mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL SCOPING REPORT FOR LISTED ACTIVITIES ASSOCIATED WITH A MINING RIGHT

SUBMITTED FOR AN ENVIRONMENTAL AUTHORISATION LODGED IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 0F 1998) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (ACT 59 OF 2008) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002) READ WITH REGULATION 19 OF THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS TAKING PLACE ON THE FARM ANNESLEY 109 KT AND THE FARM HOLFONTEIN 126 KT, SITUATED IN THE GREATER TUBATSE MUNICIPALITY OF THE LIMPOPO REGION

NAME OF APPLICANT: IMERYS REFRACTORY MINERALS SOUTH AFRICA (PTY) LTD ANNESLEY ANDALUSITE MINE
MINING RIGHT NUMBER: 73 MRC
APPLICATION PROPERTY: THE FARM ANNESLEY 109 KT AND THE FARM HOLFONTEIN 126 KT

November 2021

BECS Environmental (Pty) Ltd
In association with BECS Services (Pty) Ltd

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IMPORTANT NOTICE

Unless an Environmental Authorisation (EA) can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report (EIA/EMP) 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 Environmental Impact Assessment (EIA) Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

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

It is furthermore an instruction that the Environmental Assessment Practitioner (EAP) 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 uninterpreted information and that it unambiguously represents the interpretation of the applicant.

1 Objective of the scoping process

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

a) identify the relevant policies and legislation relevant to the activity;
b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
e) identify the key issues to be addressed in the assessment phase;
f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
g) identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

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ABBREVIATIONS

ABA	Acid Base Accounting
AECO	Aquatic Environmental Control Officer
CoP	Code of Practice
DAFF	Department of Agriculture Forestry and Fisheries
DMR	Department of Mineral Resources
DRDLR	Department of Rural Development and Land Reform
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act 73 of 1989 as amended

EIA	Environmental Impact Assessment
EIA/EMP	Environmental Impact Assessment Report/Environmental Management Programme
EIA	Ecological Importance and Sensitivity
ESR	Environmental scoping report
GA	General authorisation
GGP	Gross Geographic Product
GQM	Groundwater Quality Management
GTLM	Greater Tubatse Local Municipality
I&APs	Interested and affected parties
IWWMP	Integrated water and waste management plan
IWUL	Integrated Water Use License
IWULA	Integrated Water Use License Application
LEDET	Limpopo Department of Economic Development, Environment and Tourism
MPRDA	Mineral and Petroleum Resources Development Act No 28 of 2002 (as amended)
MPRDR	Mineral and Petroleum Resources Development Regulations, GN 527 of 2004 (as amended) i.t.o. the Mineral and Petroleum Resources Development Act No 28 of 2002 (as amended)
MRD	Mine residue deposit
MWP	Mining works programme
NDEA	National Department of Environmental Affairs
NEMA	National Environmental Management Act No 107 of 1998 (as amended)
NEMBA	National Environmental Management Biodiversity Act No 10 of 2004 (as amended)
NEMWA	National Environmental Management Waste Act 59 of 2009 (as amended)
NFA	National Forest Act No 84 of 1998
NHRA	National Heritage Resources Act No 25 of 1999
NPR	Neutralising Potential Ratio
NWA	National Water Act no 36 of 1998 (as amended)
PCD	Pollution Control Dam
PES	Present Ecological Score
PTO	Permission to Occupy
RoD	Record of decision
SAHRA	South African Heritage Resources Agency
SDM	Sekhukhune District Municipality
TSF	Tailings Storage Facility
TDS	Total dissolved solids
TWQR	Target Water Quality Results
WL	Waste License
WML	Waste Management License
WRD	Waste rock dump

Executive summary

Applicant

BECS Environmental has been appointed by Imerys Refractory Minerals South Africa (Pty) Ltd to apply for an environmental authorisation in terms of the National Environmental Management Act no 107 of 1998 (as amended) (NEMA), and the National Environmental Waste Management Act no 59 of 2008 (as amended) (NEMWA) for a Waste Management License for the extension of quarry 3 with tailings as part of increasing tailings facility storage capacity and rehabilitation. The Department of Mineral Resources and Energy (DMRE) gave confirmation of receipt of the application for environmental authorisation on the 11th of August 2021. The application has been assigned the following reference number LP 73 MR.

Project description

The proposed activities are as follows:

- The extension of quarry 3 with tailings as part of increasing tailings facility storage capacity and rehabilitation on the farm Annesley 109 KT and the farm Holfontein 126 KT.

Legal requirements

According to Section 24(2) and 24(5) of the NEMA:

'The Minister, or an MEC with the concurrence of the Minister, may identify (a) activities which may not commence without EA from the competent authority; (b) geographical areas based on environmental attributes, and as specified in spatial development tools adopted in the prescribed manner by the Minister or MEC, with the concurrence of the Minister, in which specified activities may not commence without EA from the competent authority.

The Minister, or an MEC with the concurrence of the Minister, may make regulations consistent with subsection (4) laying down the procedure to be followed in applying for, the issuing of and monitoring compliance with EAs.'

Document layout

The layout of this scoping report is based on the requirements under Appendix 2 of the NEMA EIA Regulations. Table 1 below indicates where the information has been provided/will be provided.

Table 1: Layout of document

EIA Regulations section	Description	Section in report
Appendix 2(a)	Details of - (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section 1.2 & Addendum 2A & 2B

EIA Regulations section	Description	Section in report
Appendix 2(b)	The location of the activity, including - (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 1.3
Appendix 2(c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is - (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 1.4
Appendix 2(d)	A description of the scope of the proposed activity, including - (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken, including associated structures and infrastructure;	Section 2.1 & 2.2
Appendix 2(e)	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;	Section 3
Appendix 2(f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 4
Appendix 2(h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including - (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts - (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 5

EIA Regulations section	Description	Section in report
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
Appendix 2 (i)	A plan of study for undertaking the environmental impact assessment process to be undertaken, including - (i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity; (ii) a description of the aspects to be assessed as part of the environmental impact assessment process; (iii) aspects to be assessed by specialists; (iv) a description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists; (v) a description of the proposed method of assessing duration and significance; (vi) an indication of the stages at which the competent authority will be consulted; (vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and (viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process; (ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	Section 6
Appendix 2 (j)	an undertaking under oath or affirmation by the EAP in relation to - (i) the correctness of the information provided in the report;	Section 7, page 142

EIA Regulations section	Description	Section in report
	(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and (iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	
Appendix 2 (k)	An undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment.	Section 7, page 142
Appendix 2 (l)	Where applicable, any specific information required by the competent authority; and	Section 7
Appendix 2 (m)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.	Section 7

SECTION 1: INTRODUCTION

1.1 Applicant details

Refer to Table 2 below for a description of the applicant.

Table 2: Description of the applicant

Project applicant	Imerys Refractory Minerals South Africa (Pty) Ltd
Trading name	Annesley Andalusite Mine
Contact person	Hendrik Jones
Designation	Operational Director
Telephone number	+27 82 467 4532
E-mail address	hendrik.jones@imerys.com

1.2 Details of the Environmental Assessment Practitioner

BECS Environmental was appointed as an independent consultant (EAP) to meet the requirements as set out in regulation 13 of the EIA Regulations. Refer to Table 3 below for a description of the EAP and refer to Addendum 2 for a detailed CV of the EAP, which includes the expertise including qualifications and experience.

Table 3: Description of the EAP

Name of company	BECS Environmental
Postal address	PO Box 72960, Lynnwood Ridge, 0040
Telephone number	012 361 9970
Cell phone number	072 191 6074
Facsimile number	012 361 0645
E-mail address	salome@becsenv.co.za
Name of responsible EAP (reviewer)	Salome Beeslaar
Expertise of EAP	B.Sc Environmental Science (UP[1]), B.Sc Honours Geography (UP), M.Sc Geography (UP), Registered EAP with EAPASA[2] number 2020/846, Professional Scientist (Environmental Science) with SACNASP[3] number 400385/14, member of the IAIAsa[4] with membership number: 5853
Name of responsible EAP (report compiler)	Christopher Delport
Expertise of EAP	B. Sc Environmental Science (UP), B. Sc Honours Geography & Environmental Science (UP) member of the IAIAsa[5] with membership number: 6643

[1] University of Pretoria
[2] Environmental Assessment Practitioners Association of South Africa
[3] South African Council for Natural Scientific Professions
[4] International Association for Impact Assessment South Africa
[5] International Association for Impact Assessment South Africa

I, Christopher Delport (9507265046081), hereby declare that I have no conflict of interest related to the work of this report. Specially, I declare that I have no business, personal, or financial interests in the property and/or environmental authorisation being assessed in this report and that I have no personal or financial connections to the relevant property owners or farm. I declare that the opinions expressed in this report are my own and a true reflection of my professional expertise and that there are no circumstances that may compromise my objectivity in performing such work.

_____

Christopher Delport
BSc Hons– Geography and Environmental Science
November 2021

1.3 Description of the property

Refer to Table 4 below for a description of the property. A locality map of the farm is provided below in Figure 1.

Table 4: Farm names, 21-Digit Surveyor General codes, and coordinates

	Annesley 109 KT	**Holfontein 126 KT**
Title deed number	T8670/1948	T8670/1948
Property owner	National Government of the RSA	National Government of the RSA
21-digit Surveyor General Code and extent for each farm portion	T00KT00000000010900000 2603.0193ha	T00KT00000000012600000 1839.5395ha
Coordinates	S24.4385, E30.2583 S24.3685, E30.2016 S24.3580, E30.2226 S24.3784, E30.2635	S24.4121, E30.2608 S24.3784, E30.2635 S24.4253, E30.3154 S24.4480, E30.3037

1.4 Locality map

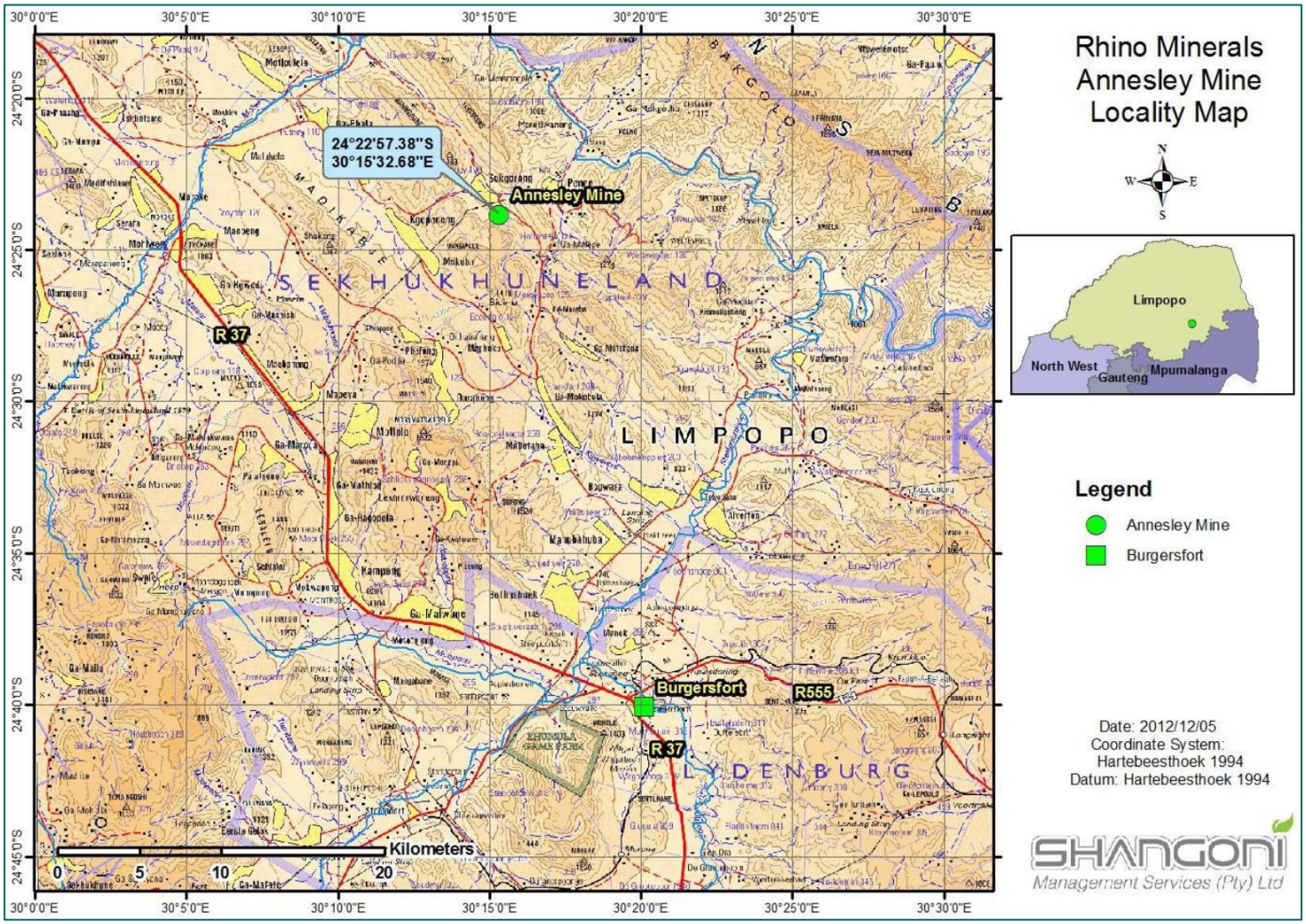


Figure 1: Locality map of Annesley Mine (Shangoni Management Services, 2012)

SECTION 2: DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

2.1 Listed and specified activities

Refer to Table 5 below for all listed activities applied for under NEMWA, tiggering a scoping and EIA process for a Waste Management License.

Table 5: All listed activities

Name of Activity	Listed Activity	Applicable Listing Notice
The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	Activity 11 Category B	GNR 633

2.2 Description of the activities to be undertaken

The mine is currently operating under mining right 73 MRC. As this is an already existing mine, no additional infrastructure requirements will be necessary. Quarry 3 is an existing open pit located on the mine. The proposed development includes the extension of quarry 3 under the above-mentioned mining right with tailings as part of increasing tailings facility storage capacity and rehabilitation on the farm Annesley 109 KT and the farm Holfontein 126 KT.

SECTION 3: POLICY AND LEGISLATIVE CONTEXT

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Authorisation applications			
MPRDA	According to the MPRDA, Annesley Andalusite Mine must have a mining right as well as an approved EMP. Due to changes from the Minerals Act no 50 of 1991 (MA) to the MPRDA in 2002, all mining rights had to be converted in 2009 from the old MA to the new MPRDA. Any mining right application submitted after 8 December 2014 must be done in terms of NEMA and not MPRDA.	N/A	The mine has an approved mining right. This mining right has also been converted to the new MPRDA requirements. The mining right was applied for and approved prior to 8 December 2014, therefore the requirements pertaining to a new mining right is not applicable.
	Any changes in the mining right, EMP, mining works programme (MWP), or EA, must be authorised through a Section 102 (in terms of the MPRDA) amendment.	N/A	The mine applied for a section 102 amendment (i.t.o. MPRDA) in 2006, to include the Segorong Project (extension) into the mining right. The amendment was approved in 2011.
NEMA and the Environmental Conservation Act 73 of 1989 as amended (ECA)	The first listed activities which required an EA (referred to as a record of decision (RoD) in the past) commenced in 1998. These activities were published in the EIA Regulations of 1998 (GN1183). In 2006, the ECA activities and EIA Regulations were replaced by the first NEMA EIA Regulations. The second set of NEMA EIA activities replaced the first set of NEMA EIA activities in 2010. The third set of NEMA EIA activities commenced on 8 December	Section 2.1	A person who wishes to commence, undertake or conduct a waste management activity listed under Category B, must conduct a scoping and environmental impact reporting process set out in the Environmental Impact Assessment Regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	2014. According to these listings, a Basic Assessment should be conducted if an activity on listing notice 1 or 3 is triggered. If an activity on listing notice 2 is triggered, then a full Environmental Impact Assessment (EIA) is required.		
NEMAQA	A list of activities which need an AEL was published in 2010 (GN 248 of 2010 i.t.o. the NEMAQA. This list was updated in 2013 (GN 893 of 2013 i.t.o. NEMAQA). These lists further included compliance timeframes for plant emission standards, whereby new plant had to comply to new plants emission standards on 1 March 2010; existing plants had to comply with existing plant standards on 1 March 2015, and existing plants have to comply with new plants standards on 1 March 2020.	N/A	There is a dryer at the Annesley Operation for which the mine has an AEL.
National Water Act No 36 of 1998, (NWA)	Section 21 of the NWA sets out the water uses for which a IWUL is required. These water uses commenced in 1 October 1998, and include permissible water uses (water uses for which no licencing or registration is necessary), general authorisations (GA) (water uses for which registration only is required), and water use licences (water used for which both registration and licencing is required). An existing lawful water use is any	N/A	The mine has an IWUL for section 21 a,c & i and g water uses.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	water use that commenced 2 years or more prior to the NWA and authorised under the old Act. These water uses are deemed lawful. In 1999, the GN 704 Regulations i.t.o. NWA were published.		
NEMWA GNR 633 Category B(11)	Waste management permits for certain waste activities were required form 1989 i.t.o. the ECA. These permits were repealed by the publishing of the first listed waste management activities licensing in 2009 (GN 718 of 2009 i.t.o. NEMWA). These listings were replaced by new listings in 2013 (GN 921 of 2013 i.t.o. NEMWA). If a site has a permit under ECA, this is still applicable until the National Department of Environmental Affairs (NDEA) requests an update under the new legislation (NEMWA).	This ESR.	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
National Heritage Resources Act no 25 of 1999 (NHRA)	All required permits as per the Act.	N/A	In the event of any heritage resource discovered, a qualified specialist will be appointed.
Section 15(1) of the National Forest Act No 84 of 1998 (NFA)	No person may cut, disturb, damage or destroy any protected tree; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except under a licence granted by the Minister.	N/A	This is not applicable as no additional vegetation will be removed.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Mining			
Mining plans and surveying: GN 447 of 2011 i.t.o. the Mine Health and Safety Act No 29 of 1996 (as amended) (MHSA)	A competent person must survey the mine. No mining operations may be carried out within a horizontal distance of 100m from reserve land, buildings, roads, railways, dams, waste dumps, or any other structure whatsoever including such structures beyond the mining boundaries, or any surface, which it may be necessary to protect in order to prevent any significant risk, unless a lesser distance has been determined safe by risk assessment and all restrictions and conditions determined in terms of the risk assessment are complied with.	N/A N/A	A competent surveyor conducts the mine surveying. The mine must compile risk assessment to assess whether any mining operations are carried out within a horizontal distance of 100m from the mentioned infrastructure.
Mine residue			
Mine residue management: Regulation 73 of the MPRDR (GN 349 of 2011 i.t.o. MPRDA), GN 632 of 2015 i.t.o. NEMWA.	The assessment of impacts relating to the management of residue deposits must form part of the EMP.	N/A	The impacts of the mine residue are contained within the mine's EIA/EMP. All impacts related to the sloping of the mine residue on Annesley Andalusite Mine (Havercroft Operation) are included in this ESR.
Mine residue management - Assessment of impacts and analyses of risks	A risk analysis based on the characteristics and the classification must be used to determine the appropriate mitigation and management measures.	N/A	Although a Waste Assessment Report was conducted for the mine residue in Annesley Operation, this does not include a risk

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Regulations 3 & 9(1)(a&g) & 12 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA, regulation 8 of GN 634 of 2013 (Waste Classification and Management Regulations) under NEMWA, GN 632 of 2015 has replaced regulation 73 of GN 527 of 2004 under MPRDA. Refer to transitional period			assessment with appropriate mitigation and management measures.
	The decommissioning, closure and post-closure management of mine residue must be done in accordance with the relevant provisions in the environmental authorisation, an EMP; and any other relevant legislation.	N/A	The decommissioning, closure and post-closure management of mine residue forms part of the EIA/EMP.
	The pollution control barrier system shall be defined by the: GN 635 of 2013 under NEMWA (National Norms and Standards for the Assessment of Waste for Landfill Disposal); and GN 636 of 2013 (National Norms and Standards for Disposal of Waste to Landfill).	N/A	This ESR is for sloping of already existing mine residue and not for new mine residue.
Mine residue management: Regulation 4 of GN 632 of 2015 under NEMWA (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	Mine residue must be characterised to identify any potentially significant health or safety hazard and environmental impact that may be associated with the residue when deposited.	N/A	A registered engineer is appointed as the competent person on dams and residue.
	Mine residue must be characterised in terms of its: • physical characteristics; • chemical characteristics; and mineral content that may include the specific gravity of the residue particles and its impact on particle segregation and consolidation.	N/A	The waste assessment has been done by Aquatico and includes these requirements.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	Mine residue must be classified in accordance with SANS 10234 within 180 days of generation.	N/A	Although a Waste Assessment Report was compiled, it does not include the GHS classification.
Mine residue management - Characterisation Regulation 5 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	A risk analysis must be conducted and documented on all mine residue.	N/A	The waste assessment has been done by Aquatico and includes these requirements.
	The classification of residue stockpile and residue deposit must be undertaken on the basis of the: • characteristics of the residue; • location and dimensions of the deposit (height, surface area); • importance and vulnerability of the environmental components that are at risk; • spatial extent, duration and intensity of potential impacts; and pollution control barrier system compliant with the commensurate norms and standards for disposal of waste to landfill.	Section 5	The Annessley Quarry 3 Optimisation Report compiled by Tailings Solutions covers importance and vulnerability of the environmental components that are at risk.
Mine residue management - Investigation and site selection Regulation 6 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	The process of investigation and selection of a site mine residue must entail: • the identification of a sufficient number of possible candidate sites. • qualitative evaluation and ranking of all alternative sites;	N/A	This was not done for any of the sites, however, no new mine residue will be established.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context

	Qualitative investigation of the top-ranking sites to review the ranking done in terms of paragraph(b);
	• a feasibility study on the highest-ranking site or sites, involving:
	  ○ a preliminary health and safety classification;
	  ○ an environmental classification;
	  ○ geotechnical investigations; and
	  ○ hydrological investigations.
	Further investigation on the preferred site, must be conducted by competent person		

Mine residue management: Regulations 7 & 9(1)(b) of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	The design of the residue stockpile and deposit shall be undertaken by a competent person. The process of investigation and selection of a site for residue stockpiling and residue deposits must entail several factors as per the legislation. This will include geotechnical investigations and groundwater investigations. From these investigations, a preferred site must be identified. Further investigation on the preferred site is also necessary. This must be carried out by a competent person. A competent person must be qualified by virtue of his or her knowledge, expertise, qualifications, skills and experience; and is familiar with the provisions	N/A	No designs according to this legislation were undertaken. This cannot be done anymore but must form part of any new mine residue planning.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	of the Act and other related legislation and has been trained to recognize any potential or actual problem in the performance of the work.		
Mine residue management - Impact Management Regulation 8 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	Conduct statistical defensible and representative characterisation programme of relevant materials	N/A	Although a Waste Assessment Report was compiled, it does not include a statistical defensible and representative characterisation programme of relevant materials.
	Conduct an impact prediction study to assess the potential impacts of such actions or activities on the water resource over the full life cycle of the mining operations and until the impact from the operation is acceptable, which includes a monitoring programme and an evaluation of the effect of the mitigatory measures to demonstrate acceptable levels of impact.	N/A	Although a Waste Assessment Report was compiled, it does not include an impact prediction study to assess the potential impacts of such actions or activities on the water resource over the full life cycle of the mining operations and until the impact from the operation is acceptable, which includes a monitoring programme and an evaluation of the effect of the mitigatory measures to demonstrate acceptable levels of impact.
Mine residue management - Impact Management Regulations 9(1)(d-f)&(2) & 11 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	Preventative or remedial action must be taken in respect of any sign of pollution.	N/A	The mine has an environmental emergency procedure.
	Adequate measures must be implemented to control dust pollution and erosion of the slopes at all residues.	Section 5	This will form part of the mine's management measures.
	Dust and mine residue must be managed in accordance with the requirements on dust control as		This will form part of the mine's management measures.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	regulated by Mine Health and Safety Act and in terms of the NEMAQA.		
	A system of routine maintenance and repair in respect of all residues must be implemented to ensure the control of pollution and the integrity of rehabilitation.		This will form part of the mine's management measures.
Mine residue management - Monitoring and reporting system Regulation 9(1)(c) & 10 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Mine Residue) under NEMWA	A monitoring system for a mining residue with respect to potentially significant impacts as identified in the EIA must be included	N/A	This forms part of the EMP of the mine.
Rehabilitation and closure			
Section 24R of NEMA, Appendix 5 of the EIA Regulations, sections 43, 56, 61 of MPRDA	A closure plan must be submitted 5 years before closure to DMR and NDEA. An EMP and rehabilitation plan must be submitted 5 years before commencing with closure to DWS. Closure objectives form part of the draft EMP and must identify the key objectives for mine closure to guide the project design, development and management of environmental impacts; provide broad future land use objective(s) for the site and provide proposed closure costs. Imerys must ensure that details of	This entire ESR	The LoM for Annesley is more than 15 years.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	rehabilitation of the residue deposit are provided in the EMP.		
Financial provision			
Section 24P of the NEMA, Regulations pertaining to financial provisioning for prospecting, exploration, mining, or production operations (GN 1147 of 2015 i.t.o. NEMA	The EMP must address the requirements as determined in the regulations, pertaining to the financial provision for the rehabilitation. The mine must annually update and review the quantum of the financial provision in consultation with a competent person, as required in terms of the approved EMP, or as requested by the Minister.	N/A	The financial provision is updated annually.
Non-mining waste management			
Waste classification and disposal Regulation 5 of GN 634 of 2013 (Waste Classification and Management Regulations) under NEMWA	Safety data sheets • Generators of hazardous waste must ensure that an MSDS for the hazardous waste is prepared in accordance with SANS 10234. • If possible, use MSDS of product or products it originates from. No MSDS necessary for Health Care Risk Waste.	N/A	This will form part of the mine's management measures.
Waste classification and disposal Regulation 15(d) of GN 1179 of 1995 (Hazardous Chemical Substances Regulations) under OHSA	A waste generator shall, as far as is reasonably practicable ensure that all HCS waste which can cause exposure, is disposed of only on sites specifically designated for this purpose in terms of the ECA (or NEMA), in such a manner that it does		

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	not cause a hazard inside or outside the site concerned.		
	No person may collect waste for removal from premises unless such person is authorised by law to collect that waste, where authorisation is required.		
Waste classification and disposal Regulation 10 of GN 634 of 2013 (Waste Classification and Management Regulations) under NEMWA	Waste generators must keep accurate and up to date records of the management of the waste they generate, which records must reflect: • the classification of the wastes; • the quantity of each waste generated, expressed in tons or m^3 per month; • the quantities of each waste that has either been re-used, recycled, recovered, treated or disposed of; and • by whom the waste was managed. The records must be retained for a period of at least five (5) years, and made available to the Department upon request.		
Waste classification and disposal Regulation 11 of GN 634 of 2013 (Waste Classification and Management Regulations) under NEMWA	Every holder of waste that has been classified as hazardous must be in possession of a waste manifest document containing the relevant information.		

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	Generators of waste classified as hazardous must complete a waste manifest document for each consignment of waste transported to a waste manager or waste transporter. All waste generators of hazardous waste must: retain copies, or be able to access copies/records, of the waste manifest documentation for a period of at least five (5) years; and make the waste manifest documentation available to the Department upon request.		
Waste handling, and storage: GN 527 of 2004 i.t.o. MPRDA, GN 1179 i.t.o. OHSA, sections 7 & 24 of NEMWA, and GN 634 of 2013 i.t.o. NEMWA	Employees collecting, transporting, and disposal of hazardous waste must wear suitable Personal Protective Equipment (PPE). A waste disposal contractor must wear suitable PPE. All collectable hazardous waste must be placed into containers that will prevent the likelihood of exposure during handling. Waste containers must be intact and not corroded or in any other way rendered unfit for the safe storage of waste. Adequate measures must be taken to prevent accidental spillage or leaking. Waste must be contained in such a way that it cannot be blown away. Avoid nuisances such as odor, visual impacts, and breeding of vectors. Prevent pollution of the environment and harm to	N/A	This will form part of the mine's management measures.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	health. Any container or storage impoundment holding waste must be labeled, or where labeling is not possible, records must be kept. A new waste storage facility must be registered with the competent authority within 90 days prior to the construction taking place. The assessment of impacts relating to the disposal of waste material must form part of the EMP.		
Waste handling, and storage: Regulation 15(f) of GN 1179 (Hazardous Chemical Substances Regulations) under OHSA, Regulation 13 of GN 926 of 2013 (National norms and standards for the storage of waste) under NEMWA	A waste generator shall, as far as is reasonably practicable ensure that if the services of a waste disposal contractor are used, a provision is incorporated into the contract stating that the contractor shall also comply with the provisions of these regulations.	N/A	This is not in the contracts.
Waste handling, and storage Regulation 6 of GN 634 of 2013 (Waste Classification and Management Regulations) under NEMWA & Regulation 10 of GN 926 of 2013 (National norms and standards for the storage of waste) under NEMWA	Any container or storage impoundment holding waste must be labeled, or where labeling is not possible, records must be kept.	N/A	This will form part of the mine's management measures.
	Hazardous waste must be stored in covered containers and only open when waste is added or emptied.		N/A

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Waste re-use, recycle, recover: GN 527 of 2004 i.t.o. MPRDA, sections 7 & 24 of NEMWA, and GN 634 of 2013 i.t.o. NEMWA	Waste must be re-used, recycled, recovered, treated and/or disposed of within 18 months of generation. Recycle hazardous waste as far as is reasonably practicable. Any person who undertakes an activity involving the reduction, re-use, recycling or recovery of waste must, before undertaking that activity, ensure that the reduction, re-use, recycling or recovery of the waste use less natural resources than disposal of such waste and to the extent that it is possible, is less harmful to the environment than the disposal of such waste.	N/A	Waste is removed from the site via a waste contractor. No recycling takes place on the mine.
Unlawful disposal and littering: Sections 26 & 27 of NEMWA	No disposal of waste in or on any land, waterbody or at any facility. No disposal of waste in a manner that is likely to cause pollution of the environment or harm to health and well-being. No littering of any public place, land, vacant erf, stream, watercourse, street or road, or on any place to which the general public has access. Unless the disposal of that waste is authorised by law	N/A	This will form part of the mine's management measures.
Waste tyres: Regulations in terms of storage of tyres (GN 149 of 2009 i.t.o NEMWA)	All requirements	N/A	The mine does not store tyres.
Asbestos management and disposal:	Ensure that all asbestos waste is placed in containers that will prevent the likelihood of	N/A	The mine does not have asbestos waste.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
GN 341 of 2008 i.t.o. ECA, and regulation 20 of GN 155 of 2001 i.t.o OHSAS	exposure during handling. All vehicles, re-usable containers or any other similar articles which have been in contact with asbestos waste must be cleaned and decontaminated after use. All asbestos waste which can cause exposure must be disposed of only on sites specifically designated for this purpose. All persons occupied in the collection, transport, and disposing of waste in a manner which may detrimentally impact on a water resource, disposal of asbestos waste, must wear PPE, including contractors.		
Water management			
Water management and pollution control: GN 527 of 2004 i.t.o. MPRDA	An assessment of impacts relating to water management and pollution control at mining operations must form part of the EMP.	N/A	The impacts of water pollution are contained within the mine's EIA/EMP.
Water management and pollution control: GN 704 Regulations of 1999 i.t.o. NWA	No TDF shall be established on the bank of any stream, river, dam, pan, wetland or lake without written permission and upon such conditions as determined and as approved in the EMP. Toilet facilities shall be located in such a manner that no water or other pollution is caused. GN 704 Regulations of 1999 i.t.o. NWA place: restrictions on locality; restrictions on the use of material; capacity requirements of clean and dirty water systems;		

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	protection of water resources; and security and additional measures.		
Water management and pollution control Regulation 9 of GN 632 of 2015 (Regulations regarding the planning and management of residue stockpiles and residue deposits) under NEMWA, Regulation 68 of GN 527 of 2004 (Mineral and Petroleum Resources Development Regulations) under MPRDA	A mine must ensure that preventative or remedial action is taken in respect of any sign of pollution.	Section 5	The mine has an environmental emergency procedure.
Dams with safety risks Sections 117-123 of NWA	All residue stockpiles and deposits must be classified into one or a combination of the following categories: (1) the safety classification to differentiate between residue stockpiles and deposits of high, medium and low hazard based on their potential to cause harm to life or property; and (2) the environmental classification to differentiate between residue stockpiles and deposits. A mine must within the period specified, provide the Minister with any information, drawings, specifications, design assumptions, calculations,	N/A	The mine does not have an environmental classification for the mine residue.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	documents and test results requested by the Minister, pertaining to dams with a safety risk.		
Hazardous chemical substances management			
Use, storage, and handling: Regulation 14 of GN1179 of 1995 under OHSAS, GN 1381 of 1994, GN 247 of 1993, and GN 690 of 1989 under the Hazardous Substances Act No 15 of 1973 (as amended) (HSA)	A Hazardous chemical substance (HCS) in storage or distributed must be properly identified, classified and handled in accordance with SABS 072 and SABS 0228. A container or a vehicle in which an HCS is transported must be clearly identified, classified and packed in accordance with SABS 0228 and SABS 0229. Any container into which an HCS is decanted must be clearly labeled with regard to the contents thereof. Hazardous substances must also be classified according to the Hazardous Substances Regulations (GN 453 of 1977) i.t.o the Hazardous Substances Act No 15 of 1973.	N/A	This will form part of the mine's management measures.
Transportation: Section 54 of National Road Traffic Act No 93 0f 1996 (NRTA), regulation 277 of GN 255 of 2000 under NRTA	No person shall except as prescribed, accept after transportation, any prescribed dangerous goods. The NRTA and regulations place strict obligations on the "consignee", "consignor, "driver" and "operator" during transportation. Imerys is in the position of the "consignee" due to the off-loading.	N/A	Due to the number of requirements as set out in these regulations, it is unclear whether this is in place.
Polychlorinated biphenyl (PCB): GN 549 of 2014 I.t.o. NEMA	PCBs must be phased out.	N/A	There is no phasing-out plan yet in place.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Radioactive sources: Section 3A of the HAS, GN 246 & 247 of 1993 i.t.o HSA	The possession and use of Group IV hazardous substances require a written authority in terms of the HSA.	N/A	There are no such sources on the mine.
Air quality management			
Ambient air quality management Regulation 64 of GN 527 of 2004 (Mineral and Petroleum Resources Development Regulations) under MPRDA, GN 1210 of 2009 (National Ambient Air Quality Standards) & GN 486 of 2012 (National Ambient Air Quality Standard for PM Less than 2.5 Micron Metres) under NEMAQA	Limits and compliance for SO2, NO2, PM10, O3, C6H6, Pb, CO, PM2.5	N/A	This will form part of the mine's management measures.
Ambient air quality management GN 351 of 2014 (Regulations Regarding the Phasing-out and Management of Ozone- Depleting Substances) under NEMAQA	Hydrochlorofluorocarbons are phased-out.	N/A	Annesley is not yet phasing out old air conditioners.
Dust control Regulations 9(f) & 11 of GN 632 of 2015 (Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits) under NEMWA	A mine must ensure that adequate measures are implemented to control dust pollution and erosion of the slopes at all residues.	N/A	This will form part of the mine's management measures.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Atmospheric impact report and air dispersion modeling GN 747 of 2013 (Regulations Prescribing the Format of the Atmospheric Impact Report) & GN 533 of 2014 (Regulations Regarding Air Dispersion Modelling) under NEMAQA	Atmospheric impact report and air dispersion modeling only if required from officer or if applying for AEL	N/A	The mine has an atmospheric impact report and air dispersion modeling in place.
Environmental noise control and management: Regulation 66 of GN 572 of 2004 i.t.o. MPRDA, section 34 of NEMAQA, Sections 25 & 26 of ECA, and GN 154 of 1992 i.t.o. ECA	The mine must comply with the provisions of the MHSA. The assessment of impacts relating to noise pollution management and control, where appropriate, must form part of the EMP No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, animal, machine, device or apparatus or any combination thereof. No person shall drive a vehicle on a public road in such a manner that it may cause a noise nuisance.	N/A	This will form part of the mine's management measures.
Noxious or offensive gases: Section 35 of NEMAQA, GN 1651 of 1974 i.t.o. APPA	No vehicle may be driven on a public road if the noxious gases emitted have a density or content as to produce a mean reading of 70 or more.	N/A	This is very old legislation, there is no new such legislation – technology also old.
Blasting, vibration and shock management, and control:	The mine must comply with the provisions of the MHSA. An assessment of impacts relating to blasting, vibration and shock management and	N/A	No blasting takes place.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Regulation 67 of GN 572 of 2004 i.t.o. MPRDA	control, where applicable, must form part of the EMP.		
Biodiversity management			
Alien and invasive species GN598 of 2014 (Alien and Invasive Species Regulations) & GN864 of 2016 (Alien and Invasive Species Lists) under NEMBA	Category 1a Listed Invasive Species must be combatted or eradicated. Category 1b Listed Invasive Species must be controlled. Category 2 Listed Invasive Species require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit. Category 3 Listed Invasive Species are subject to exemption.	N/A	The mine has an invasive alien species programme.
Fire breaks and firefighting: Sections 12, 13, 17, 18 & 34 of National Veld and Forest Fire Act No 101 of 1998 (NVFFA)	Every owner on whose land a veldfire may start or burn or from whose land it may spread, must prepare and maintain a firebreak on his/her side of the boundary between his/her land and any adjoining land. Every owner must have the appropriate equipment and measures in place to be ready to be able to combat veld fires and must be in a position to report the occurrence of fires and to take such measures as may be necessary to combat such fires.	N/A	All vehicles and equipment at the mine are regularly inspected and maintained. The emergency plan includes the prevention and control of veld fires.
Acquisition, disposal, sale or use of fertilizers, farm feeds, agricultural remedies and stock remedies:	Prohibition of certain fertilizers.	N/A	This will form part of the mine's management measures.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Section 7*bis* of Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act No 36 of 1947 (FFFARSRA)			
Soil management			
Contaminated land: GN 527 of 2004 i.t.o. MPRDA, and sections 35-41 of NEMWA	The assessment of impacts relating to soil pollution and erosion control must form part of both the EMP. The acidification, salination and mineralisation of soils through seepage of polluted water must take place as approved in the EMP. The spillage of hazardous chemicals onto soils or its escape or migration into surrounding soils from the approved deposition area must be prevented. Oils, grease, and hydraulic fluids must be disposed of. Oils, grease, and hydraulic fluid spills must be cleaned up by removing all contaminated soil and disposing such soil in a waste disposal receptacle or at a licensed facility. The chemical and physical properties of topsoil to be used for the purposes of rehabilitation must not be changed by introducing foreign material, gravel, rock, rubble or mine residue to such soil. An owner of land that is significantly contaminated, or a person who undertakes an activity that caused the land to be significantly	N/A	This will form part of the mine's management measures.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	contaminated, must notify the department of that contamination as soon as that person becomes aware, of that contamination		
Heritage resources management			
Section 52 of MPRDA, and Sections 34 & 35 of National Heritage Resources Act No 25 of 1999 (NHRA)	An EMP must include impacts on heritage aspects. No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority. Any person who discovers archaeological or palaeontological objects or material or a meteorite must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.	N/A	This will form part of the mine's management measures.
Emergency incidents			
Section 30 of NEMA, section 20 of NWA S20, and Section 18 of NVFFA	In the event of an emergency, the mine must: report through the most effective means reasonably available; take all reasonable measures to contain and minimise the effects of the incident, including its effects on the environment and any risks posed by the incident to the health, safety and property of persons; undertake clean-up procedures; remedy the effects of the incident; and assess the	N/A	The mine has a new environmental emergency procedure. This procedure will be implemented, and this will be audited as part of the legal compliance audit.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	immediate and long-term effects of the incident on the environment and public health. Any owner who has reason to believe that a fire on his or her land or the land of an adjoining owner may endanger life, property or the environment, must immediately notify the fire protection officer or, any member of the executive committee of the fire protection association, if one exists for the area; and the owners of adjoining land; and do everything in his or her power to stop the spread of the fire.		
Sustainable development			
Sustainable development principles: Section 2(3 & 4), of NEMA, section 2, 2(a)(ii), 22(2)(d) of NWA, GN 527 of 2004 i.t.o. MPRDA, section 37 of MPRDA, section 2(a)(ii) of Section 2(3 & 4) of NEMA, section 2 of NWA, section of, and section of NWA	Any mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of mining in order to ensure that exploitation of mineral resources serves present and future generations. The mine shall investigate new and emerging technologies and put into practice water efficient devices or applied technique for the re-use of water containing waste. The Closure Plan must include agreed standard or	N/A	The mine has recently updated their environmental procedures. The mine also has a Social and Labour Plan (SLP) in place. The LoM is more than 15 years, however, the mine is in the process of compiling a closure plan as part of the new NEMA requirements. This plan will include end land use.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	land use which conforms with the concept of sustainable development.		
International conventions/treaties	Convention on Biological Diversity, ratified by RSA on 2 November 1995: Conservation of biological diversity, the sustainable use of its components. UN Framework on Climate Change and Kyoto Protocol, ratified by RSA on 29 August 1997: The NDEA has published a report on 'A national climate change response strategy" in response to the Kyoto Protocol'. Greenhouse gas emissions and inventories will be specifically dealt with in the NEMAQA. Climate change is referred to explicitly in the White Paper on Integrated Pollution and Waste Management in 2000 and referenced in the White Paper on a National Water Policy for South Africa, 1997. It is also specifically addressed in the Government's imminent National Water Resource Strategy.' Greenhouse gases are only included under AEL requirements in the NEMAQA. Stockholm Convention on Persistent Organic Pollutants, ratified by RSA on 4 September 2002: Persistent organic pollutants (POPs) include	N/A	The mine must make a list of these chemicals if there are any on the mine. If there are no such chemicals on the mine, keep proof of this.

Applicable legislation and guidelines used to compile the report	Description of legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
	various insecticides as well as PCBs. South Africa published a report 'National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants' in 2012. According to this report, the duty of care covers the responsibility of Imerys to avoid the use, storage, generation, or uncontrolled disposal thereof. Vienna Convention on the Protection of the Ozone Layer, and the Montreal Protocol, ratified by RSA on 15 January 1990: The Montreal Protocol includes ozone depleting substances as well as a list of products containing these substances. On 18 September 2015, the NDEA published a notice (GN 703 of 2015), requesting all companies to submit information regarding the listed chemicals as per Annex A within 60 days from the publication. 17 November 2015.		

SECTION 4: NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

As per the Guideline on Needs and Desirability in terms of the EIA Regulations (published 20 October 2014), the following table has been compiled:

Table 6: Need and Desirability of the proposed project

Guideline requirement	Comments on requirement
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?	
1.1 How were the following ecological integrity considerations taken into account?	
1.1.1 Threatened Ecosystems,	Please note that this activity will occur on an already disturbed site. As such, no significant alterations to the fauna and flora is envisaged. The geohydrological study was, however, updated to include the activities in the application for the Quarry 3 extension and the mine has a storm water management plan in place which will implemented. A risk assessment methodology will be used to assess the the impact the development has on the region to ensure that the development does not cause significant alteration to the surrounding environment.
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,	
1.1.3 CBAs and Ecological Support Areas (ESAs),	
1.1.4 Conservation targets,	
1.1.5 Ecological drivers of the ecosystem,	
1.1.6 Environmental Management Framework,	
1.1.7 Spatial Development Framework, and	
1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	
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?	
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?	
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	No additional non-mining waste oter than that which is already generated by the mine. The mine has a waste procedure in place for non-mining waste.

Guideline requirement	Comments on requirement
recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	
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?	All proposed activities are on the already existing mining area. It is not envisaged that any cultural heritage resources will be disturbed.
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?	The backfilling of the quarries post-mining will aid in rehabilitation of the site and will not deplete any natural resources. The extension of quarry 3 will be constructed in such a way that the area is not affected by dirty water.
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?	
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 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)	

Guideline requirement	Comments on requirement
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?)	
1.7.3 Do the proposed location, type and scale of development promote a reduced dependency on resources?	
1.8 How were a risk-averse and cautious approach applied in terms of ecological impacts?	The extension of the quarry is planned to take place in an already disturbed area, thus limiting the disturbance to the surrounding ecology.
1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	
1.8.2 What is the level of risk associated with the limits of current knowledge?	It is unclear what the level of risk will be on the groundwater quality.
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?	All risks identified will be dealt with the suggested mitigation measures and a risk-averse cautious approach will be followed.
1.9 How will the ecological impacts resulting from this development impact on people's environmental right in terms following	Refer to impact assessment for a comprehensive analysis of all potential impacts. Impact identification and prediction includes a stepwise procedure to identify the direct, indirect and cumulative impacts (relating to both positive and negative impacts) for which a proposed activity and its alternatives will have on the environment as well as the community. This is undertaken by determining the sensitivity of sites and locations as well as the risk of impact of the proposed activity. Refer to Section 5.2 for a complete description of these environmental attributes. Sources of data to be used for gathering data on the environmental attributes as well as the impacts include; monitoring / sampling data collected and stored, assumptions and actual measurements, published data available
1.9.1 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?	
1.9.2 Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10 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.)?	

Guideline requirement	Comments on requirement
1.11 Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	from the departments or other stakeholders in the area as well as specialist studies. Likely impacts are described qualitatively and then studied separately in detail. This provides consistent and systematic basis for the comparison and application of judgements.
1.12 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?	There is no alternative to this project. The no-go option will ultimately have a more significant effect than the preferred alternative because it will hinder the economic benefits which could balance the environmental impacts if the development takes place.
1.13 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?	Refer to the cumulative impact assessment.
2.1 What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	Refer to Section 5.2.15 for the socio-economic context of the area.
2.1.1 The Integrated Development Plan (IDP) (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	
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.),	
2.1.3 Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	
2.1.4 Municipal Local Economic Development Strategy (LED Strategy).	
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?	There are no new employment opportunities that will be created from the activity.
2.2.1 Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	

Guideline requirement	Comments on requirement
2.3 How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
2.4 Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	
2.5 (Not applicable)	
2.6 How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	The activity is taking place over a small area on an already existing mine and is not expected to directly influence these parameters.
2.6.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	
2.6.2 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?	
2.6.3 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?	
2.7 How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	This project is not expected to affect these aspects.
2.7.1 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?	
2.7.2 Positive impacts. What measures were taken to enhance positive impacts?	
2.8 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.)?	Refer to impact assessment. There is no alternative to this project. The consultation process will involve communication with the community and all activities are planned taking environmental parameters into account.
2.9 What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	The mine generates tailings and overburden as part of its processing activities. This is an inevitable part of its mining. Backfilling of mined-out quarries has

Guideline requirement	Comments on requirement
2.10 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)? 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?	been an ongoing process on the mine, thereby reducing the footprint of an additional TDF as well as rehabilitation of mined-out quarries. Refer to the impact assessment in Section 5.3 which includes the environmental objective to be achieved, the phase applicable to management measure, management tools, management timeframe and schedule, monitoring programmes, responsibilities for implementation and long-term maintenance, financial provision for long-term maintenance and/or environmental costs and the mitigation hierarchy.
2.11 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?	
2.12 What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	
2.13 What measures were taken to:	
2.13.1 ensure the participation of all I&APs,	The process followed adheres to the National Environmental Management Act 107-1998 - National guideline on minimum information (20180209-GGN-41432-00086) and the 2012, IEM Guideline Series 7, Public participation, GN 807. Below is a summary of the announcement. Formal announcement of the project: The notices as mentioned below include all requirements as per the EIA Regulations. Advertisement: An advertisement was placed in 'Steelburger News' on the 19th of August 2021. Refer to Addendum 4B for a copy and proof of this advertisement. Site notice: Site notices were placed at the mine and in the nearby community on the 19th of August 2021. Refer to Addendum 4C for a copy and proof of the site
2.13.2 provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	
2.13.3 ensure participation by vulnerable and disadvantaged persons	
2.13.4 promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means	
2.13.5 ensure openness and transparency, and access to information in terms of the process	
2.13.6 ensure that the interests, needs and values of all I&APs were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and	
2.13.7 ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted	

Guideline requirement	Comments on requirement
2.14 Considering the interests, needs and values of all the I&APs, 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)?	notices as well as Addendum 4D for a map indicating locations of the site notices. Letters: Letters were sent to all stakeholders as well landowners to the site on the 19th of August 2021. Refer to Addendum 4E for a copy and proof of these letters sent. Public meeting: As a result of Covid-19, no public meeting will be held. This ESR is simultaneously sent to DMRE, the registered I&APs and stakeholders. Any issues raised will be included in the EIA/EMP before submission to DMRE. All registered I&APs are given the opportunity to comment on the ESR. This includes any issues that they have with the proposed activity and that they believe may be of significance in the consideration of the application.
2.15 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?	All contractors, sub-contractors and workers will attend compulsory environmental awareness training and inductions. This training will highlight the dangers associated with the workplace. Procedures relating to environmental risks will also be put in place and will be regularly updated.
2.16 Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1 the number of temporary versus permanent jobs that will be created,	No additional jobs will be created.
2.16.2 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),	
2.16.3 the distance from where labourers will have to travel,	
2.16.4 the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	
2.16.5 the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	

Guideline requirement	Comments on requirement
2.17 What measures were taken to ensure:	
2.17.1 that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and	A summary of various legislation is included in Section 3 of this report. All organs of state will receive this ESR as well as the EIA/EMP for review. Any comments from them will be incorporated into the final decision.
2.17.2 that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	
2.18 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?	
2.19 Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to impact assessment mitigation measures.
2.20 What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	There are provisions made to ensure that environmental pollution does not occur.
2.21 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?	There is no alternative to this project and the placement of the site was done considering all environmental attributes.
2.22 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?	Refer to the cumulative impact assessment.

4.1 Period for which the environmental authorisation is required

The extended area of quarry 3 will be in place until backfilled as part of closure of the mine.

SECTION 5: DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED SITE

5.1 Public participation

5.1.1 Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs

According to the Publication of Participation Guideline (NEMA), an I&AP is:
"(a) any person, group or persons or organisations interested in or affected by an activity, and (b) any organ of state that may have jurisdiction over any aspect of the activity".

This definition is more detailed in the Guideline for consultation with communities and I&APs (MPRDA):
"I&APs include, but are not limited to; (i) Host Communities, (ii) Landowners (Traditional and Title Deed owners), (iii) Traditional Authority, (iv) Land Claimants, (v) Lawful land occupier, (vi) The Department of Land Affairs, (vii) Any other person (including on adjacent and non-adjacent properties) whose socio-economic conditions may be directly affected by the proposed prospecting or mining operation (viii) The Local Municipality, (ix) The relevant Government Departments, agencies and institutions responsible for the various aspects of the environment and for infrastructure which may be affected by the proposed project."

5.1.1.1 Identification of interested and affected parties

Refer to Table 7 below for all I&APs and stakeholders identified. All of these I&APs and stakeholders were in fact consulted. Refer to Addendum 4E for a copy and proof of letters sent to all stakeholders and I&APs and Addendum 4F for proof of the draft ESR sent to I&APs and stakeholders. Refer to Addendum 4G for comments received. I&APs will be registered if they communicate in any form with regards to this process. Refer to Addendum 4H for the complete stakeholder database.

Table 7: I&APs and stakeholders identified

Interested and Affected Parties	Date comments received & Issues raised	EAPs response to issues as mandated by the applicant	Section reference in this ESR where issues and or response were incorporated
Affected parties			
Landowner/s			
According to the title deeds, the National Government of South Africa is the landowner, however, Roka Malepe Traditional Council is the traditional landowner.	None	N/A	N/A
Lawful occupier/s of the land			
The land is currently occupied by the mine.	None	N/A	N/A
Landowners or lawful occupiers on adjacent properties			
Roka Malepe Traditional Council - Manawe Malepe	None	N/A	N/A
Municipal councillor – ward 9, 15 and 16			
Cllr. OA Malakane (ward 9)	None	N/A	N/A
Cllr. A Kgaphola (ward 15)	None	N/A	N/A
Cllr. R Khoza (ward 16)	None	N/A	N/A
GTLM - Municipal manager			
Cllr R.S Mamekoa	None	N/A	N/A
SDM - Municipal manager			
Mr. Seporo Masemola	None	N/A	N/A
Organs of state			
DWS Mpumalanga – Lydenburg/Mashishing Office	None	N/A	N/A
DWS National	None	N/A	N/A
Communities			
Roka Malepe Traditional Council - Manawe Malepe	None	N/A	N/A
DALRRD Limpopo			
Mr Manamela	None	N/A	N/A
Traditional Leaders			
Roka Malepe Traditional Council - Manawe Malepe	None	N/A	N/A
Limpopo Department of Economic Development, Environment and Tourism			
Juliet Mukhari	None	N/A	N/A

Interested and Affected Parties	Date comments received & Issues raised	EAPs response to issues as mandated by the applicant	Section reference in this ESR where issues and or response were incorporated
Other Competent Authorities affected			
Limpopo Heritage Resources Agency (LHRA)	None	N/A	N/A
Limpopo Department of Agriculture and Rural Development (DARD)	None	N/A	N/A
Other affected parties			
Historical disadvantaged communities			
None identified	N/A	N/A	N/A
Land claimants			
	See below	See below	See below
Interested parties			
None identified	N/A	N/A	N/A

5.1.1.2 The details of the first phase (engagement process)

An advertisement is published in the local newspaper 'Steelburger News' on the 19th of August 2021. Refer to Addendum 4B for a copy and proof of this advertisement. Site notices were placed around the mine and in the nearby community where they were visible to people on the 19th of August 2021. Refer to Addendum 4C for a copy and proof of the site notice placement, as well as a map of the placement of the site notices.

As a result of the Covid-19 pandemic, no public meeting will be held. Letters were sent to all stakeholders on the 19th of August 2021. Refer to Addendum 4E for copy and proof of letters sent.

5.1.1.3 The details of the second phase (environmental scoping report)

This draft scoping report was sent to registered I&APs and stakeholders for comment on the 11th of October 2021. Refer to Addendum 4F for proof of this. The final ESR will be submitted to DMRE, Limpopo Department of Economic Development, Environment and Tourism (LEDET), Department of Water and Sanitation (DWS) and Department of Agriculture, Rural Development and Land Reform (DARDLR). All registered I&APs and stakeholders will also receive an electronic copy.

5.1.3 Summary of issues raised by interested and affected parties and an indication of the manner in which the issues were incorporated, or the reasons for not including them

Currently, no comments have been received. Any future comments received will be included in the reports to follow.

5.2 The Environmental attributes associated with the sites – baseline environment

5.2.1 Geology

Information for this section was extracted from the Geohydrological Study and Impact Assessment for Backfilling of Quarries at Annesley Mine (Shangoni AquiScience, 2020).

The 2628 East Rand 1:250 000 geological map indicates that Annesley Mine is directly underlain by rocks of the Timeball Formation (Figure 2) belonging to the Pretoria Group and the Transvaal Sequence of rocks believed to be of Vaalian age.

The Timeball Hill Formation consists of one or more beds of quartzite sandwiched between shale at the base and at the top of the unit. The entire Pretoria Group is widely intruded by dolerite dykes and sills. A minimum of four distinct diabase sills, irregularly weathered and probably of Bushveld ligneous Complex origin, are intrusive along bedding planes in the vicinity of and within the ore body. These sills act as aquitards, restricting the movement of groundwater through them resulting in a confined aquifer and piezometric pressure heads.

5.2.1.1 Local Geology

Within the hydrocensus covered area, the geology mainly consists out of the volcanic and sedimentary rocks of the Pretoria Group with outcrops of dolerite intrusions.

The ore zone principally comprises of quartz, feldspar, biotite and andalusite bearing hornfels. The ore body outcrops/sub-outcrops against the north-eastern slopes of the Radingwane Mountain, which is capped by Daspoort quartzite of the Daspoort Formation. The surface of the ore body is covered by a layer of rubble, between 0.5 m to 6 m thick, consisting primarily of quartzite boulders, occasional lava boulders and very little soil (Aurecon, 2010).

The ore body is a metamorphically altered alumina-rich shale horizon. It is essentially a quartzitic biotite-andalusite hornfels with minor amounts of garnet and staurolite. The ore body varies between 40 m and 50 m in thickness, strikes NW and dips on average 15° to the SW (Aurecon, 2010).

The geological map indicates the presence of several regional linear structures, comprising of NE-SW striking dolerite dykes and NW-SE striking diabase dykes. The drainage line through the mine area runs parallel to the regional orientation of the diabase dykes (Aurecon, 2010).

The intrusive bodies vary in thickness from 0.5 m to 5 m and appear to upwardly transgress through the ore body from east to west. The ore above and below these sills displays alteration through contact metamorphism.

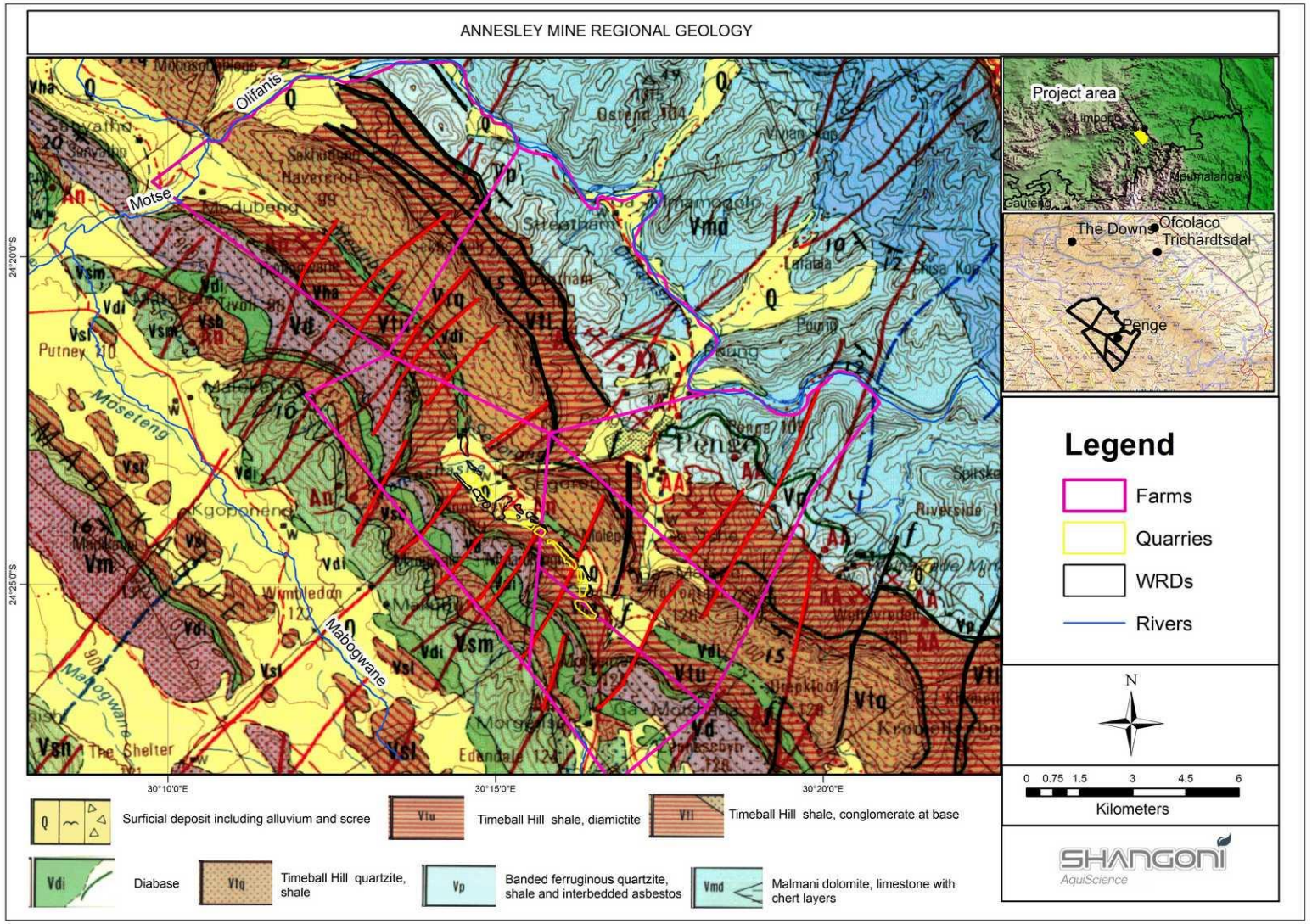


Figure 2: Regional Geology (Shangoni AquiScience, 2020)

A minimum of six, often very irregular, sub-vertical dolerite dykes of Karoo age transect the ore body along strike, from south-west to north-east. They are usually deeply weathered and deep gullies mark their position on the surface. Their effect on the ore appears to be minimal. None of these dykes will be mined, leaving the water compartments locally intact. Only minor faulting and other structural deformation have been observed. Any water compartments that may exist lie below the mining operations at depths in excess of 50 m. Similar to dolerite sills, these dykes act as vertical aquitards restricting the lateral migration of groundwater, consequently resulting in the existence of compartments (in theory). Some leakage is however expected at the surface where the dolerite dykes are usually intensely weathered.

The mining area is also underlain by a diabase sill of approximately 100 m thick and is concordant with the sedimentary rock in which it intrudes. This sill is approximately 40 m below the footfall of the ore body. Due to the highly undulating nature of the topography, varied geology and localised presence of dykes and sills, the depth to water table in the B71F quaternary catchment varies significantly. This could be less than 10 mbgl in some places and more than 40 mbgl at others while artesian boreholes and fountains are common due to the confined nature of the aquifer underlying the regional study area.

5.2.2 Climate

Information for this section was extracted from the IWWMP (Shangoni Management Services, 2012):

5.2.2.1 Regional climate

The climate is moderate to hot, with occasional, very hot conditions in the low-lying valleys. The average daily temperature variation is 15°C. The area is part of a major mountain range and the winds blow consistently from the northeast. The rainy season lasts from late October until April with a maximum in November, mainly in the form of thunderstorms from the south west, but also light to moderate precipitation blown in from the east. The rainfall is fairly low and in 12% of all years there are severe drought conditions. There is no frost.

5.2.2.2 Rainfall and evaporation

The mean monthly rainfall of the area is 559mm, which is higher than that of the surrounding area as a result of the microclimate (topography and aspect).

Table 8: Rainfall statistics

Month	Average (mm)	Days with more than 1 mm rain
January	95	9,8
February	84	6,8
March	70	6,8
April	20	2,6
May	8	2,2
June	4	1,3
July	4	1,3
August	8	1,7
September	19	1,8
October	59	6,3
November	102	10,1
December	86	8,4
Annual	559	59

Table 9: Evaporation

Month	Evaporation (mm)
January	212
February	174
March	174
April	139
May	121
June	102
July	119
August	167
September	228
October	259
November	228
December	217
Average	2140

5.2.2.3 Temperature

Table 10: Temperature for Annesley

Month	Temperature	
	Max	Min
January	30,1	17,3
February	29,7	17,4
March	28,2	16,2
April	27,4	12,1
May	24,5	8,1
June	21,7	3,9
July	21,6	4,0
August	24,0	6,9
September	27,5	11,3
October	30,4	14,6
November	30,2	16,4
December	30,1	17,4
Annual	27,1	12,2

5.2.2.4 Extreme events

The area experiences several extreme events on a regular basis, including frost, hail, drought, and high winds.

5.2.3 Topography

Information for this section was extracted from the Geohydrological Study and Impact Assessment for Backfilling of Quarries at Annesley Mine (Shangoni AquiScience, 2020).

The elevation of the mining area varies between 775 meters above mean sea level (“mamsl”) in the north and over 1070 mamsl in the south. The mining area is located on the north-eastern slope of the Radingwane Mountain. The ore body outcrops along the lower slopes of the mountain range, close to the valley floor. The quarry areas start at an elevation of 920 mamsl rising up the northern slope of the Radingwane Mountain range to a maximum elevation of 987 mamsl from where it dips again into the valley floor at approximately 775 mamsl (Figure 3). Although the slopes are intersected by many well-defined gullies, no major ravines are present on-site.

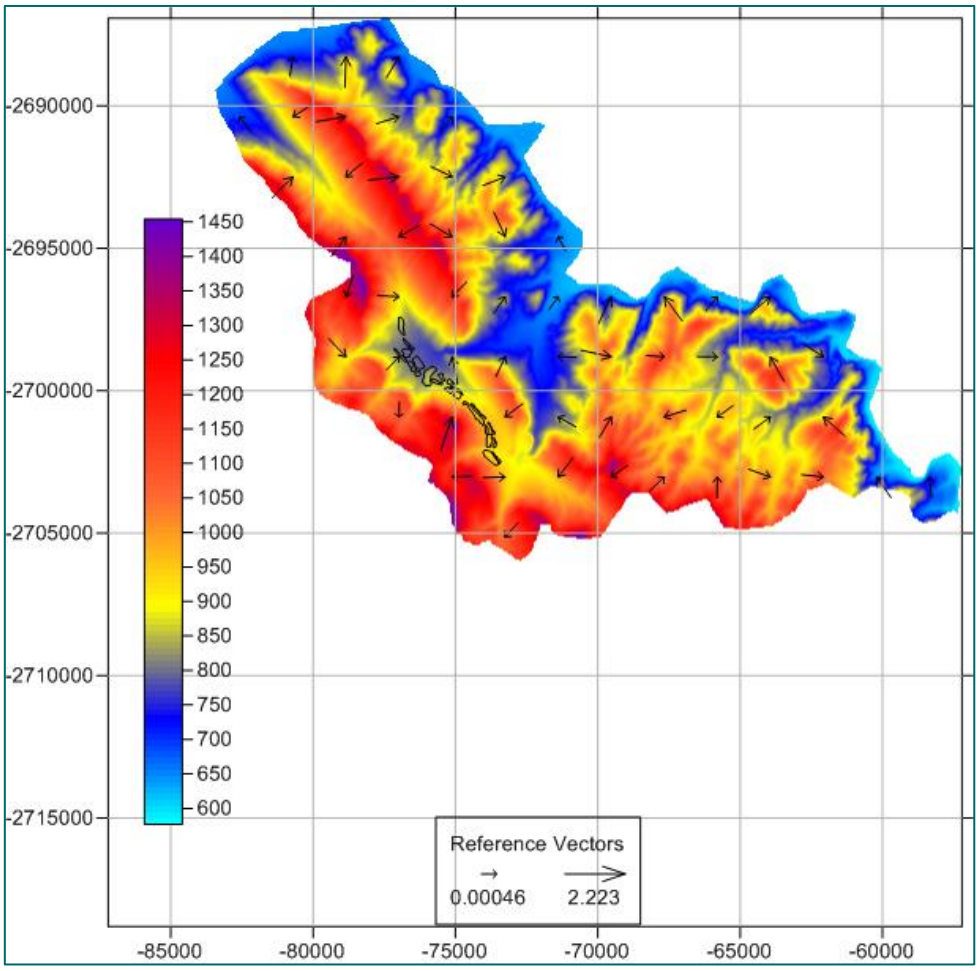


Figure 3: Topography of Annesley Mine

5.2.4 Soil

Information for this section was extracted from the Approved EMP (Shangoni Management Services, 2006):

The mining area is dominated by rock with limited soils. Red-massive or weak structured soils with high base status. The soils on the mountain slopes overlying the ore body are skeletal and only developed in localised potholes and as a component of the scree made up of metamorphic (hornfels) schists, diabase still material and quartzite rocks.

The major components of the topsoil are weathered silica and clay materials, chiefly loamy biotite and rich in porphyroblasts of staurolite and or garnets and cordierite. The topsoil is generally friable, politic, with an abundance of gravel and pebbles of all sizes. The terrain and types of soil in the area make it prone to erosion.

5.2.5 Pre-mining land capability, land use and existing infrastructure

Information for this section was extracted from the Approved EMP (Shangoni Management Services, 2006):

The area is disturbed by the existing mining excavation. The area is classified as Wilderness land as defined by the Chamber of Mines Rehabilitation Guideline. The slope of the majority of the site is considered steep, with soils being less than 250mm in depth and the volume of rocks larger than 100mm being more than 50%. The land was classified to be arable land and suitable grazing land. The entire mining area roughly comprises: Wilderness land: 50% Arable Land: 0% Grazing Land: 50% Wetland: 0%

5.2.6 Vegetation

Certain information for this section was extracted from the Approved EMP (Shangoni Management Services, 2006):

The mine is located in the Savanna Biome and within the Mixed Bushveld and Sourish Mixed Bushveld veld type (According to Acocks 1975). According to Mucina and Rutherford this area is classified as the Ohrigstad Mountain Bushveld vegetation unit (SVcb 26). This vegetation unit is characterised by open to dense woody layer, with associated woody and herbaceous shrubs and closed to open grass layer. Moderate to steep slopes on mountainsides and sometimes deeply incised valleys; also fairly flat terrain in a few places.

The quarry and plant areas are significantly disturbed. Heaps of overburden occur near the quarries and these heaps are heavily infested with *Xanthium spinosum* (Spiny cocklebur) and *X strumarium* (Large cocklebur). Of particular concern is the invasion of *Nicotiana glauca* (Wild tobacco) and *Opuntia* spp (Common prickly pear).

No red data species were noted.

Table 11: Invader plant species found on Annesley Andalusite Mine

Scientific name	Common name
Nicotiana glauca	Wild tobacco
Xanthium spinosum	Spiny cocklebur
Xanthium strumarium	Large cocklebur

5.2.6.1 River diversion

Information for this section was extracted from the Flora Report (Galago Environmental, 2016):

The vegetation of both the drainage lines and the area in between is in a natural condition, although the area was inhabited many years ago. Remnants of former habitation are still evident. The soil is sandy loam amongst scattered rocks, sustaining very dense growth of the woody stratum. The graminoid stratum is not very diverse and forbs are difficult to identify, this late in the season. A prominent feature is the lack of geophytes.

Two vegetation study units were identified (Figure 4):

- Drainage lines.
- Euphorbia shrub veld

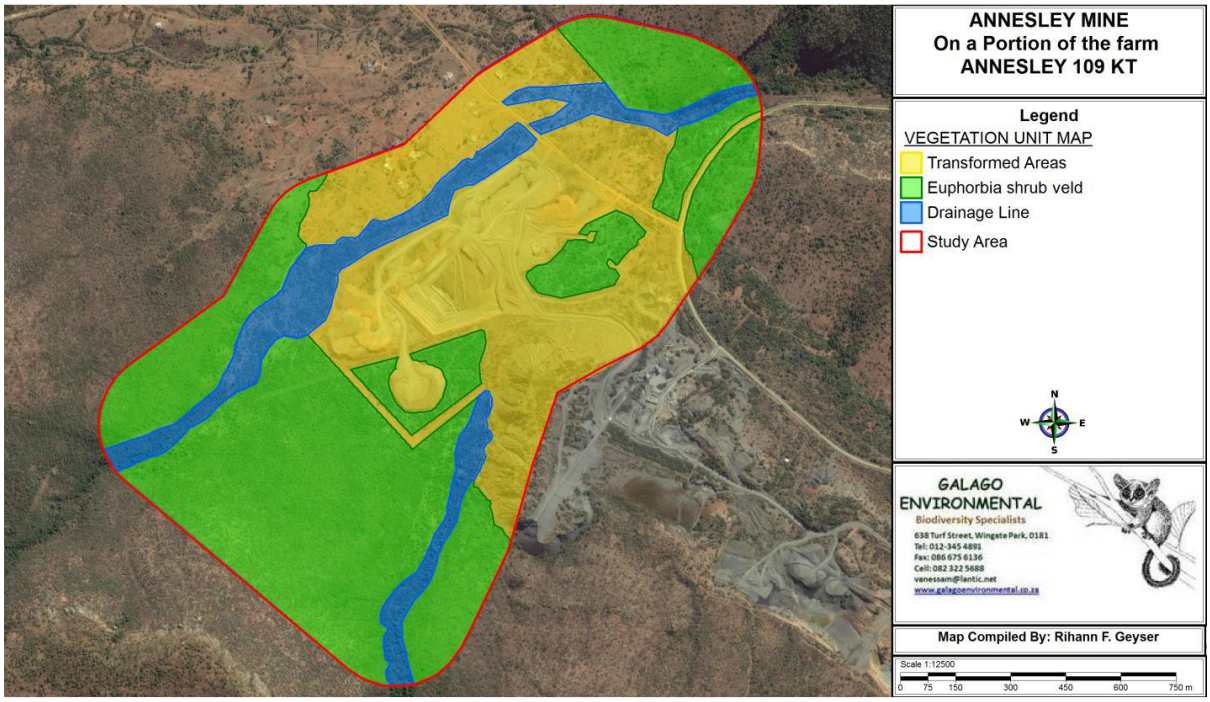


Figure 4: Vegetation study units

5.2.6.2 Medicinal species

Eleven of the 97 plant species recorded on the study site are known to have medicinal properties (Van Wyk et al. 2002; Van Wyk & Wink 2004).

Table 12: Number of medicinal plant species in the different study units. Study unit Total no. of species

Study unit	Total no. of species	No of medicinal species
Drainage lines	53	8
Euphorbia shrub veld	68	8

5.2.6.3 Alien species

Alien species are mainly herbs occurring in disturbed areas or are introduced tree and shrub species. Six alien species were recorded on the site, of which two are Category 1b, one Category 2 and one Category 3 Invasive species.

Table 13: Number of alien species in each study unit.

Study unit	No. of species	Cat. 1b	Cat. 2	Cat. 3	Not declared
Drainage lines	2	1	0	0	1
Euphorbia shrub veld	6	2	1	1	2

5.2.6.4 Species of conservation concern

There are no suitable habitats for any known species of conservation concern on the study site.

5.2.6.5 Threatened species

No threatened species were found on the study site.

5.2.6.6 Protected trees

Four tree species that are protected under NFA were found on the study site. *Balanites maughamii* subsp. *maughamii*, *Sclerocarya birrea* subsp. *caffra*, *Boscia albitrunca* and *Philenoptera violacea* occur on this study site. *Lydenburgia cassinoides* is also listed for this QDS but there is no suitable habitat on the study site.

5.2.6.7 Drainage lines

Compositional aspects and Connectivity:

The north-western seasonal drainage line is of importance because it is from here that the water flow will be diverted to bypass the mining site. The vegetation consists of mainly trees and shrubs with a low diversity in graminoid and forb content. Tree and shrub species are predominantly *Senegalia schweinfurthii, Albizia anthelmintica, Capparis tomentosa, Hippocratea longipetiolata* and *Commiphora glandulosa*. The herbaceous layer is represented by members of the Acanthaceae and a few grass species such as *Eragrostis rigidior* and *Panicum maximum*. Connectivity exists in a corridor along the entire drainage line in a southwestern direction.

Table 14: Growth forms of species in the drainage lines

Growth form	No. of species
Woody and succulent tree	13
Woody and succulent shrub	21
Climber	3
Herb	11
Graminoid	5

Medicinal and alien species:

Eight of the 53 species recorded in the study unit are known to have medicinal properties. Of the two alien species, one is a Category 1b Declared weed.

Sensitivity: The vegetation in this study unit is natural and therefore considered sensitive.

Table 15: Plant species recorded in drainage lines

Scientific name	Common name
Agave americana subsp. *americana* *	Century plant
Albizia anthelmintica	Worm-bark false-thorn
Aristida congesta subsp. *congesta*	Tassel three-awn
Asparagus sp.	Wild asparagus
Barleria prionitis	Thorny orange barleria
Bauhinia tomentosa	Yellow bauhinia
Boscia albitrunca	Shepherd tree
Boscia foetida subsp. *rehmanniana*	Foetid shepherd tree
Capparis tomentosa ♥	Woolly caper bush
Carissa edulis	Climbing num-num
Cenchrus ciliaris	Foxtail buffalo grass
Combretum hereroense ♥	Russet bush-willow
Commiphora glandulosa	Tall common corkwood
Commophora mollis	Velvet-leaved corkwood
Crotalaria sp.	
Croton menyharthii	Rough-leaved lavender fever-berry
Dichrostachys cinerea subsp. *africana* ♥	Small-leaved sickle bush
Dicliptera fruticosa	
Diospyros mespiliformis	Jackal-berry
Ehretia obtusifolia	Glandular puzzle bush
Eragrostis rigidior	Curly leaf
Euclea undulata ♥	Common guarri
Euphorbia cooperi var. *cooperi*	Bushveld candelabra tree
Euphorbia tirucalli	Hedge euphorbia
Flueggia virosa	White-berry bush
Grewia bicolor var. *bicolor*	White raisin
Grewia flavescens	Sandpaper raisin
Gymnosporia maranguensis	Tropical spike-thorn
Gymnosporia senegalensis	Red spike-thorn
Hibiscus engleri	Wild hibiscus
Hippocratea longipetiolata	Helicopter paddle-pod
Hyperacanthus amoenus	Thorn-gardenia
Jatropha sp.	
Kalanchoe rotundifolia	Nentabos

Scientific name	Common name
Kyphocarpa angustifolia	Silky burweed
Lippia javanica ♥	Fever tea
Melhania acuminata var. acuminata	Bushy honeycup
Melhania forbesii	
Melinis repens	Natal red top
*Opuntia ficus-indica * C1b*	Sweet prickly pear
Panicum maximum	Guinea grass
Pellaea calomelanos ♥	Hard fern
Philenoptera violacea	Apple-leaf
Pouzolzia mixta	Soap nettle
Pyrostria hystrix	Porcupine bush
Sansevieria hyacinthoides ♥	Mother-in-law's-tongue
Schotia brachypetala ♥	Weeping boer-bean
Searsia engleri	Velvet karee
Senegalia schweinfurthii var. *schweinfurthii*	River climbing thorn
Spirostachys africana	Tamboti
Vachellia robusta subsp. *robusta*	Broad-pod robust thorn
Vepris reflexa	Bushveld white ironwood
Waltheria indica	Meidebossie

Alien species are indicated by * and medicinal species by ♥. Declared weeds and invaders are marked C1b, C2 and C3

5.2.6.8 Euphorbia shrub veld

Compositional aspects and connectivity:

The substrate of this study unit consists of rocky, sandy loam soil sloping down from 930m to 820m in a north-eastern direction. The vegetation is dominated by woody species forming dense, shrubby stands. The unit was inhabited some years ago but the only sign of disturbance is the presence of two Agave species and some ruins. The dominant trees are *Euphorbia cooperi, Euphorbia tirucalli*, *Commiphora* species and *Albizia anthelmintica*. The dense shrubby layer is represented by *Vachellia tortilis, Dichrostachys cineria, Grewia* species and sparsely scattered creepers. At lower altitudes *Sclerocarya birrea, Boscia albitrunca* and *Balanites maughamii* become prominent. The graminoid and herb component is poorly represented. Connectivity exists to the west and southeast.

Table 16: Growth forms of species in the *Euphorbia* shrub veld

Growth form	No. of species
Woody and succulent tree	17
Woody and succulent shrub	27
Creeper	4
Herb	15
Graminoid	5

Medicinal and alien species:

Eight of the 11 medicinal species found on the study site occur in this study unit. Of the six alien species found in this study unit, two are Category 1b, one Category 2 and one Category 3 Declared invaders.

Sensitivity:

The vegetation in this unit is in a natural state. The few alien species that are sparsely present and the presence of several protected trees suggest that the vegetation is sensitive.

Table 17: Plant species recorded in the *Euphorbia* shrub veld

Scientific name	**Common name**
Agave americana subsp. *americana**	Century plant
*Agave sisalana * C2*	Sisal
Albizia anthelmintica.	Worm-bark false-thorn
Aloe castanea	Cat's-tail aloe
Aloe cryptopoda	Dr Kirk's aloe
Aloe marlothii subsp. *marlothii*	Mountain aloe
Aristida adscensionis	Annual three-awn
Asparagus acocksii	Wild asparagus
Asparagus sp.	Wild asparagus
Balanites maughamii subsp. *maughamii* ♥	Green thorn
Barleria kaloxytona	
Berchemia discolor	Brown ivory
Boscia albitrunca	Shepherd tree
Canthium armatum	
Capparis tomentosa ♥	Woolly caper bush
Cardiospermum halicacabum var. *microcarpum* * C3	Lesser balloon vine
Cheilanthes hirta var. *hirta*	Parsley fern
Clematis brachiata	Traveller's joy
Commiphora glandulosa	Tall common corkwood
Commiphora mollis	Velvet-leaved corkwood
Crabbea velutina	
Croton menyharthii	Rough-leaved lavender fever-berry
Dichrostachys cinerea subsp. *africana* ♥	Small-leaved sickle bush
Dyschoriste transvaalensis	
Ehretia rigida subsp. *nervifolia*	Puzzle bush
Enteropogon macrostachyus	Mopane grass
Eragrostis rigidior	Curly leaf
Euphorbia cooperi var. *cooperi*	Bushveld candelabra tree
Euphorbia tirucalli	Hedge euphorbia
Gomphocarpus sp.	
Gossypium herbaceum subsp. a*fricanum*	Wild cotton

Scientific name	Common name
Grewia bicolor var. *bicolor*	White raisin
Grewia flava	Velvet raisin
Grewia flavescens	Sandpaper raisin
Grewia villosa var. *villosa*	Mallow raisin
Gymnosporia senegalensis	Red spike-thorn
Hibiscus praeteritus	
Hippocratea longipetiolata	Helicopter paddle-pod
Melhania acuminata var *acuminata*	Bushy honeycup
Ochna inermis	Stunted plane
Opuntia aurantiaca * C1b	Jointed prickly pear
Opuntia ficus-indica * C1b	Sweet prickly pear
Panicum maximum	Guinea grass
Pechuel-Loeschea leubnitziae	Stinkbush
Pellaea calomelanos	Hard fern
Philenoptera violacea	Apple-leaf
Plectranthus sp.	
Psydrax livida	Green quar
Ptycholobium sp.	
Pupalia lappacea var. *lappacea*	Forest burr
Rhoicissus revoilii	Bushveld grape
Sansevieria hyacinthoides ♥	Mother-in-law's-tongue
Schotia brachypetala ♥	Weeping boer-bean
Sclerocarya birrea subsp. *caffra*	Marula
Seddera capensis	Seddera
Senegalia erubescens	Blue-thorn
Senegalia nigrescens	Knob-thorn
Sida dregei	Spider-leg
Steganotaenia araliacea var. *araliacea*	Carrot tree
Sterculia rogersii	Star-chestnut
Tetradenia sp.	
Triaspis glaucophylla	Blue-leaved saucer-fruit
Urochloa mosambicensis	Bushveld signal grass
Vachellia tortilis subsp. *heteracantha*	Umbrella thorn
Waltheria indica	Meidebossie
Ximenia americana var. *micropphylla*	Blue sourplum
Zinnia peruviana *	Redstar zinnia
Ziziphus mucronata ♥	Buffalo thorn

Alien species are indicated by * and medicinal species by ♥. Declared weeds and invaders are marked C1b, C2 and C3.

5.2.7 Animal life

Information for this section was extracted from the Approved EMP (Shangoni Management Services, 2006):

5.2.7.1 Mammals

The following larger mammals (amongst many more) are found in the general area: Kudu (*Tragelaphus strepiceros*), Klipspringer (*Oreotragus oreotrachus*), Grey Rhebok (*Pelea capreolus*) which is classed as Endangered, Common Duiker (*Sylvicapra grimmia*), Grey buck (*Raphicerus malanotis*), Bushpig (*Potamochoerus porcus*), Caracal (*Felis caracal*), Jackal (*Canis mesomelas*), African Wild Cat (*Felis lydic*)a, Leopard (*Panthera pardus*) which is classed as Endangered, Porcupine (*Hystrix africaeaustralis*), Dassie (*Procavia capensis*), Brown Hyaena (*Hyaena brunnea*), Slender Mongoose (*Galerella sanguinea*), Scrub Hare, (*Lepus saxatilis*), Chacma Baboon (*Papio ursinus*).

5.2.7.2 Birds

Birds that were recorded on the site were identified visually and with aid of audio recognition. Only a small fraction of the bird population was encountered. One of the species on the list White backed vulture is labelled by the IUCN (2000) as "vulnerable to extinction with an estimated continuing decline of at least 10% within the next 10 years. A pair of Black Eagles nest less than 1km from the current mining site.

5.2.8 Surface water

Information for this section was extracted from the IWWMP (Shangoni Management Services, 2012), the Aquatic Ecosystem Delineation Report (Galago Environmental, 2016), and the Geohydrological impact assessment as input to the Section24G Rectification (Shangoni AquaScience, 2017):

The mine lies in the Primary Catchment of the Olifants River and the Quaternary Catchment referred to as the B71F draining region as defined by the DWS. The applicable water management area is the Olifants and the responsibility of the Mpumalanga Regional DWS. The quaternary catchment B71F has a mean annual precipitation of 799.91mm and mean annual runoff of 101.3%.
Information for this section was extracted from the IWWMP (Shangoni Management Services, 2012) and the Aquatic Ecosystem Delineation Report (Galago Environmental, 2016):

The area in which the mine is located shows an abundance of non-perennial streams flowing down the escarpment. There is no permanent natural surface water on the mining site. The area is drained by several non-perennial water courses. The most southern section of the mine area is drained by several intermittent streams flowing into a larger northern flowing stream which eventually confluences with the Olifants River. The northern section of the mine is drained by a number of NW flowing intermittent streams which flows to the Sekgorong River, forming part of the greater Olifants River catchment.

5.2.8.1 Surface water hydrology

Three upper tributaries of the Segorong River pass through the farm Annesley 109 KT over the andalusite ore body that will be mined in the near future During the wetland delineation site visit an impacted site was observed as a result of mining activities. Two drainage lines were observed, draining from steep mountain catchment areas into the existing open cast mining areas (red lines in Figure 5). Both drainage lines are currently intersected by the open cast mining activities on site. The eastern line has been rerouted and with diffused flows drains to the north. The northern line also redirected its diffused flows with much of the water expected to end up in the opencast mining area.

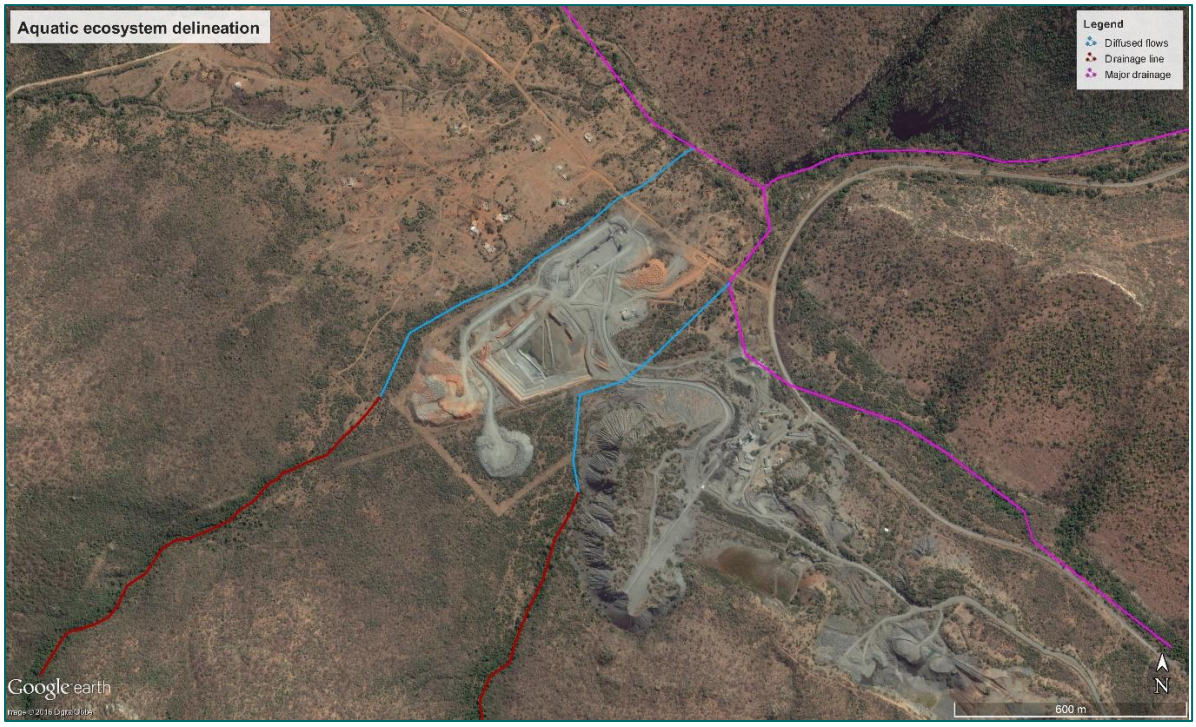


Figure 5: The aquatic ecosystems of the study site (Galago Environmental, 2016)

Due to the impact of the open cast mining, the proposed new activities on site include the diversion of two drainage lines into a single diversion to the east of the open cast mining area (Figure 6). This will remove the northern drainage line and divert water into the major drainage line to the northeast (Figure 7).

(***NOTE:*** *The diversion of the drainage lines is not part of this application, but is included for a complete overview.*)

Figure 6: The location of the diversion (Galago Environmental, 2016)

Figure 7: The effect of the diversion on the drainage lines (Galago Environmental, 2016)

The drainage lines found on site only has active flows during high rainfall events in the catchment of the system (expected to be once every 5-20 years) and is ephemeral in nature. No hydrophytes were observed in the drainage lines. Alluvial deposits were however observed in areas with least inclination. Smaller cobbles and rock bubbles with hydric souring and formation was observed in these areas. The channel sinuosity improved with length of the system.

5.2.8.2 Wetland indicators as in line with DWA, 2005

With exception of the topographic location of the systems, the wetland indicators necessary for the classification as wetlands were not observed on site.

Wetland (hydromorphic) soils and anaerobic conditions in the soil:
None was observed, mainly due to the low rainfall on the site.

The presence, at least occasionally, of water loving plants (hydrophytes):
Not observed.

Topographical location in relation to the landscape:
The drainage lines are located in a mountainous catchment where geological indentations have created valley bottoms for water to drain.

Open standing water or water near the surface:
Not observed.

5.2.8.3 Riparian area indicators as in line with DWA, 2005

The drainage lines found on site has some of the characteristics required to classify the system as riparian with one large exception - the lack of large trees and hydrophytes required to classify the area as riparian. It is in the author's opinion that this, combined with the highly infrequent flows in the system, classifies the aquatic ecosystems of the study site as drainage lines.

Topography associated with the watercourse:
The drainage lines are located in a mountainous catchment where geological indentations have created valley bottoms for water to drain.

Vegetation especially changes in the composition of communities found on site:
Not observed, mainly derivative for the classification as drainage line.

Alluvial soils and deposited materials:
Some were observed in areas but not throughout.

5.2.8.4 Aquatic ecosystem classification

The classification of the system was done using the dichotomous key in Ollis et al. (2013).

Table 18: Classification of the wetland system

Watercourse	**Level 3**		**Level 4: HGM Unit**			**Level 5**				
	Key 1 Landscape Unit		**Key 2**			**Key 3a River Flow types**		**Key 3b Hydroperiod**		
	Level 3a	Level 3b	Level 4a HGM Type	Level 4b River zonation/ Landform/ Outflow drainage	Level 4c River Flow type	Level 5a	Level 5b	Level 5 a Inundation period	Level 5b Saturation period	Level 5 c Inundation depth class
Drainage line		Saddle						Never/ Rarely inundated	Unknown Saturation period	Unknown depth class

5.2.8.5 Present Ecological Score (PES) and Ecological Importance and Sensitivity (EIS)

Due to the classification of the system, no methods can be empirically used to determine the PES of the drainage system.

EIS:

During the site visit, the study area was quiet with no major bird activity. No signs or tracks of animals were observed. The site seemed devoid of life with the exception of dense vegetation and signs of cattle grazing (also old) on the site. It is suspected that poaching and active hunting has eliminated much of the natural fauna in the area. The system is also ephemeral and the lack of water (albeit standing or flowing) reduces faunal activity in the area. The wetland found within the extended study area can be considered to be of moderate ecological management class. The REMC was calculated to be in **Low/ Marginal** condition “Aquatic ecosystems that is not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers”. The Ephemeral hydrology of the system combined with the impact of the open cast mining somewhat isolates the system from the larger hydrological drainage network.

5.2.8.6 Surface water quality

Water quality monitoring was done in March 2016 (Chemical and Microbiological Analysis Report: Letaba Environmental Services, 2016). Refer below for the results.

Table 19: Surface water quality

Variable	Unit	Limit (Domestic use: Target Water Quality Guidelines)	Sample number		
			AN1	AN3	AN4
pH		6.0-9.0	6.84	7.44	7.17
Conductivity*	mS/m	≤70	6.7	374.0	455.0
Total dissolved solids (TDS)	mg/l	≤450	2087	3914	2345
Fluoride	mg/l	≤1.0	<0.05	<0.05	<0.05
Chloride	mg/l	≤100	15.9	347.9	651.8
Nitrate: N	mg/l	≤6	<0.02	<0.02	<0.02
Phosphate: P	mg/l		<0.02	<0.02	<0.02
Sulphate	mg/l	≤200	6.9	496.0	595.6
p-Alkalinity			0.0	0.0	0.0
m-Alkalinity			13.3	141.2	237.9
Carbonate			0.0	0.0	0.0
Bicarbonate			16.2	279.4	382.4
Total hardness		≤50	39.7	734.4	1,145.7
Calcium hardness			16.9	279.4	382.4
Magnesium hardness			22.8	455.0	763.4
Calcium	mg/l	≤32	6.8	111.9	153.1
Magnesium	mg/l	≤30	5.5	110.5	185.4
Sodium dissolved	mg/l	≤100	6.9	253.2	439.6
Potassium dissolved	mg/l	≤50	0.97	42.18	10.95
Iron dissolved	mg/l	≤0.1	<0.002	<0.002	<0.002
Manganese dissolved	mg/l	≤0.05	<0.005	<0.005	<0.005
Sum Cation	me/l		1.12	26.77	42.30
Sum Anion	me/l		1.13	26.78	42.31
Turbidity	Ntu	≤1	0.02	16.34	6.37
Suspended solids*	mg/l	≤25	2	26	8
Total viable organisms*	per 100ml	≤75	239	97	197
Total coliform	per ml	≤5	66	<1	3
Faecal coliform	per ml	0	29	<1	<1

AN1 - Upstream River

AN2 - Downstream River

AN3 - Penge Dam

5.2.9 Groundwater

Information for this section was extracted from the Geohydrological Study and Impact Assessment for Backfilling of Quarries at Annesley Mine (Shangoni AquiScience, 2020).

5.2.9.1 Geology

The 2628 East Rand 1:250 000 geological map indicates that Annesley Mine is directly underlain by rocks of the Timeball Formation (Figure 2) belonging to the Pretoria Group and the Transvaal Sequence of rocks believed to be of Vaalian age.

The Timeball Hill Formation consists of one or more beds of quartzite sandwiched between shale at the base and at the top of the unit. The entire Pretoria Group is widely intruded by dolerite dykes and sills. A minimum of four distinct diabase sills, irregularly weathered and probably of Bushveld ligneous Complex origin, are intrusive along bedding planes in the vicinity of and within the ore body. These sills act as aquitards, restricting the movement of groundwater through them resulting in a confined aquifer and piezometric pressure heads.

Within the hydrocensus covered area, the geology mainly consists out of the volcanic and sedimentary rocks of the Pretoria Group with outcrops of dolerite intrusions.

The ore zone principally comprises of quartz, feldspar, biotite and andalusite bearing hornfels. The ore body outcrops/sub-outcrops against the north-eastern slopes of the Radingwane Mountain, which is capped by Daspoort quartzite of the Daspoort Formation. The surface of the ore body is covered by a layer of rubble, between 0.5 m to 6 m thick, consisting primarily of quartzite boulders, occasional lava boulders and very little soil (Aurecon, 2010).

The ore body is a metamorphically altered alumina-rich shale horizon. It is essentially a quartzitic biotite-andalusite hornfels with minor amounts of garnet and staurolite. The ore body varies between 40 m and 50 m in thickness, strikes NW and dips on average 15° to the SW (Aurecon, 2010).

The geological map indicates the presence of several regional linear structures, comprising of NE-SW striking dolerite dykes and NW-SE striking diabase dykes. The drainage line through the mine area runs parallel to the regional orientation of the diabase dykes (Aurecon, 2010).

The intrusive bodies vary in thickness from 0.5 m to 5 m and appear to upwardly transgress through the ore body from east to west. The ore above and below these sills displays alteration through contact metamorphism.

A minimum of six, often very irregular, sub-vertical dolerite dykes of Karoo age transect the ore body along strike, from south-west to north-east. They are usually deeply weathered and deep gullies mark their position on the surface. Their effect on the ore appears to be minimal. None of these dykes will be mined, leaving the water compartments locally intact. Only minor faulting and other structural deformation have been observed. Any water compartments that may exist lie below the mining

operations at depths in excess of 50 m. Similar to dolerite sills, these dykes act as vertical aquitards restricting the lateral migration of groundwater, consequently resulting in the existence of compartments (in theory). Some leakage is however expected at the surface where the dolerite dykes are usually intensely weathered.

The mining area is also underlain by a diabase sill of approximately 100 m thick and is concordant with the sedimentary rock in which it intrudes. This sill is approximately 40 m below the footfall of the ore body. Due to the highly undulating nature of the topography, varied geology and localised presence of dykes and sills, the depth to water table in the B71F quaternary catchment varies significantly. This could be less than 10 mbgl in some places and more than 40 mbgl at others while artesian boreholes and fountains are common due to the confined nature of the aquifer underlying the regional study area.

5.2.9.2 Acid generation capacity

Mineral waste material, mostly from coal and gold mines, contain sulphidic material (mostly pyrite) which may oxidise to produce acid mine drainage ("AMD"). The result is sulphuric acid generation which acidifies water it comes in contact with. This has several negative consequences and most notably includes the solubilisation of a variety of trace metals and metalloids. A number of factors control the generation of AMD, but the most important are the relative abundance of acid producing minerals (generally the sulphides) and acid consuming minerals (generally carbonates), moisture content/ ingress and exposure to air. As AMD has the potential to impact significantly on surface and groundwater quality, it is necessary to also quantify the potential of waste to generate acid.

Acid-Base Accounting ("ABA") is a straightforward test to determine the acid potential of rock. The total acid generating potential ("AP") is calculated from the total sulphur content of the rock material. The neutralising potential ("NP") of minerals in the material is measured by reacting a finely ground sample of the test material with a measured excess of hydrochloric acid and back-titrating to a selected pH endpoint between 6.0 and 8.3 (to differentiate between the actions of carbonates and silicates). The balance between the potentially acid consuming and potentially acid generating minerals in the sample is expressed as the net neutralising potential ("NNP").

A study conducted by Shangoni in 2014 revealed that the Annesley mineral waste materials generated by the mining activities are non-acid forming. Shangoni concluded that this classification was based on the very high buffer minerals present in the material and virtually no acid generating sulphide minerals.

Table 20: Acid base accounting results for Annesley mineral waste material (from Shangoni, 2014)

Acid – Base Accounting Modified Sobek (EPA-600)	**Sample Identification**			
	Primary Waste	**Overburden**	**Slimes**	**HMS Waste**
Paste pH	7.5	8.0	7.9	8.0
Total Sulphur (%) (LECO)	0.02	0.01	0.02	0.01
Acid Potential (AP) (kg/t)	0.625	0.313	0.625	0.313
Neutralization Potential (NP)	7.00	2.50	5.50	0.500
Nett Neutralization Potential (NNP)	6.38	2.19	4.88	0.187
NPR (NP: AP)	11.20	8.00	8.80	1.60
Rock Type	III	III	III	III

If NNP (NP – AP) < 0, the sample has the potential to generate acid

If NNP (NP – AP) > 0, the sample has the potential to neutralise acid produced

As a result of the low acid forming potential and high neutralisation potential, no net acid can be generated from the mineral waste generated by Annesley. The pH is likely to be neutral to slightly alkaline and heavy metal solubilisation will therefore be minimal. The rock type can therefore be classified as a ***Type III*** which is defined as "***non-acid*" forming**.

Table 21: Rock classification

TYPE I	Potentially Acid Forming	Total S(%) > 0.25% and NP:AP ratio 1:1 or less
TYPE II	Intermediate	Total S(%) > 0.25% and NP:AP ratio 1:3 or less
TYPE III	Non-Acid Forming	Total S(%) < 0.25% and NP:AP ratio 1:3 or greater

5.2.9.3 Hydrogeology

5.2.9.3.1 Unsaturated zone (vadose zone)

The characteristics of vadose zone vulnerability dominating factors are closely related to the migration and transformation mechanisms of contaminants in the vadose zone, which directly affect the state of the contaminants percolating to the groundwater. The permeability and thickness of the unsaturated zone are some of the main factors determining the infiltration rate, the amount of runoff and consequently the effective recharge percentage of rainfall to the aquifer. The type of material forming the unsaturated zone as well as the permeability and texture will significantly influence the mass transport of surface contamination to the underlying aquifer(s). Factors like ion exchange, retardation, biodegradation and dispersion all play a role in the unsaturated zone.

The thickness of the unsaturated zone was determined by subtracting the undisturbed static water levels in the study area from the topography. Water level measurements showed that the depth to water level, and thus the unsaturated zone, generally varies between 6 and 45 meters below ground level (mbgl).

5.2.9.3.2 Saturated zone

Groundwater occurrence favours weathered shale, brecciated or jointed zones and especially the contact zone between intrusive diabase sheets and shale. These contact zones would usually act as targets for groundwater exploration.

The water-bearing properties of the shale formations are generally more favourable than those of the quartzites due to their greater susceptibility to weathering. The quartzites do, however, constitute productive aquifers where these rocks are fractured and especially in the presence of ferruginization. Lesser and/ or more isolated groundwater occurrences are associated with fault and associated shear zones and with contact zones between diabase sills, dykes, shale and quartzite. Water may also occur in occasional joints and fractures in fresh diabase.

Annesley is located in a d3 aquifer class region. The groundwater yield potential is classed as low to medium on the basis that most of the boreholes on record in vicinity of the study area produce between 0.5 and 2.0 l/s. Higher yields do sporadically occur where groundwater is tapped from good water yielding fractures.

Typical characteristics of the saturated aquifer are:

- It is present as either confined or semi-confined aquifers. In the former instance, the aquifer is overlain by sediments (clay) or rock (dolerite, shale, etc) of a confining nature, thus limiting direct recharge from rainfall.
- Aquifers in the study area typically have a low hydraulic conductivity but are known to be highly heterogeneous with yields ranging from 0.5 up to 5 L/s. Higher yields are typically associated with higher hydraulic conductivities along contact zones with intrusive rocks.
- The contact zones of dolerite dykes with the host rock provide preferential flow paths, while the dolerite itself is rather impermeable or semi-permeable (hydraulic conductivity of 0.00086 m/d or $1x10^{-8}$ m/s). This setting promotes groundwater flow along, but not across dykes or sills.
- Depending on the residence time of the water in the aquifer, groundwater quality can be good to moderate.
- Recharge from rainfall is generally low and averages between 2.5 to 5% of the annual rainfall.
- Characteristics of the aquifer vary greatly over short distances.
- Contaminant transport through fracture flow aquifers is comparatively fast.
- There is hardly any attenuation of pollutants in the fractures.

5.2.9.3.3 Hydraulic conductivity

Three (3) boreholes were subjected to aquifer falling head tests to determine the hydraulic conductivity (K) of the aquifer in vicinity of the study area. The methodology used is discussed in detail under Section 4.5.1 of the original report. The results are displayed in Table 22 below and falling head curves can be viewed in Appendix B of the original report.

The K-values determined indicate that the aquifer/s in the vicinity have relatively low permeabilities with values ranging between 0.014 and 0.57 m/d, the former recorded for *ANBHChief* and the latter for the community borehole, *HBH02*.

Table 22: Borehole information and aquifer test results

Model	Borehole ID	Latitude	Longitude	SWL (mbs)	Borehole Depth (m)	Early K (m/d)	Late K- (m/d)
Aqtesolv	ANBH Chief	-24.38843	30.24434	24.06	89	0.014	-
Aqtesolv	ANBH Mine 3	-24.38794	30.24434	26.13	100.30	0.092	0.047
Aqtesolv	HBH02	-24.42537	30.28087	45.10	88.45	0.57	0.44

mbs – meters below surface

5.2.9.4 Groundwater levels

Groundwater levels were measured during the hydrocensus survey that was conducted in August 2020. Groundwater levels including other details captured can be viewed in Table 23 below.

Due to the mountainous terrain, borehole distribution is sparse. Seven boreholes were surveyed during August 2020, one fountain, Penge Shaft and four Quarries. Five of the boreholes surveyed (*ANW 02, ANBH Mine, ANBH Mine 2, ANBH Chief and ANBH Mine 3*) are owned by Annesley. Four (4) of these are unequipped and used for monitoring purposes while one is equipped and used for water supply to change house and workshop on the mine.

Two boreholes belong to the community (*HBH01* and *HBH02*). One, *HBH02,* used to supply water to the school but is currently unequipped while the other, HBH01 is equipped but not in working order.

Other localities surveyed include one fountain, Penge Shaft and 4 Quarries - Segorong Quarry 1 (SW01), Quarry 7 (SW02), Quarry 3 (SW03) and Segorong Quarry 2 (SW04).

All borehole water levels recorded were static. The water level of *ANW 02*, the borehole supplying water to the mine, could not be measured due to an obstruction. Large ranges were recorded – the shallowest being 6.70 meters below surface ("mbs") and the deepest 45.20 mbs for *HBH02*, the borehole at the community school. Penge Shaft measured a water level of 86 mbs.

A map showing the positions of the localities surveyed can be viewed in Figure 8.

Table 23: Hydrocensus information (survey conducted 5-6 August 2020)

Borehole ID	Coordinates		Type	SWL (m)	Elevation (mamsl)	Application	Owner	Equipped
Groundwater/fountain								
ANBH Penge	-24.383510	30.280190	Shaft	86.00	688	Water supply - Plant	Annesley	Yes - submersible
ANW 02	-24.394860	30.255470	Borehole	obstructed	788	Water supply - Change house & workshop	Annesley	Yes - submersible
ANBH Mine	-24.393880	30.254360	Borehole	8.79	782	Monitoring	Annesley	No
ANBH Mine2	-24.393810	30.254400	Borehole	6.70	781	Monitoring	Annesley	No
ANBH Chief	-24.388430	30.244340	Borehole	24.06	792	Monitoring	Annesley	No
ANBH Mine 3	-24.387940	30.238650	Borehole	26.13	813	Monitoring	Annesley	No
HBH01	-24.424060	30.283780	Borehole	27.06	883	Water Supply	Community	Yes- Submersible – not in functional condition
HBH02	-24.425370	30.280870	Borehole	45.20	893	Water supply	School	No
ANW01	-24.442450	30.276600	Fountain	-	1022	Monitoring	Annesley	No
Surface water								
SW01	-24.391810	30.246670	Segorong Quarry 1	-	-	Rehabilitation (backfill)	Annesley	N/A
SW02	-24.421930	30.271160	Quarry 7	-	-	Rehabilitation (backfill)	Annesley	N/A
SW03	-24.402370	30.260760	Quarry 3	-	-	Water storage	Annesley	N/A
SW04	-24.389240	30.243350	Segorong Quarry 2	-	-	Mining	Annesley	N/A

N/A – not applicable

mamsl – meters above mean sea level

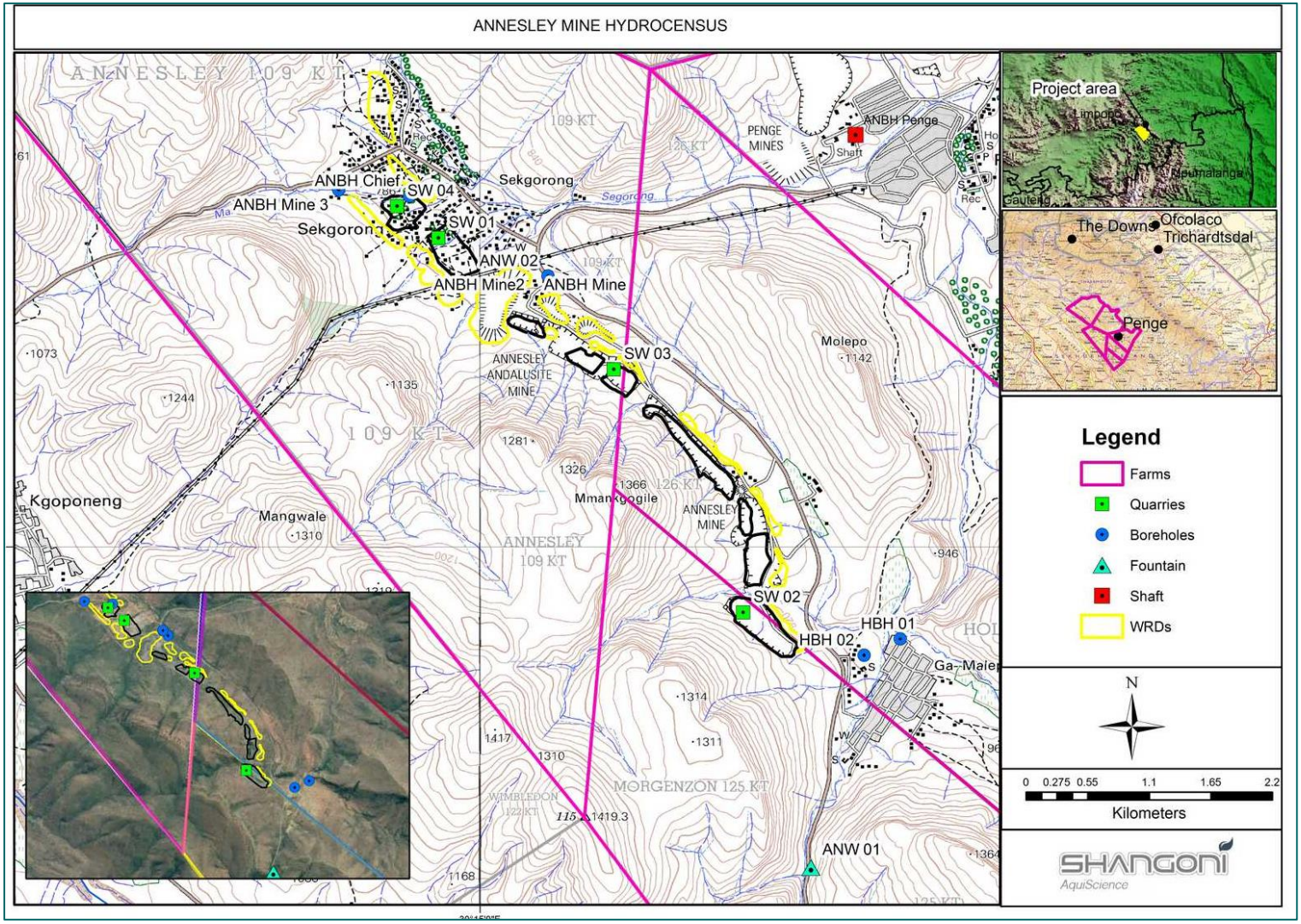


Figure 8: Hydrocensus locality map (Shangoni AquiScience, 2020).

Figure 9 shows linear regressions between the hydraulic heads of the deeper fractured aquifers and topography. Generally, a good relationship exists between topography and static hydraulic heads. This relationship can be used to distinguish between boreholes with natural unaffected water levels (*static*), or boreholes with anomalous groundwater levels due to disturbances such as pumping or seepage. A fair correlation of 0.91 was achieved for the hydraulic heads and the topography. However, Penge Shaft obviously does not represent a natural groundwater level and was removed from the regression, and a better correlation of 0.96 was achieved. Although it is assumed that groundwater flow patterns will mimic surface topography within the area, some unnatural deviations still exist.

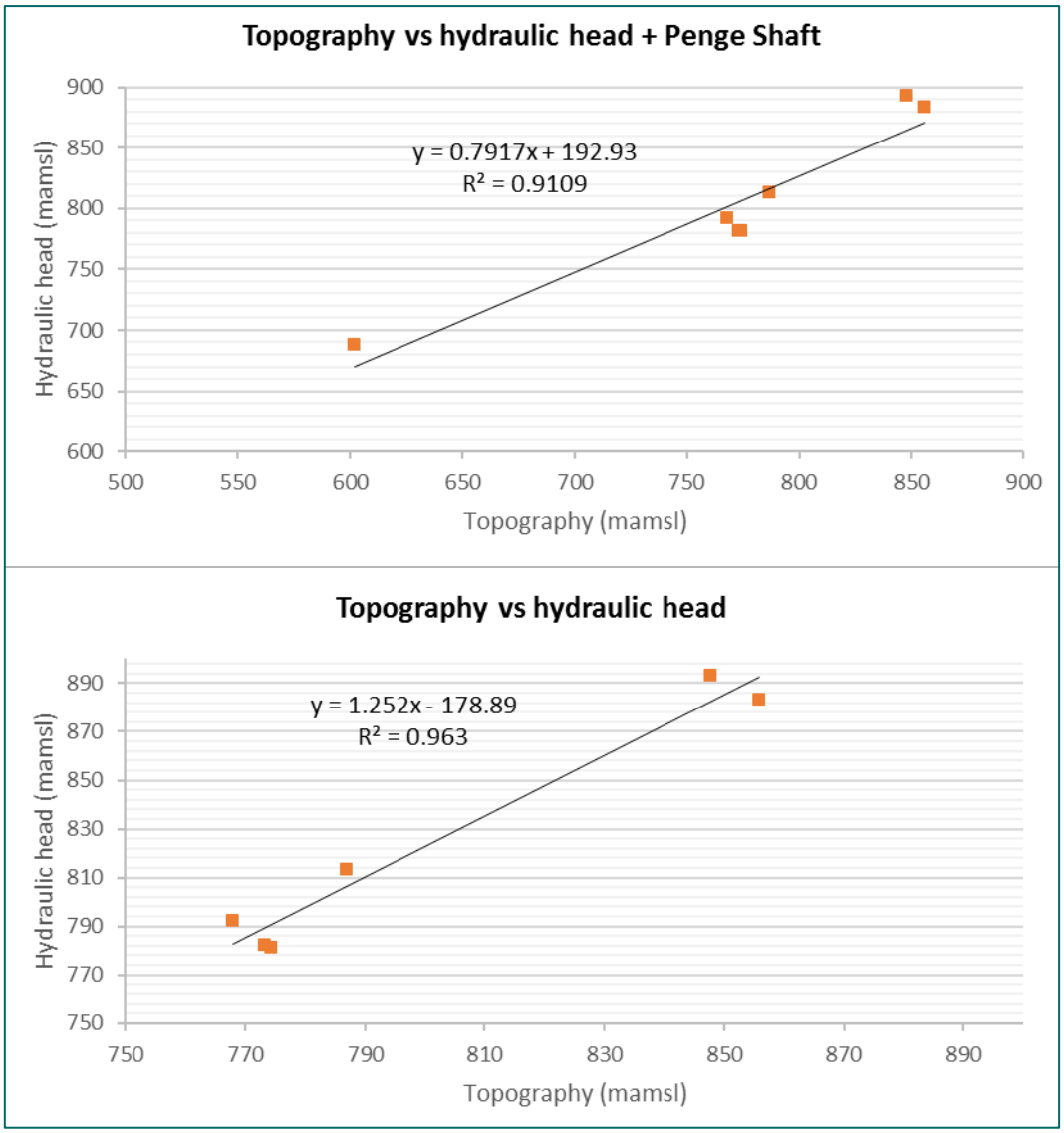


Figure 9: Linear regression between topography and hydraulic heads with suspected unnatural levels (A) and removed (B)

5.2.9.5 Groundwater potential contaminants

5.2.9.5.1 Geochemical assessments

Shangoni (2012) and Aquatico (2018) performed geochemical assessments on waste rock and tailings for classification purposes, and to identify contaminants of concerns. Shangoni also did an acid potential study to investigate acid generating tendencies of the mineral waste material. Based on the ABA study, it was concluded that the mineral waste materials are *non-acid generating* (refer to Section 5.2 of the original report).

Whole elemental analyses did reveal certain trace and major metals to be raised but due to the non-acid potentials and high neutralisation potentials, metals will remain in non-soluble state. Both these studies identified certain major ions and metals such as sulphate (SO_4), chloride (Cl), sodium (Na), fluoride (F) and manganese to be potential contaminants of concern ("CoC") but with low risk potentials.

5.2.9.5.2 Wastewater quality

An assessment of the hydrochemistry of wastewater produced is another way to evaluate the CoCs within a mining environment.

Water is pumped from Penge Shaft into Quarry 3, and from there water is pumped to the plant for use as process water. Runoff from the plant and the site are directed into the PCD (emergency dam). Hydrochemical assessment of these wastewater sources may provide a good indirect estimation of the potential CoCs and risks posed towards groundwater.

Water quality for the PCD was supplied by the client and water from Quarry 3 and Penge Shaft was sampled and analysed during the 2020 hydrocensus. The data can be viewed in Table 24 and a Stiff diagram based on the dataset in Figure 10. *Note that the evaluation based on the SANS drinking water standards is solely for reference purposes and does not imply any non-compliances or usage suggestions.*

Table 24: Wastewater quality at Annesley Mine (August 2020)

Locality / Guideline Parameter	Unit	Domestic use SANS 241(1)	Quarry 3	PCD	Penge Shaft
			Aug'20	Jan'20	Aug'20
pH	-	5 - 9.7	7.90	7.70	7.10
EC	mS/m	≤170	**239**	**295**	**246**
TDS	mg/l	1200	**1602**	**1925**	**1569**
Calcium (Ca)	mg/l		136	111	151
Magnesium (Mg)	mg/l	-	151	124	134
Sodium (Na)	mg/l	200	**216**	**269**	196
Potassium (K)	mg/l	-	8.9	3.1	46.3
Total alkalinity (MALK)	mg/l	-	234	212	363
Chloride (Cl)	mg/l	300	**436**	**312**	**385**
Sulphate (SO_4)	mg/l	500	**513**	473	437
Nitrate as N (NO_3-N)	mg N/l	11	<0.35	0.020	<0.35
Total ammonia (NH_3-N)	mg N/l	1.5	<0.45	-	<0.45
Phosphate (PO_4-P)	mg P/l	-	<0.03	0.020	<0.03
Fluoride (F)	mg/l	1.5	0.49	0.050	0.16
Aluminium (Al)	mg/l	0.30	<0.01	0.030	0.070
Iron (Fe)	mg/l	2	<0.01	0.002	<0.01
Manganese (Mn)	mg/l	0.5	0.040	0.005	**1.25**
Chromium (Cr)	mg/l	0.05	<0.01	-	<0.01
Copper (Cu)	mg/l	2.0	<0.01	-	<0.01
Nickel (Ni)	mg/l	0.070	<0.01	-	<0.01
Zinc (Zn)	mg/l	5.0	<0.01	-	<0.01
Total Hardness	mg $CaCO_3$/l	-	961	785	929

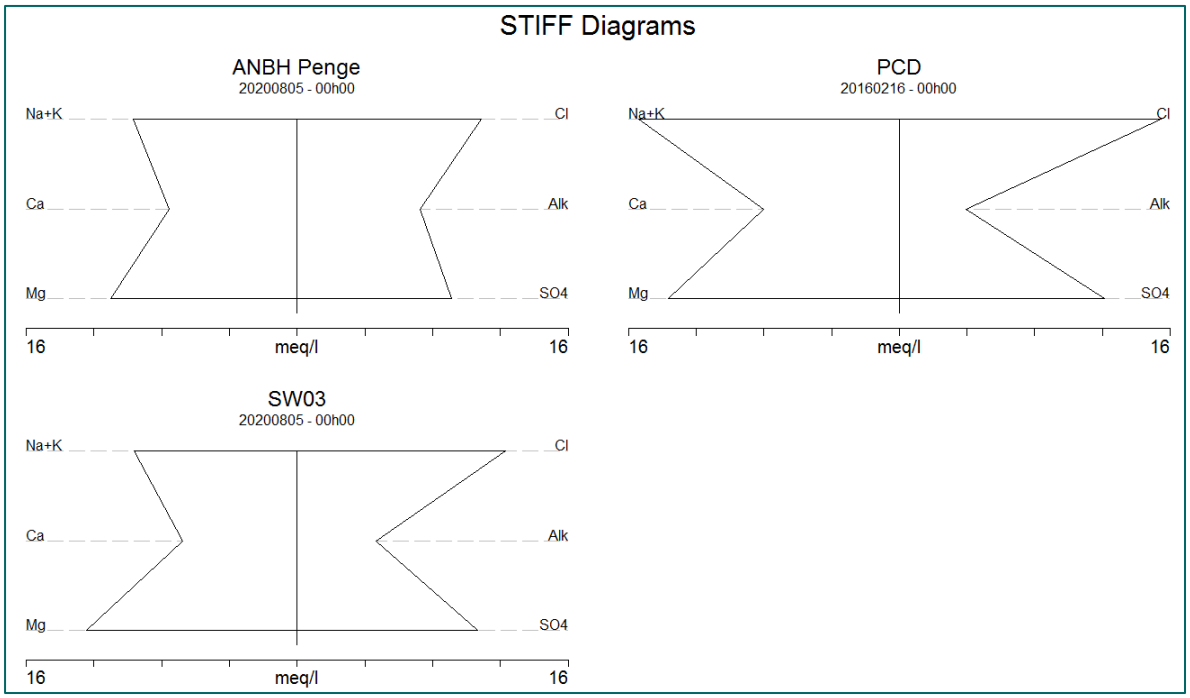


Figure 10: Stiff diagrams displaying major ions of wastewater at Annesley in meq/l

Based on Table 10 and Figure 10 the following:

- Similar chemical profiles exist for the wastewater with the PCD and Quarry 3 showing signs of evaporations not evident in Penge Shaft.
- The water is circum-neutral and extremely hard with raised EC/TDS.
- Raised salinity is largely attributed by Cl, SO_4 and Na and to lesser extents by Ca and Mg.
- Except for Mn in Penge Shaft, all trace metals recorded in low to undetected levels.
- EC/TDS, Cl, Na, SO_4 and Mn (only for Penge Shaft) exceed SANS drinking water standards (evaluation according to domestic standards is used for reference purposes only).

5.2.9.6 Groundwater Quality

During the hydrocensus (refer to sections 4.2 and 5.4 of the original report), samples were taken from boreholes and surface water and analysed for hydrochemical quality. The hydrochemical data is displayed in tables 25 (groundwater) and 26 (surface water), while interpretation based on hydrogeochemical Stiff diagrams and a Piper diagram can be viewed in figures 11 and 12, respectively. A map showing spatial TDS data as analysed in 2020 for the hydrocensus localities, is shown in Figure 13 below.

Based on the data in tables 25 and 26, the following:

- The pH levels of groundwater from the boreholes and Penge Shaft are circum-neutral ranging between 7.10 and 7.30.
- EC and TDS are raised in groundwater from Penge Shaft as well as in boreholes ANW02, ANBH Mine and ANBH Mine 2.
- Groundwater range from hard to very hard between 294 and 1275 mg/l with an average of 632 mg/l. Scaling of hot water appliances may expected at these concentrations.
- Nitrate (NO_3), total ammonia (NH_3) and phosphate (PO_4) in ground- and surface water remain low to undetected.
- Trace metals recorded in low to very low concentrations except for Mn in Penge Shaft, which recorded a concentration of 1.25 mg/l.
- Penge Shaft, ANW02, ANBH Mine, ANBH Mine 2 and Quarry 3 display similar water quality profiles.

Based on the hydrogeochemical diagrams in figures 11, 12 and 13, the following:

- Four distinct groundwater types can be distinguished, Na(Mg)-Cl(SO_4), Na-Cl, Na-HCO_3 and Mg(Ca)-HCO_3.
- *Penge Shaft, ANW02, ANBH Mine, ANBH Mine 2 and Quarry 3* display Na(Mg)-Cl(SO_4) water types and plot in the top half of the diamond shaped quadrant. This profile is typical of mine impacted water that has undergone significant ion exchange, especially with SO_4, Cl, Na and Mg ions.
- One sample, Segorong Quarry 1 (*SW01*) display a Na-Cl(HCO_3) type, representing a Na(Mg)-Cl(SO_4) water that has mixed with water rich in Na or that has an evaporative signature.
- Quarry 7 (*SW02*) plot in the bottom left quadrant which is typical of fresh water that has undergone Na ion exchange.
- The remaining samples are Mg-HCO_3 types representing fresh, clean, relatively young water that has started to undergo Mg ion exchange.
- The spatial TDS map shows higher TDS levels for the boreholes ANW02, ANBH Mine and ANBH Mine 2, as well as for water from Penge Shaft and water contained in Quarry 3 (*SW03*).

Table 25: Groundwater quality results

Locality / Guideline Parameter	Unit	Domestic use SANS 241(1)[a]	ANBH Penge	ANW02	ANBH Mine	ANBH Mine 2	ANBH Chief	ANBH Mine 3	HBH01	HBH02
pH	-	5 - 9.7	7.10	7.10	7.10	7.10	7.30	7.00	7.10	7.30
EC	mS/m	≤170	246	369	164	319	87	62	105	84
TDS	mg/l	1200	1569	2479	1074	2184	481	317	622	445
Calcium (Ca)	mg/l	-	151	225	132	205	54	42	74	43
Magnesium (Mg)	mg/l	-	134	173	51	143	45	33	43	46
Sodium (Na)	mg/l	200	196	359	171	328	60	30	90	70
Potassium (K)	mg/l	-	46.3	11.9	6.6	13.7	5.6	2.5	4.3	2.3
Total alkalinity (MALK)	mg/l	-	363	421	208	361	365	238	417	380
Chloride (Cl)	mg/l	300	385	631	266	554	67	43	71	42
Sulphate (SO_4)	mg/l	500	437	819	322	718	17.3	25	21	11.0
Nitrate as N (NO_3-N)	mg/l	11	<0.35	1.43	<0.35	0.640	2.72	<0.35	15.6	0.67
Total ammonia (NH_3-N + NH_4-N)	mg/l	1.5	<0.45	<0.45	<0.45	<0.45	0.88	<0.45	<0.45	<0.45
Ortho-phosphate (PO_4)	mg/l	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Fluoride (F)	mg/l	1.5	0.16	0.44	0.55	0.55	0.10	0.12	0.17	0.22
Aluminium (Al)	mg/l	0.3	0.070	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron (Fe)	mg/l	2	<0.01	<0.01	0.040	<0.01	<0.01	0.010	<0.01	0.010
Manganese (Mn)	mg/l	0.5	1.25	0.050	0.070	0.13	0.16	0.040	<0.01	<0.01
Chromium (Cr)		0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper (Cu)		2.0	<0.01	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Nickel (Ni)		0.070	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)		5.0	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01
Total Hardness	mg/l	-	929	1275	539	1103	319	238	361	294
[a] SANS 241: 2011										

Table 26: Surface water quality results

Locality / Guideline Parameter	Unit	Domestic use SANS 241(1)[a]	ANW01 (Fountain)	SW01 (Segorong Quarry 1)	SW02 (Quarry 7)	SW03 (Quarry 3)	SW04 (Segorong Quarry)
pH	-	5 - 9.7	6.46	8.33	7.71	7.91	8.34
EC	mS/m	≤170	4.8	71.7	58.8	239	81.4
TDS	mg/l	1200	25	384	316	1601	476
Calcium (Ca)	mg/l	-	3.6	10.9	21	136	29
Magnesium (Mg)	mg/l	-	1.82	13.7	23	151	37
Sodium (Na)	mg/l	200	2.85	117	72	216	99
Potassium (K)	mg/l	-	0.71	1.09	5.59	8.94	3.35
Total alkalinity (MALK)	mg/l	-	13.6	125	277	234	331
Chloride (Cl)	mg/l	300	5.70	92	24	436	45
Sulphate (SO_4)	mg/l	500	2.05	74	5	513	63
Nitrate as N (NO_3-N)	mg/l	11	<0.35	<0.35	<0.35	<0.35	<0.35
Total ammonia (NH_3-N + NH_4-N)	mg/l	1.5	<0.45	<0.45	<0.45	<0.45	<0.45
Ortho-phosphate (PO_4)	mg/l	-	<0.03	<0.03	<0.03	<0.03	<0.03
Fluoride (F)	mg/l	1.5	0.11	0.90	0.82	0.49	0.53
Aluminium (Al)	mg/l	0.3	0.030	0.090	<0.01	<0.01	<0.01
Iron (Fe)	mg/l	2	0.040	0.039	<0.01	<0.01	0.010
Manganese (Mn)	mg/l	0.5	0.010	<0.01	<0.01	0.040	<0.01
Chromium (Cr)		0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Copper (Cu)		2.0	<0.01	<0.01	0.01	<0.01	<0.01
Nickel (Ni)		0.070	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc (Zn)		5.0	<0.01	<0.01	<0.01	<0.01	<0.01
Total Hardness	mg/l	-	16.4	84	148	961	226
[a] SANS 241: 2011							

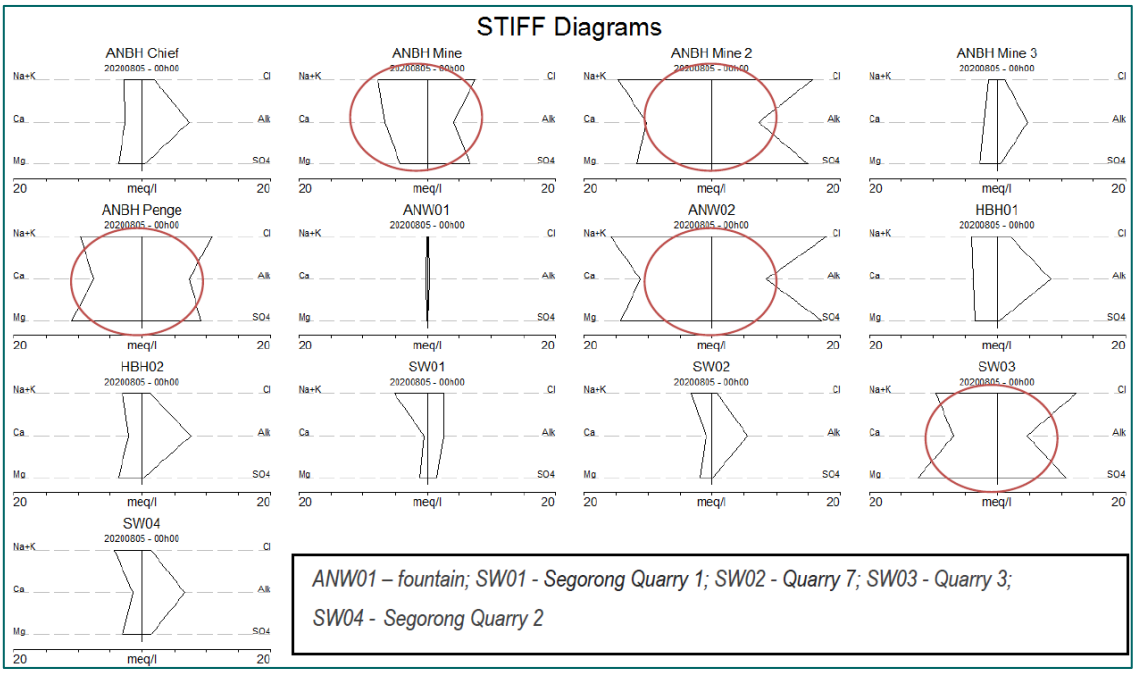


Figure 11: Stiff Diagrams based on meq/l

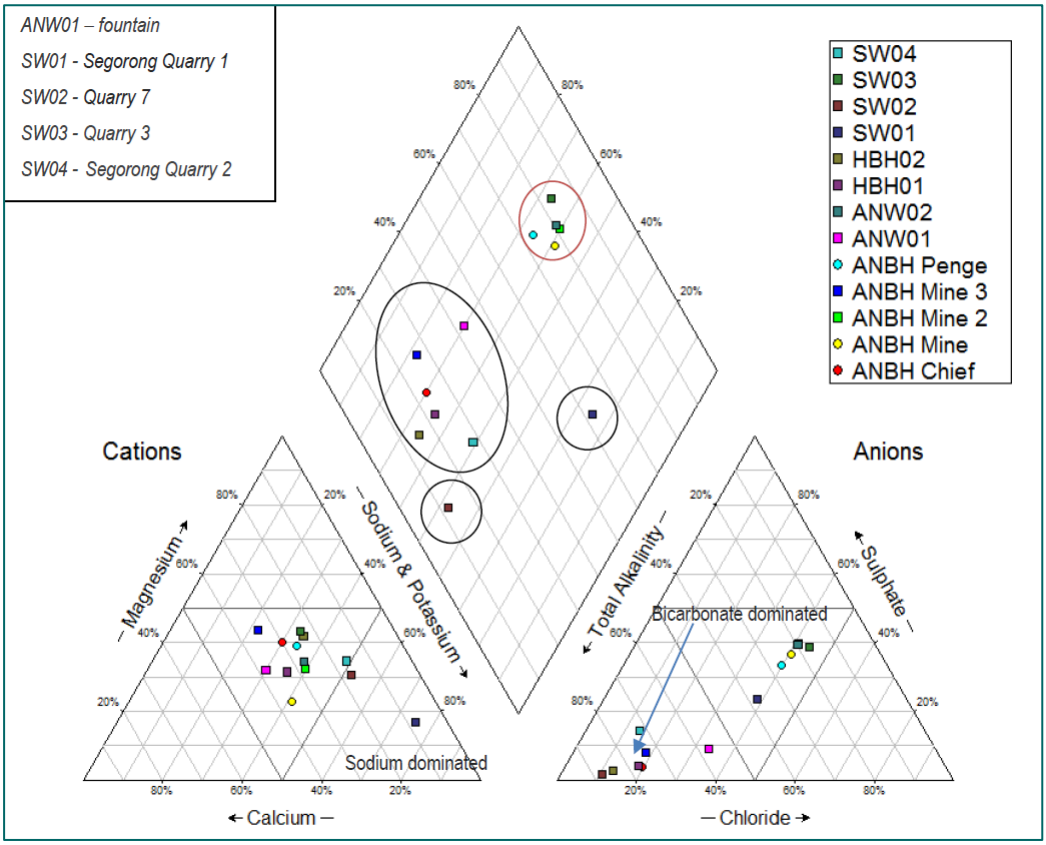


Figure 12: Piper diagram based on relative meq/l

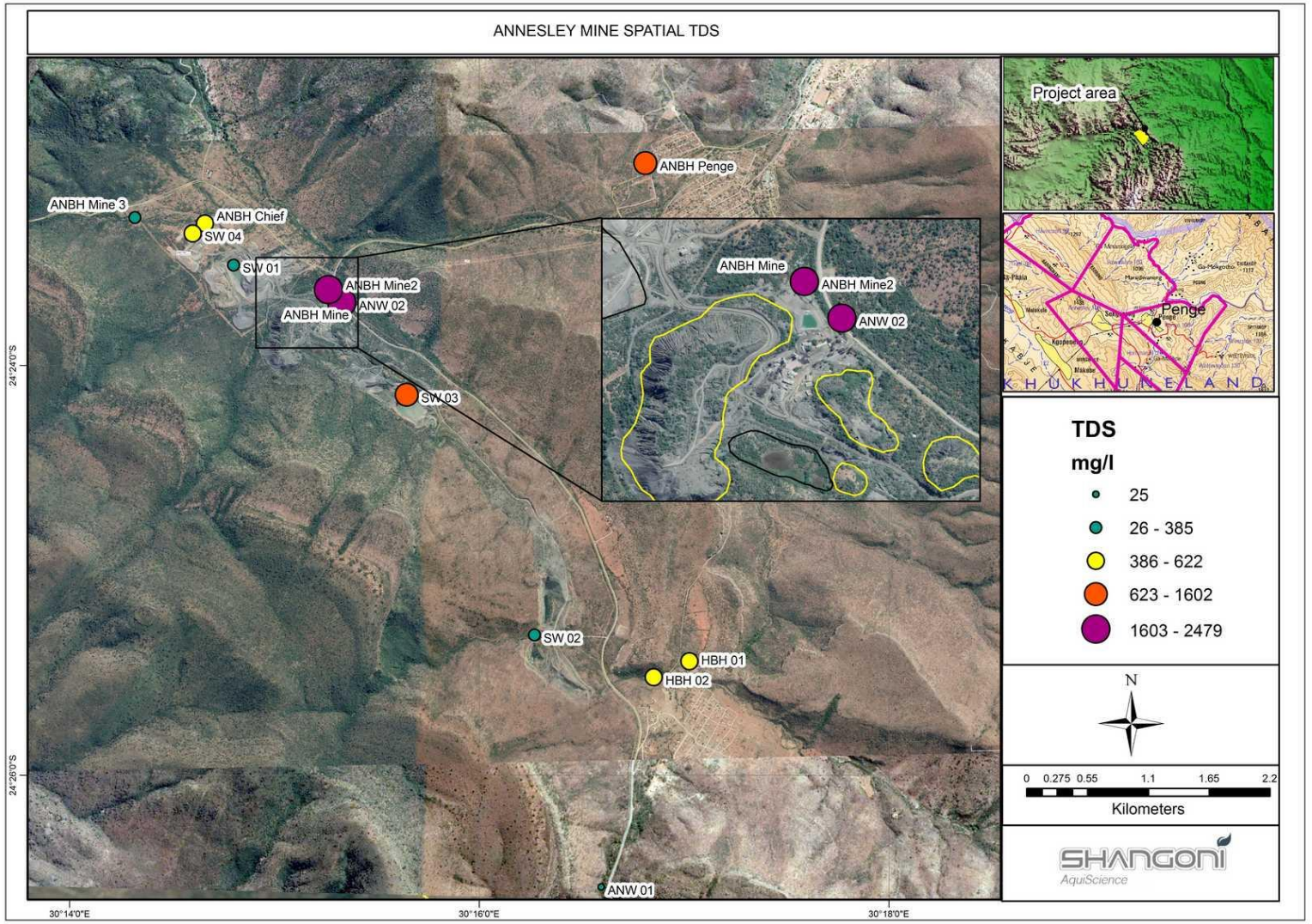


Figure 13: Spatial TDS (Shangoni AquiScience, 2020)

5.2.9.7 Aquifer Characterization

5.2.9.7.1 Aquifer vulnerability

Table 27 summarizes the rating and weighting values and the final score for the vulnerability of the aquifer in vicinity of Annesley Mine. The final DRASTIC score of 101 indicates that the aquifer/s in the region has a medium susceptibility to pollution. It must be noted that the values are based on averages. Because of this together with the typical heterogeneity of fractured rock aquifers, the vulnerability should therefore be viewed as a worst-case scenario. Refer to the *Aquifer Protection Classification* in Section 6.3 of the original report for the *Groundwater Quality Management Index* and aquifer protection required.

Table 27: DRASTIC vulnerability scores

Factor	Range/Type	Weight	Rating	Total
D	15 - 30 m	5	3	25
R	10 - 50 mm	4	6	24
A	Fractured	3	6	18
S	Loamy sand	2	7	14
T	0-2%	1	10	10
I	Pretoria	5	4	20
C	-	3	-	-
DRASTIC SCORE = 101				

5.2.9.7.2 Aquifer classification

The Department of Water and Sanitation ("DWS) has characterised South African aquifers based on the rock formations in which they occur together with its capacity to transmit water to boreholes drilled into specific formations. The water bearing properties of rock formations in South Africa can be classified into four classes defined as:

1. **Class a - Intergranular**
    - Aquifers associated either with loose and unconsolidated formations such as sands and gravels or with rock that has weathered to only partially consolidated material.
2. **Class b - Fractured**
    - Aquifers associated with hard and compact rock formations in which fractures, fissures and/or joints occur that are capable of both storing and transmitting water in useful quantities.
3. **Class c - Karst**
    - Aquifers associated with carbonate rocks such as limestone and dolomite in which groundwater is predominantly stored in and transmitted through cavities that can develop in these rocks.
4. **Class d - Intergranular and fractured**
    - Aquifers that represent a combination of Class a and b aquifer types. This is a common characteristic of South African aquifers. Substantial quantities of water are stored in

the intergranular voids of weathered rock but can only be tapped via fractures penetrated by boreholes drilled into the fractured aquifer.

The classes are further subdivided into groups relating to the capacity of an aquifer to transmit water to boreholes, typically measured in l/s. The groups therefore represent various ranges of borehole yields. The current operations at Annesley are in a **d3 aquifer class** region (Figure 14) with the geology listed as mostly undifferentiated rocks of mixed lithologies (shale with hornfels and carbonate layers in places) and pyroclastic rock such as tuff and agglomerate.

The groundwater yield potential is classed as moderate on the basis that most of the boreholes on record for the study area produce between 0.5 and 2.0 l/s. Groundwater should be targeted in vicinity of dolerite dykes or within fault areas where groundwater is held in good water yielding fractures.

The general groundwater occurrences for the Annesley area occur in joints and fractures in competent arenaceous rocks related to tensional or compressional stresses and off-loading, and good yields can be expected in vicinity of dolerite dykes and/ or faults. The hydrogeology of the region is defined as secondary fractured meta-sedimentary with the main sources of groundwater found in fractures, bedding planes, joints and faults and sometimes limited to weathered material. The aquifer formed is as a result of fracturing in sedimentary rocks caused by intrusions and / or metamorphosis to various degrees of the host rock/s (Figure 15).

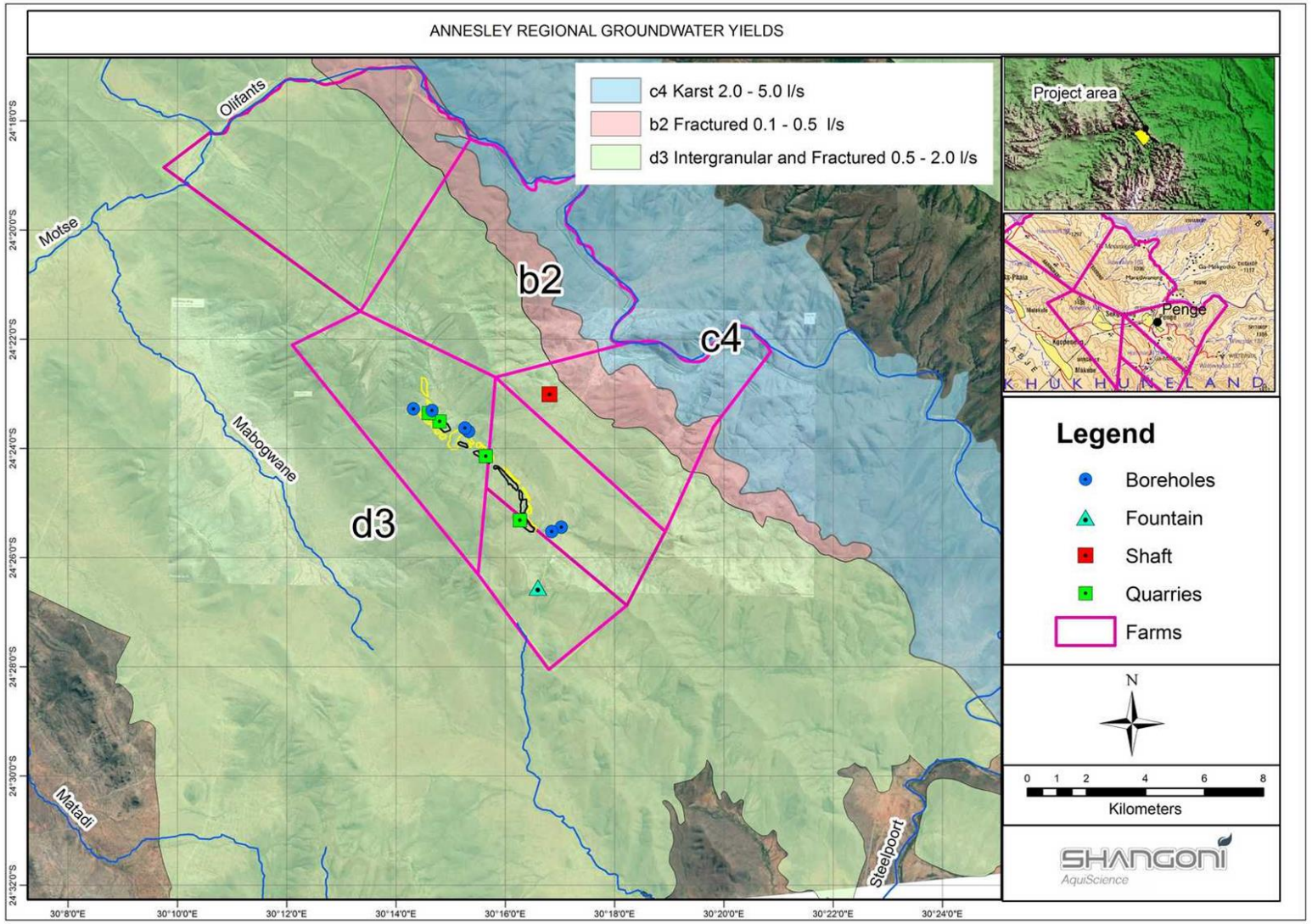
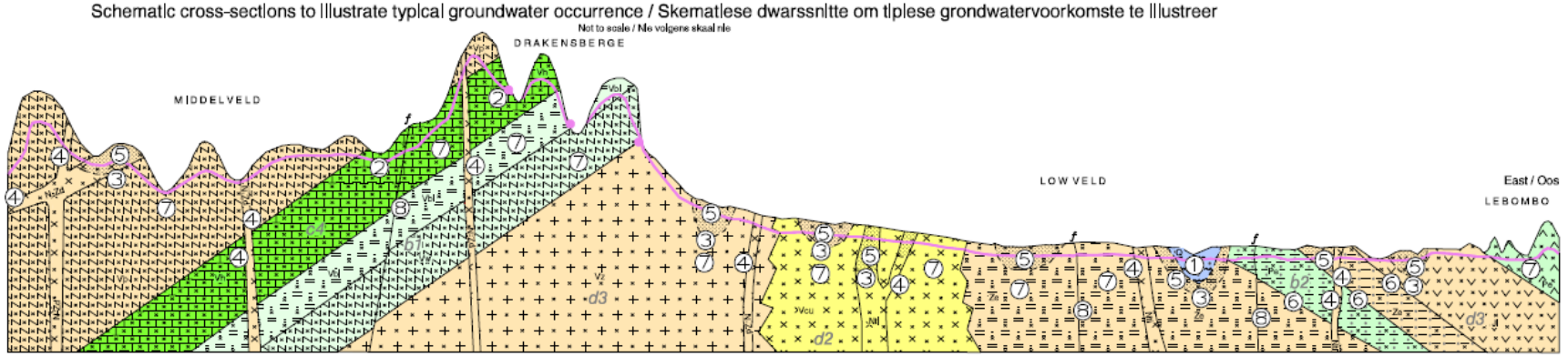


Figure 14: Typical groundwater occurrences in the study area (Shangoni AquiScience, 2020)



Typical groundwater occurrence	
1	Saturated unconsolidated alluvial deposits mainly occurring along river systems
2	Solution channels and fractures occurring in the carbonate rocks of the Chuniespoort dolomites
3	Fractured transitional zone between weathered and un-weathered bedrock
4	Fractures along the contact zone related to heating and cooling of host rock caused by the intrusion of dykes and sills
5	Basins of weathering occurring mostly in the crystalline rocks
6	Along sedimentary or sedimentary / igneous rock contacts
7	Fractures related to tensional or compressional stresses and / or off-loading
8	Faults or shear zones

Figure 15: Schematic cross section illustrating the typical groundwater occurrences for the study region (Shangoni AquiScience, 2020)

5.2.9.7.3 Aquifer protection classification

In order to achieve the Groundwater Quality Management Index a point scoring system as presented in tables 28 – 14 were used.

Table 28: Ratings for the Aquifer System Management and Second Variable Classifications

Aquifer System Management Classification		
Class	Points	Study Area
Sole Source Aquifer System	6	
Major Aquifer System	4	
Minor Aquifer System	2	2
Non-Aquifer System	0	
Special Aquifer System	0-6	
Second Variable Classification (fractured)		
High	3	
Medium	2	2
Low	1	

Table 29: Ratings for the Groundwater Quality Management (GQM) Classification System

Aquifer System Management Classification		
Class	Points	Study Area
Sole Source Aquifer System	6	
Major Aquifer System	4	
Minor Aquifer System	2	2
Non-Aquifer System	0	
Special Aquifer System	0-6	
Second Variable Classification		
High	3	
Medium	2	2
Low	1	

The occurring aquifer, in terms of the above definitions, is classified as a minor aquifer system. The vulnerability, or the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer is classified as medium. The level of groundwater protection based on the Groundwater Quality Management Classification is shown in Table 30:

Table 30: GQM index for the study area

GQM Index	Level of Protection	Study Area
<1	Limited	
1-3	Low level	
3-6	Medium level	4
6-10	High level	
>10	Strictly non-degradation	

The ratings for the Aquifer System Management Classification and Aquifer Vulnerability Classification yield a GQM index of 4 for the study area, indicating that medium level groundwater protection is required to adhere to water quality objectives set by DWS. Reasonable and sound groundwater protection measures are recommended to ensure that no cumulative pollution affects the aquifer, during short- and long-term. DWS's water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that if any potential risk exists, measures must be taken to limit the risk to the environment, which in this case is the protection of the underlying aquifer.

5.2.10 Air quality

Information for this section was extracted from the 'Draft final air quality management plan' (LWI, 2008):

The main activity in the Burgersfort, Steelpoort and Orighstad areas is the mining of chrome and platinum. There are also three chrome smelters in the area. Therefore, the area is likely to have air pollutants such as sulphur dioxide, nitrous oxides, chromium (VI) and particulate matter. Heavy traffic also occurs in the area due to the transportation of minerals which introduces a lot of pollution from the vehicles. Other pollutants such as pesticides can also emanate from the farms around Orighstad, the extent of which has not yet been determined.

The mine itself is situated in a rural area. There are no direct activities within the area surrounding the mine that would cause significant air pollution.

5.2.11 Environmental noise

Information for this section was extracted from the 'Approved EMP (nd, nd):

No baseline values were determined as the area is classified as rural and the statutory requirement for such areas is known to be 45dB. The only source of noise beyond the boundaries of the mine is expected to be low volume traffic noise from public roads.

5.2.12 Visual aspects

There is no specialist study done for visual aspects. Based on observations made during site visits Annesley Mine Operation is only visible from the Penge access road, adjacent to the mine.

5.2.13 Cultural and heritage resources

Information for this section was extracted from the Approved EMP (Shangoni Management Services, 2006), and the EMP PAR (BECS Environmental, 2015):

Malepe Tribal Authority grave sites are situated in the proposed mining area. According to the Cultural Resources Survey done by the National Cultural History Museum in August 2001 there are a total of 353 graves. These graves are not yet removed.

Some tools dating to the Early and Middle Stone Age were found within the boundaries of Segorong village but are of low archaeological significance.

No archaeological site dating to the Iron Age was identified in the area of the mining area.

5.2.14 Sensitive landscapes

The mine is located in an area described as Critical Biodiversity Area 1 as per the Limpopo Conservation Plan, however the mine itself is described as an Ecological Support Area as per the Limpopo Conservation Plan (SANBIGIS). The mine area falls within the Sekhukune Norite Bushveld vegetation unit which is an Endangered ecosystem as per NEMBA. The mine falls within a 'High biodiversity importance - high risk to mining' according to the Mining and Biodiversity Guidelines. Refer to Figure 4 (above) and figures 16, 17 and 18 below for the sensitive landscapes.

The mine already consists of disturbed areas and the proposed expansion of quarry 3 will take place in an already disturbed area.

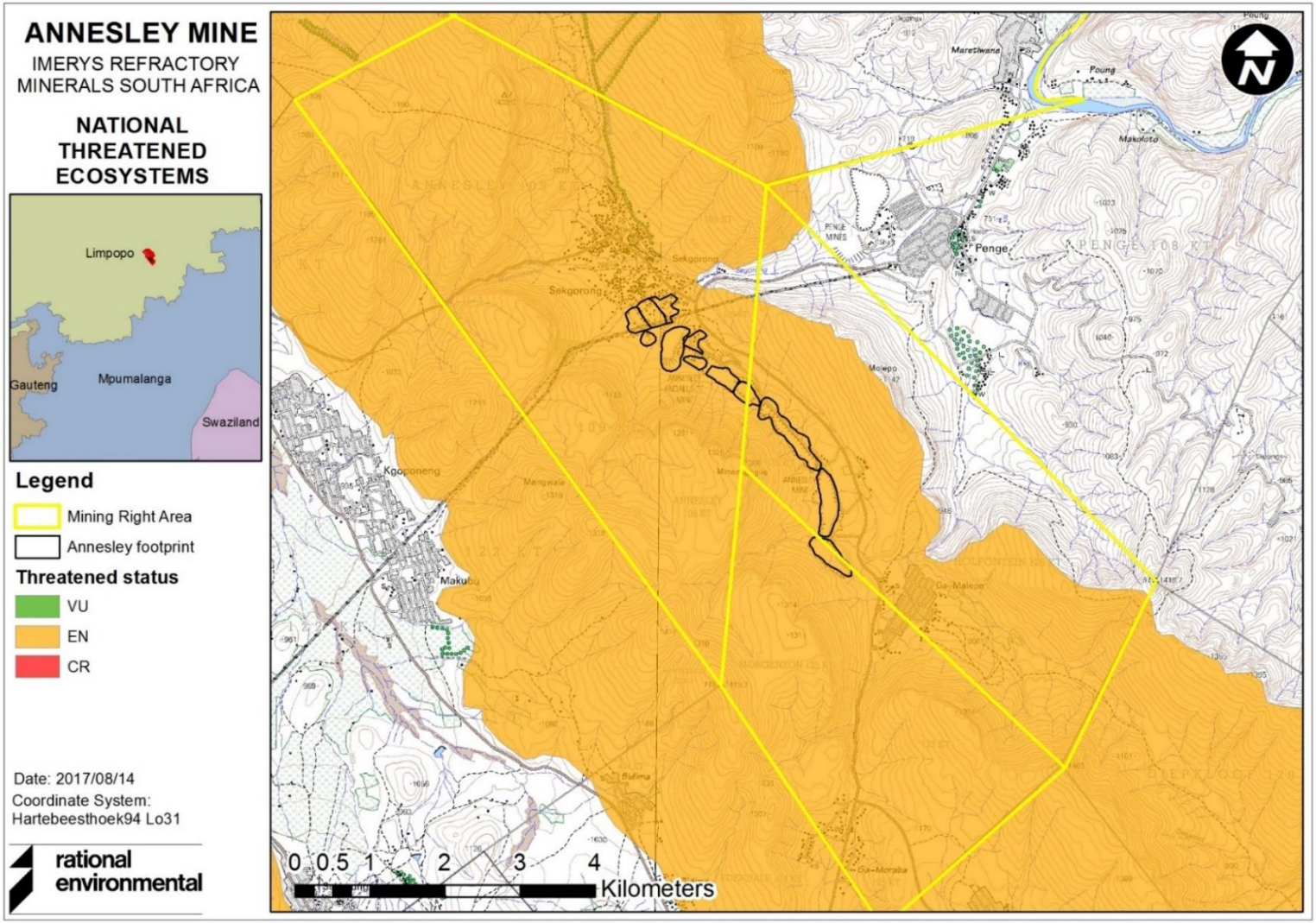


Figure 16: Layout plan which includes the national list of threatened ecosystems (Rational Environmental, 2017)

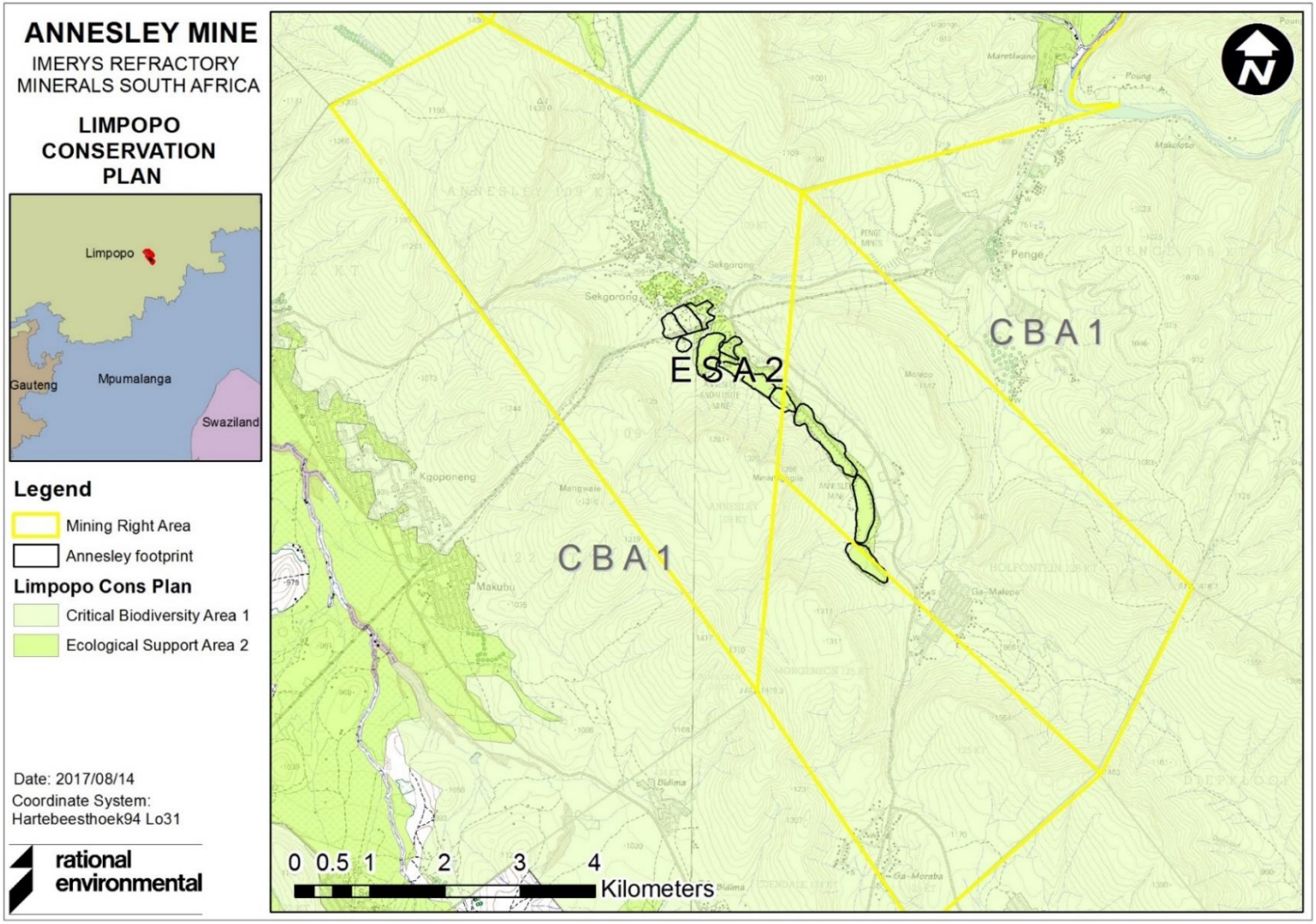


Figure 17: Layout plan indicating the Limpopo Critical Biodiversity Areas (Rational Environmental, 2017)

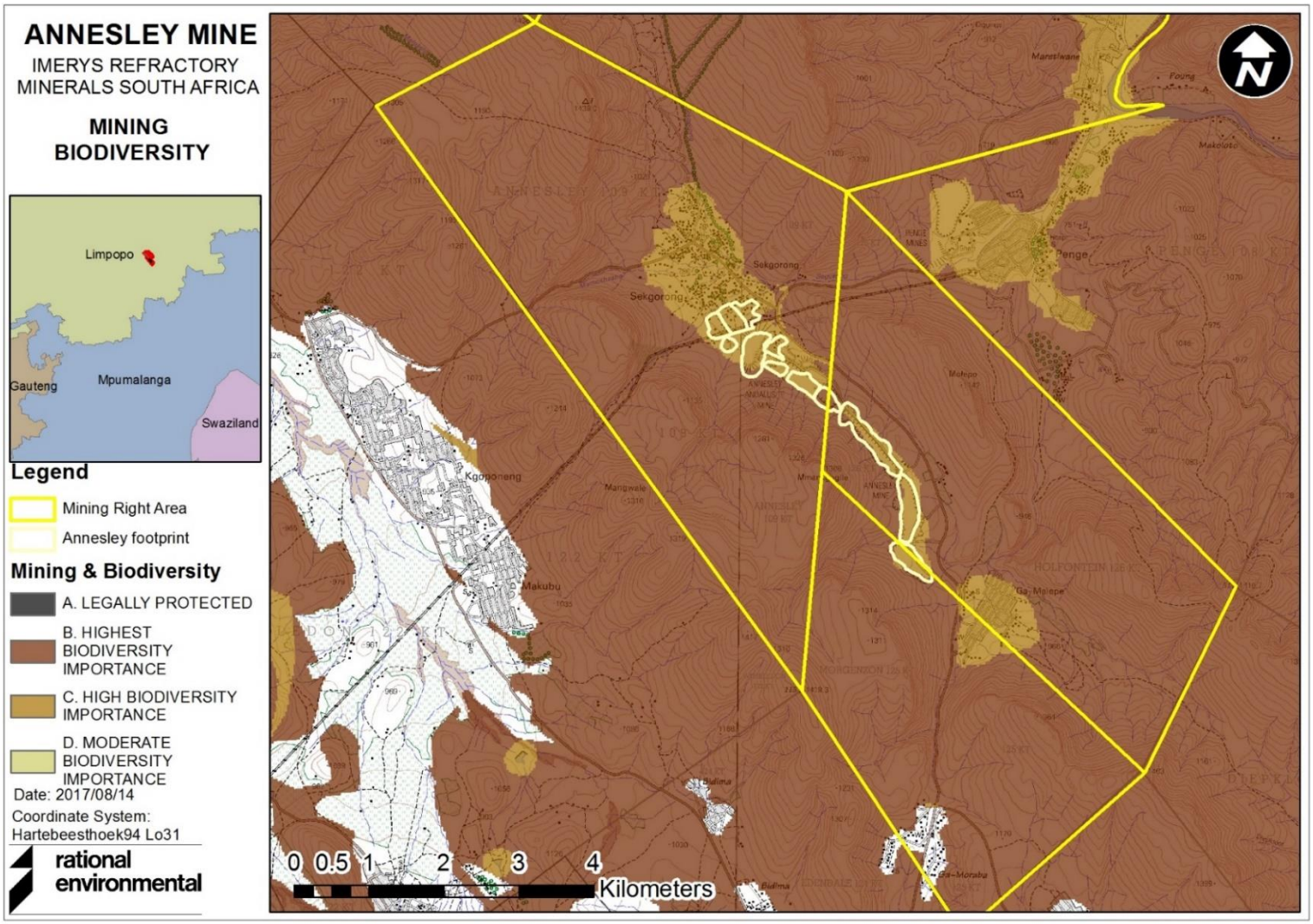


Figure 18: Layout plan indicating the Mining Biodiversity areas (Rational Environmental, 2017)

5.2.15 Regional socio-economic aspects

Information for this section was extracted from the IWWMP (Shangoni Management Services, 2012):

The mining site is situated within the SDM and GTLM. The statistics indicated in the table below was generated by the Demarcation Board and was valid as of March 2000.

Table 31: Socio-economic statistics for the area

Statistic	Number	Statistic	Number
No. of Households	1,410	**Age breakdown**	
Population		0-4	1,085
African	7,625	5-19	3,531
Coloured	12	20-29	1,155
Indian	0	30-49	1,143
White	12	50-64	426
Unspecified	33	Over 65	294
Gender		Age Unknown	55
Male	3,434		
Female	4,246		
Annual individual income		**Annual household income**	
None	6,740	None	472
R1 – 2,400	86	R1 – 2,400	163
R2,401 – 6,000	366	R2,401 – 6,000	313
R6,001 – 12,000	121	R6,001 – 12,000	182
R12,001 – 18,000	91	R12,001 – 18,000	96
R18,001 – 30,000	62	R18,001 – 30,000	54
R30,001 – 42,000	67	R30,001 – 42,000	39
R42,001 – 54,000	49	R42,001 – 54,000	28
R54,001 – 72,000	20	R54,001 – 72,000	22
R72,001 – 96,000	3	R72,001 – 96,000	16
R96,001 – 132,000	3	R96,001 – 132,000	5
R132,001 – 192,000	3	R132,001 – 192,000	4
R192,001 – 360,000	1	R192,001 – 360,000	3
Over R360,000	0	Over R360,000	0
Unspecified	70	Unspecified	13

5.2.15.1 Major economic activities and sources of employment

- Annesley Andalusite Mine;
- Local shops;
- Schools and
- Farmers in the Burgersfort/Steelpoort areas.

5.2.15.2 Unemployment estimate for the region

Statistics are misleading as rural communities don't always understand the difference between self-employed, employed, unemployed and pensioner. It is estimated that only about 11% of the residents are formally employed.

5.2.15.3 Housing demand, and availability

The mine is in the Malepe Tribal Area and land allocation is informal. The land is administrated as communal land where small plots are allocated on a "Permission to Occupy" (PTO) basis. A number of formal townships have been established in the region, or is in the construction phase, and stands are readily available.

5.2.15.4 Social infrastructure - schools, hospitals, sporting and recreating facilities, shops, police, civil administration

- Churches at Segorong: 4 churches namely; Baptist Church, Segorong RCC, Apostolic Church, St Engenas ZCC.
- Schools in Segorong: Segorong Primary School: (260 pupils, 8 teachers) and Madikoloshe Secondary School (126 pupils, 9 teachers);
- Businesses in Segorong: Magana Gokatwa (bottle store, not in use), Hygienic Butchery (not in use), Matikwene Eating house (active), Majestic Café, Super Saving Store (active);
- Health Services: Hospital at Penge;
- Recreation Facilities: None;
- Police: Burgersfort;
- Civil Administration: The authority in the area is the Malepe Tribal Authority and is in the jurisdiction of the SDM. The Administrative Centre is at Praktiseer, some 24km to the south.

5.2.15.5 Bulk services

- Process water to the mine is pumped from the old mine at Penge;
- Bulk water supply to Segorong Village is from a tank fed by a fountain;
- There is no internal water reticulation in Segorong. The community collects the water at the storage tank and carries it to their houses;
- No waste removal services exist;
- Existing sewerage varies from ordinary pit latrines with makeshift structure to no sewerage at all;
- The high voltage power line to Penge passes through the property and a low voltage line from the Penge substation supplies electricity to the mine;
- There is no electricity in Segorong Village.
- Key Economic Activities

There are no Gross Geographic Product (GGP) estimates available for SDM, in which the Annesley Andalusite Mine – Segorong Project resides, since the demarcation was done in December 2000. The closest proxy is to consider sectoral employment. However, there is not a strict correlation between employment and GGP, because a sector such as agriculture has a considerably higher employment co-efficient than a sector such as mining, which is more capital intensive. Sectoral employment figures for SDM are reflected below, because these are the best available at present.

Table 32: Socio-Economic statistics for the area

Sector	Employment number
Agriculture, hunting; forestry and fishing	11357
Mining and quarrying	5618
Manufacturing	3315
Electricity; gas and water supply	707
Construction	3299
Wholesale and retail trade	9180
Transport; storage and communication	2668
Financial, insurance, real estate and business services	2736
Community, social and personal services	17250
Other and not adequately defined	6
Private Households	7642
Undetermined	6844
Total	70622

Community services, which are mostly government, is the largest employer by far, accounting for 25% of employment. It is probably also the largest contributor to GGP. It is evident that government is far more dominant in the Limpopo portion of SDM than in Mpumalanga.

The second biggest employer is agriculture and hunting, with 16% of total employment. In this case, Mpumalanga is the dominant contributor. Trading activities are in third place (13%) and this time the relative contributions from Limpopo and Mpumalanga are more balance, but with Limpopo ahead. This is a reflection of the larger number of people living in the Limpopo part of SDM.

Private household activities are in fourth place at 11%. This time Mpumalanga is well ahead, reflecting the domestic work opportunities that are available at Groblersdal, Marble Hall and Burgersfort. Mining is only the fifth largest employer, but probably the largest or second largest contributor to GGP. Limpopo, with its platinum mines in Tubatse and Fetakgomo, is the dominant area.

All the other sectors, including manufacturing and construction, are relatively small, accounting for less than five percent of total employment each. In-migration is likely to be less than 3000 of the total employment of almost 71,000, which is less than 5%. However, in addition to the total number of locally

employed persons, there are probably at least 42,000 men who have families in SDM, but who work elsewhere.

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5.3 Impact assessment, and management measures

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

Impact assessment

The methodology used to assess the significance of an impact is based on the requirements as set out in EIA Regulations, (GN 982) of 2014 i.t.o. the NEMA as well as the Proposed National Guideline on Minimum Information Requirements for Preparing EIA for Activities that Require EA, of 2018, GN 86 in terms of NEMA. The impact significance methodology described below also complies to Appendix B of the Operational Guideline to Integrated Water and Waste Management of 2010 in terms of the NWA. In the event of any Section 21c&i water uses in terms of the NWA being assessed, Appendix A of the General Authorisations of 2016, GN 509 in terms of the NWA will be used to construct a risk matrix. Regulation 3(b) of the General Authorisations of 2016, GN 509 in terms of the NWA states that a suitably qualified SACNASP professional member must determine risks associated with this risk matrix.

Impact identification and prediction means forecasting the change of environmental parameters due to developmental patterns. These parameters may also be changing due to climate change and should be included.

Method of assessment: Impact identification and prediction is a stepwise procedure to identify the direct, indirect and cumulative impacts (relating to both positive and negative impacts) for which a proposed activity and its alternatives will have on the environment as well as the community. This should be undertaken by determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity aspects of sites and locations as well as the risk of impact of the proposed activity. Refer to part A(h)(iv) for a complete description of these environmental attributes. Sources of data to be used for gathering data on the environmental attributes as well as the impacts include; monitoring / sampling data collected and stored, assumptions and actual measurements, published data available from the departments or other stakeholders in the area as well as specialist studies. Likely impacts should be described qualitatively and then studied separately in detail. This provides consistent and systematic basis for the comparison and application of judgements.

Significance rating: Ratings should then be assigned to each criterion. Significance of impacts should be determined for each phase of the project lifecycle this includes; preconstruction, construction, operational, closure (including decommissioning) and post closure phases. The significance of impacts should further be assessed both with and without mitigation action. The description of significance is largely judgemental, subjective and variable. However, generic criteria can be used systematically to identify, predict, evaluate and determine the significance of impacts resulting from project construction, operation and decommissioning. The process of determining impact magnitude and significance should never become mechanistic. Impact magnitude is determined by empirical prediction, while impact significance should ideally involve a process of determining the acceptability of a predicted impact to

society. Making the process of determining the significance of impacts more explicit, open to comment and public input would be an improvement of environmental assessment practice. Impact magnitude and significance should as far as possible be determined by reference to either legal requirements (accepted scientific standards) or social acceptability. If no legislation or scientific standards are available, the EAP can evaluate impact magnitude based on clearly described criteria. A matrix selection process is the most common methodology used in determining and ranking the site sensitivities:

- The consequence: includes the nature / intensity / severity of the impact, spatial extent of the impact, and duration of the impact.
    - The nature / intensity / severity of the impact: An evaluation of the effect of the impact related to the proposed development on the receiving environment. The impact can be either positive or negative. A description should be provided as to whether the intensity of the impact is high, medium or low or has no impact in terms of its potential for causing negative or positive effects. Cognisance should be given to climate change which may intensify impacts.
    - The spatial extent of the impact: Indication of the zone of influence of the impact: A description should be provided as to whether impacts are either limited in extent or affect a wide area or group of people. Cumulative impacts must also be considered as the extent of the impact as may increase over time.
    - The duration of the impact: It should be determined whether the duration of an impact will be short-term, medium term, long term or permanent. Cumulative impacts must also be considered as the duration of the impact as it may increase over time.
- The likelihood: includes the probability of the potential occurrence of the impact, and frequency of the potential occurrence of the impact
    - The probability of the impact: The probability is the quality or condition of being probable or likely. The probability must include the degree to which these impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, managed or mitigated
    - The frequency of the potential occurrence of the impact.
- The significance: This is worst case scenario without any management measures. See below how significance is determined: Impact that may have a notable effect on one or more aspects of the environment or may result in noncompliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence. Mitigation measures should be provided with evidence or motivation of its effectiveness

Example of significance rating:

Prior to mitigation

Intensity and magnitude	1 Natural processes or functions are not affected and will adequately return to its natural state. The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated.	2 Natural processes or functions are affected, and natural processes or functions will continue in a modified manner. The impact will be reversed to some degree with correct management, and can be somewhat avoided, managed, or mitigated	3 Natural processes or functions are to the extent where it temporarily or permanently ceases. The impact cannot be reversed even with correct management, and cannot be avoided, managed, or mitigated
Resource replaceability	1 Loss of resource can be completely replaced.	2 Loss of resource can somewhat be replaced.	3 Resources will be completely lost.
Duration	1 The impact will be short-lived.	2 The impact will last for the entire operational life of the activity but will be mitigated thereafter.	3 The impact will not cease after the operational life of the activity ceases but will be permanent.
Extent or spatial scale	1 The impact will be site specific.	2 The impact will affect the local area.	3 The impact will affect an area larger than just the local area.
Probability	1 It is unlikely that the impact will occur.	2 There is a probability for the impact to occur.	3 The impact will definitely occur.
Significance	None or low If the sum of the above ranking is equal or more than 5 and 7, and no ranking equals 3.	Medium If the sum of the above ranking is equal or more than 8 to 11.	High If the sum of the above ranking is 12 or more.

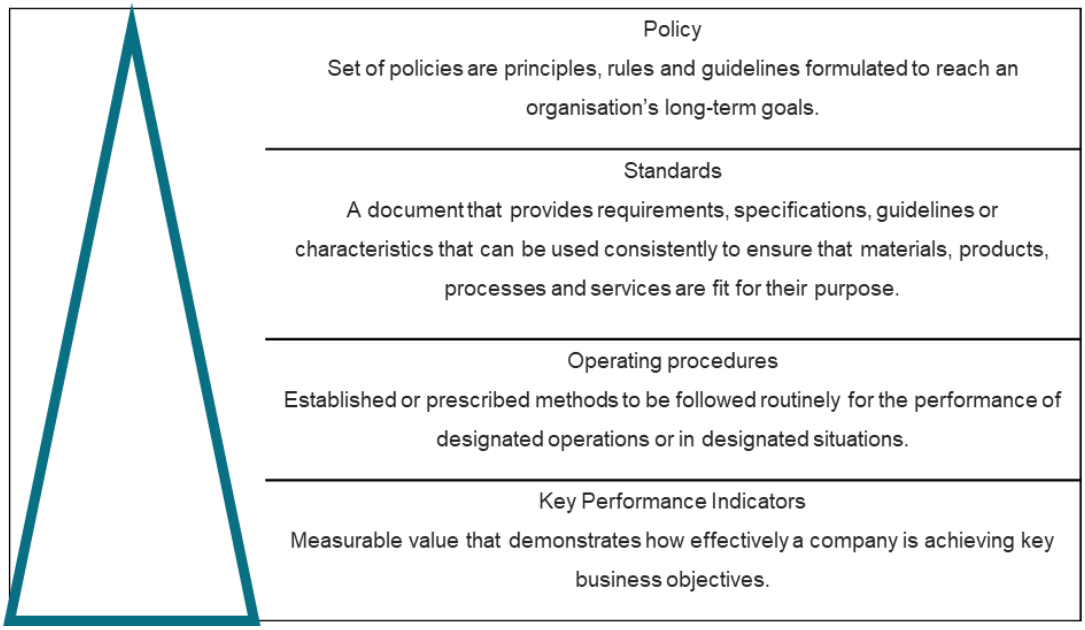
Post to mitigation

Intensity and magnitude	1 Natural processes or functions are not affected and will adequately return to its natural state. The impact will be completely reversed with correct management, and can be completely avoided, managed, or mitigated.	2 Natural processes or functions are affected, and natural processes or functions will continue in a modified manner. The impact will be reversed to some degree with correct management, and can be somewhat avoided, managed, or mitigated	3 Natural processes or functions are to the extent where it temporarily or permanently ceases. The impact cannot be reversed even with correct management, and cannot be avoided, managed, or mitigated
Resource replaceability	1 Loss of resource can be completely replaced.	2 Loss of resource can somewhat be replaced.	3 Resources will be completely lost.
Duration	1 The impact will be short-lived.	2 The impact will last for the entire operational life of the activity but will be mitigated thereafter.	3 The impact will not cease after the operational life of the activity ceases but will be permanent.
Extent or spatial scale	1 The impact will be site specific.	2 The impact will affect the local area.	3 The impact will affect an area larger than just the local area.
Probability	1 It is unlikely that the impact will occur.	2 It is likely for the impact to occur.	3 The impact will definitely occur.
Significance	None or low If the sum of the above ranking is equal or more than 5 and 7, and no ranking equals 3.	Medium If the sum of the above ranking is equal or more than 8 to 11.	High If the sum of the above ranking is 12 or more.

Mitigation and management

Management methodology is based on the requirements as set out in EIA Regulations, (GN 982) of 2014 i.t.o. the NEMA as well as the Proposed National Guideline on Minimum Information Requirements for Preparing EIA for Mining Activities that Require EA, of 2018, GN 86 in terms of NEMA; and the Mining and Biodiversity Guideline (Mainstreaming Biodiversity into the Mining Sector) IDB of 2013 in terms of the MPRDA.

Management statements detail the processes, procedures and practices required to achieve an impact management outcome. A hierarchy of management tools used can also be used as seen below.



Mitigation should include measures in the following order of priority. The aim is to prevent adverse impacts from happening or, where this is unavoidable, to limit their significance to an acceptable level.

Avoiding or preventing impacts

If the biodiversity (an ecosystem, habitat for threatened species, ecological corridor or area that provides essential ecosystem services) is of conservation value or importance, it is best to plan to avoid

or prevent impacts altogether by changing the location, siting, method or processes of the mining activities and related infrastructure.

Minimising impacts

Minimising impacts of mining is a mitigation measure that deals with the environment in general. In areas where the biodiversity is to be affected is of conservational value or importance, then every effort should be made to minimise those impacts that cannot be avoided or prevented. Mining companies should strive to minimise impacts on biodiversity to ensure environmental protection. Section 2 of NEMA contains environmental management principles that resonates with minimising the impact rather than stopping at mitigation, this is imperative in the mining sector.

Rehabilitating impacted areas

Rehabilitation is the measures that are undertaken to "as far as it is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which aligns to the generally accepted principle of sustainable development. A closure plan is an essential part of rehabilitation and must be developed based on the establishment of the closure objectives and criteria.

Biodiversity offsets

Biodiversity offsets are measurable conservation gains that help to balance any significant biodiversity losses that remain after actions to avoid, minimise and restore negative impacts have been taken. They are the last stage of mitigation and should be considered after appropriate avoidance, minimisation, and rehabilitation/restoration measures have been applied already.

When dealing with management, impact management outcomes must:

- be set for the expected activity-based impacts;
- describe the desired outcome of the management measure/s prescribed or the standard to be achieved (environmental objective);
- be clearly documented and identified per project phase as in the impact identification and significance rating process (this must be aligned to the mines closure objectives, and must therefore include predicted long-term result of the applied management measures);
- be measurable to determine compliance, which includes time frames and schedule for the implementation of the management measures; responsibilities for implementation and long-term maintenance of the management measures; financial provision for long-term maintenance; and monitoring programmes to be implemented;
- be informed by stakeholder expectations; and
- ensure legal compliance;

Finally, the impact assessment must refer to the residual and latent impact after successful implementation of the management measures.

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

This section includes the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which these impacts can be reversed; may cause irreplaceable loss of resources; and can be avoided, an assessment of each identified potentially significant impact and risk, including cumulative impacts, as well as how these impacts can be managed or mitigated and level of residual risk.

5.3.2.1 Geology and topography including drainage patterns and visual aspects

Activity, nature, and consequence of impact:

Partially sloping of mine residue over potentially economically viable minerals and change in topography due to sloping of the slimes dam, waste rock dumps and the pits.

Cumulative impacts:

Geology is also removed at the other quarries of the mine and activities across Annesley mine also impact the pits due to mining activities.

Assumptions, uncertainties, and gaps in knowledge:

Information for this risk was extracted from the Approved EMP (Shangoni Management Services, 2006).

Impact pre-mitigation:

	Partially sloping of mine residue over potentially economically viable minerals
Intensity and magnitude	1 The impact of the sloping mine residue will not alter the geology in the area, therefore, natural, social, cultural and environmental processes are not affected.
Resource replaceability	3 The impact is not reversible and the resource cannot be replaced.
Duration	3

	Partially sloping of mine residue over potentially economically viable minerals
	Once sloping is finished, this will remain as a permanent land pattern.
Extent or spatial scale	1 Impact occurs on-site at the point where the mine residue is sloping.
Probability	1 The mine has already removed all the economic viable material.
Significance	9 Medium

Impact post-mitigation:

	Partially sloping of mine residue over potentially economically viable minerals
Intensity and magnitude	1 The impact of the sloping mine residue will not alter the geology in the area, therefore, natural, social, cultural and environmental processes are not affected.
Resource replaceability	3 The impact is not reversible and the resource cannot be replaced.
Duration	3 Once sloping is finished, this will remain as a permanent land pattern.
Extent or spatial scale	1 Impact occurs on-site at the point where the mine residue is sloping.
Probability	1 The mine has already removed all the economic viable material.
Significance	9 Medium

Impact pre-mitigation:

	Topography including drainage patterns and visual aspects
Intensity and magnitude	2 The impact on the topography will be positive and medium to high. Topography is not a resource, however, other resources such as drainage patterns and visual aspects are affected.
Resource replaceability	2 The original topography cannot be replaced, however sloping will achieve a more natural appearance.
Duration	3 Once sloping is finished, this will remain as a permanent land pattern.
Extent or spatial scale	1 Impact occurs on-site at the point where the pits and mine residue will be sloped.
Probability	3 The impact will occur regardless of any prevention measures
Significance	11 Medium **(Positive)**

Impact post-mitigation:

	Topography including drainage patterns and visual aspects
Intensity and magnitude	3 The impact on the topography will be positive and medium to high. Topography is not a resource, however, other resources such as drainage patterns and visual aspects are affected.
Resource replaceability	2 The original topography cannot be replaced, however sloping will achieve a more natural appearance.
Duration	3 Once sloping is finished, this will remain as a permanent land pattern.
Extent or spatial scale	1

	Topography including drainage patterns and visual aspects
	Impact occurs on-site at the point where the pits and mine residue will be sloped.
Probability	3 The impact will occur regardless of any prevention measures
Significance	12 High **(Positive)**

Environmental objective
To ensure correct sloping of mine residue.

Management measures to be applied	**Phase applicable to management measure**	**Management tools**	**Monitoring programmes**	**Management timeframe and schedule**	**Responsibilities for implementation and long-term maintenance**	**Mitigation hierarchy**
Sloping should be done in accordance with the rehabilitation plan. In short: • Q3: General sloping for free drainage should be established. • Sloping of most of the material to the north in the direction of the tailings facility and to the east towards the plant area.	During rehabilitation	Rehabilitation Strategy and Implementation Plan	Monitoring of rehabilitation: After reshaping the resultant topography must be surveyed to determine the degree to which the final topography meets planned objectives, particularly in terms of surface drainage and slope.	During rehabilitation	Mine Manager	Rehabilitate

Stakeholder expectations and / or comments
None received.
Residual and latent risks
The residual impacts from the removal of geology will remain, as well as the residual impact from covering of geology. The sloping will lessen this residual impact. No additional latent impacts are envisaged.

5.3.2.2 Soils

Activity, nature, and consequence of impact:

The EMP focusses on soil pollution. No mention is made of the residual impacts on the soil erosion. Very little topsoil was stockpiled during the mining activities. Topsoil is mixed with overburden and shows signs of erosion. Until such time that revegetation is completed, these areas will be prone to soil erosion.

Cumulative impacts:

Farming, residential and mining activities in the area can lead to soil erosion and pollution.

Assumptions, uncertainties, and gaps in knowledge:

Information obtained as per the final EMP Performance Assessment conducted in 2018, erosion is visible on the site.

Impact pre-mitigation:

	Soil erosion	**Soil pollution**
Intensity and magnitude	2 The risks on soil erosion will be somewhat severe. The resources are moderately sensitive.	1 The risks on soil pollution will not be severe. The resources are not sensitive.
Resource replaceability	2 The risks on soil erosion will be somewhat severe and reversible. The resources are moderately sensitive.	1 The risks on soil pollution will not be severe and reversible. The resources are not sensitive.
Duration	3 Soil erosion will be permanent without management.	1 Soil pollution will be temporary.
Extent or spatial scale	1 The risks will be site specific.	1 The risks will be site specific.
Probability	2 The impact will be probable without management measures.	2 The impact will be probable without management measures.

	Soil erosion	Soil pollution
Significance	10 Medium	6 Low

Impact post-mitigation:

	Soil erosion	Soil pollution
Intensity and magnitude	1 The risks on soil erosion will be somewhat severe. The resources are moderately sensitive.	1 The risks on soil pollution will not be severe. The resources are not sensitive.
Resource replaceability	1 The risks on soil erosion will be somewhat severe and reversible. The resources are moderately sensitive.	1 The risks on soil pollution will not be severe and reversible. The resources are not sensitive.
Duration	2 Soil erosion will be temporary with management.	1 Soil pollution will be temporary.
Extent or spatial scale	1 The risks will be site specific.	1 The risks will be site specific.
Probability	1 The impact is less likely with management measures.	1 The impact is less likely with management measures.
Significance	6 Low	5 Low

Environmental objective
To prevent soil erosion and pollution.

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Mitigation hierarchy
Soil erosion prevention as per the rehabilitation plan.	Operational phase until closure	Rehabilitation Strategy and Implementation Plan	Erosion monitoring	On-going until rehabilitation and closure	Mine Manager	Prevent
All vehicles and machinery must be maintained to prevent soil pollution. Any contaminated soil due to leakages or spilages must be removed as hazardous waste.	Operational phase until closure	Spill handling procedure, spill kits	Site inspections.	On-going until rehabilitation and closure	Mine Manager	Prevent

Stakeholder expectations and / or comments
None received.
Residual and latent risks
No residual risks from soil erosion or pollution; however, the loss of topsoil, which is a residual risk from mining activities, will remain.

5.3.2.3 Vegetation

Activity, nature, and consequence of impact:

EMP (Shangoni, 2006), after closure, the rehabilitated soil could become infested with alien and invasive plant species.

Cumulative impacts:

Residential, farming and mining activities can lead to the loss of indigenous vegetation and enhance the growth of alien vegetation.

Assumptions, uncertainties, and gaps in knowledge:

Information for this risk was extracted from the Approved EMP (Shangoni Management Services, 2006).

Impact pre-mitigation:

	Risk of alien vegetation infestation	**Risk of incorrect planting methods**
Intensity and magnitude	2 The risks of alien vegetation infestation will be somewhat severe. The resources are also moderately sensitive.	2 The severity of incorrect planting methods is medium.
Resource replaceability	2 The impacts will be somewhat severe but reversible.	2 Incorrect planning methods can be somewhat reversed.
Duration	3 Destruction of natural vegetation due to alien vegetation will be permanent.	3 Destruction of natural vegetation due to the incorrect plating of indigenous vegetation will be permanent.
Extent or spatial scale	1 The risk wil be site specific.	1 The risk wil be site specific.
Probability	3 Alien vegetation is already evident on the existing mine.	2 Incorrect planting methods is a possibility.
Significance	11 Medium	10 Medium

Impact post-mitigation:

	Risk of alien vegetation infestation	**Risk of incorrect planting methods**
Intensity and magnitude	1 The risks of alien vegetation infestation will less severe with management.	1 The severity of incorrect planting methods is low with management.
Resource replaceability	1 Alien vegetation impacts are reversible with adequate management.	1 Incorrect planting methods can be reversed with management.
Duration	1 Destruction of natural vegetation due to alien vegetation will be temporary with mitigation measures.	1 Destruction of natural vegetation due to the incorrect plating of indigenous vegetation will be temporary with mitigation measures.
Extent or spatial scale	1 The risk wil be site specific.	1 The risk wil be site specific.
Probability	1 Probability is low with management.	1 Probability is low with management.
Significance	5 Low	5 Low

Environmental objective
To prevent the establishment of alien vegetation as they use a lot of environmental resources which restricts the growth of indigenous vegetation.

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Mitigation hierarchy
Implement an alien invasive plant monitoring and management plan whereby the spread of alien and invasive plant species into the rehabilitated areas are regularly removed and re-infestation monitored for at least five years.	Rehabilitation phase	Rehabilitation Strategy and Implementation Plan	Rehabilitated areas will be monitored for a period of at least five years for the occurrence or alien invasive plant speciess	During Rehabilitation	Mine Manager	Minimise and avoid

Stakeholder expectations and / or comments
None received.
Residual and latent risks
With adequate monitoring and maintenance, there will be no residual or latent risks.

5.3.2.6 Groundwater

Mineral waste that is backfilled in open pits is sometimes neutralised with lime to reduce acidity and/or solute generation but due to the low acid potential of the mineral waste generated at Annesley, no additional treatment is necessary.

Activity, nature, and consequence of impact:

The impacts on groundwater quality are primarily related to the management of materials, wastes and spills and unauthorised disposal of contaminated substances. Contamination of groundwater may also arise due to incorrect handling and disposal of waste materials. This risk is considered low. Due to the short exposure and small scale of these possible spills, the impacts will be negligible during the construction phase. Except for the lesser oil and diesel spills, there are no activities expected that could impact on regional groundwater quality. This phase should thus cause very little additional impacts. It is expected that the current status quo will be maintained. A very limited groundwater quality impact is expected during the construction phase, generally because of the small surface areas involved and the short duration thereof.

No sulphidic minerals are present in the tailings or waste rock that could result in acidity of drainage or mine water and ABA tests confirmed that no acid potential exists. The mineral waste material is a low risk waste with no acid generating capacity. Trace metals will remain in non-soluble states and is, therefore, of no concern. However, geochemical studies did identify that SO4, Cl, Na, F to be potential contaminants of concern with some seepage potentials.The impact on the groundwater quality during the operational phase is therefore expected to be low.

Cumulative impacts:

No other mines or any other groundwater abstractions are taking place that could result in substantial cumulative water quality or water quantity impacts that will remain post closure.

Assumptions, uncertainties, and gaps in knowledge:

Information for this risk was extracted from the Geohydrological Study (Shangoni AquiScience, 2020).

Impact pre-mitigation:

	Groundwater quality
Intensity and magnitude	1 A very limited groundwater quality impact is expected.
Resource replaceability	1 The resource is not irreparably damaged and is replaceable.
Duration	2 This is a medium term impact.
Extent or spatial scale	2 The local area is affected.
Probability	1 It is improbable for this impact to occur.
Significance	7 Low

Impact post-mitigation:

	Groundwater quality
Intensity and magnitude	1 A very limited groundwater quality impact is expected.
Resource replaceability	1 The resource is not irreparably damaged and is replaceable.
Duration	2 This is a medium term impact.
Extent or spatial scale	1 The risk is localised.
Probability	1

	Groundwater quality
	It is improbable for this impact to occur.
Significance	6 Low

Environmental objective
Prevent or contain groundwater contamination from seepage and to contain and remediate any accidental hydrocarbon or other chemical spillages..

Management measures to be applied	**Phase applicable to management measure**	**Management tools**	**Monitoring programmes**	**Management timeframe and schedule**	**Responsibilities for implementation and long-term maintenance**	**Mitigation hierarchy**
• Monitor groundwater levels in source and receptor boreholes. • Separation of clean and affected water through diversion canals and an affected water management system that collects affected runoff water from dirty management areas, which drain towards the process water storage facilities. Such water is then re-used in the plant as process water. • Minimisation of dirty water management areas and the separation of clean and dirty water management areas. • Keep the quarry as dry as possible. • The quarry should be compacted as far as possible to reduce rainfall recharge.	Operational until closure	SWMP	• Surface water drainage systems • Surface water quality • Groundwater levels and quality • Develop and maintain a Standard Operating Procedure to contain and remediate any accidental hydrocarbon or other chemical spillages.	Until DWS and DMR states otherwise.	Mine Manager	Minimise

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Mitigation hierarchy
• Surface water should be directed around the backfilled quarry. • Water quality and levels of the quarry should be measured on a quarterly basis. The parameters should correspond to the waste classification elevated parameters. • When flow is visible in the Segorong River, water samples should be taken for chemical analysis. • Contain spillage, excavate and dispose of soil if required. Utilisation of spill kits and/or excavation of affected soil with subsequent disposal at an accredited disposal site is crucial.						

Stakeholder expectations and / or comments
None received.
Residual and latent risks
Depending on the results of further monitoring, the risk of potential pollution and sedimentation will not be a latent risk.

5.3.2.7 Surface water

Activity, nature, and consequence of impact:

Run-off is generated from already existing mine residue. This can lead to pollution and sedimentation. In order to prevent dirty water from mixing with clean water, underdrains in the Tailings Storage Facility (TSF) are allowed for. Collected water reports to the plant storage tank from where it is kept in the "dirty" water circuit. Drain outlets discharge into the provided sump. This water is kept in the "dirty" water system and re-used in the mineral processing plant. Stormwater from the upstream hillside is diverted around the TSF (Tailings Solutions, 2020).

Cumulative impacts:

According to the Hydrogeological Report (Shangoni Management Services, 2013, the sewerage works, Annesley Mining Operations and domestic activities will influence the surface water quality.

Assumptions, uncertainties, and gaps in knowledge:

Information for this risk was extracted from the Quarterly Water Quality Monitoring Report (BECS Environmental, 2016) and Rhino Minerals (Pty) Ltd – Annesley Andalusite Mine Storm Water Management Plan (Shangoni Management Servies, 2013)

Impact pre-mitigation:

	Surface water pollution	**Sedimentation**
Intensity and magnitude	2 The dirty water may mix with the clean water stream if berms and other means of diversion are not implemented.	1 Sloping of wastes do pose several advantages compared to surface storage and include the elimination of erosion and therefore sedimentation risks towards the receiving environment.
Resource replaceability	2 The impacts will be somewhat reversible.	1 The impact is reversible.
Duration	3 Pollution potential will be permanent, depending on new monitoring results	3

	Surface water pollution	**Sedimentation**
		Pollution potential will be permanent, depending on new monitoring results
Extent or spatial scale	2 Receptors which may be influenced by the mining activities include the users in the Mogomotsi River (aquatic species, livestock, wildlife).	2 Receptors which may be influenced by the mining activities include the users in the Mogomotsi River (aquatic species, livestock, wildlife).
Probability	2 This is already evident on the existing mine; however, the probability will decline if management measures are implemented.	1 Sedimentation from mine residue will not be probable.
Significance	11 Medium	8 Medium

Impact post-mitigation:

	Surface water pollution	**Sedimentation**
Intensity and magnitude	1 The impact is lessened with mitigation measures.	1 Sloping of wastes do pose several advantages compared to surface storage and include the elimination of erosion and therefore sedimentation risks towards the receiving environment.
Resource replaceability	2 The impacts will be somewhat reversible.	1 The impact is reversible.
Duration	3 Pollution potential will be permanent, depending on new monitoring results	3 Pollution potential will be permanent, depending on new monitoring results
Extent or spatial scale	1 Impacts are kept to a local scale with management.	1 Impacts are kept to a local scale with management.
Probability	1 This impact is less probable if management measures are implemented.	1 Sedimentation from mine residue will not be probable.
Significance	8 Medium	7 Low

Environmental objective
To prevent the contamination and sedimentation of surface water resources by implementing management strategies.

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Mitigation hierarchy
The quarry will be sloped as to reduce erosion and subsequent sedimentation. In addition the slimes dam will be revegetated. This will help to reduce any form of sedimentation from the dam.	Operational until closure	SWMP	• Surface water drainage systems • Surface water quality • Maintenance and inspections	On-going until rehabilitation and closure	Mine Manager	Minimise
Maximum amount of clean runoff upstream of the mining area should be diverted away to separate the clean and affected areas. This berm should be located upstream of the mining activities and gradually cut the contour lines to provide a steady slope draining to the west. The use of rocks to line the floor of the berm is recommended.						
Regular inspections and maintenance should be conducted to ensure the capacity and integrity of the berms, culverts and the trenches are maintained.						

Stakeholder expectations and / or comments
None received.
Residual and latent risks
Depending on the results of further monitoring, the risk of potential pollution and sedimentation will not be a latent risk.

5.3.2.8 Community safety

Activity, nature, and consequence of impact:

Extension of Quarry 3 as a Tailings Storage Facility (TSF) to increase tailings storage capacity.

Cumulative impacts:

There is a safety concern related to highwalls of other pits on the mine.

Assumptions, uncertainties, and gaps in knowledge:

Some of the information for this section was obtained from the Imerys Annesley Quarry 3 Optimisation Report (Tailings Solutions, 2020).

Impact pre-mitigation:

	Quarry 3 TSF safety identification	**High walls of open pits**
Intensity and magnitude	3 Based on the determined Zone of Influence and the safety identification, the Annesley Q3 TSF would classify as having a **High Hazard** Classification. The third party worker at the Plant and mine offices as well as the cost of an environmental clean-up justifies this classification.	3 People from the community who walk in the vicinity of the mine are at risk of falling into the open pits.
Resource replaceability	3 Risk to the surrounding environment is high without mitigation.	3 Risk to the community is high without mitigation.
Duration	3 The impact is permanent.	3 The impact is permanent.
Extent or spatial scale	1 The impact is local in scale.	1 The impact is local in scale.
Probability	1 Slimes dam failure is not probable.	2 Falling from a pit is probable without management measures.
Significance	11	12

	Quarry 3 TSF safety identification	High walls of open pits
	Medium	High

Impact post-mitigation:

	Quarry 3 TSF safety identification	High walls of open pits
Intensity and magnitude	2 The risk profile associated with the TSF design and operation would be acceptable, providing deposition and management stay within design and operational limits, meeting with good practice.	1 People from the community who walk in the vicinity of the mine are at low risk of falling into the open pits.
Resource replaceability	2 Risk to the surrounding environment is reduced with mitigation.	1 Risk to the community is greatly reduced with mitigation.
Duration	3 The impact is permanent.	3 The impact is permanent.
Extent or spatial scale	1 The impact is local in scale.	1 The impact is local in scale.
Probability	1 Slimes dam failure is not probable.	1 Falling from a pit is improbable with management measures.
Significance	9 Medium	7 Low

Environmental objective
Provide an environment that is safe for the community

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Mitigation hierarchy
Slurry pumping capacity and the integrity of the slurry reticulation infrastructure have been identified as one of the important risk drivers.	Operational until closure	Operational Manual. This is part of the Mandatory Code of Practice. (CoP) as per DMR regulations	Inspection and maintenance	On-going until rehabilitation and closure	Mine Manager	Prevent
The performance and durability of pumps, electrical motors, performance duties, pipes and valves must be monitored as part of the management and risk controls of the Code of Practice (CoP)						
Standpipe piezometers are part of the integrity and performance monitoring on TSF's. These instruments can be installed after commissioning, however, installation during construction is cost effective and the depth can be accurately controlled.						
Coarse tailings should be placed from the Course discard wall crest, using an upstream deposition technique. This would cover the drains with coarse material, beaching the fines away from the perimeter wall, maintain freeboard and construct the coarse and dry outer wedge. Supernatant water will be decanted. No water would be stored on top of the TSF. Tailings placement would be with spraybars, an upstream deposition method would be implemented. Tailings placement would meet with the standards as per the quarry 3 Optimisation report.						

Management measures to be applied	Phase applicable to management measure	Management tools	Monitoring programmes	Management timeframe and schedule	Responsibilities for implementation and long-term maintenance	Mitigation hierarchy
The TSF must be considered to be an access control area. The water is part of the "dirty" water circuit and should be treated as such. Underdrains in the TSF are allowed for. Collected water reports to the plant storage tank from where it is kept in the "dirty" water circuit. Stormwater from upstream hillside is diverted around the TSF.	Operational until closure	SWMP	Inspection and maintenance	On-going until rehabilitation and closure	Mine Manager	Minimise
Drowning or being stuck in mud is a health and safety risk. The following should be implemented (as a minimum): The TSF complex should be fenced, with at least a cattle proof fence. Safety and warning signage to be placed along this fence. This signage should be installed specifically at the catwalk and penstock entrances, and walkways to the side of the TSF.	Operational until closure	Highwall safety CoP	Inspection and maintenance	On-going until rehabilitation and closure	Mine Manager	Prevent

Stakeholder expectations and / or comments
None received.
Residual and latent risks
No residual or latent risks.

5.4 Details of the development footprint alternatives considered

Please note, there is no alternative.

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

The development footprint and the site layout will be finalised, taking into account all sensitive features. An alternative to the preferred plan, with specialist inputs, are not considered as viable.

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

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

5.4.3 The outcome of the site selection matrix. Final site layout plan

The layout plan will be finalised once input is received from the registered I&APs and stakeholders.

5.4.4 Motivation where no alternative sites were considered

There is no alternative to the proposed extension of quarry 3, however there will be a positive impact on the local community as mentioned above in Section 5.3.2.9. The consultation process will involve communication with the community. As above, the development footprint and the site layout will be finalised, however an alternative to the preferred plan, with specialist inputs, are not considered as viable.

5.4.5 Statement motivating the preferred site

Not applicable. No alternative considered.

SECTION 6: PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

6.1 Description of the aspects to be assessed as part of the environmental impact assessment process

All aspects to be assessed are included in Section 5.3 of this report.

6.2 Description of aspects to be assessed by specialists

The following specialist reports are incorporated.

- Annesley Quarry 3 Optimization Report - 2020
- Geohydrological Study and Impact Assessment for Backfilling of Quarries at Annesley Mine – 2020
- Rhino Minerals (Pty) Ltd – Annesley Andalusite Mine: Storm Water Management Plan - 2013

6.3 The stages at which the competent authority will be consulted

Date	Description
8 May 2021	Submission of integrated application to DMRE
11 August 2021	Acceptance of application form by DMRE
24 September 2021	Final date to submit final scoping report to DMRE
October 2021	Draft EIAR/EMP to DMRE
November 2021	Final EIAR/EMP to DMRE

6.4 Description of the tasks that will be undertaken during the environmental impact assessment process

Refer to the Table 33 for the plan of study for the environmental assessment in terms of NEMA.

Table 33: Plan of study for the environmental assessment process

Date	Description
Conducted	Specialist studies
8 May 2021	Submission of application
11 August 2021	Acceptance of application form
19 August 2021	Commencement of first phase PPP.
On or before 24 September 2021	ESR to I&APs and stakeholders
On or before 24 September 2021	Final ESR to DMRE
October 2021	Draft EIA/EMP to I&APs and stakeholders.
October 2021	Draft EIAR/EMP to DMRE
November 2021	Final EIAR/EMP to DMRE

SECTION 7: ADDITIONAL INFORMATION

7.1 Other Information required by the competent Authority

Any impact raised by an I&AP will be included in the EIA/EMP.

7.2 Period for which the environmental authorisation is required

Not applicable.

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

24 (4) Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment-	
(a) must ensure, with respect to every application for an EA-	
i. Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;	DMRE is the only applicable authority for the proposed integrated EA and thus the only organ of state. DWS is, however the competent authority for the WML. All other organs of state and stakeholders will receive the ESR as well as the EIA/EMP for review.
ii. That the findings and recommendations flowing from an investigation, the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set out in section 2 are taken into account in any decision made by an organ of state in relation to any proposed policy, programme, process, plan or project;	All the findings from investigations have been included in this ESR.
iii. That a description of the environment likely to be significantly affected by the proposed activity is contained in such application;	Environmental baseline information, based in specialist studies, has been included in this ESR.
iv. Investigation of the potential consequences for or impacts on the environment of the activity and assessment of the significance of those potential consequences or impacts; and	Investigation of impact on the environment and assessment of the significance of the potential impacts has been included in this ESR.
v. Public information and participation procedures which provide all I&APs, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures; and	Refer to Section 5 for the PPP.
(b) must include, with respect to every application for an EA and where applicable-	

i. Investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;	Investigation of impact on the environment and assessment of the significance of the potential impacts have been done by specialists.
ii. Investigation of mitigation measures to keep adverse consequences or impacts to a minimum;	Investigation of mitigation measures were done by the specialists.
iii. Investigation, assessment and evaluation of the impact of any proposed listed or specified activity on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), excluding the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act;	Specialist information under Section 5.2.13. No archaeological site dating to the Iron Age was identified in the area of the mining area.
iv. Reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;	All gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information will be included in the EIA/EMP.
v. Investigation and formulation of arrangements for the monitoring and management of consequences for or impacts on the environment, and the assessment of the effectiveness of such arrangements after their implementation;	A monitoring plan will be included in the EIA/EMP.
vi. Consideration of environmental attributes identified in the compilation of information and maps contemplated in subsection (3); and	Environmental attributes identified were taken into consideration during the process.
vii. Provision for the adherence to requirements that are prescribed in a specific environmental management Act relevant to the listed or specified activity in question.	Refer to Section 3 for adherence to requirements that are prescribed in a specific environmental management Act relevant to the listed or specified activity in question.

UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I Christopher Delport, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and I&APs has been correctly recorded in the report.

_____

Signature of the EAP
DATE: November 2021

UNDERTAKING REGARDING LEVEL OF AGREEMENT

I Christopher Delport, herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with I&APs and stakeholders has been correctly recorded and reported herein.

_____

Signature of the EAP
DATE: November 2021

-END-

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