will result in the water runoff being deemed as clean water and thus minimising the impact on surface and ground water quality. Remedy the impact through the removal of all contaminated material, as necessary. In addition, the impact will be remedied through the implementation of erosion control measures on the slimes dam as identified in the rehabilitation plan.	Operational (concurrent rehabilitation) and decommissioning (rehabilitation actions must be initiated at the earliest opportunity),	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.
	Ponding of water in the quarries as well as on the WRD's and slimes dam will occur. This may lead to seepage of minerals into the groundwater, and affect the stability of the side slope, which in turn can impact	Control the impact through the management of the quarries (and the water contained within) after the closure of the mine.	Operational (concurrent rehabilitation) and decommissioning and post closure	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.

Activity	Potential Impact	Mitigation Type	Time Period for Implementation	Compliance with Standards
	vegetation establishment in these areas and may lead to erosion.	Control the impact through the construction of paddocks on top of the old tailings dam and the waste rock dump. Control the impact through the placement of rocky bunding, in order to decrease the runoff velocity.		
Land capability and use				
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	The main impact on the land capability is the quarries that will not be rehabilitated and with no proposed land use. Surrounding land use will not be affected significantly, however, the mining activities will have impacted on the landscape character.	Control through ensuring that mining ceases and no increase in the quarry footprints take place. Control the impact through the management of the quarries (and the water contained within) after the closure of the mine.	Decommissioning and post-closure	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.
Vegetation				
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Vegetation is destroyed in the quarries and the footprint of the WRD's. Some vegetation that was established on the slimes dam was removed during re-mining of the slimes. Compacted soil areas where infrastructure was located as well as poorly vegetated access roads also occur. Bare areas disturbed during mining activities will be prone to weed and invader establishment. The increase of wees and invasive plants may lead to a decrease in indigenous vegetation growth.	Remedy through re-seeding all the bare areas, and subsequently implementing monitoring until the end of 2018 to ensure that vegetation has established. Control through conducting a biodiversity survey to verify that adequate vegetation cover has been achieved. Remedy areas showing erosion through redirecting storm water (implementation of erosion control measures specifically with regards to the slimes dam). Control through the implementation of berms to allow for vegetation establishment and surface water management. Control through the implementation of an alien eradication programme.	Decommissioning (rehabilitation actions must be initiated at the earliest opportunity) and post-closure.	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.
Visual				
Decommissioning and closure of the Anref mine, which includes the biophysical areas: • Waste rock dumps, • Slimes dam, • Access roads, • Opencast quarries.	Abandoned quarries may impact on the visual quality of the area. The large WRD to the south creates a visual impact when driving past on the N4 highway. Visibility is mainly due to the height of the WRD and absence of vegetation cover.	Control through the implementation of the rehabilitation programme (which includes the re-vegetation of the WRD's).	Decommissioning (rehabilitation actions must be initiated at the earliest opportunity)	In compliance with the rehabilitation plan (Shangoni Management Services, 2013) and the final rehabilitation, decommissioning and closure plan (See Annexure A) and the closure objectives.

1.7 Financial Provision

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

The proposed decommissioning and closure activity is to be carried out on an already disturbed site (Anref Mine). The closure objectives for the proposed activity do however relate to the rehabilitation and associated activities of the mine. The closure objectives for the mine have been defined based on two approaches, the first approach provides closure objectives to assist in managing the baseline biophysical environment while the other approach is focused on the actions required to close specific mine areas.

Table 19: Alignment between closure objectives and baseline environment

Closure Objectives		Alignment with baseline environment
Environmental Specific Closure Objectives		
Topography	1) During the decommissioning phase, all slopes need to be finished to the prescribed 1:3 slope. 2) Reduce the visual impact of the altered topography by a process of sloping, benching and rehabilitation.	By using the Agis Atlas (2006), the original slope of the mine area can be assessed (Refer Figure 10). The area of the mine is indicated roughly in this figure. It is evident that prior to mining, the slope varied from between 3% (gentle slope) to more than 20% (steep slope). Mining activities (such as quarrying and creating elevated structures such as WRD's and slimes dams) are not indicated on this figure, but also have an impact on the slope of the area. The quarries, WRD's and slimes dam could potentially have slope stability issues. In addition, the high walls of the quarries and steep slopes (prior to rehabilitation) of the WRD may be a safety concern. By extension, a slope failure will also have an impact on the visual aspect of the surroudings. The following was obtained for the Rehabilitation plan (Shangoni Management Services, 2013)[37]: *The functionality of the slope is largely determined by the local precipitation, soil type, and vegetation to be used during rehabilitation. The slope should allow for vegetation growth and minimise the risk of erosion caused by accelerated runoff. Evidence on site suggests that vegetation*

[37] Refer to Section 2.3 of the Rehabilitation plan (2013) for the rehabilitation approach defined to reshape and slope the mining areas.

can grow naturally on very steep slopes. However, there are clear signs of erosion on un-rehabilitated side slopes of the waste rock dump and discard dumps.

A functional slope of 18 degrees has been identified as an acceptable angle for rehabilitation of this site. All earth moving operations will therefore be aimed to reach at least 18 degrees. It should be noted that a flatter slope does not necessarily constitute more successful rehabilitation as it will increase the footprint of disturbance. A well-balanced rehabilitation is proposed to optimise topography with the least disturbance of the surrounding natural habitat.

Therefore, a closure objective has been compiled to ensure that the quarries, WRD's and slimes dam's sides are sloped to 1:3.

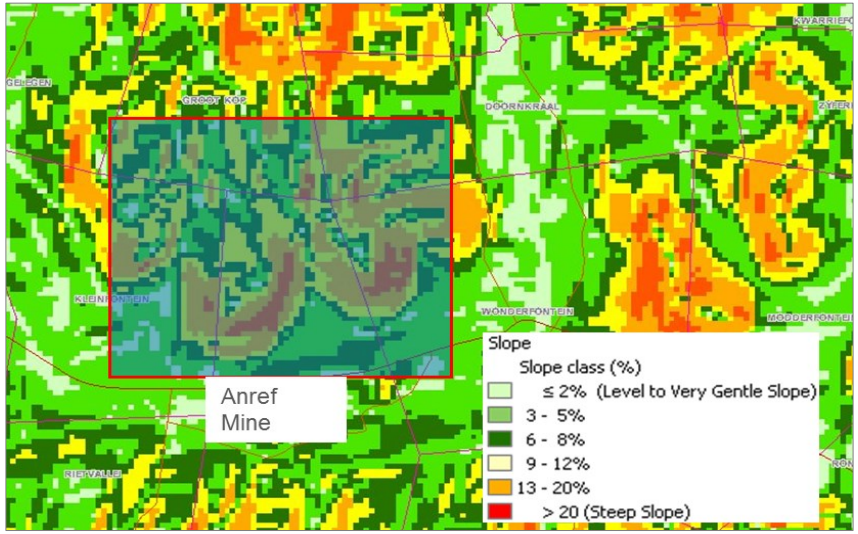


Figure 10: Slope classification (Source: AGIS Atlas)

In addition to above, mining activities also have an impact on the visual aspect of the area. The large WRD to the south creates a visual impact when driving past on the N4 highway. Visibility is mainly due to the height of the WRD and absence of vegetation

		cover. Decreasing the slope of the quarries, WRD's and slimes dam could lead to more successful vegetation establishment, which in turn would increase the visual aspect of the area. **Success criteria:** Dumps have been sloped as per closure objective and vegetation has established on shaped slopes which limits visual impact.
Soils	1) The re-introduction of the topsoil will return the land to its previous land capability. 2) Remove contaminated soil.	All mining areas without vegetation cover impacts on the grazing capability (proposed final land use). The closure objectives will ensure that all contaminated soil accumulated during the operation of the mine is removed, and that topsoil is replaced on disturbed areas during rehabilitation. **Success criteria:** Refer to Section 8.1.1 of the final decommissioning, rehabilitation and closure plan. Any contaminated soil has been removed.
Land capability and land use	1) The land will be returned to cattle/game farming or utilised for other purposes that may become viable in the time of operation. 2) The decommissioning process must take the final use into account in order to achieve a sustainable use.	The area has a high agricultural potential. The Agricultural Land Demarcation is applicable to this area. Land capability for Part 1 is non-arable with a low to moderate potential for grazing. Parts 2 and 3 have a marginal potential for arable land. Grazing capacity ranges from 11 ha / AU (moderately high) to 25 ha / AU (moderately low) for the area. Around the Groot Marico River to the east of the site, the grazing capacity is more than 100 ha / AU due to transformed rangelands. Irrigated land is only applicable around the Groot Marico River. Therefore, the site itself has mostly a grazing potential for especially cattle. The Agricultural GDP is moderate to low of 151 – 300 R / ha. The closure objectives aim to ensure that the area is rehabilitated to the original land capability and that the decommissioning process takes the final land use into account. **Success criteria:** Rehabilitated areas have adequate carrying capacity to ensure it can be used for cattle grazing.
Natural vegetation	1) During the decommissioning phase, the final portions of the mined area must be vegetated and care should be	The area falls within the vegetation unit classified by Mucina and Rutherford (2006) as Zeerust Thornveld (SVcb 3) and north of the quarries as Dwarsberg-Swartruggens Mountain Bushveld (SVcb 4). The Zeerust Thornveld vegetation is described as deciduous, open to dense short thorny woodland, dominated by Acacia species with herbaceous layer of mainly grasses. The

	taken to investigate the total area previously mined to identify areas where the progressive rehabilitation and vegetation has not been totally successful. 2) Special care should be given to: (i) Quality of vegetation; (ii) Any noxious plants and exotic plants that have established themselves and that have to be removed; and (iii) Any signs of erosion. (iv) Corrective measures need to be taken depending on the problems identified.	Dwarsberg-Swartruggens Mountain Bushveld is described as having variable vegetation structure depending on the slope, exposures, aspect and local habitat with various trees and shrub layers often with dense grass layer. The final decommissioning, rehabilitation and closure plan (Shangoni Management Services, 2018) contains specific management measures with regards to preparation for re-vegetation, revegetation and alien control as taken from the rehabilitation plan (Shangoni Management Services, 2013). These measures will assist the mine in achieving this closure objective. The closure objective (1) ensures that all portions disturbed by mining must be vegetated once the mining activities are completed. Furthermore, areas that were previously re-vegetated through progressive rehabilitation, should be investigated to ensure that the vegetation establishment was successful. The second closure objective provides specific aspects that should be taken into account when re-vegetating a disturbed area with regards to the quality of vegetation, control and removal of noxious and exotic plants, control of erosion and the implementation of corrective actions. **Success criteria:** Vegetation has established on shaped slopes which limits visual impact. Weed species should not be dominating plant cover and indigenous species should be present.
Animal life	1) Animal life will start returning throughout the process of continuous rehabilitation and it is important that disturbance in rehabilitated areas be limited to the minimum.	Existing baseline information indicates that cattle belonging to the local farmers are found on site and that no endangered or rare species have been observed near the mine. This closure objective intends to ensure that rehabilitation actions are conducted in such a way that disturbances are limited as much as possible, in order to facilitate the return of animal life to the mining area. **Success criteria:** Potential fauna habitat should be present.

Surface water	1) Landscaping should facilitate surface runoff and result in free draining areas.	Existing baseline information indicates that the flow in the Marico River (MAR 126 million m³/year) is highly variable and intermittent. There are two major storage reservoirs that regulate the flow in the Marico River, namely the Marico Bosveld Dam in the upper catchment and the Molatedi Dam further down-stream. The Groot Marico flows approximately 2 km east of the mining site. For the Crocodile area, the natural surface Mean Annual Runoff (MAR) is approximately 646 million m³/annum. Stream-flow reduction due to invasive alien vegetation has not been considered to have a large impact on water availability in this catchment. The aim of this closure objective is to ensure that all landscaping actions (sloping, re-vegetation and rehabilitation) facilitates surface runoff and leads to a free draining area. Water drainage should flow naturally without pooling and flooding in the rehabilitated areas. The objective also aims to ensure that minimal erosion occurs where water flows from drainage structures. **Success Criteria:** Water drainage flows naturally without pooling or flooding. Minimal erosion where water flows from drainage structures.
Air quality	1) To remove any forms of dust generation due to mining activities.	Limited baseline information is available with regards to the air quality of the area, little is known about the air quality of the area. Due to the lack of industries and mining activities, the area is not considered to have a poor air quality. The aim of the objective is to ensure that dust is minimised throughout all phases of the operation. The re-establishment of vegetation on most areas limits the amount of dust generated on site. Should additional bare areas be noted, which could potentially increase the amount of dust released from the site, these areas should be re-seeded. **Success Criteria:** Vegetation has established on most areas limiting dust movement off site.
Specific Mining Area Closure Objectives		
Old slimes dam	1) Although the slimes dam walls are very steep, it is already well vegetated and	Prior to the commencement of mining, the areas where the slimes dam can now be seen was a natural area with indicative floral and faunal species of the surrounding area. Due to mining, all vegetation has been removed from the footprint and the topography has been changed.

	further disturbance will not add value.	The aim of this objective is to ensure that the slimes dam (and the established vegetation) is not disturbed further. Although the aim of rehabilitation is to ensure that the disturbed areas' slopes are not too steep (which could lead to erosion, slope failure, increased siltation in run-off surface water and impaired vegetation establishment) the fact that vegetation has established effectively on the current slopes, it would not be beneficial to disturb it again.[38] Below is a photograph, as taken during the October 2016 site visit (see Figure 11).  *Figure 11: Old slimes dam (October 2016)* During the site visit conducted June 2017, the following two photographs were taken on top of the old slimes dam (refer Figure 12 & Figure 13)

[38] Section 9.4 of the Final decommissioning, rehabilitation and closure plan (Shangoni Management Services, 2018) contains some additional actions required which relates to conducting a biodiversity study to ensure that the vegetation that has established, and the balance between the indigenous and alien vegetation, is acceptable. In addition, an action is included to ensure that areas where erosion is visible should be mitigated through redirecting storm water.

		 *Figure 12: Vegetation establishment on Slimes dam (1)*  *Figure 13: Vegetation establishment on Slimes dam (2)* In comparing these three photographs it is evident that the revegetation of the old slimes dam has been effective over the last year. **Success Criteria:** Indigenous vegetation has established on the slimes dam rehabilitated surfaces. Alien species should not be dominating plant cover and indigenous species should be present. Water drainage flows naturally without pooling or flooding. Minimal erosion where water flows from drainage structures.
Large waste rock dump	1) Visually, the southern side wall is the most significant as it is visible from the national road. The objective is to decrease the height and reduce the slope in order to successfully re-vegetate. 2) Material from the waste rock dump will also be used to fill the depression to the north of	Mining activities does not only impact on the topography of the area but also have an impact on the visual aspect. The large WRD to the south creates a visual impact when driving past on the N4 highway. Visibility is mainly due to the height of the WRD and absence of vegetation cover. The aim of this objective (1) is to ensure that the large waste rock dump's is not too high, and its slopes are not too steep (which could lead to erosion, slope failure, increased siltation in run-off surface water and impaired vegetation establishment) in order to minimise the visual impact of the dump. Ideally, the rehabilitation strategy should allow for making use of the material on site to reshape the desired topography. In order to avoid the need to bring in more material an optimised cut and fill strategy is proposed where equal amount of material is "cut"

	the WRD and the eastern quarry. 3) The mine may also consider selling some of the waste rock material to use during construction or upgrading of roads.	from the top and "filled" into the depressions. Cut and fill operations will be used to fill in depressions and reduce the height of some sections of the dump (Objective 2). The final decommissioning, rehabilitation and closure plan (Shangoni Management Services, 2018) contains specific management measures with regards to the cut and fill operations as taken from the rehabilitation plan (Shangoni Management Services, 2013). Should all cut and fill operations be completed efficiently with enough material already available, it will not be necessary to implement objective 3. **Success Criteria:** The dump has been sloped per closure objectives. Vegetation has established on shaped slopes which limits visual impact[39].
Topsoil stockpiles east and west	1) Material from the topsoil stockpiles will mainly be used for final sloping and cover to promote vegetation growth. Unused topsoil will be sloped into low lying cavities to allow gradual topography with free drainage.	As discussed above, mining activities does not only impact on the topography of the area but also have an impact on the visual aspect and drainage of water. The aim of this objective is to ensure that the topsoil stockpiles' slopes are not too steep (which could lead to erosion and increased siltation in run-off surface water) and that the topsoil is used for final sloping. The objective also provides guidance on what should be done should some topsoil remain. The aim is to ensure that the topography is free draining and gradual. **Success Criteria:** Any remaining topsoil stockpiles have been sloped as per objective[40].
Quarry east	1) Benches will be sloped using cut and fill techniques.	

[39] Section 9.4 of the Final decommissioning, rehabilitation and closure plan (Shangoni Management Services, 2018) contains some additional actions required which relates to reseeding this dump (seeds were washed away during the March 2017 storm). In addition, an action is included to ensure that the re-vegetation is verified and monitored until the end of 2018.

[40] Section 9.4 of the Final decommissioning, rehabilitation and closure plan (Shangoni Management Services, 2018) contains some additional actions required which relates to sloping one topsoil stockpile observed during the site visit.

	2) The water body to the east will remain intact while the floor to the west of this quarry will be filled with material from the north and south slopes. 3) Rocky contours are proposed within main drainage lines to reduce runoff velocity and prevent siltation of the water body.	The high walls of the quarries may be a safety concern. By extension, a slope failure will also have an impact on the visual aspect of the surroundings. The slope should allow for vegetation growth and minimise the risk of erosion caused by accelerated runoff. Decreasing the slope of the quarries could lead to more successful vegetation establishment, which in turn would increase the visual aspect of the area. In order to implement the proposed final-land use (grazing), and use the water left in the quarries to water the animals, it would be necessary to provide the animals with a safe access to the water source. The aim of these objectives (objectives 1, 2 and 3) is to ensure that the East quarry's benches are sloped (if the benches are left as is, it could lead to erosion, slope failure. and increased siltation in run-off surface water) and provides specific guidance with regards to rehabilitation actions required for specific areas. **Success Criteria:** Benches have been sloped. Infilling was done where required. Berms / sediment traps are installed where necessary to reduce sediment loads. No evidence of siltation of nearby natural drainage lines.
Quarry west	1) Benches will be sloped using cut and fill techniques. 2) The water body will remain intact with sloping of the surrounding high walls limited to the current footprint of the water body. 3) Prevention of siltation is again proposed using rocky bund walls within the main drainage lines towards the water body. 4) Final slopes around both quarries should allow at least	The high walls of the quarries may be a safety concern. By extension, a slope failure will also have an impact on the visual aspect of the surroundings. The slope should allow for vegetation growth and minimise the risk of erosion caused by accelerated runoff. Decreasing the slope of the quarries could lead to more successful vegetation establishment, which in turn would increase the visual aspect of the area. In order to implement the proposed final-land use (grazing), and use the water left in the quarries to water the animals, it would be necessary to provide the animals with a safe access to the water source. The aim of these objectives (1,2 and 3) is to ensure that the West quarry's benches are sloped (if the benches are left as is, it could lead to erosion, slope failure and increased siltation in run-off surface water) and provides specific guidance with regards to rehabilitation actions required for specific areas. Objective (4) will ensure that all slopes around the east and west quarries are sloped in such a way that decent to the water source at the bottom of the rehabilitated quarry does not pose any risk to the animal's safety.

	one section with safe and easy access for animals to reach the water.	**Success Criteria:** Benches have been sloped. The high-walls do not exceed the footprint of the water body. Berms / sediment traps are installed where necessary to reduce sediment loads. No evidence of siltation of nearby natural drainage lines. Cattle and other fauna on site has safe access to the water.
Quarry north	1) The only objective for the northern quarry is to make it safe by sloping the benches using cut and fill techniques.	The aim of this objective is to ensure that the North quarry's benches are sloped (if the benches are left as is, it could lead to erosion, slope failure, safety concerns and increased siltation in run-off surface water). **Success Criteria:** Quarry is fenced off, restricting access.

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

Imerys refractory mineral (Pty) Ltd is the landowner and have been involved in the finalisation or the closure objectives for Anref mine. The I&AP's were provided with the relevant closure documentation indicting the closure objectives via the Shangoni Website. Closure objectives for Anref mine will be applied to the project area. No changes to the existing closure objectives for Anref mine is required.

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

The rehabilitation plan has been compiled and contained as Annexure E. This rehabilitation plan contains the final land use of each specific mine area, as well as a short inscription of all the rehabilitation actions still required to be implemented in 2018 (aligned with the annual rehabilitation plan).

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

The Final rehabilitation, decommissioning and closure plan (Shangoni Management Services, 2018) contains closure criteria which is aligned with the rehabilitation initiatives. The initiatives are focussed on ensuring that the closure objectives can be met i.e. sloping, revegetation and water management structures.

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

The quantum of the financial provision required to manage and rehabilitate the environment amounts to R 841 785.81 (excluding VAT).

Table 20: Cost of Physical and Bio-physical closure

Item	DMR maintenance	Ripping	Seeding	Grand Total
Access roads		R 236,751.00	R 190,005.00	R 426,756.00
Maintenance	R 254,851.94			R 254,851.94
Grand Total	R 254,851.94	R 236,751.00	R 190,005.00	R 681,607.94
P&G			13.50%	R 92,017.07
Contingency			10%	R 68,160.79
Sub-total 2				**R 841,785.81**
VAT			14%	R 117,850.01
Grand total				R 959,635.82

A detailed calculation of the quantum in accordance with the applicable guideline is contained in Appendix 2 of Annexure A.

1.7.6 Confirm that the financial provision will be provided as determined.

As this is an existing mining activity the financial provision has been updated annually taking changes to the mining operation into account. Imerys (Pty) Ltd provides evidence of available funds on an annual basis. The recalculation of the immediate closure cost was performed in 2017 thereafter a report was submitted to DMR which included the new quantum calculation. Refer to Annexure F for proof of financial provision available (as available in June 2013).

1.8 Mechanisms for monitoring compliance with and performance assessment against the environmental management programme

Mechanisms for monitoring compliance with proposed rehabilitation actions and mitigation measures and reporting thereon, including:

- Monitoring of Impact Management Actions
- Monitoring and reporting frequency
- Responsible persons
- Time period for implementing impact management actions
- Mechanism for monitoring compliance

Table 21: Mechanism for monitoring compliance with mitigation measures

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
Decommissioning and closure of the Anref mine, which includes the biophysical areas.	Vegetation cover (Species diversity and abundance).	Vegetation monitoring.	Imerys Head office	Monthly monitoring (or after a heavy rainfall event in the case of erosion) during the decommissioning phase and closure phase (until the end of 2018).
	Erosion (surface stability).	Erosion monitoring.		

1.9 Indicate the frequency of the submission of the performance assessment/ environmental audit report.

The performance assessment on the proposed rehabilitation measures will be submitted along with the application for the closure certificate in terms of section 43 of the MPRDA.

1.10 Environmental Awareness Plan

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

Imerys Group has developed various codes on conducts including policies and protocols applying to employees which covers the compliance with laws and regulations, as well as protection of the environment and human rights.

Imerys Code of Business Conduct and Ethics ("the Code") summarizes the principles of ethical behaviour the Group expects from all of its employees, contractors, suppliers, and other partners. The umbrella principles set forth in the Code are supported by a series of policies and protocols applying to both the general conduct of Imerys and the individual conduct of each employee. The subjects covered by the Code include compliance with laws and regulations, protection of environment and human rights, relations with local communities and trade unions, workplace safety and health, diversity and equality, confidentiality, prevention of fraud or corruption, insider trading, conflicts of interest, protection of the Group's assets, fair competition, transparency, and integrity.

Imerys Group requires each if its operations to have an effective Environmental Management System (EMS) to identify and control significant environmental risks. They also insure compliance with local regulations and with Imerys' specific environmental protocols. The mandatory EMS requirements are detailed in a Group-specific environmental protocol which includes eight pillars embracing the core elements of the international standards for EMS. The Eight pillars are: existence of a policy; identification of aspects & impacts; identification of legal requirements; setting goals and targets; appointment of a management representative; training; emergency procedures, and auditing.

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

Imerys has incorporated environmental focus into their sustainable development programme. The company works to reduce their environmental impact and use natural resources efficiently through the adoption of management systems for the main environmental aspects of their activities.

The company has further development a post mining rehabilitation protocol that requires operations to prepare their quarries' future and describes the restoration methods that will be applied during the site's operating life and when it closes.

1.11 Specific information required by the Competent Authority

The following information will be required by the competent authority.

Table 22: Information required by competent authority

Information	Frequency of submission
Compliance with the Financial Provisioning Regulations GN. R 1147.	Annually, until closure certificate has been received.

2. UNDERTAKING

The EAP herewith confirms

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

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

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

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

Signature of the environmental assessment practitioner:

Shangoni Management Services (Pty) Ltd.

Name of company:

14 November 2018.

Date:

-END-