GLENCORE OPERATIONS SOUTH AFRICA (PTY) LTD: RIETVLY SILICA MINE

BASIC ASSESSMENT REPORT FOR THE PROPOSED CLEARANCE OF VEGETATION FOR THE CREATION OF A STOCKPILE AREA

JANUARY 2019

SHANGONI
Management Services (Pty) Ltd

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

BASIC ASSESSMENT REPORT

AND

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

NAME OF APPLICANT: GLENCORE OPERATIONS SOUTH AFRICA (PTY) LTD: RIETVLY MINE

PROJECT: PROPOSED CLERANCE OF VEGETATION FOR THE CREATION OF A STOCKPILE AREA

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DMR REF NO:

JANUARY 2019

DRAFT FOR PUBLIC COMMENT

GLENCORE

xstrata

OBJECTIVE OF THE BASIC ASSESSMENT PROCESS

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

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

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

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

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

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

  (ii) the degree to which these impacts—

    (aa) can be reversed;

    (bb) may cause irreplaceable loss of resources; and

    (cc) can be managed, avoided or mitigated;

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

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

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

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

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[1] Documents as included under Annexure H contain existing information (in some cases specialist studies) generated for the Rietvly Mine's previous EMP purposes as well as for environmental management implementation purposes on the mine. It should be noted that these studies were conducted prior to the promulgation of the 2014 EIA Regulations, but the content of such studies remain applicable for inclusion into this BAR/EMPr document.

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BACKGROUND DESCRIPTION

Glencore Alloys is involved in the mining of Chrome and Platinum Group Metals (PGM's) and the manufacture of ferro-alloys. The company was known as Xstrata Alloys prior to the merger of Glencore International plc and Xstrata plc in May 2013. Rietvly Silica Mine forms part of the Glencore Alloys Section. There have been two previous owners of Rietvly Silica Mine; Mr D. Henzen operating under the name of Rietvly Silica CC and then Chrome Resources (Pty) Ltd. Xstrata purchased Rietvly from Mr D. Henzen in 1998. The current corporate structure and shareholding of Glencore Operations South Africa (Pty) Ltd. is set out in Figure 1 below.

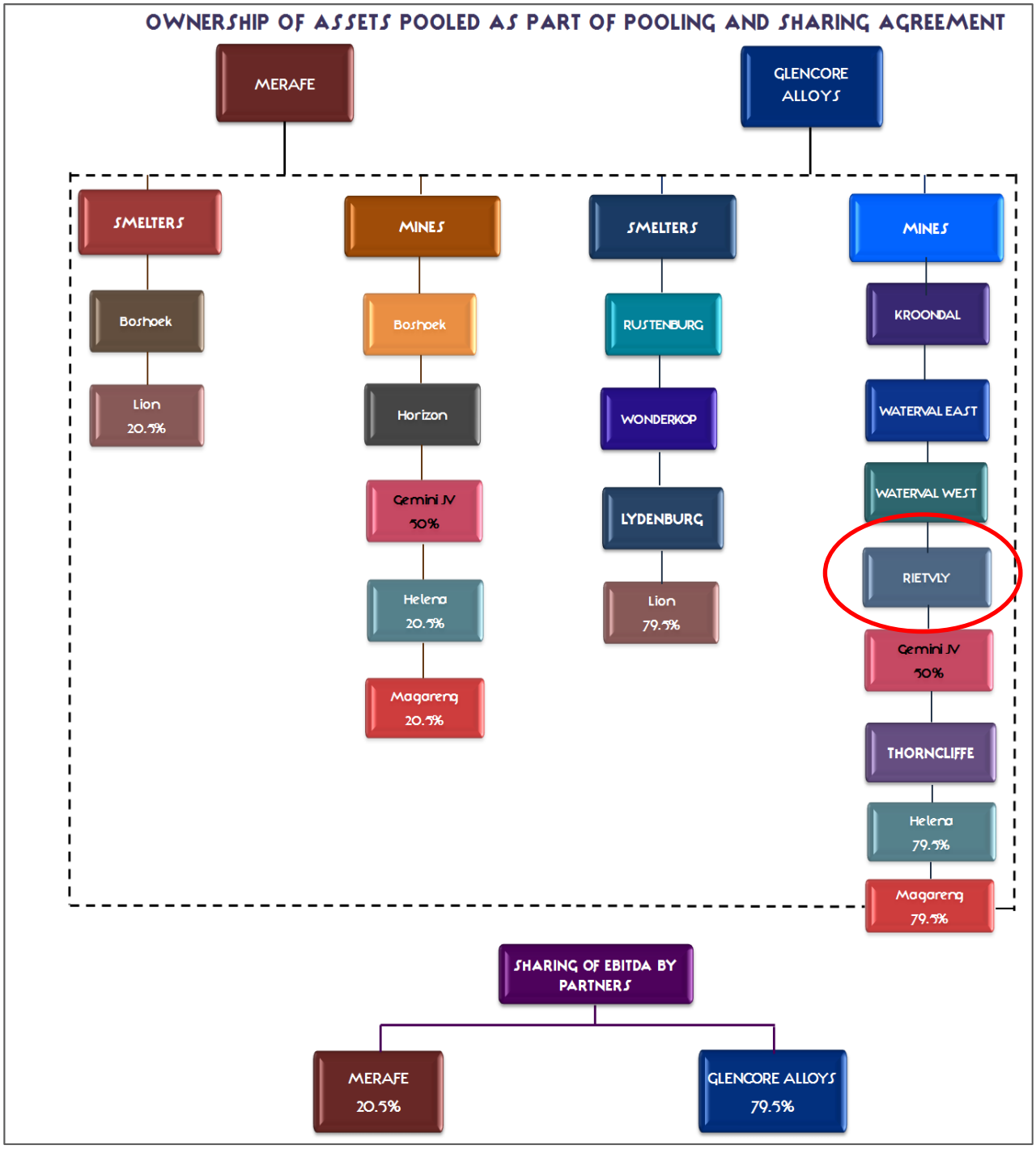

Figure 1: Current corporate structure of Glencore Operations South Africa (Pty) Ltd (SLP, 2014 – 2018)

Rietvly Mine is an existing mine situated 10 km North West of Rustenburg in the North West Province on portions of the farm Rietvly 271 JQ and Fogwill 324 JQ. The main aim of the operation is to produce silica ore for the ferrochrome furnaces of Xstrata, situated in the Rustenburg area. The silica ore fragments are obtained through blasting, crushing, washing, drying and screening.

Rietvlei Silica Mine has recently purchased Portion 103 of the Farm Shylock 256 that is situated adjacent to the current operations. It is proposed that this property will be used for stockpiling silica product. A drainage line is located on the north-eastern portion of the property and the current stockpile is situated within a 100 m of this non-perennial drainage line. Shangoni Management Services (Pty) Ltd ("Shangoni") was appointed by Glencore Operations South Africa (Pty) Ltd. as the independent Environmental Assessment Practitioner (EAP) to conduct the required Basic Assessment (BA) for the Environmental Authorisation for the clearing of vegetation that is associated with the creation of a stockpile area.

The table below provides a summary of the listed activities for which authorisation is applied for as per GNR 983 and GNR 985 of 4 December 2014, as amended.

Table 1: Listed Activities triggered by the proposed clearing of vegetation

Listed Activity	Listed Activity Description
GNR 983 Listing Notice 1 Activity 12 (iii) (a) (c)	The Development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 metres measured from the edge of a watercourse.
GNR 983 Listing Notice 1 Activity 27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation.
GNR 985 Listing Notice 3 Activity 12 (h) (iv) (vi)	The clearance of an areas of 300 square metres or more of indigenous vegetation. **h. North West** iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority. vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.

PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1. Contact Person and correspondence address

1.1 Details of the EAP

Name of The Practitioner: Shangoni Management Services: Marvin Grimett
Tel No.: (012) 807 7036
Fax No. : (012) 807 1014
e-mail address: marvin@shangoni.co.za

1.2 Expertise of the EAP.

Table 2: The qualifications of the EAP

NAME	QUALIFICATIONS
Brian Hayes (Technical reviewer)	BEng (Chemical Engineer), MSc (Environmental Engineering), Pr.Eng.
Marvin Grimett	B.Soc.Sci. (Hons): Environmental Science

Table 3: Summary of the EAP's experience.

NAME	SUMMARY OF EXPERIENCE
Brian Hayes	Brian is a registered professional engineer (Chemical) with a master's degree in Environmental Engineering from the University of Nottingham. Brian has 25 years' experience in environmental management and environmental engineering.
Marvin Grimett	Marvin completed the BSocSci. (Hons) Environmental Science at the University of KwaZulu-Natal. Marvin has over 5 years' experience in completing the Environmental Assessment Processes and Environmental Audits for various projects.

2. Location of the overall Activity

Table 4: Location of the Activity

Farm Name:	Portion 103 of the farm Shylock 256 JQ
Application area (Ha)	12.3 hectares
Magisterial district:	Bojanala District Municipality Rustenburg Local Municipality (RLM)

	Kgetlengrivier Local Municipality (KLM)
Distance and direction from nearest town	Rietvly Mine is situated 5 km west of Rustenburg in the North-west Province
21digit Surveyor General Code for each farm portion	T0JQ000000000025600103

3. Locality map

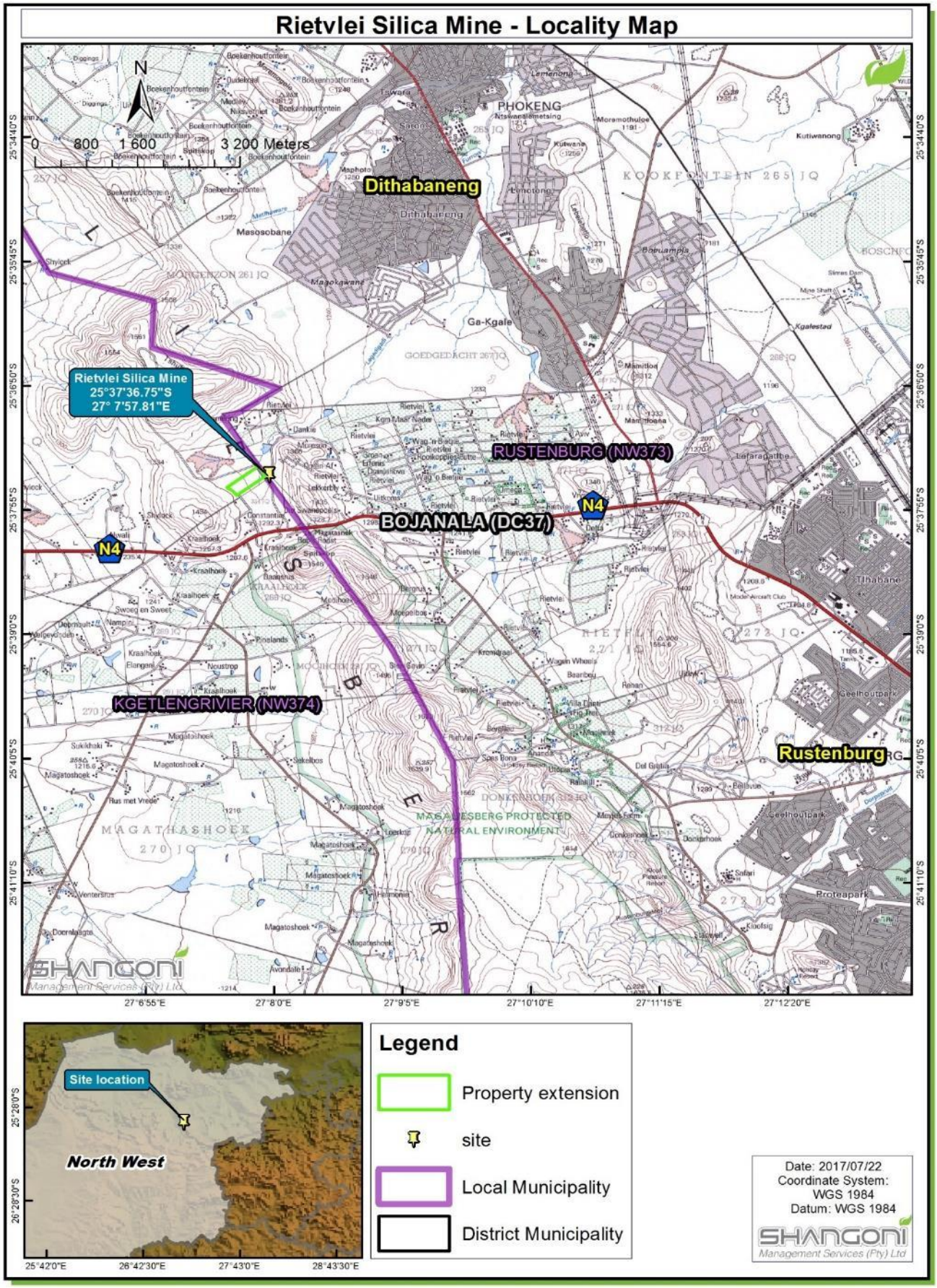

Figure 2 : Locality map of the project area

4. Description of the scope of the proposed overall activity

4.1 Listed and specified activities

Table 5: Activities and listed activities associated with proposed stockpile area

NAME OF ACTIVITY	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 544, GNR 545 or GNR 546)
Clearance of indigenous vegetation for new stockpile area.	12.3Ha	X	Listing Notice 1 Activity 27 The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation. Listing Notice 3 Activity 12 The clearance of an areas of 300 square metres or more of indigenous vegetation. **h. North West** iv. Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority. vi. Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland.
Stockpiling of product: After Crushing and Screening: • Large Lump Stockpile • Small Lump Stockpile After Washing: • Large Chip Stockpile • Small Chip Stockpile • Fines Stockpile	12.3Ha	X	Listing Notice 1 Activity 12 The Development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 metres measured from the edge of a watercourse.

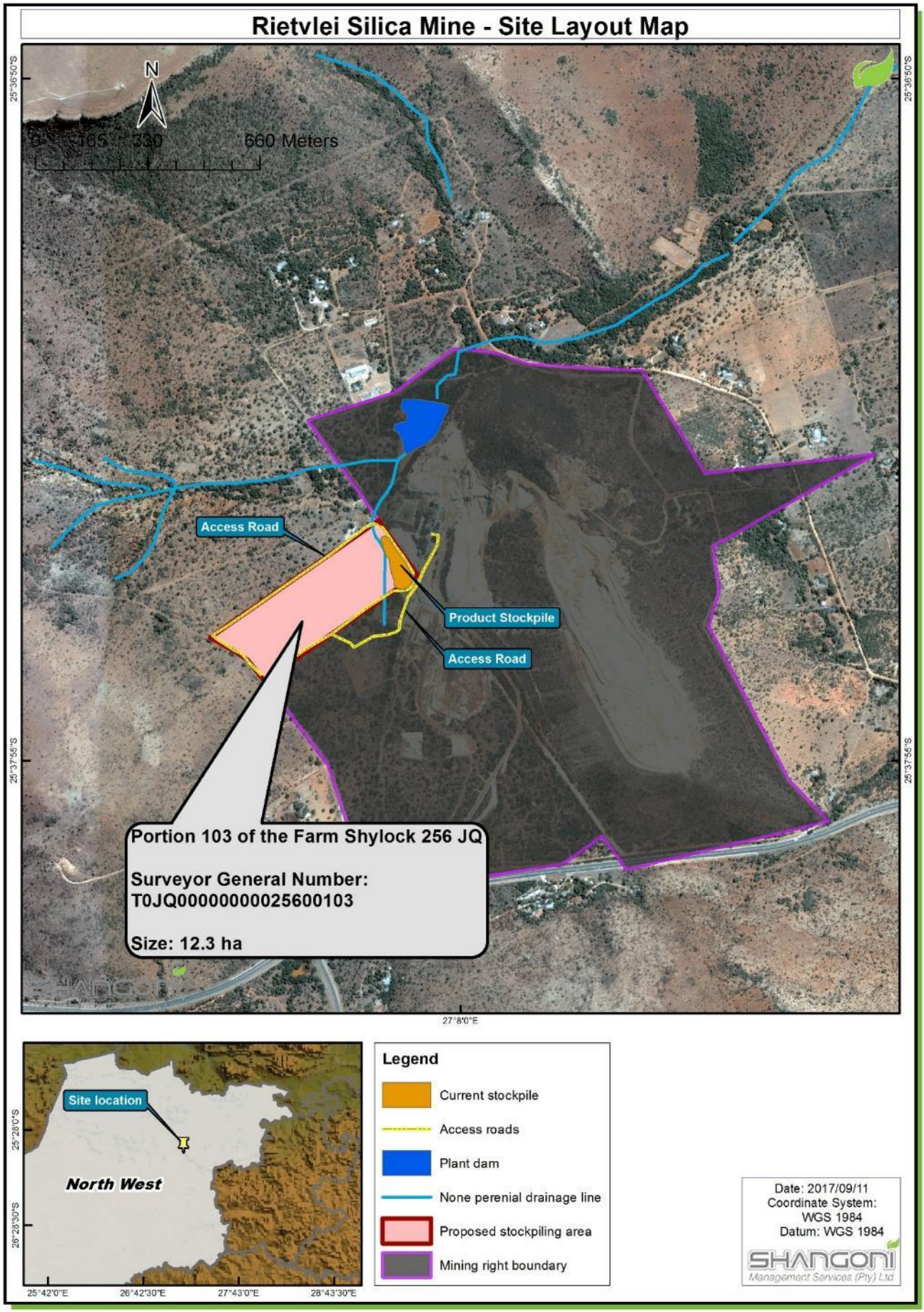

Figure 3: Site Layout Map for new stockpile area

4.2 Description of the activities to be undertaken

Rietvly Mine intends on extending the existing open cast (bench) mining operation to portions 33, 92 and 220 of the farm Rietvly 271 JQ[2] (refer to Figure 4 below). These areas were approved through the Metago Scoping Report (dated March 2008)[3] and EMPr Addendum (dated August 2006) submitted to the Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Development Act (MPRDA), 2002 and regulations there under, and was also incorporated into the previous approved EMPr, dated 2009.

As such, Rietvly Mine has recently purchased Portion 103 of the Farm Shylock 256 that is situated adjacent to the current operations. It is proposed that this property will be used for stockpiling silica product. Five (5) stockpiles of various grades (sizes) of silica are proposed to be stockpiled on Portion 103 of the Farm Shylock 256. The 5 grades of silica to be stockpiles are as follows:

- Large Lump;
- Small Lump;
- Large Chip;
- Small Chip; and
- Fines

As part of the process, a haul road will be constructed to haul the silica product to and from the proposed stockpiles.

[2] Portions 92 and 220 of Rietvly 271 JQ now forms part of Portion 231 of Rietvly 271 JQ
[3] Application for a mining right on portions 33, 92 and 220 of the farm Rietvlei 271 JQ commenced in March 2008 with the Scoping Report submitted to the DMR. The mentioned submission of the Scoping Report (and thus also the submission of the mining rights application) was in process before the promulgation of the EIA Regulations (GN. R 385, GN. R 386 and GN. R 387), dated April 2006.

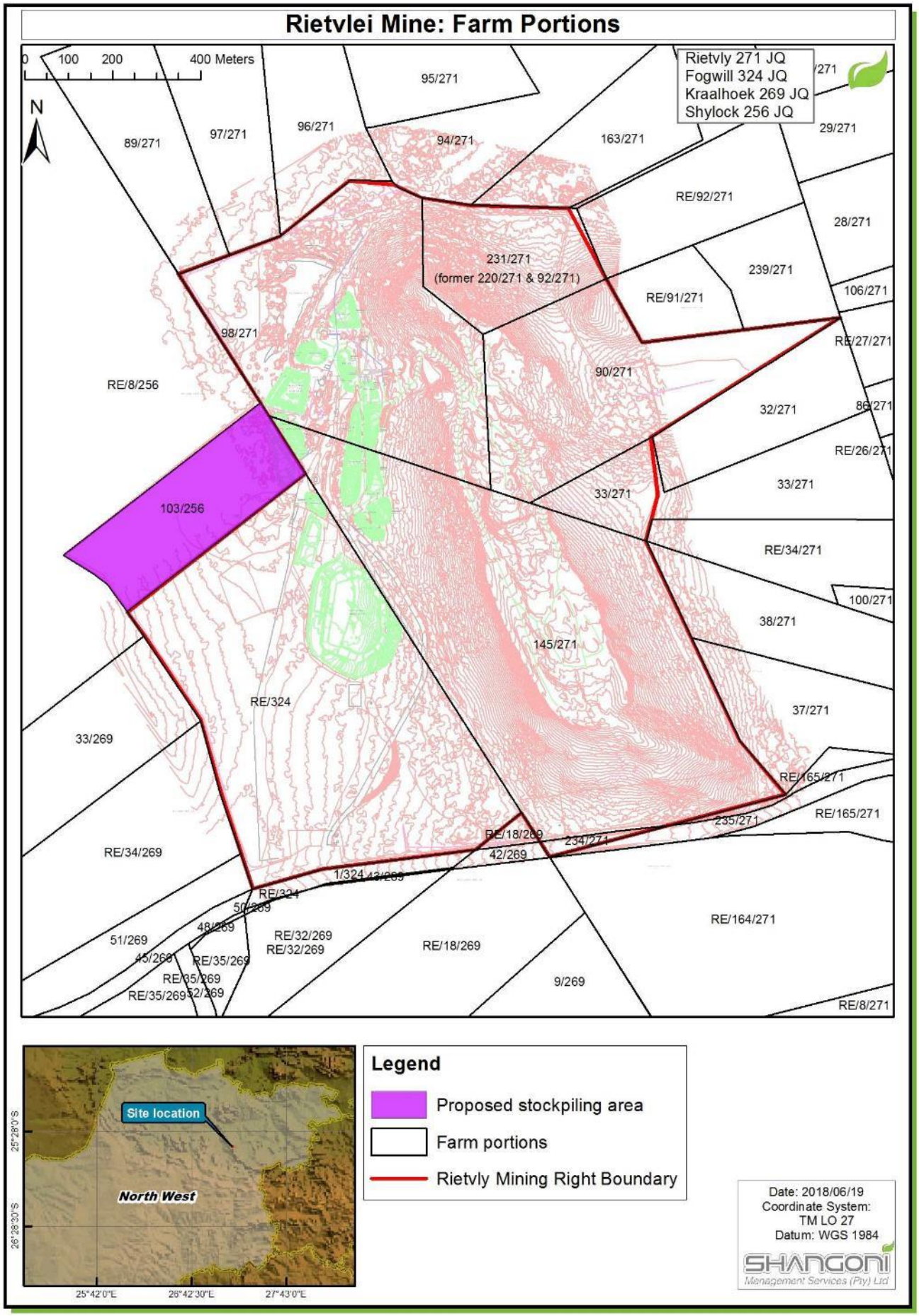

Figure 4: Farm portions relevant to Rietvly Mine

The storm water management proposed for the stockpiling area aims to address concerns that have been identified in terms of the proposed development. The plan attempts to provide management measures that should be in place to prevent flood damage proactively and contribute to the effective channelling and containment of surface water.

The storm water management assessment for the new product stockpile area provides an examination of the situation at the stockpiling area and an investigation of different rainfall scenarios for the operation that are critical to the planning process for effective storm water management during the operational phase. Runoff simulations were performed based on the relevant area as defined by the operation.

The tables 6 and 7 below reflect the peak runoff and volumes expected during a 1:50 year and 1:100-year flood scenario on the respective affected water containment facilities.

Table 6: Expected runoff volumes for 1:50 year flood towards the respective areas

	Tc (hours)	PR (mm)	ARF (%)	AI (mm/h)	Factor (Ft)	RC (%)	Peak flow (m^3/s)	Runoff Volume (m^3)
S1	0.13	34.0	99.8	269.7	0.95	44.5	11.24	7890.48
S2	0.12	33.4	99.8	271.6	0.95	44.5	11.15	7225.2

Table 7: Expected runoff volumes for 1:100 year flood towards the respective areas

	Tc (hours)	PR (mm)	ARF (%)	AI (mm/h)	Factor (Ft)	RC (%)	Peak flow (m^3/s)	Runoff Volume (m^3)
S1	0.13	41.8	99.7	331.7	1.00	46.9	14.55	10214.1
S2	0.12	41.1	99.7	334.1	1.00	46.9	14.43	9350.64

The catchments depicted in Figures 5 and 6 below are clean water runoff that will need to be diverted away from the stockpiling area:

- Catchment S1 – Option 1;
- Catchment S2 – Option 2;

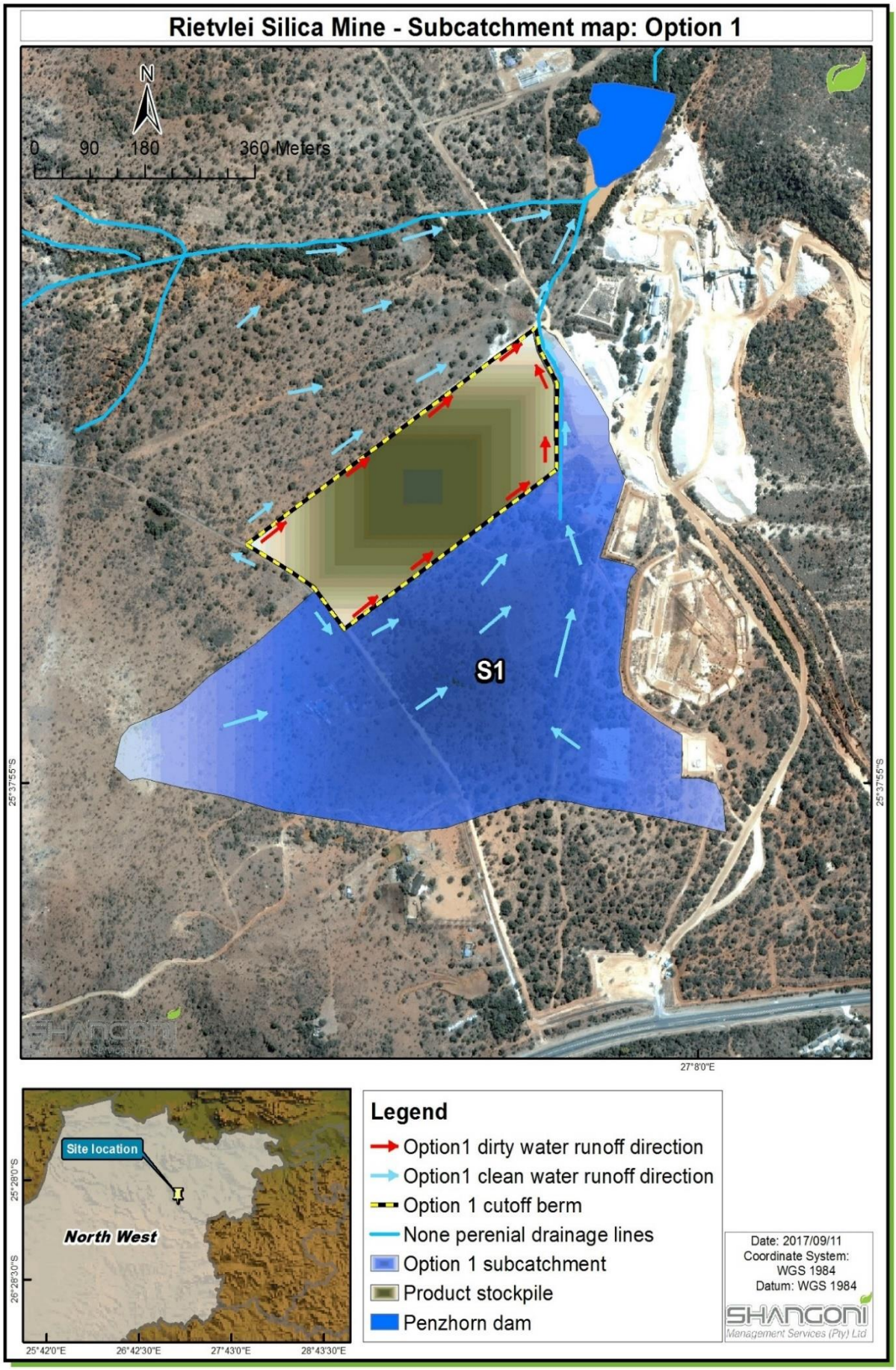

Figure 5: SWMP catchments – Option 1.

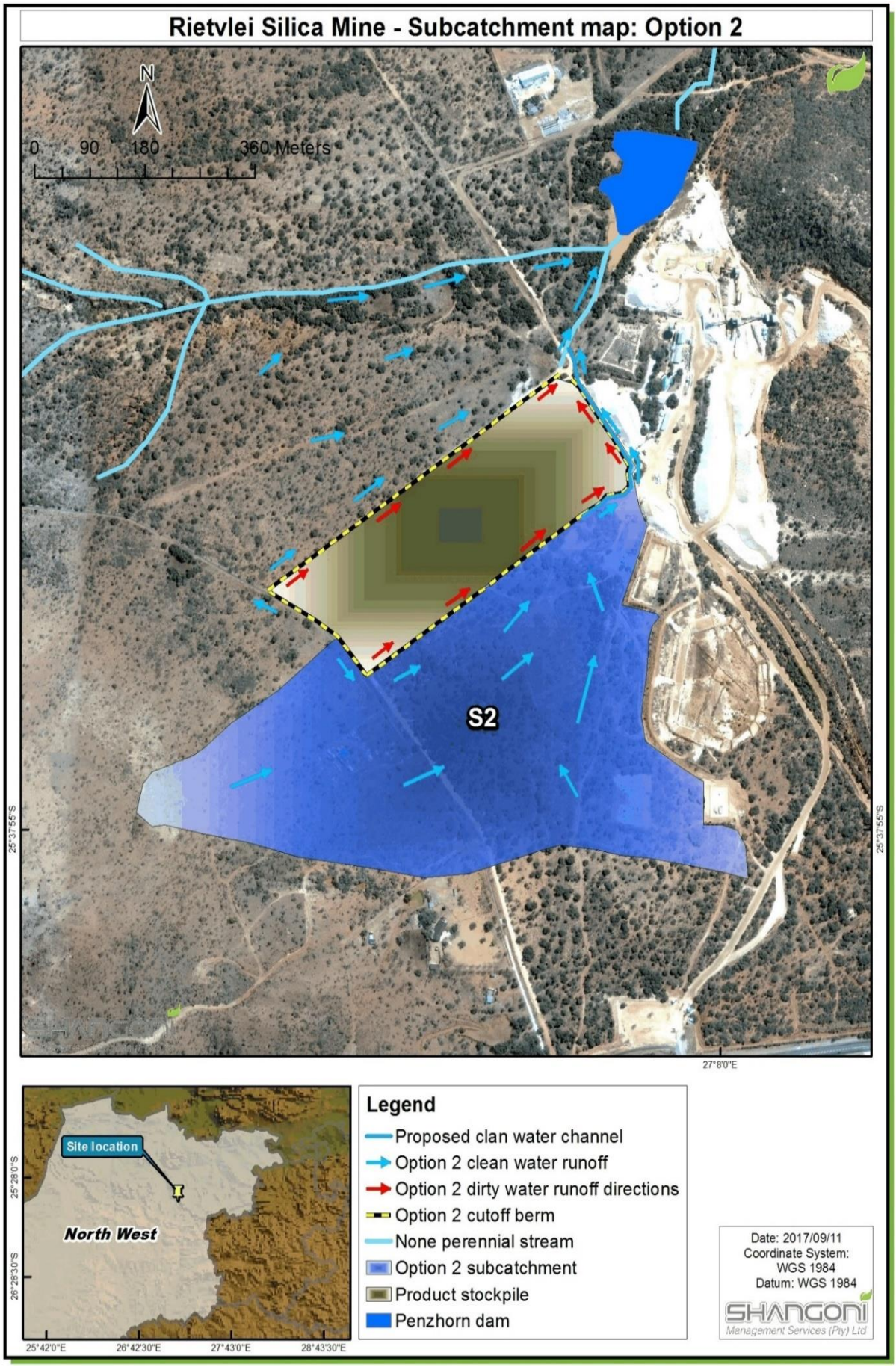

Figure 6: SWMP catchments – Option 2

A non-perennial drainage line runs through the eastern portions of the property and conveys clean water to the Penzhorn Dam. If the entire property is utilized for stockpiling, it will impede on the flow of the drainage line and result in the damming of water that could decrease the amount of clean water available for the catchment.

Clean runoff generated in catchment 1 (Figure 5) will report to the existing drainage line and subsequently drain into the Penzhorn dam. The runoff volume associated with a 1:50 year and 1:100-year storm events was calculated as 7890.48 m^3 and 10214.10 m^3 respectively.

Clean runoff generated in catchment 2 (Figure 6) will report to the proposed clean water diversion channel (the diverted drainage line) and subsequently drain into the Penzhorn dam. The runoff volume associated with a 1:50 year and 1:100-year storm events were calculated as 7225.20 m^3 and 9350.63 m^3 respectively. These runoff volumes should serve as a guideline only and must be confirmed during the design phase of the channel.

There are two proposed methods for the handling of storm water at the new product stockpile area (Figures 7 and 8), both have been assessed and Option 1 has been chosen as the preferred alternative. A buffer (at least outside the 1:100-year flood line) will be maintained between the stockpile area and the drainage line. This will be done through the construction of a diversion berm between the stockpile and the drainage line. The berm will extend around the property to separate affected and clean water.

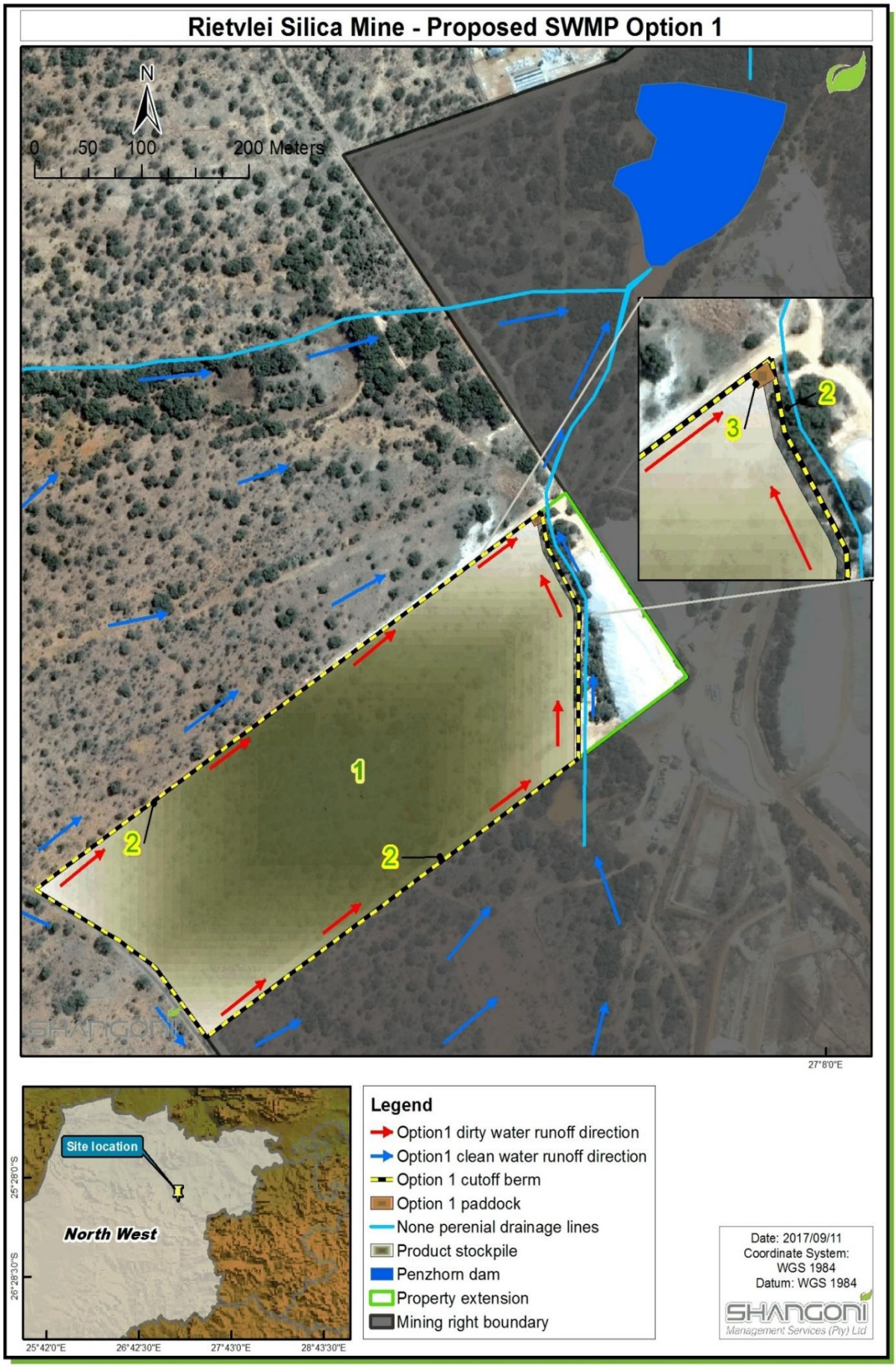

Figure 7: Option 1 (preferred) clean and dirty water channel system (Shangoni, September 2017)

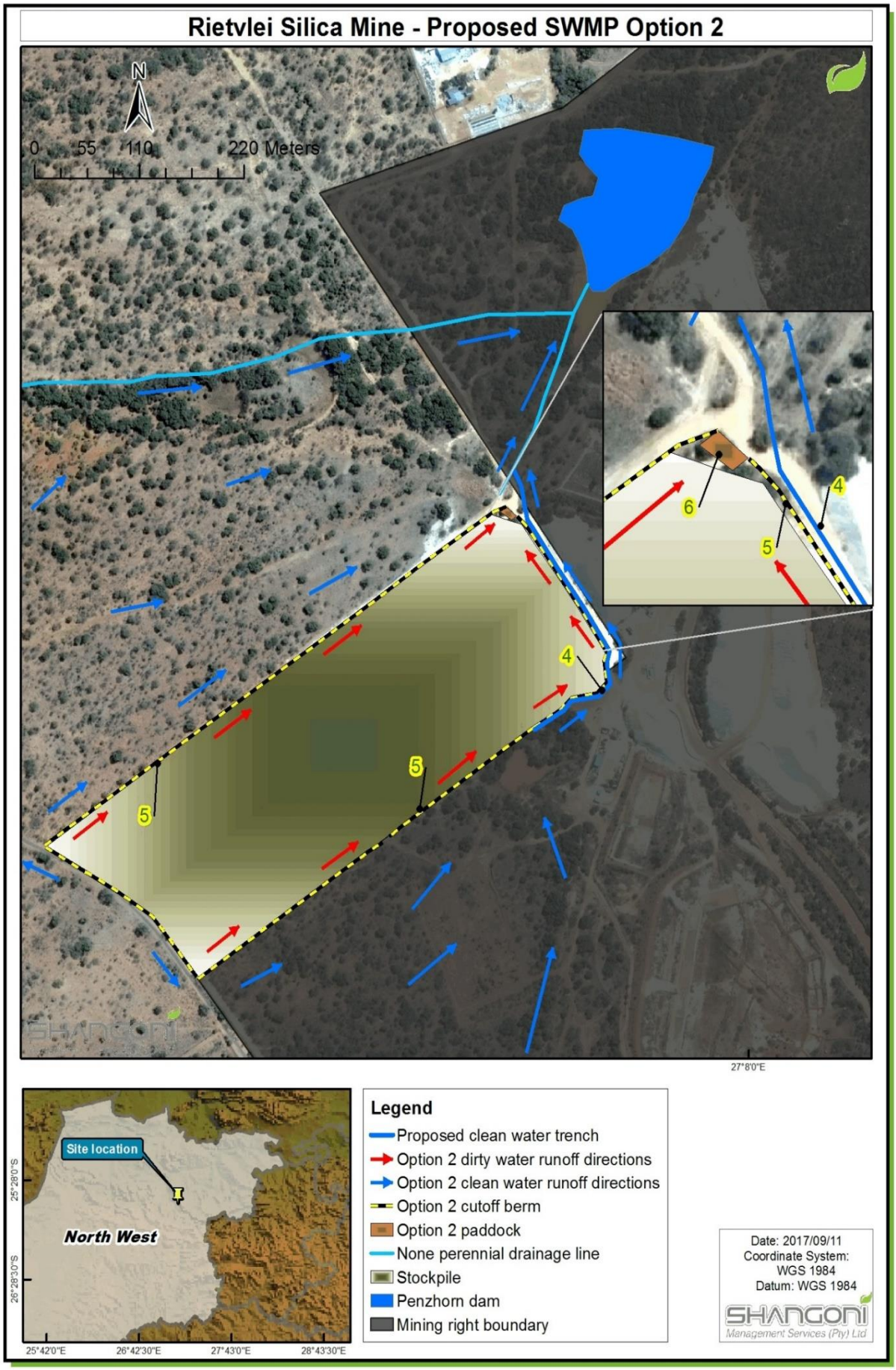

Figure 8: Option 2 clean and dirty water channel system (Shangoni, September 2017)

5. Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
The Constitution of the Republic of South Africa (Act 108 of 1996).	Throughout the whole document	Section 2 of the Constitution of the Republic of South Africa (Act 108 of 1996) (CA) states that: "This Constitution is the supreme law of the Republic; law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled." Section 24 of the CA, states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: • prevent pollution and ecological degradation; • promote conservation; and • secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. Section 24 guarantees the protection of the environment through reasonable legislative (and other measures) and such legislation is continuously in the process of being promulgated. Section 33(1) concerns administrative justice which includes the constitutional right to administrative action that is lawful, reasonable and procedurally fair. This document was accordingly prepared, submitted and considered within the constitutional framework set by, inter alia, section 24 and 33 of the Constitution.
The Promotion of Access to Information Act, 2000(Act No.2 of 2000).	Throughout the whole document	Without access to information, a person may be unable to determine whether or not his or her right to just administrative action (or to an environment not harmful to human health or wellbeing or, for that matter, any other Constitutional right) has been infringed. The purpose of the Promotion of Access to Information Act ("PAIA") is to give effect to the Constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights, and to provide for matters connected therewith. In addition to providing access to information, cognisance should be taken that PAIA also makes provision for the refusal of access to information that is deemed to be of a sensitive, confidential or classified nature. This is captured under Chapter 4 of part 2 and 3 of PAIA.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
National Environmental Management: Waste Act 59 of 2008	Section 4.2 of Part A	Section 20 of the NEMWA pertains to the consequences of listing waste management activities and states that no person may commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required. In terms of the current statutory framework with regards to waste management, a waste management licence is required for those waste management activities identified in the Schedule to GN 718. Certain of the waste management activities listed in the Schedule are governed by specific thresholds. Where any process or activity falls below or outside the thresholds stipulated, a waste management licence is not required. Consideration was given to additional waste management activities and potential licencing. A waste license will not be required in terms of the National Environmental Management: Waste Act 59 of 2008. All waste generated at the silica stockpile site will be stored at the mine's salvage yard. Contaminated soil will be stored in skips demarcated for this purpose and disposed of by an appointed waste disposal certificated contractor to a permitted landfill site.
The Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)	Throughout the whole document	The MPRDA was passed in order to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources, and to provide for matters connected therewith. The Preamble to the MPRDA *inter alia* affirms the State's obligation to: • protect the environment for the benefit of present and future generations; • ensure ecologically sustainable development of mineral and petroleum resources, and; • promote economic and social development. The aforesaid MPRDA preamble affirms the general right to an environment provided for in section 24 of The Constitution of the Republic of South Africa, Act 108 of 1996 (then Constitution). The national environmental management principles provided for in section 2 of the National Environmental Management Act (NEMA), Act No.107 of 1998 apply to all prospecting and mining operations and any matter relating to such operation. These principles apply throughout the Republic to the actions of all organs of state including, inter alia, the Department of Mineral Resources (DMR), previously known as the Department of Minerals and Energy (DME), that may significantly affect the environment. Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
		factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations.
The National Environmental Management Act, 1998 (Act No. 107 of 1998). The Environmental Impact Assessment Regulations, R. 982 dated December 2014, and amended. The Environmental Impact Assessment Regulations, R. 983 dated December 2014, and amended. The Environmental Impact Assessment Regulations, R. 984 dated December 2014, and amended. The Environmental Impact Assessment Regulations, R. 985 dated December 2014, and amended.	Throughout the whole document	The overarching principle of the National Environmental Management Act 1998 (Act 107 of 1998) (NEMA) is sustainable development. It defines sustainability as meaning the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure the development serves present and future generations. Section 2 of the NEMA (Act no 107 of 1989) provides for National Environmental Management Principles. These principles include: • Environmental management must place people and their needs at the forefront of its concern. • Development must be socially, environmentally and economically sustainable. • Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated. • Environmental justice must be pursued. • Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued. • Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle. • The participation of all Interested and Affected Parties (I&APs) in environmental governance must be promoted. • Decisions must take into account the interests, needs and values of all I&APs. • The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment. • Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law. • The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
		• The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment. Section 24 of the NEMA, headed "Environmental Authorisations" sets out the provisions which are to give effect to the general objectives of Integrated Environmental Management (IEM), and laid down in Chapter 5 of the NEMA. In terms of section 24(1), the potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority charged by the NEMA with granting of the relevant environmental authorisation. On 04 December 2014, the Department of Environmental Affairs (DEA) published the 2014 NEMA Environmental Impact Assessment (EIA) Regulations and listed activities in Government Gazette No. 38282, which was amended in 2017. The proposed development involves 'listed activities', as identified in terms of the NEMA read with the Environmental Impact Assessment Regulations of 2014. In terms of section 24(2) and 24D of the NEMA no person may commence an activity listed or specified in terms of the act unless the competent authority has granted an environmental authorisation for the activity. All proposed activities at the proposed silica product stockpile area will undergo all of the required environmental authorisation processes.
Bojanala Platinum District Municipality: Air quality management by-law, published under LAN230 in North West Provincial Gazette 7191 of 15 November 2013.	Section 1.4.9 (Part B) of this BAR / EMPr.	District and Local Municipality by-laws have been taken into consideration during the inclusion of mitigation and management measures. Refer to Section 1.4.9 (Part B) of this BAR / EMPr as well as Annexure J.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
Bojanala Platinum District Municipality: Fire services by-law, published under LAN204 in North West Provincial Gazette 7053 of 09 November 2012.		
Bojanala Platinum District Municipality: Municipal health services by-law, published under LAN199 in North West Provincial Gazette 6947 of 22 November 2011.		
Bojanala Platinum District Municipality: Draft Air Quality Management Plan. 2011.		
Rustenburg Local Municipality: Air pollution by-law, published under LAN264 in North West Provincial Gazette 7383 of 12 December 2014.		
Rustenburg Local Municipality: By-law relating to the disposal of contaminated and / or infectious waste, published		

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
under LAN234 in North West Provincial Gazette 6205 of 06 September 2005.		
Rustenburg Local Municipality: By-law relating to the prevention of nuisances, published under LAN233 in North West Provincial Gazette 6205 of 06 September 2005.		
Rustenburg Local Municipality: By-law pertaining to public health hazards and nuisances, published under LAN238 in North West Provincial Gazette 6205 of 06 September 2005.		
Rustenburg Local Municipality: Waste management by-law, published under LAN79 in North West Provincial Gazette 7005 of 12 June 2012.		
Guideline on Need and Desirability in terms of the	Section 6 (Part A) of this BAR/ EMPr.	The need and desirability of the mine has been discussed in Section 6 below in terms of the required format contained in the Guideline on Need and Desirability (GN 891 of 2014).

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
Environmental Impact Assessment (EIA) Regulations, 2010. Government Notice 891 of 2014.		It should however be noted that Rietvly Mine is an existing mine, and the Need and Desirability section (below) has been described in this context, as well as taking the extension of the mining area into Portions 33, 92 and 220 of the farm Rietvly 271 JQ, into consideration (i.e. continuation of mining).

6. Need and desirability of the proposed activities.

6.1 Need and Desirability in terms of the Guideline on Need and Desirability, 2017

In 2017, the Department of Environmental Affairs published an Integrated Environmental Management Guideline, the Guideline on Need and Desirability. The following table indicates on how the guideline requirement were considered in this Basic Assessment Report:

REQUIREMENT	PART WHERE REQUIREMENT IS ADDRESSED/RESPONSE
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?[4]	Rietvly Mine falls within Mucina & Rutherford's (2006) Gold Reef Mountain Bushveld (SVcb 9) vegetation type. Gold Reef Mountain Bushveld consists of rocky hills and ridges often west-east trending, with more dense, woody vegetation often on the south-facing slopes associated with distinct floristic differences. Rietvly Mine is situated on the Magaliesberg mountain range where it adjoins the Magaliesberg Biosphere Reserve and Important Bird Area. A large portion (almost 60%) of the Rietvly study area comprises natural habitat, which supports a notable diversity of wild flora and fauna including various introduced ungulate game species. The impacts of the proposed silica stockpile area in terms of biodiversity are discussed in detail in Annexure J (Risk Assessment Report). Refer also to Section 7.5 of Part A of this BAR / EMPr.
1.1 How were the following ecological integrity considerations taken into account?	
1.1.1 Threatened Ecosystems.[5]	
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.[6]	
1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").	As per Chapter M of Section 7.4 (Part A) of this BAR / EMPr, the North West Conservation Plan (NW: C Plan) is based on a provincial Biodiversity Assessment (Desmet et al. 2009) and provides important guidance for biodiversity conservation and sustainable development in the province. Among other things, the C Plan will be used to inform the development of provincial biodiversity Sector Plans, bioregional plans, Spatial Development Frameworks (SDFs), Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and the Environmental Impact Assessment (EIA) process in the province.
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.	

[4] Section 24 of the Constitution and section 2(4)(a)(vi) of NEMA refer.
[5] Must consider the latest information including the notice published on 9 December 2011 (Government Notice No. 1002 in Government Gazette No. 34809 of 9 December 2011 refers) listing threatened ecosystems in terms of Section 52 of National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
[6] Section 2(4)(r) of NEMA refers.

	According to the latest NW:C Plan, the Rietvly Mine is situated in a Category 2 Critical Biodiversity Area (CBA 2) and Ecological Support Area 2 (ESA 2). Furthermore, the National Terrestrial Priority Areas (NPA) assessment was based on integrating data on species, habitats and ecological processes to identify areas of greatest biodiversity significance. This resulted in the identification of nine spatial priority areas for terrestrial biodiversity (Driver et al. 2004). These priority areas represent areas with high concentrations of biodiversity features and/or areas where there are few options for meeting biodiversity targets (Rouget et al. 2004). Rietvly Mine is situated in the Bushveld-Bankenveld Priority Area, which faces the highest pressure of the nine identified NPA's (NBI, 2004). According to the Bojanala District Municipality Integrated Development Plan (IDP), 2012-17, large parts of the District Municipality are characterised by high levels of biodiversity as determined in the North West Biodiversity database. In response to the importance of the Bojanala Platinum District as far as biodiversity is concerned, the North West Parks and Tourism board is also considering the extension of several existing nature reserves and conservation areas.
1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).[7]	A Provincial Air Quality Management Plan was developed for the North West Province, in March 2009, which Rietvly Mine needs to be take cognisance of. Furthermore, as per Government Notice 154, dated 08 March 2013, the Waterberg National Priority area (in terms of air quality) has been changed to now also include the Bojanala District Municipality. The name of the priority area has been changed to the 'Waterberg-Bojanala National Priority Area'. An Air Quality Management Plan has been drafted for the priority area, setting out the objectives and implementation plan for the area.

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

	This has been taken into consideration during the inclusion of the mitigation and management measures in this BAR / EMPr. Refer to Section 1.4.9 (Part B) of this report.
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?[8]	The potential impacts that may occur as a result of the proposed activity have been identified and discussed in Section 7.5 of Part A. The impacts have also been assessed and mitigation measures were explored to minimise and remediate the 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?[9]	
1.4 What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?[10]	Glencore's Chrome Mining Division has a central waste management procedure that is to be adhered to by Rietvly Mine. According to the mentioned procedure all possible recycling methods are to be identified in order to reduce the quantities of waste at all sites. Chrome Mining Division has appointed a contractor to manage and control all waste and scrap generated within all sites, excluding tyres. Colour coded bins are placed at strategic points and once full the bins are transported to the salvage yard by the contractor, where the contractor will sort the waste into the respective storage areas for example, plastic, paper, hazardous and domestic waste, etc. Glencore Chrome Mining Division has a documented Waste Management and Minimisation Plan (WMMP). The overall objective of the WMMP is to reduce generation and environmental impacts of all forms of waste. The mentioned plan provides guidance on waste management, disposal, re-use, recycling, reporting and auditing and divides waste types into the 'reduce, re-use and recycle' streams

[8] Section 24 of the Constitution and Sections 2(4)(a)(i) and 2(4)(b) of NEMA refer.
[9] Section 24 of the Constitution and Sections 2(4)(a)(ii) and 2(4)(b) of NEMA refer.
[10] Section 24 of the Constitution and Sections 2(4)(a)(iv) and 2(4)(b) of NEMA refer.

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?[11]	No sites or landscapes that constitute the nations cultural heritage will be disturbed or enhanced as a result of the construction of the silica product stockpiling area.
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?[12]	This project comprises the clearing of vegetation for the construction of a stockpile area, and it does not affect underground operations and non-renewable natural resources. The potential impacts that may occur as a result of the proposed activity have been preliminarily identified and discussed in Section 7.5 of Part A.
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?[13]	This project comprises the clearing of vegetation for the creation of a silica product stockpile area, and it does not affect renewable natural resources. Refer to Section 7.5 (Part A) of this BAR / EMPr and Annexure J for more information regarding the environmental and social impacts identified. Refer also to Section 7.4 (Part A) for detail regarding water management on-site.
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)	
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?)	

[11] Section 24 of the Constitution and Sections 2(4)(a)(iii) and 2(4)(b) of NEMA refer.
[12] Section 24 of the Constitution and Sections 2(4)(a)(v) and 2(4)(b) of NEMA refer.
[13] Section 24 of the Constitution and Sections 2(4)(a)(vi) and 2(4)(b) of NEMA refer.

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?[14]	A risk-averse and cautious approach was applied by the undertaking of numerous specialist studies and monitoring programmes during recent years. A conservative approach was followed in terms of the identification and assessing of environmental impacts during the BAR / EMPr phase.
1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	The knowledge gaps and uncertainties have been identified during the process of the proposed project and are discussed in Section14 of Part A.
1.8.2 What is the level of risk associated with the limits of current knowledge?	The proposed project relates to the clearing of vegetation for the creation of a stockpile area. Since a detailed risk / impact assessment has previously been undertaking as part of the current operations, the level of risk (currently) associated with the limits of current knowledge can be considered low.
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?	A conservative approach was followed in terms of the identification and assessing of environmental impacts associated with the proposed project. Part A Section 7.5 addresses potential impacts that the activities have on the surrounding environment.
1.9 How will the ecological impacts resulting from this development impact on people's environmental right in terms following:[15]	
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?	The potential impacts that may occur as a result of the proposed activity have been identified and discussed in Section 7.5 of Part A. The impacts have also been assessed and mitigation measures were explored to minimise and remediate the 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.)?	The identification and assessment of the environmental and socio-economic impacts have been presented in Section 8 (Part A) below. Refer also to Annexure J (Risk Assessment Report) for a detailed assessment of the identified potential impacts.

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

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?	The proposed project relates to the clearing of vegetation for the creation of a silica product stockpile area. The proposed project will have a low effect on the ecological integrity of the area as no red data or near threatened species will be removed or destroyed on site as per the biodiversity assessment conducted by NSS in 2015. Once the mine closes, the proposed silica product stockpile area will be rehabilitated as per the mine's closure and rehabilitation plans.
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?[16]	Alternatives identified have been described in Section 7.1 of Part A.
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?[17]	The positive and negative cumulative impacts have been described in Section 9 of Part A.
2. "Promoting justifiable economic and social development"[18]	
2.1 What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1 The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	Refer to Chapter O of Section 7.4.1 (Part A) of this BAR/EMPr. The identification and assessment of the environmental and socio-economic impacts have been presented in Section 9 (Part A) below. Refer also to Annexure J (Risk Assessment Report) for a detailed assessment of the identified potential impacts.
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 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?	
2.2.1 Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	

[16] Section 2(4)(b) of NEMA refer.
[17] Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.
[18] Section 24 of the Constitution refers.

2.3 How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?[19]	Refer to Chapter O of Part 7.4.1 (Part A) of this EIAR/EMPr and the Social and Labour Plan attached hereto as Annexure E. Note that Rietvly Mine is an already existing mining operation in the area.
2.4 Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term?[20] Will the impact be socially and economically sustainable in the short- and long-term?	The identification and assessment of the positive and negative environmental and socio-economic impacts have been presented in Section 9 (Part A) below. Refer also to Annexure J (Risk Assessment Report) for a detailed assessment of the identified potential impacts. The mine will be economically sustainable over the short and long-term as the mining operation is expected to continue for at least the next 30 years.
In terms of location, describe how the placement of the proposed development will:[21]	
2.4.1 result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	The proposed project relates to the clearing of vegetation for the creation of a silica product stockpile area for the Rietvly mine. As the mine is an existing mining operation, no new location impacts have been identified. The mine will continue to provide work for employees during the operational phase.
2.4.2 reduce the need for transport of people and goods,	
2.4.3 result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	
2.4.4 compliment other uses in the area,	
2.4.5 be in line with the planning for the area,	
2.4.6 for urban related development, make use of underutilised land available with the urban edge,	
2.4.7 optimise the use of existing resources and infrastructure,	
2.4.8 opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.4.9 discourage "urban sprawl" and contribute to compaction/densification,	
2.4.10 contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	
2.4.11 encourage environmentally sustainable land development practices and processes,	

[19] Section 2(2) of NEMA refers.
[20] Sections 2(2) and 2(4)(c) of NEMA refers.
[21] Section 3 of the Development Facilitation Act, 1995 (Act No. 67 of 1995) ("DFA") and the National Development Plan refer.

2.4.12 take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	
2.4.13 the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	
2.4.14 impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	
2.4.15 in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	
2.5 How were a risk-averse and cautious approach applied in terms of socio-economic impacts?[22]	A conservative approach was followed in terms of the identification and assessing of socio economic impacts associated with the proposed project. Part A Section 7.5 addresses potential impacts that the activities have on the surrounding environment.
2.5.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?[23]	
2.5.2 What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	
2.5.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
2.6 How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following	
2.6.1 Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	No negative impacts on the socio-economy as a result of the proposed project have been identified.
2.6.2 Positive impacts. What measures were taken to enhance positive impacts?	The positive impacts of the proposed clearing of vegetation for the creation of a silica product stockpile on the socio-economy, is that it creates a continuation of employment and creation of temporary employment locally.
2.7 Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	The identification and assessment of the environmental and socio-economic impacts have been presented in Section 9 (Part A) below. Refer also to Annexure J (Risk Assessment Report) for a detailed assessment of the identified potential impacts.

[22] Section 2(4)(a)(vii) of NEMA refers.
[23] Section 24(4) of NEMA refers.

2.8 What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?[24]	Refer also to Annexure E for a copy of the Social and Labour Plan.
2.9 What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)?[25] 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?	A conservative approach was followed in terms of the identification and assessing of environmental impacts associated with the proposed project. Part A Section 7.5 addresses potential impacts that the activities have on the surrounding environment.
2.10 What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?[26]	The identification and assessment of the environmental and socio-economic impacts have been presented in Section 9 (Part A) below. Refer also to Annexure J (Risk Assessment Report) for a detailed assessment of the identified potential impacts. Refer also to Annexure E for a copy of the Social and Labour Plan.
2.11 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?[27]	A conservative approach was followed in terms of the identification and assessing of environmental impacts associated with the proposed project. Part A Section 7.5 addresses potential impacts that the activities have on the surrounding environment.
2.12 What measures were taken to:	
2.12.1 ensure the participation of all interested and affected parties,	Refer to Section 7.2 of Part A for a description of the Public Participation Process conducted. The Public Participation Process presents the details of all I&APs that were identified, how the I&APs were notified and involved in the process, any issues and concerns raised by the I&APs and the final results of the Public Participation Process.
2.12.2 provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,[28]	
2.12.3 ensure participation by vulnerable and disadvantaged persons,[29]	
2.12.4 promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,[30]	

[24] Section 2(4)(b) of NEMA refers.
[25] Section 2(4)(c) of NEMA refers.
[26] Section 2(4)(d) of NEMA refers.
[27] Section 2(4)(e) of NEMA refers.
[28] Section 2(4)(f) of NEMA refers.
[29] Section 2(4)(f) of NEMA refers.
[30] Section 2(4)(h) of NEMA refers.

2.12.5 ensure openness and transparency, and access to information in terms of the process,[31]	
2.12.6 ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge[32]*, and*	
2.12.7 ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?[33]	
2.13 Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?[34]	The identification and assessment of the environmental and socio-economic impacts have been presented in Section 9 (Part A) below. Refer also to Annexure J (Risk Assessment Report) for a detailed assessment of the identified potential impacts. Refer also to Annexure E for a copy of the Social and Labour Plan.
2.14 What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?[35]	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.
2.15 Describe how the development will impact on job creation in terms of, amongst other aspects: -	
2.15.1 the number of temporary versus permanent jobs that will be created,	According to the mine's SLP Annual Report (2015) (Annexure E), Rietvly Mine has a workforce of 58 employees (including contractors). Therefore, the continuation of the mine would result in continued job security for the current employees.
2.15.2 whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.15.3 the distance from where labourers will have to travel,	
2.15.4 the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and	
2.15.5 the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
2.16 What measures were taken to ensure:	

[31] Section 2(4)(k) of NEMA refers.
[32] Section 2(4)(g) of NEMA refers.
[33] Section 2(4)(q) of NEMA refers.
[34] Section 2(4)(g) of NEMA refers.
[35] Section 2(4)(j) of NEMA refers.

2.16.1 that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and	Refer to the Public Participation Process in Section 7.2 of Part A. Other government departments are included on the list of I&APs and stakeholders and received the notifications of the proposed activity as well as notifications on the availability of the report for review. All applicable environmental legislation was considered during the Basic Assessment process.
2.16.2 that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	
2.17 What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?[36]	During the initial Public Participation Process, all issues and concerns raised by the I&APs, stakeholders and the Organs of State are taken into account and responses provided.
2.18 Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?[37]	Mitigation measures for each of the identified impacts will be described in detail in the EMPr. The proposed mitigation measures will be realistic to protect both the bio-physical and socio-economic environment in both the short- and long-term.
2.19 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?[38]	The applicant will be responsible for the costs of any remediation of pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects.
2.20 Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?[39]	Alternatives identified have been described in Section 7.1 of Part A.
2.21 Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?[40]	The positive cumulative impact on the socio-economy by the continuation of mining, continuation of employment and employment of local contractors are in line with the planned development of the area

[36] Section 2(4)(o) of NEMA refers.
[37] Section 240(1)(b)(iii) of NEMA and the National Development Plan refer.
[38] Section 2(4)(p) of NEMA refers.
[39] Section 2(4)(b) of NEMA refers.
[40] Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.

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

7.1 Details of the development footprint alternatives considered.

Glencore Rietvly Mine is an existing operational mine. There are several sillica product stockpiles located within the north western area of the mining rights boundary. However, Rietvly mine propose to mine those areas and purchased land (Portion 103 of the Farm Shlock 256 JQ) outside of the mining rights boundary to establish a stockpile area. The reason that Portion 103 of the Farm Shylock was chosen as the preferred site was because the area is within close proximity to the existing operations and the topography allows for the creation of a stockpile. The areas surrounding the mine to the east, south and north are farming areas and creating a stockpile area in those areas would mean that new haul roads will have to be constructed and dust associated with the haul roads will cause a nuisance to the farmers.

Silica is highly resitant to weathering so the chances of mobilising to ground water is low and silica does not pose a problem to human health, hence the reason for the proposed activity being undertaken on Portion 103 of the Farm Shylock 256 JQ).

Due to a non-perrennial drainage line that runs through the eastern portions of the property, two layout options were considered for the stockpile. The first option would be to stockpile the product on the land and maintain a buffer (at least outside the 1:100 year flood line) between the stockpile area and the drainage line. This will be done through the construction of a diversion berm between the stockpile and the drainage line. The berm will extend around the property in order to separate affected and clean water. It is proposed to construct a paddock at the lowest point to collect and contain the dirty water runoff from the proposed berm. This paddock will be designed and constructed to contain at least a 1:50 year flood event. This option will decrease the amount of land available for the stockpile areas but will be cheaper to establish.

It is proposed that Rietvly Mine will conduct a waste characterisation assessment of the Silica Stockpiles to ensure that the “waste water” proposed to be stored in the paddock is characterised and quantified to prevent environmental pollution. Should the waste characterisation assessment results indicate that there are high levels of waste, a Section 21 (g) water use will need to be applied for. However, should the waste characterisation assessment results indicate that the waste levels in the water are negligible, it is recommended that the water be attenuated to control the silt and then allow the water to be released into the Penzhorn Dam. This option would require Rietvly Mine to apply for a GN R704 exemption.

The second option would be to stockpile the product on the entire portion of land that will impede the non-perrinnial drainage line. This option will increase stockpiling footprint, however, the non-perrennial drainage line will have to be diverted by constructing an engineered clean water diversion channel to the east of the new property. Although this will increase the stockpiling footprint, this will be a costly option and is, therefore, not the

preferable option. In addition, this option may also trigger other authorisations, e.g. a Section 21(c) & (i) water use licence.

In terms of the technology to be utilised for the proposed activity, the clearing of the vegetation will take place by utlising graders to clear the land. A buffer will be placed around the drainage line to ensure that no encroachment into sensitive environment takes place. Once the clearing and grubbing actvities take place, the silicia product will be transported from the plant to the stockpile areas via trucks. Trucks will again be utilised to transport the silica product from site.

The option of not implementing the activity would mean that the mine cannot expand its operations. As per the Mining Works Programme (MWP), the life of mine is more than 30 years, hence the need for this expansion. The collateral effect of not implementing the activity would mean that employees of the mine would have to be retrenched leading to job loss.

7.2 Details of the Public Participation Process Followed

The public participation process for this project was conducted in terms of:

- The procedures and provisions in terms of the NEMA;
- Chapter 6 of the 2014 EIA Regulations;
- GN 807 of 2012; Public Participation Guideline; and
- Other relevant legislation such as the Promotion of Access to Information Act (PAIA), 2000.

A detailed public participation process was undertaken, and included the following:

- Key Stakeholder identification;
- Method of notifications, e.g. advertisements, site notices, BID, email notifications;
- Registration of Interested and Affected Parties (I&AP's) and key stakeholders;
- Access and opportunity to comment on the draft BAR by I&AP's; and
- Consultation with the relevant authorities.

The following key stakeholder were identified and notified of the project:

- Landowner/s;
- Lawful occupier/s of the land;
- Landowners or lawful occupiers on adjacent properties;
- Municipal councillor;
- Municipality;
- Organs of state;
- Communities; and
- Other Competent Authorities affected.

The following notification and consultation methods were used:

- Newspaper advertisement in the Rustenburg Herald placed on the 18 January 2019;

- Site notices were placed on 14 January 2019 (refer to Annexure E2 for proof of site notices placed); and
- Background Information Document (BID) sent to key stakeholders with email notifications (refer to Annexure E3 for a copy of the BID and Annexure E4 for proof of the notifications sent).

The potential key stakeholders were notified of the project and have been provided with the opportunity to register as an I&AP by 20 February 2019.

The draft BAR and EMPr is available to the public for review for a period of thirty (30) days, from 21 January 2019 to 20 February 2019. An electronic copy of the BAR and EMPr will also be posted on the Shangoni's website (www.shangoni.co.za) for public comment for the same period of thirty days.

A meeting was held with the DMR on 19 January 2018 and response on the meeting was provided on the 25th of January 2018 (refer to Annexure C2 for a copy of the response). Once the public review of the draft BAR has been completed, the report will be finalised inclusive of the comments from I&APs and will be submitted to the DMR for review. Once DMR has made a decision, registered stakeholders will be notified of the decision.

7.3 Summary of issues raised by I&APs

The table below will be completed when the final BAR is compiled and will provide a summary of the comments and issues raised and reaction to those responses.

INTERESTED AND AFFECTED PARTIES	DATE COMMENTS RECEIVED	ISSUES RAISED	EAPS RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED.
Landowner/s				
Glencore Operations South Africa (Pty) Ltd:				
Lawful occupier/s of the land				
Glencore Operations South Africa (Pty) Ltd:				
Landowners or lawful occupiers on adjacent properties				
Christiaan Cloete				
Walt Hay				
Municipal councillor				
Cheryl Philips				
Municipality				
Bojanala District Municipality				
Rustenburg Local Municipality (RLM)				
Kgetlengrivier Local Municipality (KLM)				
Organs of state				
North West Department of Rural, Environment and				

INTERESTED AND AFFECTED PARTIES	DATE COMMENTS RECEIVED	ISSUES RAISED	EAPS RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED.
Agricultural Development (READ)				
SAHARA				
Department of Environmental Affairs				
Department of Water and Sanitation				
Department of Mineral Resources				
Communities				
Innovative Mining Supplies cc				
Andru Mining				
Bryce Norton				
Murbanes				
R&W Electrocon				
WCB Draughting Services				

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

7.4.1 Type of environment affected by the proposed activity

A baseline description or "status quo" of the present environmental situation is provided in this part of the document. The following attributes / aspects have been described in detail, in the following respective chapters:

- Chapter A: Geology
- Chapter B: Climate.
- Chapter C: Topography.
- Chapter D: Soil.
- Chapter E: Vegetation.
- Chapter F: Fauna.
- Chapter G: Surface water.
- Chapter H: Sensitive landscapes.
- Chapter I: Groundwater.
- Chapter J: Air Quality.
- Chapter K: Noise, vibration and shock.
- Chapter L: Visual.
- Chapter M: Protected areas and conservation planning.
- Chapter O: Sites of archaeological and cultural importance.
- Chapter P: Regional socio-economic structures.

Note: Documents as included in this section (and attached in Annexure H) contain existing information (in some cases specialist studies) generated for the Rietvly Mine's previous EMP purposes as well as for environmental management implementation purposes on the mine. It should be noted that the specialist studies specifically were conducted prior to the promulgation of the 2014 EIA Regulations, but the content of such studies remain applicable for inclusion into this EIAR/EMPr document.

7.4.1.1 Chapter A: Geology

As per the Mining Works Programme, Rietvly Mine is situated in the Magaliesberg Formation of the Pretoria Group. The Pretoria Group forms part of the Transvaal Sequence (2 300 Million Years). The Magaliesberg Formation consists of quartzite's (often re-crystallised) and shale (metamorphosed to hornfels) varying in thickness from 500 m to 3800 m. The formation forms a very resistant, prominent topographical ridge, which can be seen from kilometres away.

At Rietvly Mine, the quartzite's dip towards the east and north-east with the dips varying between 32° and 62°. The Magaliesberg Formation forms the immediate floor to the Bushveld Complex and, therefore, follows the regional trend of the dipping Bushveld Complex layers.

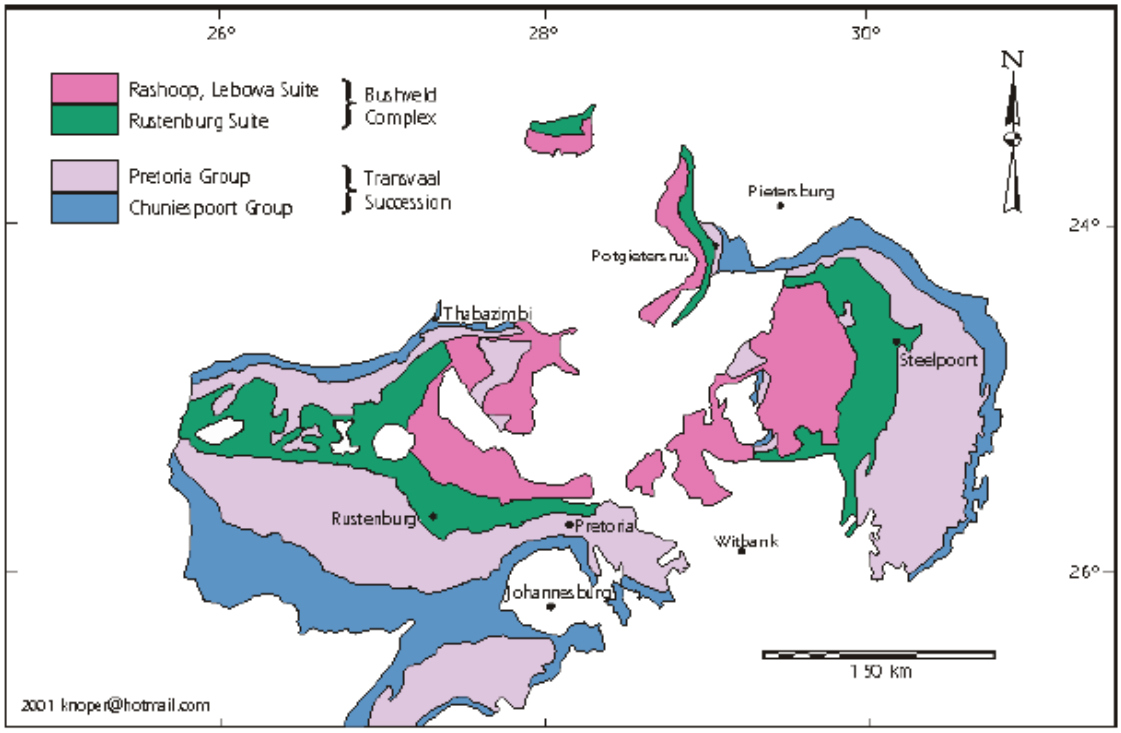

Figure 9: Bushveld Complex (www.geocites.com)

The quartzite's vary in grain size from fine to coarse grained with the colour ranging from white to reddish to purplish along certain joint zones.

The surface soil cover is minimal, a few centimetres along the crest and higher slopes of the ridge, increasing to just less than a meter along the lower slopes. No overburden stripping is, therefore, needed to expose into ore.

Weathering has reduced some of the quartzite ore along the side slopes to quartzite sand. The extent of this effect has not been determined and is believed to be restricted to isolated patches along the sloped where fractures and joints have aided weathering. Jointing throughout the formation is prominent. The depth of the fracturing can only be established with diamond core drilling.

The whole of the surface area is underlain by quartzite's. No indications on surface can be seen of major geological disruptive features. A major regional fault (the Rustenburg Fault) is developed to the east and southeast of the mine (off the mine property).

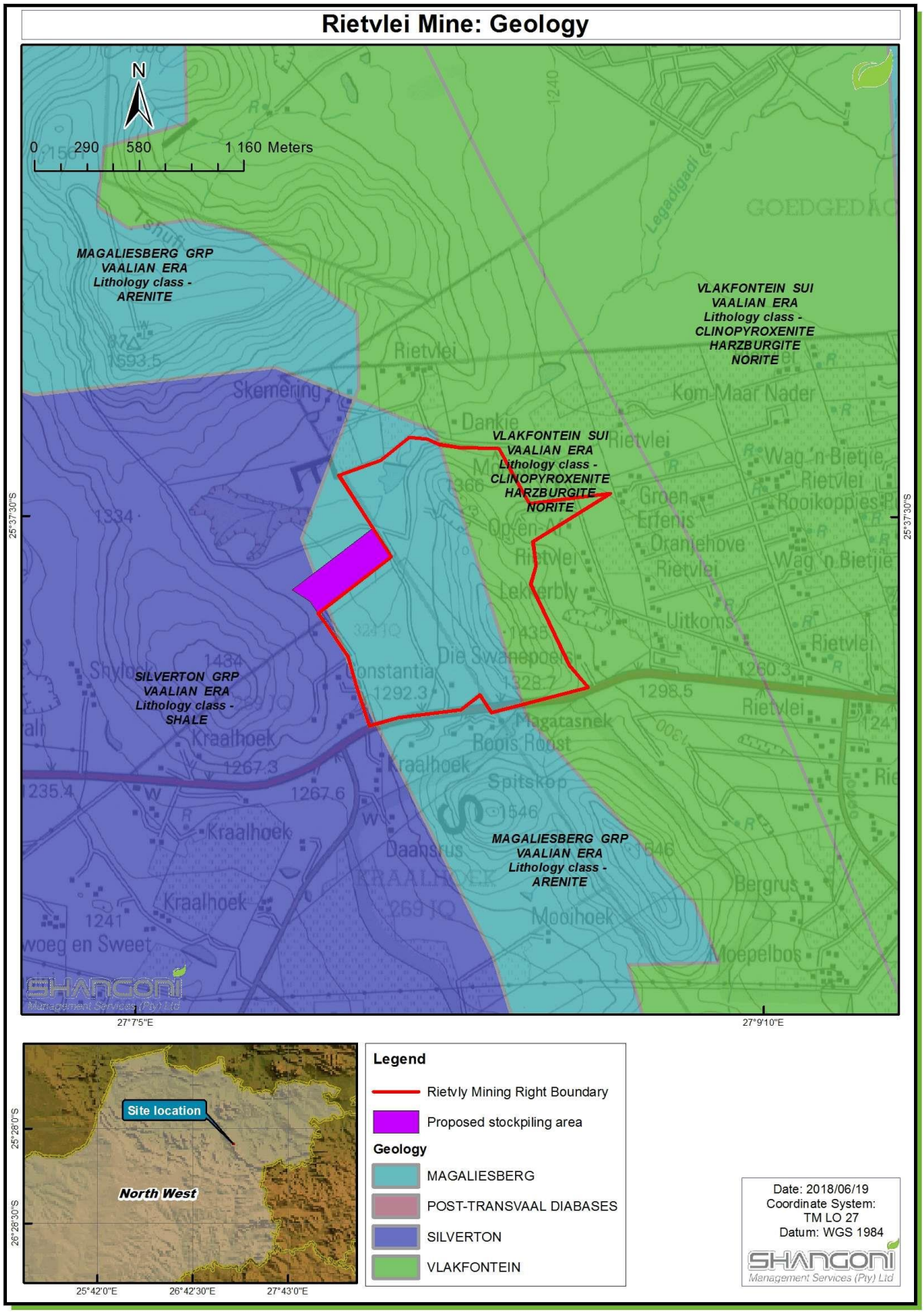

Figure 10: Geology map of Rietvly Mine

7.4.1.2 Chapter B: Climate

Information contained in this section was obtained from the following sources:

- The report titled: "*Conceptual Storm Water Management Plan: Rietvlei Silica Operation. Report, Version – 1*", dated January 2015, compiled by GCS, attached in Annexure;
- The report titled: *"Glencore (Pty) Ltd: Rietvly Silica Mine. Storm Water Report in Support of Shylock Land Basic Assessment,"* dated September 2017, compiled by Shangoni Management Services, attached as Annexure H1; and
- The report titled: "*Geohydrological investigation of proposed new site for Xstrata Rietvly Tailings Facility"*, dated August 2006, compiled by the Institute for Groundwater Studies (IGS) at the University of the Free State.

The site is situated in the Highveld climate zone (Kleynhans et al. 2005). This climate zone is characterised by plains with a moderate to low relief with isolated hills, as well as various grassland vegetation types.

Temperature

The average annual temperature for Rustenburg is 18.7°C. The warm summer months of October through to March commonly have average temperatures in excess of 20°C. The winter month of July typically has a temperature minimum of 2.8°C whereas the maximum summer temperature can exceed 39°C in February. Refer to Figure 11 below for average monthly temperatures.

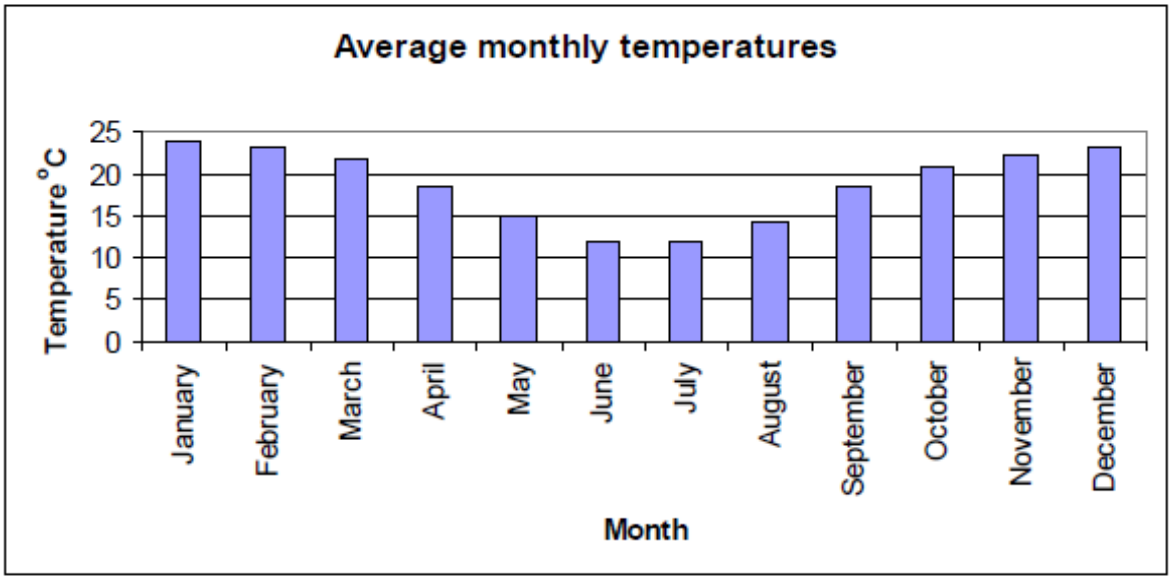

Figure 11: Average monthly temperature (IGS, 2006)

Rainfall

The rainfall depths used within this study were extracted from the closest weather station to the study site, obtained from the Design Rainfall Estimation Programme (Smithers, 2002). The selection of Station Rustenburg (POL) is because this is the closest station to the mine with a reliable record. The rainfall distribution on-site is classified as a type 3 design rainfall distribution (Weddepohl, 1988), this influences the intensity of the rainfall event being analysed.

The Mean Annual Precipitation (MAP) near the site was calculated to be 653 mm; the average monthly rainfall depths are shown in Figure 12.

About 85% of the annual rainfall falls in summer (October to March), in the form of showers and thunderstorms, with the maximum precipitation falling in January. Figure 13 shows the calculated storm duration (days of consecutive rainfall) and their statistical frequencies. This indicates that the rainfall events are short and intense. Figure 14 shows the storm distributions (days between rainfall events) and their statistical frequencies

The 24-hour storm rainfall depths for the 2-year, 10-year, 20-year, 50-year and 100-year recurrence interval events, at the SAWS Station 0511400_W (Rustenburg (POL)) was abstracted from the database (GCS, 2015). The depths are presented in Table 8 below.

Table 8: 24-Hour Storm Rainfall Depths (mm) (GCS, 2015)

Recurrence Interval (Years)	1 in 2	1 in 10	1 in 20	1 in 50	1 in 100
24 Hour Rainfall depth (mm)	71.8	115.9	134.8	161.2	182.4

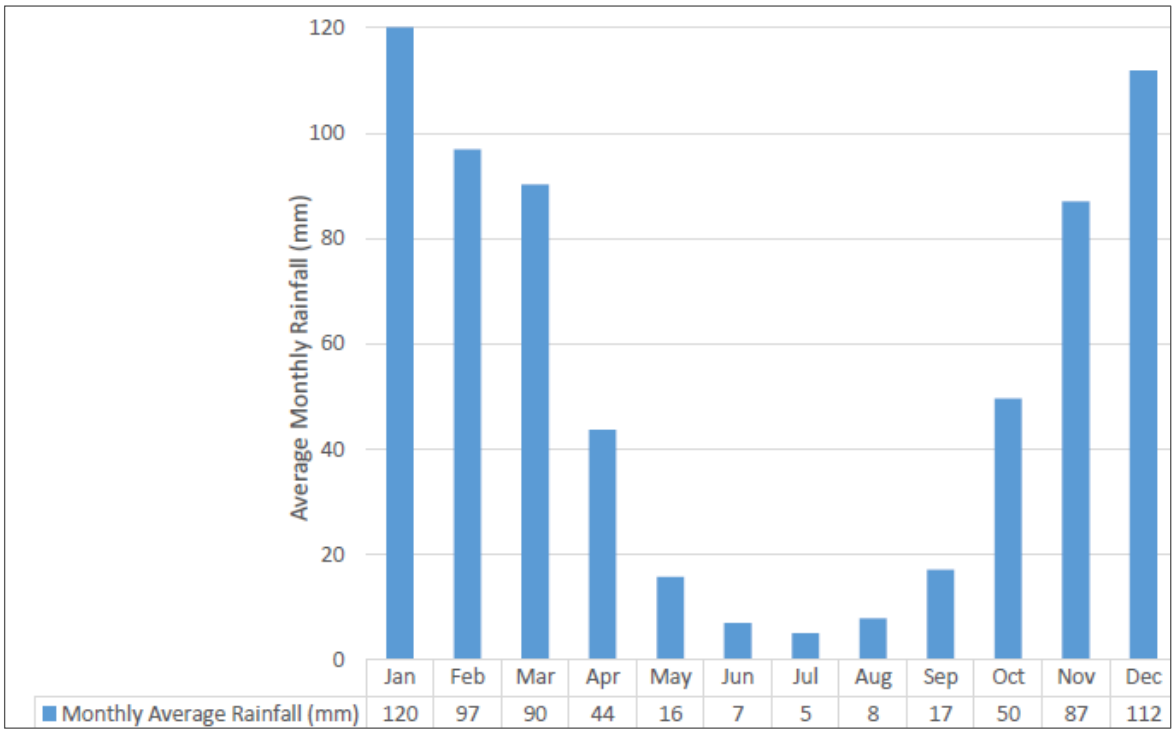

Figure 12: Calculated monthly average rainfall (mm) for rainfall station 0511400_W (Rustenburg (POL)) (GCS, 2015)

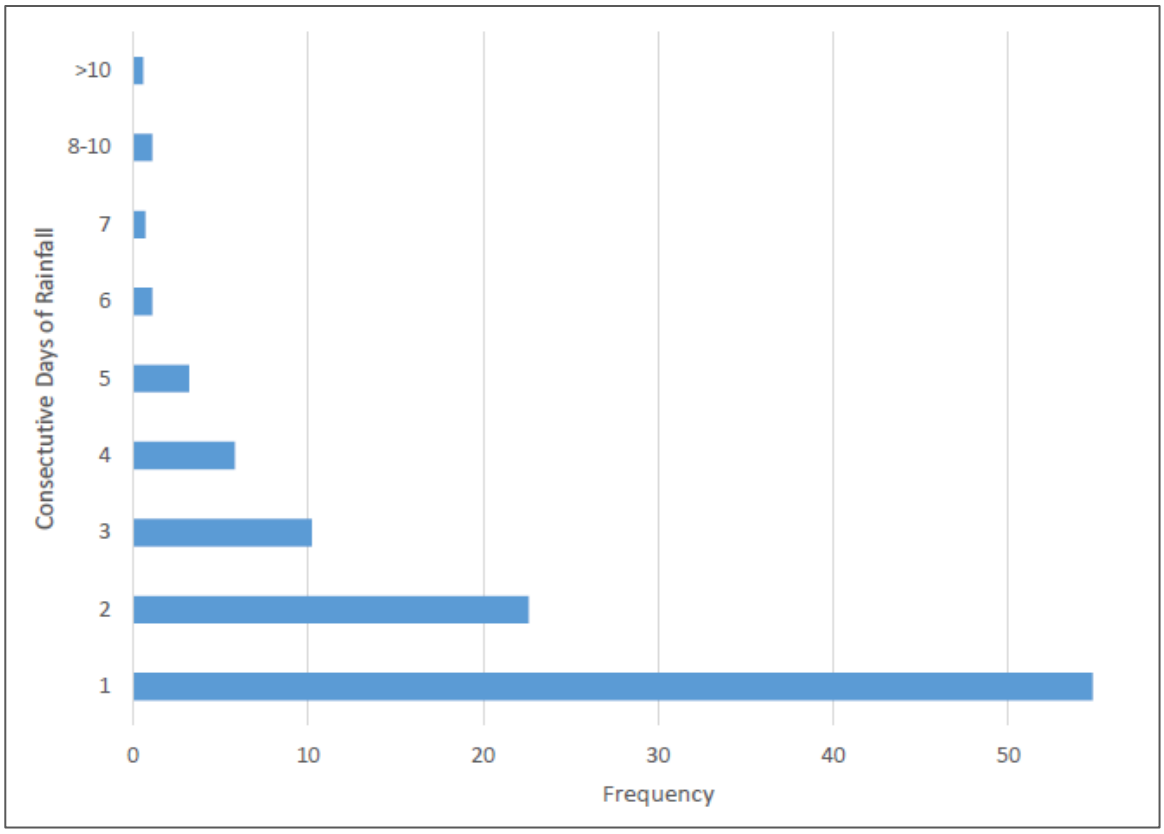

Figure 13: Storm durations for rainfall station 0511400_W (Rustenburg (POL)) (GCS, 2015)

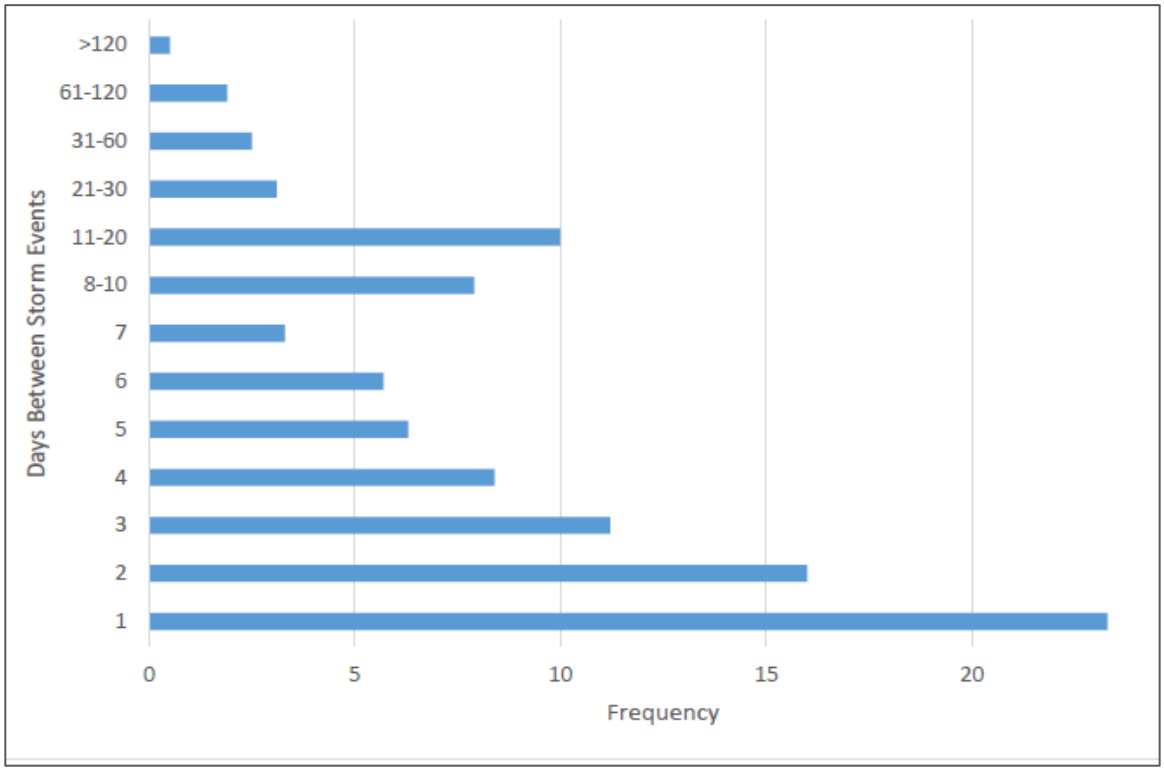

Figure 14: Storm distributions for rainfall station 0511400_W (Rustenburg (POL)) (GCS, 2015)

Evaporation

The mean annual Symons-pan (S-Pan) evaporation in the area was found to be 1434 mm (WR2005). Average monthly evaporation values are presented in Figure 15 below.

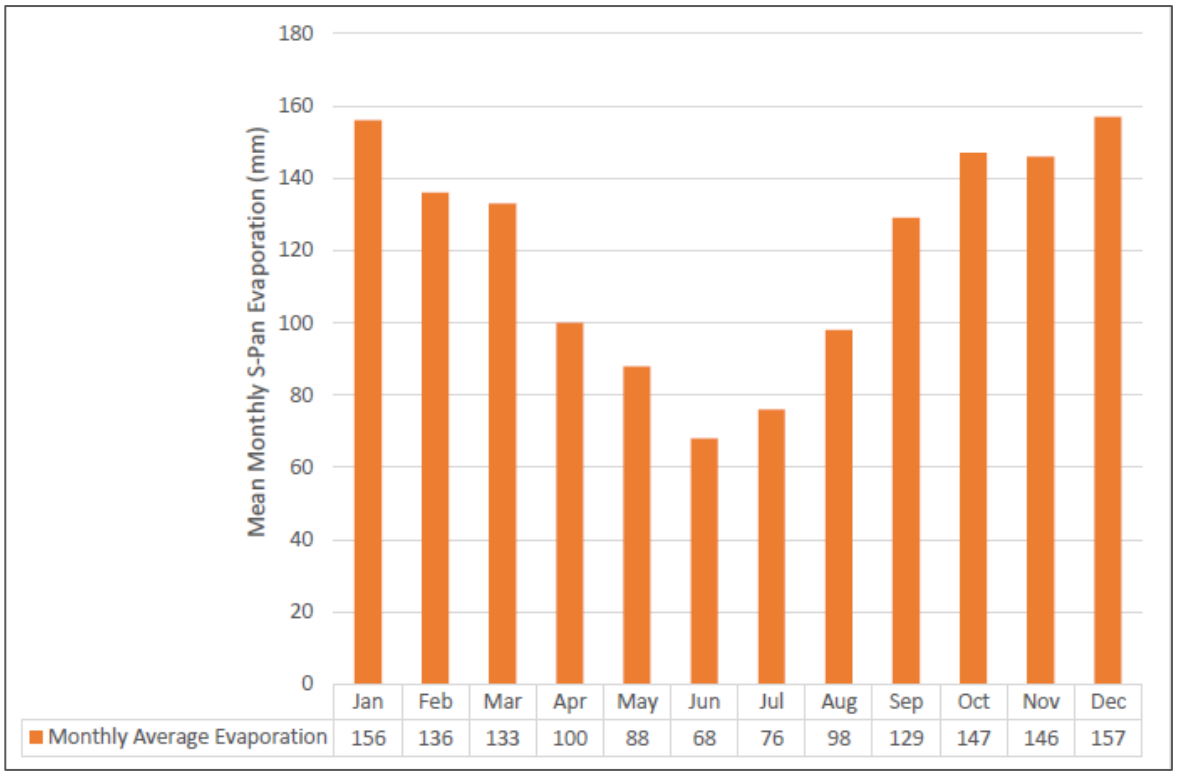

Figure 15: Mean monthly S-Pan evaporation values for Rietvlei area (GCS, 2015)

Wind Speed and Direction

As per the approved EMPr, dated 2009, the predominant wind directions are north-westerly and north-easterly. The most frequently occurring wind speeds are in the range of 5.4 km/h – 11.9 km/h.

7.4.1.3 Chapter C: Topography

Rietvly Mine is located at the foot–slopes of the Magaliesberg and adjacent to the Magaliesberg Natural Protected Environment. The mine is flanked on three sides (west, north and east) by peaks of the Magaliesberg. Mine surface infrastructure is located at an altitude of between 1 280 m and 1 240 m amsl. There are two peaks/koppies on the mine property itself. These koppies lie at an altitude of 1 435 m and 1 366 m above mean sea level (amsl). The lower western parts, the top and eastern slopes of these koppies are currently being bench mined by the mine. The non–perennial Legadigadi stream passes the mine (at an altitude of approximately 1 260 m amsl) on the western side and flows north east towards the Elands River.

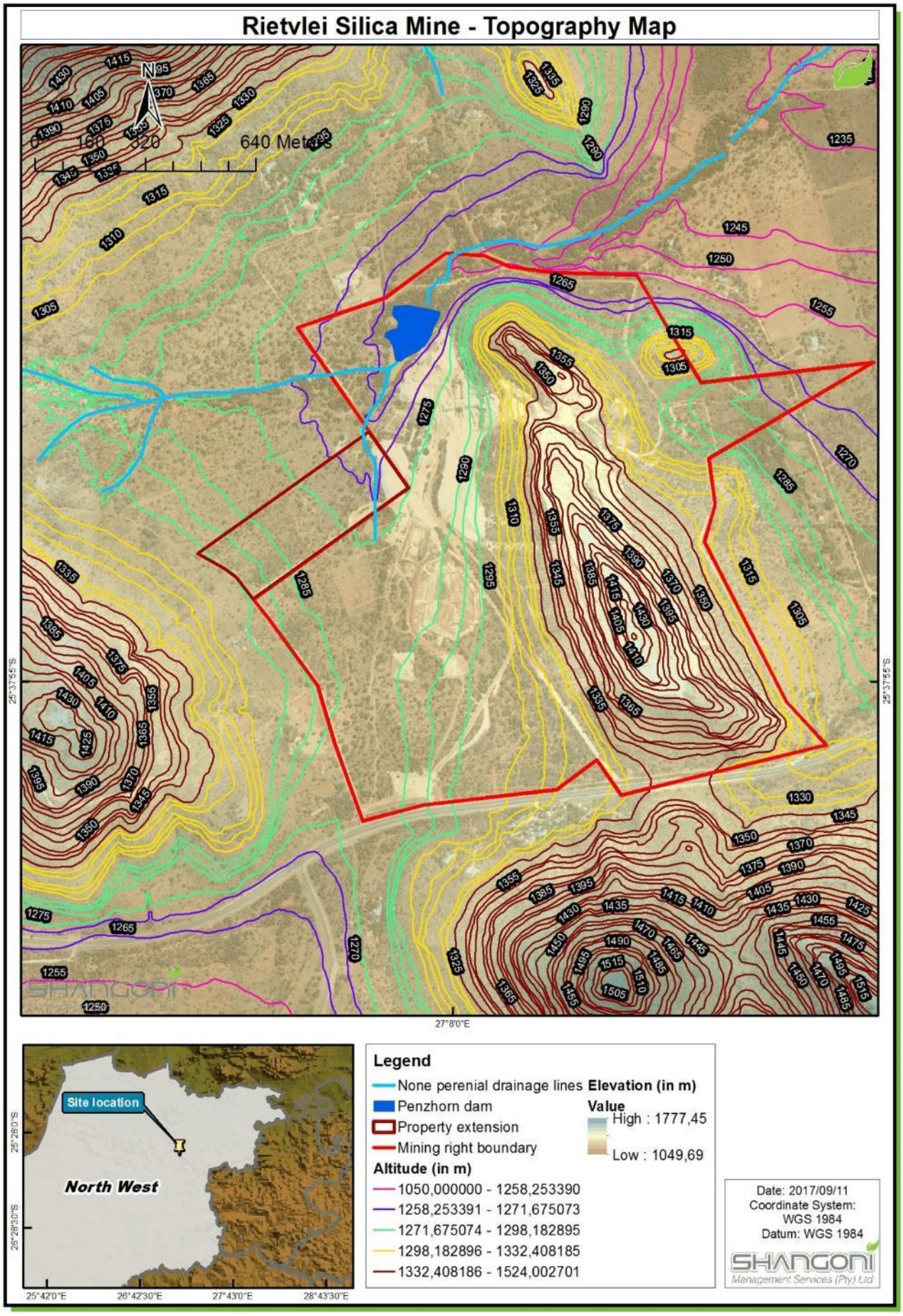

Figure 16: Topography of Rietvly Mine

7.4.1.4 Soil

A soils and land capability study was undertaken for Rietvly Mine by the Institute for Soil, Climate and Water in June 2006. The soils were classified according to the South African Soil Classification System (Soil Classification Working Group, 1991).

The main properties of soils encountered in the area are provided in Table 9 below. Most of the area (over 80%) consists of shallow, stony soils on rock. Within the region the lb and Fb land types are predominant (Mucina & Rutherford, 2006). Rietvly is situated within land type lb3 (NSS, 2015).

Table 9: Summary of the soils present at Rietvly Mine (Metago, 2006)

Map unit	Dominant soil form / family	Other soil forms	Depth (mm)	Description[41]
Hu/R	Hutton 3100	Mispah 1000	50-300	Brown to reddish – brown, stony structureless sandy loam subsoil on rock. Rock outcropping occurs
Sd	Shortlands 2110	Hutton 3100	600-1200	Brown to reddish – brown, often stony, weakly structured sandy clay loam top soils on reddish – brown, moderately structured sandy clay loam to sandy clay subsoil on rock. Some rock outcropping occurs.

[41] As per Figure 22 below, the area is classified to be within a S16 Soil code, characteristic of "non-soil land classes", may be water intake areas and restricted land use options"

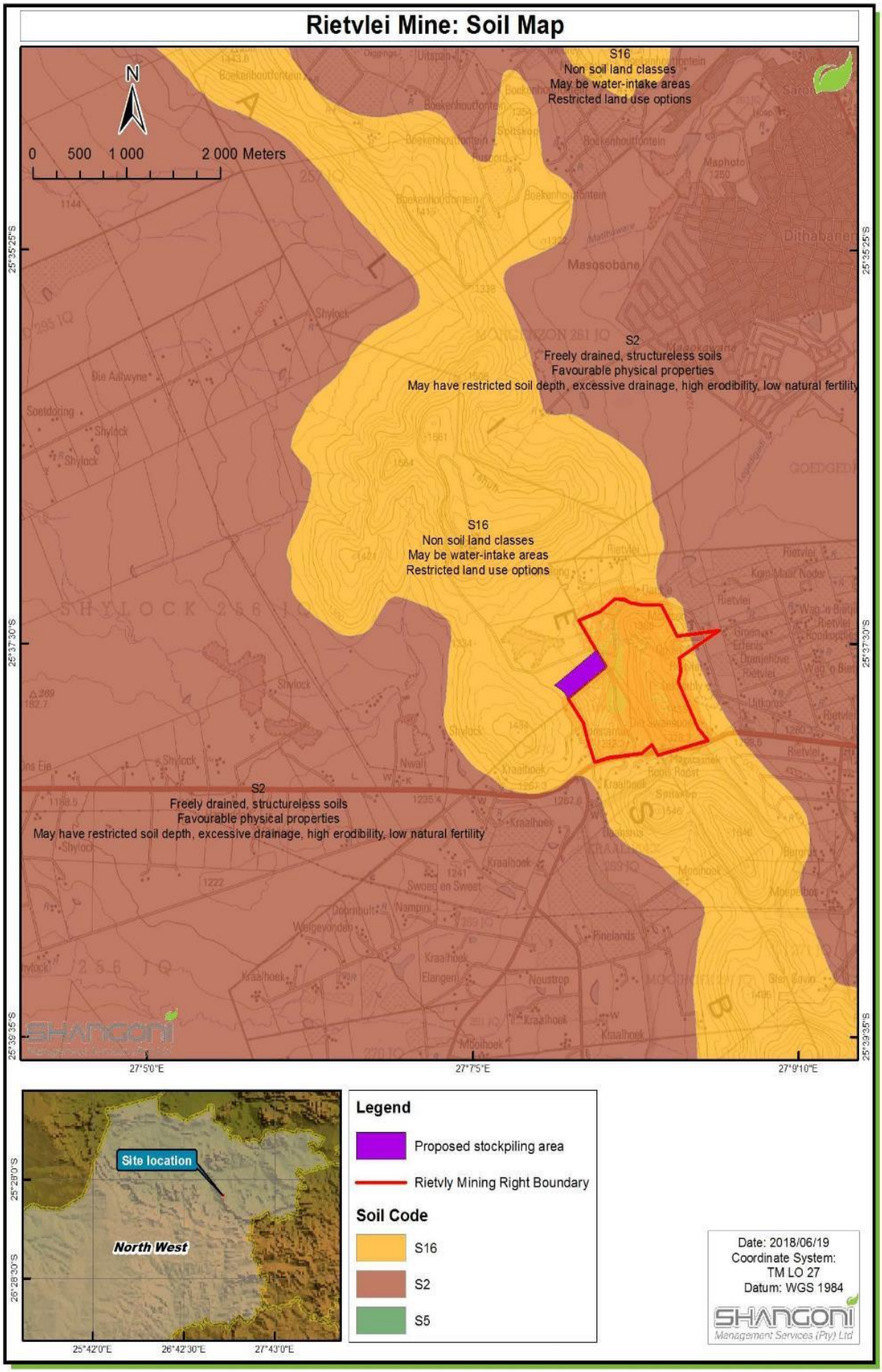

Figure 17: Soils of Rietvly Mine

7.4.1.5 Chapter E: Vegetation

Information contained in this section was sourced from the report titled:" *Rietvly Biodiversity Assessment. Glencore Alloys*" dated September 2015 and compiled by Natural Scientific Services. The mentioned report is attached in Annexure H2.

Regional Vegetation

Rietvly Mine falls within Mucina & Rutherford's (2006) Gold Reef Mountain Bushveld (SVcb 9) vegetation type (Figure 30). Gold Reef Mountain Bushveld consists of rocky hills and ridges often west-east trending, with more dense, woody vegetation often on the south-facing slopes associated with distinct floristic differences (e.g. preponderance of Acacia caffra on the southern slopes) and tree cover elsewhere is variable. Tree and shrub layers are often continuous whilst the herbaceous layer is dominated by grasses (Mucina & Rutherford, 2006).

Site Specific Vegetation

SANBI frequently collect/collate floral data within Southern Africa and update their PRECIS database system (National Herbarium Pretoria (PRE) Computerised Information System) that is captured according to quarter degree squares (QDSs). The Rietvly study site falls with 2527 CA QDS.

Species within the POSA database for this QDS do not exceed 918 species (Date extracted: August 2015) and represent 153 families. This is quite a comprehensive list for the region as opposed to surrounding QDS's.

The dominant families are Poaceae (Herb), Asteraceae (shrubs to small trees) and Fabaceae (graminoid), with the herbs representing 25.33%, graminoids representing 12.39% and shrubs representing 16.01%. As the natural area around the site is considered Thornveld, approximately 34% of the species on site are considered woody shrubs or trees. On site, the growth form structure is largely representative of the QDS's, with herbs, shrubs and graminoids being most dominant.

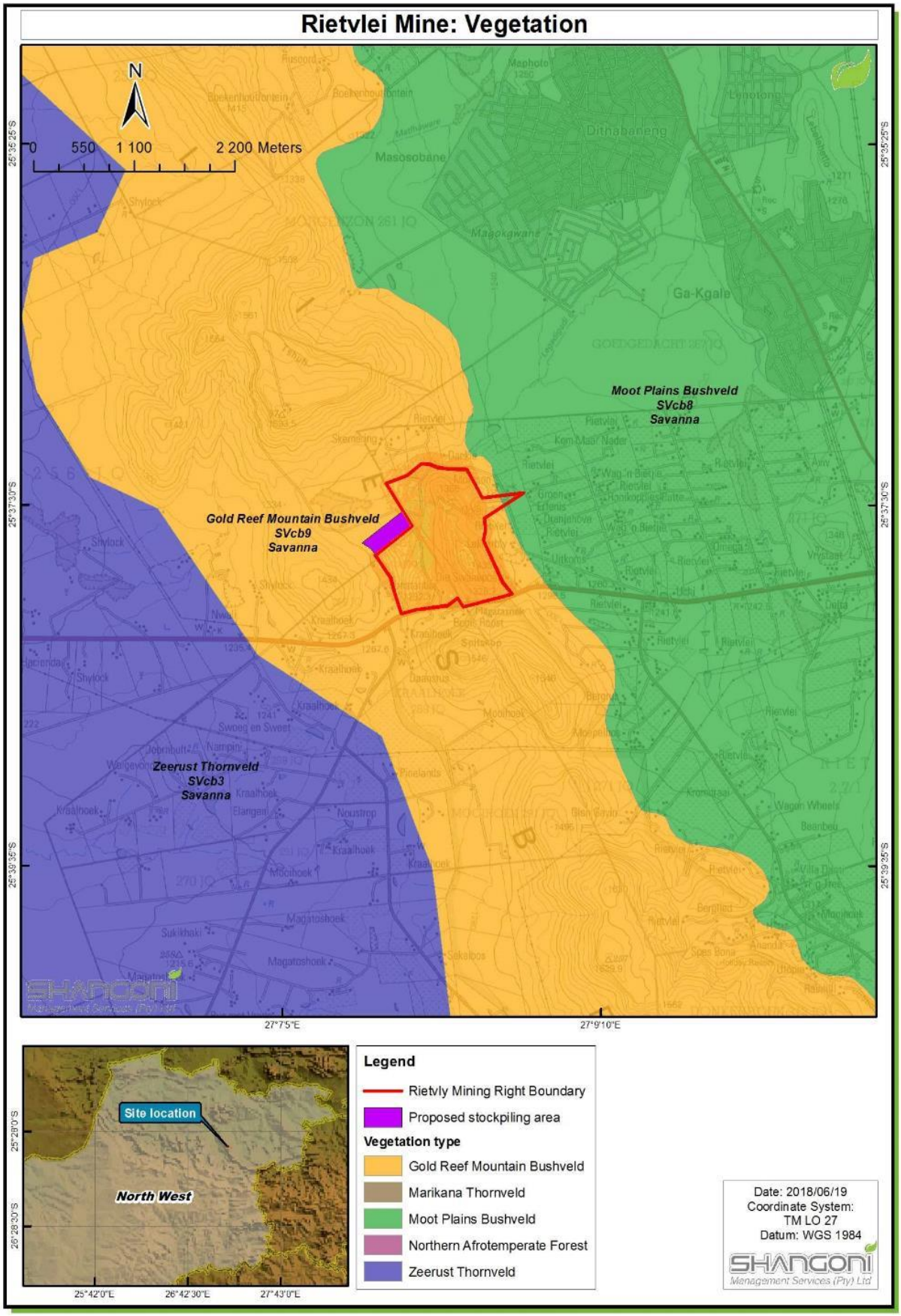

Figure 18: Vegetation of Rietvly Mine

Vegetation Communities

The NSS (2007) study identified three broad vegetation units within the boundaries of Rietvly Mine, these being Acacia woodland, Protea woodland and crest-ridge habitats. A review of the vegetation within the mine area in 2011 presented more detail with four communities listed as:

- Faurea saligna / Protea caffra upper slopes
- Acacia caffra / Olea europea lower slopes
- Searsia lancea / mixed Acacia savanna
- Waterbodies

NSS performed a more detailed and refined assessment in 2015, with similar habitats emerging from the analysis. However, additional communities included the Combretum – Cymbopogon East Slopes and the exposed outcrops within the Protea-Faurea Open Woodland – Southern and Western Slope. Over 32% of the site is transformed through mining operations. Ephemeral drainage areas and dams constitute around 1.43% of the area. For this assessment, 29 vegetation sampling points were recorded. These were located within the remaining natural and semi-natural areas within Rietvly Mine. These points were analysed using TWINSPAN. Six floral communities were used (Units 1-6) with Units 1 covering wetland type habitat, Unit 3 Acacia Thornveld and Unit 2, 4 and 5 covering wooded rocky communities. Unit 6 represents the exposed grassed rocky outcrops that contain several succulent species. A gradient of moisture and structure (rocky nature) is evident from this ordination. The identified communities are listed in Table 10 and mapped in Figure 19.

Table 10: Broad habitat / vegetation communities (NSS, 2015)

Unit	Habitat / Vegetation Community	Floral AoS[42]	Overall AoS	% Area
Wetland / Riparian Habitats				
	Wooded Ephemeral System	Medium	High	1.27%
1	Dams and seep areas	Medium	Medium-High	0.16%
Gold Reef Mountain Bushveld				
2	*Combretum- Cymbopogon* East Slope	High	High	28.11%
3	*Searsia - Acacia* - Lower lying Open Bushveld	Medium	Medium	23.75%
	Searsia - Acacia - Lower lying Thicket	Medium-High	Medium-High	7.90%
4	Dense Slope Thicket	High	High	4.86%
5	*Protea-Faurea* Open Woodland – Southern and Western Slope	High	High	9.73%
6	*Loudetia – Tristachya* Exposed Outcrops	Very high	Very high	1.64%
Transformed habitats				
	Mining and related infrastructure	Low-None	Low-None	32.74%

[42] Areas of significance

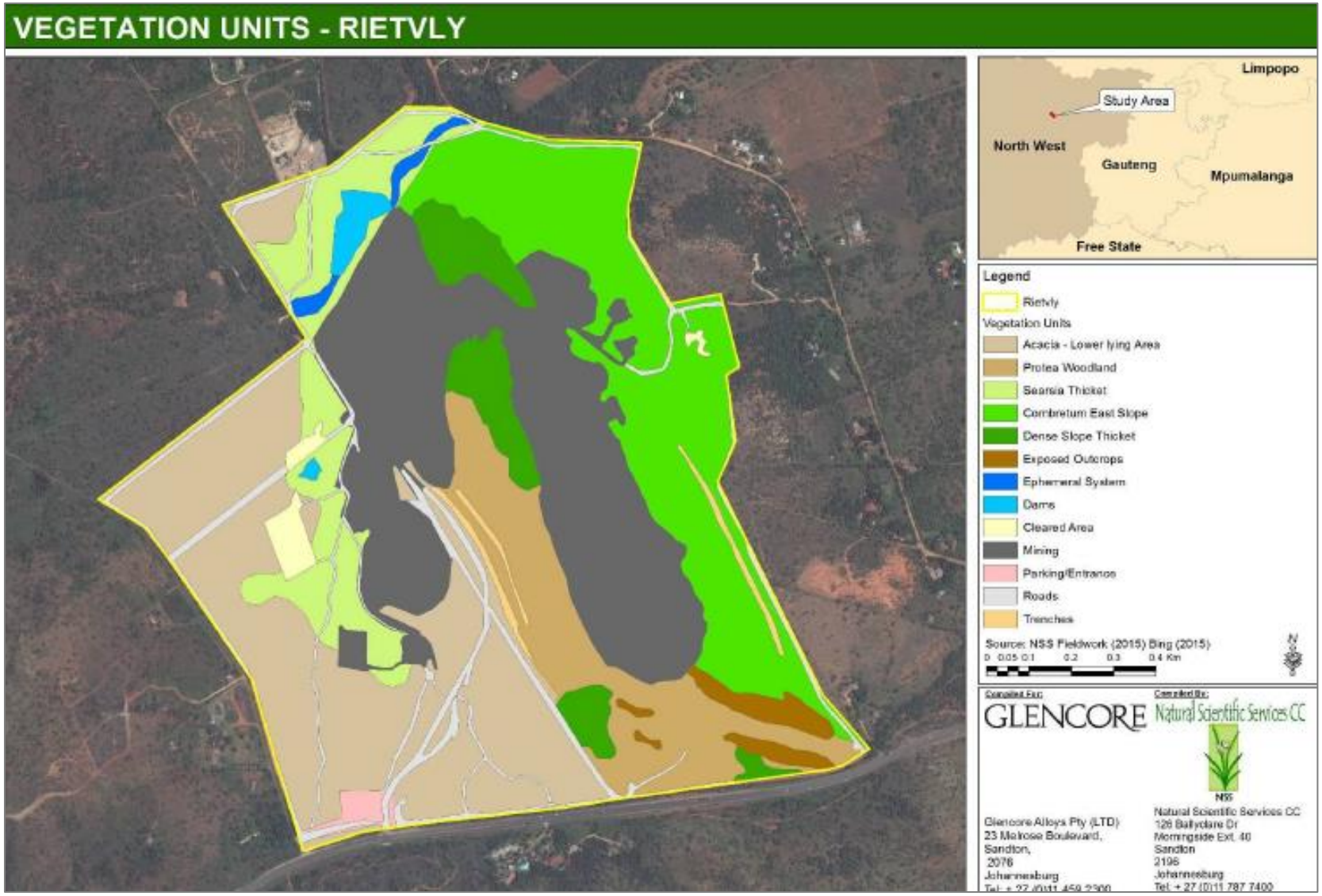

Figure 19: Identified vegetation communities within the Rietvly Mine boundary area (NSS, 2015)

Conservation Important Flora

It is well documented that heterogeneous landscapes, diverse geology and a range of environmental conditions provide a diverse number of habitats for plant species (Pickett, et.al. 1997; O'Farrell, 2006; KNNCS, 1999). These areas are normally associated with high levels of species endemism and richness. For example, at least 74% of the 23 threatened Highveld plant taxa occur on the crests and slopes of ridges and hills (Pfab & Victor 2002). However, homogenous landscapes, either natural or that have been transformed through historical farming practices and infrastructural development contain minimal diversity and endemism. The Rietvly site has been altered by approximately 32% by mining related activities, however, the remaining vegetation is considered quite heterogenous representing at least 7 different vegetation communities.

Within this section the Conservation Important (CI) species are discussed. These include the National Threatened Plant Species Programme (TSP) lists, any Protected species according to the Nature Conservation Ordinance, 1983 (Act 12 of 1983) and any specific Endemic or Rare species.

The Threatened Plant Species Programme (TSP) is an ongoing assessment that revises all threatened plant species assessments made by Craig Hilton-Taylor (1996), using IUCN Red Listing Criteria modified from Davis et al. (1986). According to the TSP Red Data list of South African plant taxa (POSA, August 2015), there are 46 Red Data listed species within the North West Province (including Data Deficient species) of which 2 species are Critically Endangered (CR), 4 Endangered (EN) and 8 are Vulnerable (VU).

From the POSA website (QDS 2527CA) four species are considered Threatened with an additional eight as either Declining, Data Deficient or Rare. During the 2015 NSS study, three of these species were located (as highlighted in Table 24 and Figure 31). This included the Near Threatened (NT) Adromischus umbraticola subsp. umbraticola. This species occurs on south-facing rock crevices on ridges (as found on site), restricted to Gold Reef Mountain Bushveld in the northern parts of its range, a vegetation type typical of the study region. Its habitat and ultimately populations are declining mainly due to urbanisation. For Rietvly, this species is under threat from the expanding mining operations of the ridge system. The two remaining species were the Declining Hypoxis hemerocallidea and Boophone disticha.

Through the various NSS studies, several protected species have also been detected. These include:

- Boophone disticha (Protected and TSP Listed as Declining)
- Ceropegia rendallii (Protected)
- Hypoxis hemerocallidea
- Cussonia paniculata (Protected)
- Cussonia transvaalensis (Protected)
- Gladiolus cf sericeovillosus (Protected)
- Gladiolus permeabilis (Protected)
- Duvalia polita (Protected)
- Pellaea calomelanos (Protected – True fern species)
- Crinum spp
- Sclerocarya birrea (Protected Tree)

These are also considered Protected species under the Nature Conservation Ordinance, 12 of 1983. Protected Species may not be cut, disturbed, damaged, destroyed without obtaining a permit from North West Province or a delegated authority.

In terms of the National Forests Act of 1998 certain tree species (types of trees) can be identified and declared as protected. On site the Marula - Sclerocarya birrea was located within the lower lying areas to the west. In terms of the National Forests Act of 1998 forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Forestry (or a delegated authority).

In addition to the CI species, several plants identified have a medicinal value as well. There is a growing focus on the importance of medicinal plants and traditional health systems in solving the health care problems of the world. Because of this awareness, the international trade in plants of medical importance is growing phenomenally, often to the detriment of natural habitats and mother populations in the countries of origin. According to Van Wyk et.al. (2002), over 3000 of the 30 000 plant species recorded within Southern Africa are used as medicines and over 350 of these are commonly used and traded for their medicinal use.

Therefore, plants that contain medicinal or cultural uses are considered as species with conservation importance. At least 52 species contain medicinal value (Appendix 1c of Annexure H2). Hypoxis hemerocallidea (found on site) has been used for centuries in African traditional medicine but has recently been recognised in the alternative medicine trade as a 'Wonder cure' for its immune-boosting properties. Indiscriminate harvesting of the species has led to widespread decline of the natural population. In response to this, this species is, therefore, classified as Declining nationally. Another species is Schizocarphus nervosus (Scilla) (found on site), which is used for conditions associated with pain and inflammation, such as rheumatic fever.

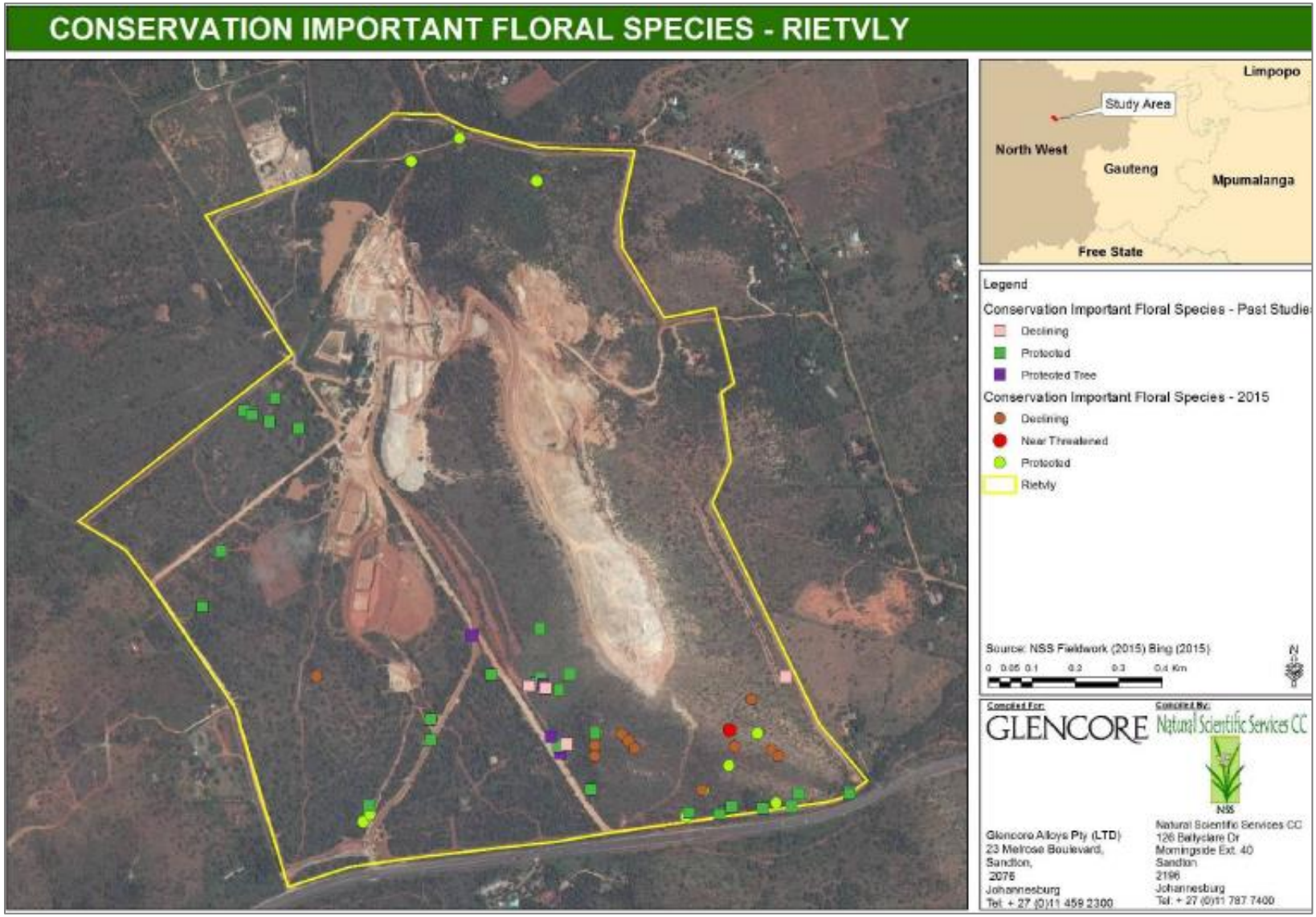

Figure 20: Locations of observed Conservation Important floral species at Rietvly Mine (NSS, 2015)

Table 11: Conservation Important floral species within the 2527CA QDS's (NSS, 2015)

Family	Species	Threat Status	Flowering times	Habitat	Likelihood of Occurrence (LoO)
EUPHORBIACEAE	*Acalypha caperonioides Baill. var. caperonioides*	DDT[43]	-	In grassland, *Brachystegia* woodland and at margins of vleis, typically after grass fires	Possible
CRASSULACEAE	*Adromischus umbraticola C.A.Sm. subsp. umbraticola*	NT[44]	September - January	Rocky ridges and outcrops	Present
ASPHODELACEAE	*Aloe peglerae Schönland*	EN[45]	July - August	Grassland, in shallow, gravely quartzitic soils on rocky, north-facing	Possible
AMARYLLIDACEAE	*Boophone disticha (L.f.) Herb.*	Declining	July-October	Dry grassland and rocky areas.	Present
HYACINTHACEAE	*Drimia elata Jacq.*	DDT	-	Sandy and clay soils	Possible
HYACINTHACEAE	*Drimia sanguinea (Schinz) Jessop*	NT	September - October	Open veld and scrubby woodland in a variety of soil types.	Possible
MESEMBRYANTHEMACEAE	*Frithia pulchra N.E.Br.*	Rare	Spring - Summer	Temperate grassland	Possible
GUNNERACEAE	*Gunnera perpensa L.*	Declining	October - January	It is an obligate wetland plant that grows in shallow water around the edge of pools in marshy areas or along streams.	Highly Unlikely
HYPOXIDACEAE	*Hypoxis hemerocallidea Fisch., C.A.Mey. & Avo-Lall.*	Declining	November	Occurs in open grassland and woodland	Present
AQUIFOLIACEAE	*Ilex mitis (L.) Radlk. var. mitis*	Declining	Spring and early summer	Grows on the banks of rivers and streams and moist spots in woods and forests	Possible (norther drainage area)

[43] Data Deficient - Taxonomically Problematic
[44] Near threatened
[45] Endangered

Family	Species	Threat Status	Flowering times	Habitat	Likelihood of Occurrence (LoO)
MYROTHAMNACEAE	*Myrothamnus flabellifolius Welw.*	DDT	September - November	Rocky slopes. It usually forms large stands in shallow soil on sunny rocky hills or along cracks and crevices in rocks	Possible
OSACEAE	*Prunus africana (Hook.f.) Kalkman*	VU	October - May	Confined to evergreen forests from near the coast to the mist belt and montane forests in KwaZulu-Natal, Eastern Cape, Swaziland, Mpumalanga, Zimbabwe and tropical Africa.	Unlikely
MYRSINACEAE	*Rapanea melanophloeos (L.) Mez*	Declining	June - December	Found along the damp areas of mountain and coastal forests or swamps and bush clumps.	Unlikely

Alien Invasive Vegetation

Two main pieces of legislation are applicable to this section:

- Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983) (CARA)
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEM:BA)
- NEM:BA Regulations August 2014 - Government Gazette Vol 526, No. 32090

In terms of the amendments to the regulations under CARA, landowners are legally responsible for the control of alien species on their properties. Declared weeds and invasive species had been divided into three categories in accordance with the Act (Category 1-3). The protection of our natural systems from invasive species is further strengthened within Sections 70 - 77 of NEM:BA. Chapter 5 of the Act specifically deals with Species and Organisms Posing Potential Threats to Biodiversity. To summarise, the purpose of Chapter 5 is to:

- Prevent the unauthorised introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur.
- To manage and control alien species and invasive species to prevent or minimise harm to the environment and to biodiversity.
- To eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Furthermore, Section 73 (2) states that a person who is the owner of land on which a listed invasive species occurs must:

- Notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
- Take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
- Take all the required steps to prevent or minimise negative impacts to biodiversity.

An Alien Invasive Plan was conducted by NSS in 2009. At Rietvly Mine, the top 6 species identified were:

- *Conyza bonariensis* (Flax-leaf Fleabane)
- *Opuntia ficus-indica* (Sweet prickly pear)
- *Zinnia peruviana* (Red star Zinnia)
- *Tecoma stans* (Yellow bells)
- *Tagetes minuta* (Khakibos)
- *Jacaranda mimosifolia* (Jacaranda)

From the surveys conducted by NSS on-site, at least 39 alien species have been recorded within the Rietvly Mine boundary area. Twenty-one (21) of these species are listed under NEM:BA as Category 1b species and 15 as Category 1 under CARA legislation.

Table 12: The main observed alien invasive plant species within the Rietvly mine boundary area[46]

Species	Growth forms	Survey	CARA	NEMBA
Acacia mearnsii	Tree	2009	2	2
Achyranthes aspera	Herb	2009	1	Weed
Arundo donax L.	Graminoid	2009/2015	1	1b
Bidens pilosa	Herb	2009	Weed	Weed
Campuloclinium macrocephalum	Herb		1	1b
Canna indica	Herb	2009	1	1b
Cereus jamacaru DC.	Succulent	2009/2015	1	1b
Conifer sp.	Tree	2009	Weed	Weed
Conyza bonariensis (L.) Cronquist	Herb	2009	Weed	Weed
Conyza sp.	Herb	2009	Weed	Weed
Cuscuta campestris Yunck.	Parasite	2015	1	1b
Cymbopogon pospischilii (K. Schum.) C.E. Hubb.	Graminoid	2015	Weed	Weed
Datura stramonium L.	Herb, shrub	2009	1	1b
Flaveria bidentis (L.) Kuntze	Herb	2009	Weed	1b
Harrisia martinii	Succulent	2009	1	1
Hibiscus trionum L.	Herb	2015	Weed	Weed
Jacaranda mimosifolia D. Don	Tree	2009/2015	3	1b
Lantana camara L.	Shrub	2009/2015	1	1b
Melia azedarach L.	Tree	2009	3	1b
Mirabilis jalapa	Shrub	2009	Weed	1b
Morus alba	Tree	2009	3	3
Nicotiana glauca Graham	Shrub, tree	2009	1	1b
Opuntia ficus-indica (L.) Mill.	Succulent	2009/2015		1b
Opuntia stricta	Succulent	2009	1	1b
Pennisetum clandestinum Hochst. ex Chiov.	Graminoid	2009	Weed	1b
Pennisetum setaceum (Forssk.) Chiov.	Graminoid	2009	1	1b (Wetlands)

[46] Highlighted cells represent Category 1 species through either CARA or NEMBA

Species	Growth forms	Survey	CARA	NEMBA
Persicaria lapathifolia (L.) Gray	Hydrophyte	2015	Weed	Weed
Pseudognaphalium luteo-album (L.) Hilliard & B.L. Burtt	Herb	2015	Weed	Weed
Psidium guajava	Tree	2009	2	2 for plantations in North-West
Ricinus communis	Dwarf Shrub	2009	2	2
Schkuhria pinnata (Lam.) Kuntze ex Thell.	Herb	2015	Weed	Weed
Senna (Cassia) sp.	Tree	2009	3	1b
Solanum mauritianum	Tree	2009	1	1b
Solanum retroflexum	Dwarf Shrub	2009	Weed	Weed
Tagetes minuta L.	Herb	2009/2015	Weed	Weed
Tamarix ramossisima	Tree	2009	1	1b
Tecoma stans (L.) Juss. ex Kunth var. stans	Shrub, tree	2009	1	1b
Tipuana tipu	Tree	2009	3	3
Verbena aristigera	Herb	2009	Weed	Weed
Zinnia peruviana (L.) L.	Herb	2009	Weed	Weed

7.4.1.6 Chapter F: Fauna

Lists of potentially occurring faunal species for the study area are provided in Appendices 2-8 of Annexure H4. To date 38 mammal, 124 bird, 10 reptile, 7 frog, 27 butterfly, one dragonfly, and two scorpion species have been observed during all NSS surveys at Rietvly Mine.

Mammals

Of potentially ~140 regionally-occurring mammal species, Mammal Map (2015) has records for 64 species in the QDS 2527CA wherein Rietvly Mine is situated. Based on Rietvly Mine's locality and current habitat diversity, approximately 90 mammal species (with a Likelihood of Occurrence of 1, 2 or 3 in Appendix 2 of Annexure H4) could occur, including 14 Conservation Important (CI) mammal species. NSS has to date detected a total of 38 mammal species at Rietvly Mine, including four species that were detected for the first time during the 2015 site survey, and four CI i.e. Near Threatened (NT) species, namely Honey Badger, Brown Hyaena, Leopard and Serval.

The presence of a pair of honey badgers (female and cub) was confirmed by the motion camera M1b deployed along a game trail in a bush clump near the northern perimeter fence. Although widely distributed in Africa and Asia, Honey Badgers are considered to be rare, and typically occur at very low densities (e.g. 0.03 adults/km² in the Kalagadi Trans frontier Park; Begg, 2001; Skinner & Chimimba, 2005). Honey Badgers face a wide variety of threats, with the greatest being persecution by poachers, traditional healers (due to their fearlessness and

tenacity), beekeepers and livestock farmers; directly through shooting or gin traps, or indirectly through eating from carcasses poisoned for other predators (Begg et al. 2008). These threats are confounded by the species' low reproductive rate. Females typically do not breed every year, and only give birth to a single cub, which takes 12-16 months to reach independence (Skinner & Chimimba, 2005), and which faces a high (47%) mortality risk (Begg, 2001; Friedmann & Daly, 2004). In South Africa it is estimated that only some 2 600 mature animals exist in the wild. A low population size and density, a high number of threats and a low reproductive rate consequently afford Honey Badgers their NT status in South Africa.

Brown Hyaena was confirmed within the study area from spoor that was observed during the 2011 survey. National Brown Hyaena populations are stable, but threats such as persecution for traditional medicine, hunting and poisoning have resulted in localised population declines (Friedman & Daly 2004).

The presence of Leopard was similarly confirmed from a set of spoor in 2011. Although classified as Least Concern (LC) on the South African Red List (Friedmann & Daly, 2004) the Leopard is recognised as NT on a global scale (IUCN, 2014) and as Vulnerable (VU) under the NEM:BA (ToPS 2007). Although adaptable and widespread, certain Leopard populations are in peril, particularly those in North Africa. Throughout their range the species is threatened with habitat loss and intense persecution (Henschel, 2014).

Serval was detected during the preceding NSS studies on site. Although Servals typically frequent dense grassland habitat near water, they are not exclusively dependant on wetland habitat, and do occur in drier savannah. Servals also appear to be relatively resilient to habitat transformation and anthropogenic activity. NSS has frequently detected Servals in areas with considerable fencing, anthropogenic activity, and even severe habitat transformation.

The quartzitic ridge that bisects Rietvly Mine is a continuation of the Magaliesberg mountain range, and currently supports a number of rupicolas (rock-dwelling) species such as Rock Hyrax, Jameson's Red Rock Rabbit, Chacma Baboon, Mountain Reedbuck (Redunca fulvorufula), Klipspringer, Caracal, Leopard (VU), and likely also supports Rock Elephant-shrew and Namaqua Rock Mouse. Wetland-associated mammal species that were detected on site include the Water Mongoose, Vlei Rat, and Serval (NT), and species such as the Cape Clawless Otter, Angoni Vlei Rat, Swamp Musk Shrew (DD) and Water Rat (NT) might also occur in the wetter, northern region of the site. The mine property is currently stocked with Eland, Kudu, Bushbuck, Blue Wildebeest, Blesbok, Gemsbok and Impala. It appears that game densities are high, and likely exceed the carrying capacity of the property. This was evidenced by the high levels of overgrazing, which were particularly high in the well-wooded, lower-lying areas, which are dominated by sweet mixed Acacia bushveld.

These areas were also found to support a host of smaller mammal species including Scrub Hare, Tree Squirrel, Porcupine, Common Mole-rat, Single-striped Mouse, Red Veld Rat, Vervet Monkey, Slender Mongoose, Large-spotted Genet, Small-spotted Genet, Dwarf Mongoose, Black-backed Jackal, Honey Badger (NT), Bush pig, and Common Duiker. Potentially occurring CI mammal species which may also utilise this habitat type include the Southern African Hedgehog (NT), Cape Fox (PS) and Black-footed Cat (VU). Suitable habitat also exists for

Pangolin (VU). However, the likelihood of this rare and illusive species occurring is low due to the small, fragmented nature of the site, high levels of human activity, and the presence of an electrified perimeter fence.

During the acoustic bat surveys at Rietvly, the calls of Roberts's Flat-headed Bat, Cape Serotine and Zulu Serotine were recorded, and several other bat species certainly occur in the study area. The most likely to occur are species that do not require specialised subterranean roosting habitat, such as Wahlberg's Epauletted Fruit Bat, Mauritian Tomb Bat, Egyptian Free-tailed Bat, Dusky Pipistrelle, Cape Serotine, Yellow-bellied House Bat and Egyptian Slit-faced Bat. The only CI bat species considered highly likely to occur on site is the Rusty Pipistrelle (NT). This small bat frequents savannah woodland, and roosts in rock crevices and under tree bark (Stuart & Stuart, 2007). CI (NT) bat species that are less likely to occur include Hildebrandt's, Geoffroy's, Darling's, Blasius' and the Bushveld horseshoe bats. Although these bat species preferentially roost in subterranean caves and mine shafts, where these habitats are absent (such as at Rietvly), these bats are known to occasionally roost in trees, buildings and large rock crevices. Therefore, their presence on site cannot be ruled out.

Refer to Table 7-13 in Annexure H4 for a list of the present and potentially occurring CI mammal species.

Birds

For the QDS 2527CA wherein Rietvly Mine is situated, there are records from the SABAP 1 and 2 for over 400 bird species (SABAP2, 2015). Rietvly Mine itself may support as many as 300 bird species (Appendix 3 of Annexure H4) - including 16 CI bird species - based on these species' distributions and in situ habitat diversity. However, due to seasonal bird movements, the number of species detected at any one time may be significantly less than this. For instance, only 170 species have been recorded during SABAP 2 surveys within the pentad (2535_2705) covering the study area. The SABAP 2 pentad list of bird species is also not necessarily 100% representative of the bird diversity at Rietvly Mine, because some species may have been overlooked (e.g. Red-billed Firefinch, African Green-pigeon and African Stonechat), and the pentad may include habitats (and therefore, bird species) not present on site (e.g. drier bushveld species such as Magpie Shrike, Red-billed Hornbill and Capped Wheatear). In total, 124 bird species have been recorded by NSS at Rietvly Mine to date, with the latest (2015) study adding 42 species not previously detected on site.

During all NSS surveys at Rietvly Mine, only one CI bird species has been detected viz. the Cape Vulture (VU), which was observed flying overhead. The species is threatened by the loss of habitat supporting large herds of game (and therefore, carrion), electrocution on powerlines, drowning, and persecution by livestock farmers through shooting and poisoning (Barnes, 2000). As the Cape Vulture is a cliff-nesting species it is not expected to breed on site. Breeding colonies of this species are, however, situated at Skeerpoort and Nooitgedacht in the adjoining Magaliesberg IBA.

In contrast, the White-backed and Lappet-faced vultures normally nest in small colonies and construct large stick nests on top of tall trees, particularly Terminalia prunoides, Acacia nigrescens, Boscia albitrunca and B. foetida. No vulture nests were, however, observed in the study area. This may be because White-baked Vultures preferentially inhabit dry woodland, while Lappet-faced vultures frequent semi-arid regions (particularly in the

north of the country). Except for the Endangered (EN) Lappet-faced Vulture, which has a marginal distribution, all the potentially occurring vulture species are, nonetheless, likely to forage in the study area.

Within the study area, no large raptor nests were observed. Although suitable nesting habitat (trees taller than 5m) may be present for Martial Eagle (VU), human activity levels are likely too high. The ridge and associated tall, mixed Acacia bushveld provide suitable conditions for a variety of other raptor species including the CI Tawny Eagle (VU), Lanner Falcon (NT), Lesser Kestrel (NT) and Peregrine Falcon (VU). The only CI raptor species that might utilise the site for breeding is Lanner Falcon. No nests or individuals were observed but the large boulders and crevices on the ridge provide suitable habitat. These areas may also be suitable for breeding by Rock Kestrel. A pair of (Black) Verreaux's Eagles was regularly observed flying overhead during NSS visits to Rietvly Mine. The pair nests on a cliff face a few kilometres north of Rietvly Mine, and likely predates upon the Rock Dassie population that occupies a boulder outcrop at the northern end of the Rietvly ridge.

The water bodies on site (although large) are all artificial, and lack dense stands of emergent hydrophytes along their banks, which limits waterfowl diversity significantly. All the regionally-occurring CI water bird species (in groups 2 and 3), except for Yellow-billed Stork, are unlikely to occur mainly due to their marginal distributions, but also due to a lack of suitable habitat on site (e.g. rivers for Black Stork, and shallow pans for the Greater and Lesser flamingos). Large terrestrial CI bird species such as Secretary bird (VU), Kori Bustard (VU) and White-bellied Korhaan (VU) are not expected to occur due to high levels of sensory disturbance and the small fragmented nature of the site.

Surprisingly, no Red-billed Oxpeckers were observed during any of the NSS surveys. Although formerly widespread in South Africa, this bird species has suffered local population declines, particularly in the Eastern Cape and Pilanesberg National Park, because of hunting of game, and the use of arsenic-based ‘purple label’ cattle dips, which poison both ticks and Oxpeckers.

However, ongoing Oxpecker re-introductions, and the use of Oxpecker-friendly green-label dips, together with the Oxpecker’s adaptability to feed on domestic livestock, are bringing this species back from localised extinctions (Barnes, 2000). The apparent absence of this species at Rietvly Mine is puzzling considering the location of the site and its high density of game. A possible explanation may lie in the type of tick control being utilised for the game. Refer to Table 7-15 in Annexure H4 for a list of the present and potentially occurring CI bird species.

Reptiles

A complete list of the 72 potentially occurring reptile species for the study area is provided in Appendix 4 of Annexure H4. Of these species, 60 are considered likely to occur on site based on their distributions and the availability of suitable habitat. At a regional scale, 46 reptile species have been recorded in the QDS 2527CA covering the study area (Bates et al. 2014; Reptile Map, 2015).

Reptiles are notoriously difficult to sample. Despite active searching and trapping (during (2007, 2011 and/or 2015) using drift arrays with funnel and pitfall traps at cumulatively four locations, NSS has detected only 12

reptile species at Rietvly Mine. These included Marsh Terrapin (dam), Common House Snake, Brown Water Snake (trap), Nile Crocodile (visual 2011, since removed), Savanna Lizard, Yellow-throated Plated Lizard (trap), Tree Agama (visual), Puff Adder (shedding), Western Yellow-bellied Sand Snake (trap), Common Dwarf Gecko (visual), Common Flap-neck Chameleon (visual, several juveniles) and Variable Skink (visual). Of concern is the distinct lack of tortoise records from Rietvly Mine, despite the availability of suitable habitat. This is possibly the result of human persecution, electrocution along the game fence, and/or vehicle traffic.

As reflected by many fauna and flora, the Magaliesberg mountain range represents an ecological transitional zone for reptiles, with species south of the mountains being typical of the Highveld grasslands (e.g. Rinkhals and Spotted Harlequin Snake), and species to the north being more characteristic of the bushveld (e.g. Black Mamba and Southern African Python).

Rietvly Mine lies towards the northern end of this transitional zone and, therefore, mainly supports bushveld reptile species (e.g. Python, sand snakes, quill-snouted snakes, garter snakes, lacertid lizards, and worm lizards).

The ridge, in addition, provides suitable habitat for rupicolous reptile species such as Turner's Gecko, Wahlberg's Snake-eyed Skink, Southern Rock Monitor, Southern Rock Agama, and the Common Girdled Lizard. In contrast to the latter species, Jones' Girdled Lizard is typically associated with trees, where it occupies microhabitats beneath bark and rotting logs (Jacobsen, 1989), and might occur in the lower-lying Acacia woodland in Rietvly Mine. Other present or potentially occurring arboreal reptile species include the Common Flap-neck Chameleon, Tree Agama, Boomslang, Spotted Bush Snake, Eastern Tiger Snake, and Southern Twig Snake.

The water bodies on site were found to be occupied by Marsh Terrapin and Brown Water Snake, and almost certainly support other wetland-associated reptile species such as the Nile Monitor, Red-lipped Snake, and South-eastern Green Snake. The red sandy soils on site provide suitable habitat for lacertid lizards (such as Savanna Lizard, Holub's Sandveld Lizard and Spotted Sandveld Lizard), skinks (such as Savanna Legless Skink and Sundevall's Writhing Skink), agamids (such as the Eastern Ground Agama), and snakes (such as the Cape Wolf Snake and Dwarf Sand Snake).

Present and potentially occurring venomous snakes include Puff Adder (recorded), Black Mamba, Sundevall's Garter Snake (mildly venomous; reluctant to bite), Snouted Cobra, Mozambique Spitting Cobra (observed by mine at gate), Boomslang, and Southern Twig Snake.

Only two CI reptile species occur in the region Nile Crocodile (VU) and Southern African Python (PS) (refer to Table 7-16 in Annexure H2). NSS previously observed a single Nile Crocodile in the large dam in the northern section of Rietvly Mine, but according to mine authorities the crocodile was since removed by North West Nature Conservation.

No Python has been observed by NSS, but the study area provides ideal habitat, and a suitable prey base for this species. Although listed as LC by Bates et al. (2014) the Python is still listed as a Protected Species in South Africa under the NEM:BA (ToPS 2007). The Python is also listed under CITES Appendix II as it is threatened (among other things) by high levels of persecution for its skin, which is used in the leather industry.

Frogs

A complete list of the 24 potentially occurring frog species for the study area is provided in Appendix 5 of Annexure H2. Of these species, 22 are considered likely to occur on site based on their distributions and the availability of suitable habitat. At a regional scale, 10 frog species have been recorded in the QDS 2527CA (Minter et al. 2004; FrogMap, 2015). Seven frog species have been recorded at Rietvly during NSS site visits.

The large, permanently inundated water bodies on site, such as the dam and watering hole, provide suitable habitat for species such as Guttural Toad (visual), Red Toad (visual / trap) Eastern Olive Toad, Raucous Toad, Bubbling Kassina (call), Banded Rubber Frog (visual), Plain Grass Frog (visual/heard), Common River Frog (visual), Common Platanna and (where suitable overhanging riparian vegetation is present) Southern Foam Nest Frog (although the distribution of this species is marginal).

Smaller rain-filled puddles, in contrast, provide habitat for species such as Tremolo Sand Frog, Natal Sand Frog, Tandy's Sand Frog, Northern Pygmy Toad, Snoring Puddle Frog and potentially Ornate Frog.

Sand frogs were observed on site, but Tremolo and Tandy's sand frogs, which are morphologically indistinguishable and sympatric in the area, could not be distinguished without reliable call data (Du Preez & Carruthers, 2009). Vegetated wet habitats towards the northern boundary of Rietvly may provide suitable habitat for species such as Boettger's Caco, Broad-banded Grass Frog, and Striped Stream Frog. Bushveld Rain Frog are not dependant on standing water to breed (as tadpoles develop within a burrow kept moist by unfertilized egg capsules) and are likely to occur throughout most of the lower-lying, undisturbed areas on site.

The study area lies within an area of range overlap of two CI frog species, the Giant Bullfrog (NT) and African Bullfrog (PS). Based on this, both species may occur but, if present, are expected to only utilise the lower-lying parts of the site for foraging and overwintering, since typical suitable breeding habitat for these species was not observed.

Refer to Table 7-17 in Annexure H2 for a list of the present and potentially occurring CI frog species.

Terrestrial marco-invertebrates

A list of potentially occurring CI terrestrial macro-invertebrates is provided in Table 7-18 in Annexure H2.

Butterflies

A list of the potentially occurring and observed butterfly species is provided in Appendix 6 of Annexure H2. The ADU's LepiMap (2015) holds records for 110 species for the QDS covering the study area, but 161 species are likely to occur on site. In total 27 butterfly species have been recorded during all NSS visits to Rietvly Mine.

Sweep-netting for longer periods during different seasons would increase the probability of recording additional butterfly species in the study area. Based on the available butterfly distribution data, only one CI butterfly species viz. the Marsh Sylph, is likely to occur in the region. The Marsh Sylph is listed as nationally VU by Henning et al. (2009), but globally LC by Mecenero et al. (2013), based on a wider distribution than what was previously known.

The Marsh Sylph is, however, still considered to be a Rare Habitat Specialist due to its specific habitat and larval host plant requirements. As its larval food plant, Swamp Rice Grass (Leersia hexandra), was not detected on site, this species has a moderate to low likelihood of occurrence.

Dragonflies and Damselflies

Analysis of distribution data provided in Samways (2008) suggests that some 42 dragonfly and damselfly species have the potential to occur in the region (Appendix 7 of Annexure H2). None of these species have been assigned a Red List status (Samways, 2006). Although the dams and waterholes provide some permanent open water, these habitats are artificial, and lack significant submerged and emergent vegetation. The vegetated ephemeral drainage line in the north is impacted by water inputs from mining operations.

Optimistically, 36 odonata species may occur on site based on habitat and distribution. One dragonfly species was observed during the NSS site visit viz. Machado's Skimmer.

Scorpions

Of the 12-scorpion species that occur in the region (Leeming, 2003), 10 species are likely to occur on site based on habitat suitability and distribution (Appendix 8 of Annexure H2). Of these, three species are of conservation importance and are listed as national PS (ToPS, 2007). These include one rock scorpion, Hadogenes gunningi, and two burrowing scorpions, Opistophthalmus glabifrons and Opistophthalmus carinatus. The large, rounded boulders on the eastern side of the ridge line provide ideal habitat for rock scorpions. In contrast, the sandy red soils in the lower-lying areas provide suitable habitat for burrowing scorpions. Both Opistophthalmus glabifrons and Opistophthalmus carinatus may occur based on distribution (Leeming, 2003) although the former is the more prevalent of the two in the area. It is likely that the various burrows encountered on site belong to this species. Only one CI scorpion Opistophthalmus sp. was observed during the 2011 study. Additionally, the site lies within an area of range overlap of four stinger scorpion species namely Uroplectes planimanus, Uroplectes carinatus, Uroplectes vittatus and Uroplectes traingulifer. Of these, only the latter species was detected, on multiple occasions always in scrapes beneath rocks. Uroplectes planimanus, if present, will likely occupy prime rocky habitats high on the ridge slopes, particularly under rock exfoliations. Uroplectes carinatus like U. triangulifer is common and widespread and may be found in a variety of habitats while U. vittatus is more likely to be encountered under the bark of trees and in logs. Other scorpions that may occupy this type of microhabitat are the thick-tailed scorpions. These species are of greater medical importance with particularly potent venom. Two species may occur at Rietvly Parabuthus mossambicensis and Parabuthus transvaalicus.

Megalomorph Spiders

These include baboon and trapdoor spiders. Certain members of the baboon spider group (family Theraphosidae) are listed as national PS on the ToPS (2007) List. Three genera may occur on site.

These include horned baboon spiders (Ceratogyrus sp.), common baboon spiders (Harpactira sp.) and golden-brown baboon spiders (Pterinochilus sp.). Although no baboon spiders or their burrows were detected during site visits, a cork lid trapdoor spider (Stasimopus sp.) was detected at Trap Site 2b. At least three species of cork lid trapdoor spider are known to occur in the North West Province, namely S. coronatus, S. nigellus and S. robertsi.

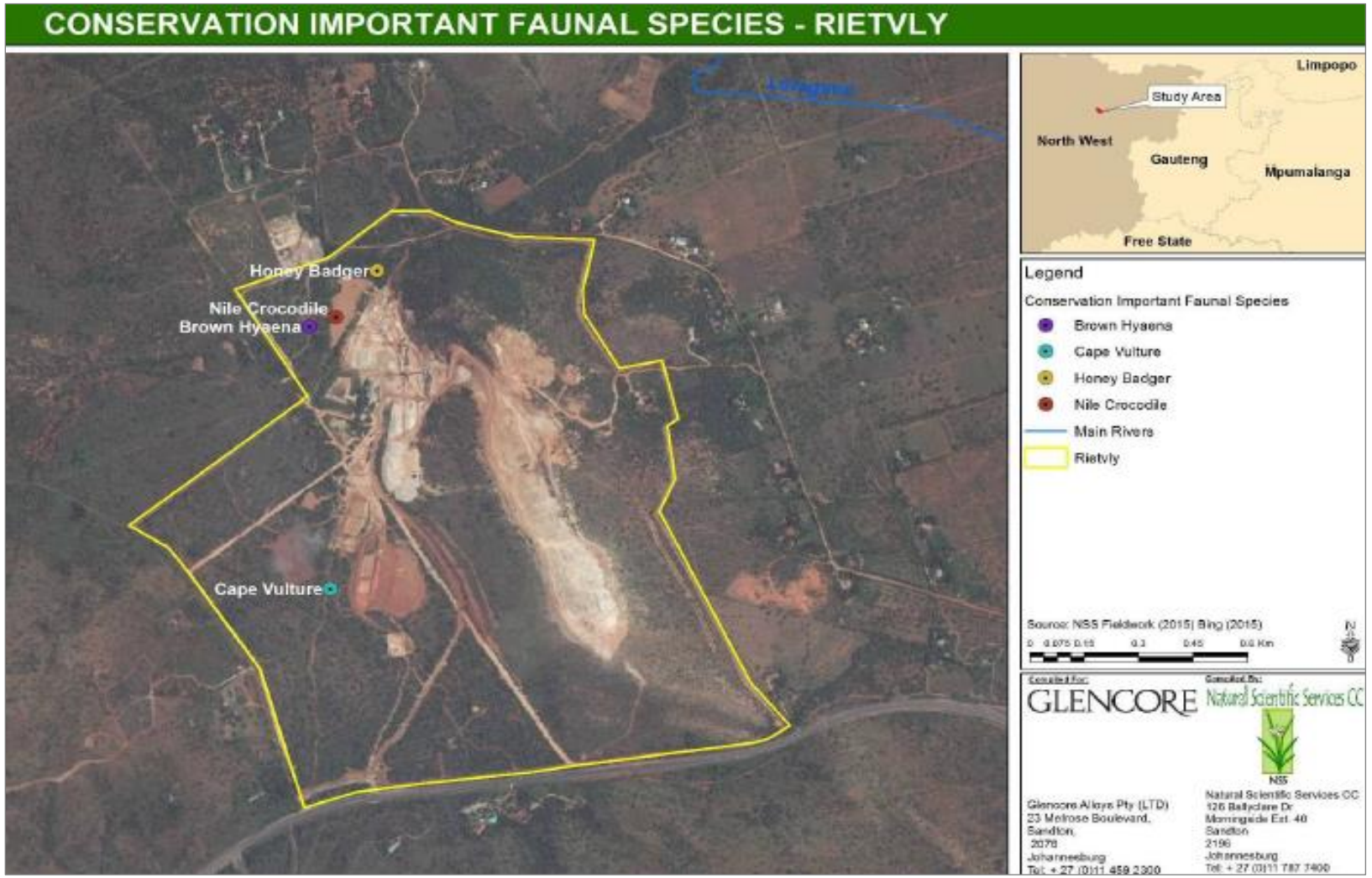

Figure 21: Locations of observed Conservation Important faunal species at Rietvly Mine (NSS, 2015)

7.4.1.7 Chapter G: Surface Water

Catchment Hydrology

Rietvly Mine falls within the Crocodile (West) Marico Water Management Area (WMA), more specifically the Leragane Catchment (which forms part of the Upper Crocodile Sub-Management Area) and is located within quaternary catchments A22C and A22F (refer to Figure 22).

In terms of surface drainage at (or near to) the site, the headwaters of the Legadigadi (non-perennial) stream is located on the northern edge of the site and flows into the Leragane River (non-perennial).

The Leragane River, which is located ± 500 m from Rietvly Mine, flow northwards and merges with the Elands River, which flows further downstream into the Crocodile River (sub-drainage region A2) (NSS, 2015). The Crocodile River flows north-westwards into the Marico River, and becomes the Limpopo River at their confluence. The mine is located on a watershed. Due to the mountainous terrain, all water runs off the slopes of the ridges during rainstorms.

Mean Annual Runoff (MAR)

The mean annual runoff (MAR) for Quaternary sub catchment A22F is 27.52 x 10 m^3 (EMPr, 2009). An estimate of the mean annual runoff (MAR) has been estimated on a surface–area proportional basis from the MAR for Quaternary sub catchment A22F, as determined from WRC WR90 (Midgley et al, 1995).

Flood Peaks and Volumes

Peak flows associated with different recurrence intervals have been determined for each of the catchments within the project area using the Rational Method (Table 13) The flood discharge volumes for each of the catchment areas were calculated by multiplying the peak discharge by the corresponding time of concentration (EMPr, 2009).

Table 13: Flood volumes and flow rates (Metago, 2006)

Catchment	Area (km^2)	Recurrence interval			
		1:20	1:50	1:100	RMF
Flood volumes					
Existing catchment	4.05	179,334	233,466	285,606	330,440
Extension to current catchment	1.20	61,549	77,588	92,496	102,336
Flood flow rate (m3/s)					
Existing catchment	4,05	59	68	77	79
Extension to current catchment	1.20	17	20	23	24

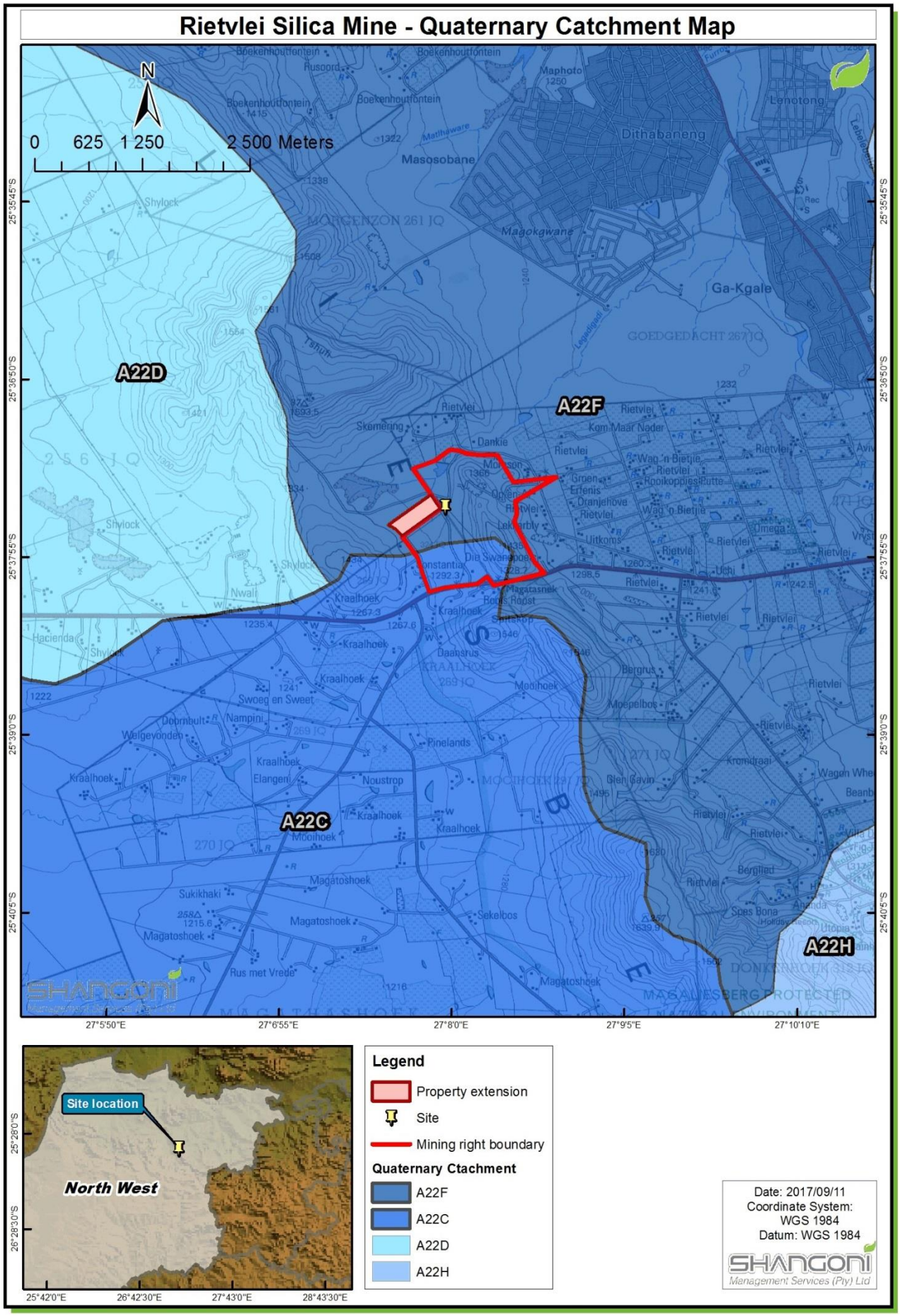

Figure 22: Catchment map

Surface Water Use

More than half of the total water use in the WMA comprises urban, industrial and mining use, approximately a third is used for irrigation and the remainder of the water requirements are for rural water supplies and power generation.

Surface Water Quality

Aquatico Scientific was commissioned by Glencore Alloys: Western Mines to conduct monthly surface- and quarterly groundwater quality evaluations at their sites (including Rietvly Mine). The quarterly monitoring reports for the periods January to March 2016 and April to June 2016, containing the results of the surface water monitoring surveys conducted, are attached in Annexure H4.

Surface Water Quality Monitoring Localities

Five (5) surface water monitoring localities currently form part of the Rietvly Mine monitoring programme. Figure 23 and Table 14 below presents all surface water monitoring localities at Rietvly Mine.

Locality WS03 and WS04 remained dry throughout the monitoring period. Due to the ephemeral nature of the Legadigadi, water is usually only recorded following a rainfall event. Localities WS01, WS02 and WS07 were sampled.

Table 14: Location and description of surface water monitoring localities[47]

Locality	Description	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May	Jun
Dams							
WS01	Thickener	•	•	•	•	•	•
WS02	Penzhorn Dam	•	•	•	•	•	•
WS07	Water Pumped from Phokeng into Erickson Dam	•	•	•	•	•	•
River or stream							
WS03	Legadigadi upstream of Penzhorn Dam	Dry	Dry	Dry	Dry	Dry	Dry
WS04	Legadigadi downstream of Penzhorn Dam mine boundary	Dry	Dry	Dry	Dry	Dry	Dry

[47] Sampled

Figure 23: Map showing Rietvly Mine's surface water monitoring localities (adapted from Aquatico, January – March 2016 QWMR)

Surface Water Quality Monitoring Results

The quarterly surface water average water quality for the January – March 2016 period and the April – June 2016 period is presented in Table 15 below. The time series graphs for selected variables (January 2015 to April 2016) is presented in Figure 23.

Based on the DWAF (1998) classification system, the surface water quality at Glencore Rietvly Mine can be classified and described as in Table 15 below.

Table 15: Quarterly average water quality classification and description of surface water for Rietvly Mine (Aquatico, April - June 2016)

Locality	Previous Quarterly Class	Jan – Mar 2016 Quarterly Class	Worst Substance	Alkalinity	Salinity	Hardness
WS01	Good	Good	Mn	Neutral	Non-saline	Moderately Hard
WS02	Marginal	Ideal	-	Alkaline	Non-saline	Moderately Hard
WS03	Dry					
WS04	Dry					
WS07	Marginal	Marginal	Total Hardness	Neutral	Saline	Very Hard

7.4.1.8 Sensitive Landscapes

National Freshwater Ecosystem Priority Areas (NFEPA)

The National Freshwater Ecosystem Priority Areas Project (NFEPA) project has been a multi-partner project between the CSIR, South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), DWS, Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). According to Driver et al. (2011), the NFEPA project provides strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources in South Africa.

FEPA's were identified using a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries. The NFEPA guidelines state that FEPAs should be regarded as ecologically important, and as generally sensitive to changes in water quality and quantity, owing to their role in protecting freshwater ecosystems and supporting sustainable use of water resources. FEPA's that are in a good condition should remain so, and FEPAs that are not in a good condition should be rehabilitated to their best attainable ecological condition. Land-use practices or activities that will lead to deterioration in the current condition of a FEPA as well as land-use practices or activities that will make rehabilitation of a FEPA difficult or impossible are considered unacceptable (Driver et al. 2011).

As confirmed by the NSS Biodiversity Assessment Report (2015) (Annexure H4), no FEPA wetland or river occurs within at least a 5km radius of Rietvly Mine. Only systems listed as Unclassified by the NFEPA (NSS, 2015) (indicated as Seep systems below; Shangoni wetlands map, 2016) occur near the mine (refer to Figure 24 below).

Although the dams and waterholes on-site provide some permanent open water, these habitats are artificial, and lack significant submerged and emergent vegetation.

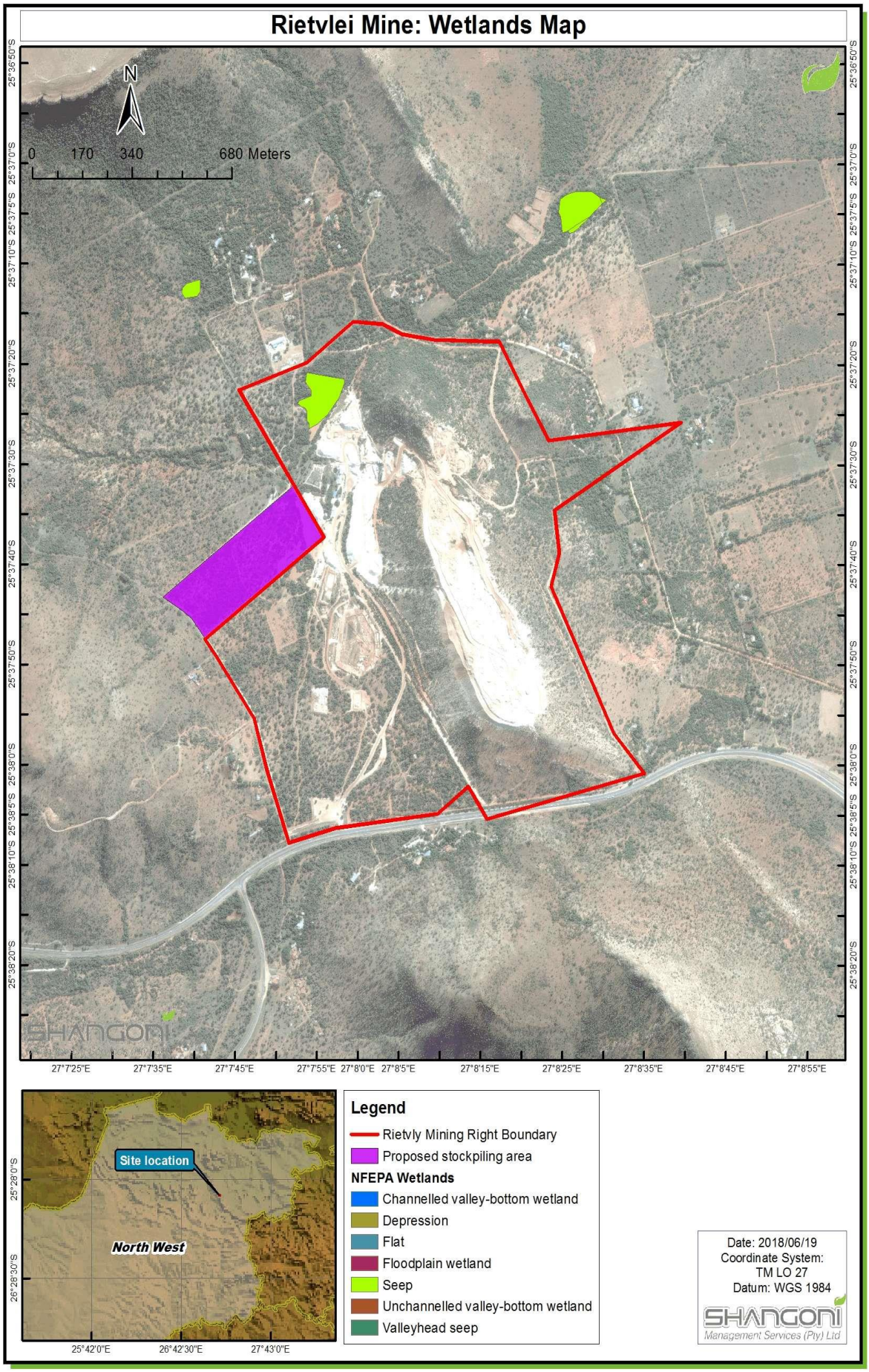

Figure 24: NFEPA wetland map

Status of Rivers Within the Surrounding Area

The section of the Leragane River adjacent to Rietvly Mine is a Lower Foothill and Critically Endangered system and is not protected (Driver et al. 2011; Nel & Driver, 2012). The moderate EI of the Leragane River is due to the one wetland and eight riparian habitat types, 14 different types of vegetation cover, three protected and four endemic species in this sub-quaternary catchment. The size of stream, morphology and geomorphic habitat units determine the ES. The Leragane River is highly sensitive to modified flow conditions and water level changes. The degree of flow change will elicit a particular level of response, and the smaller streams are usually more sensitive, i.e. rapid loss of useable habitats as flows decrease (DWS, 2014).

A summary of the Leragane River's Present Ecological State (PES), Ecological Importance (EI), Ecological Sensitivity (ES), and current impacts is presented in Table 16 below. According to the Department of Water and Sanitation (DWS) (2014), the PES of the Leragane River is seriously modified (i.e. an E ecological category) and is influenced by agricultural and mining activity in the area. The instream and riparian habitats are influenced by river bed and channel disturbances, erosion, overgrazing and trampling. Water quality is largely impacted by algal growth, mining activities, run-off and effluent from mining and urban areas. There is also a moderate impact from alien aquatic macrophytes, and sedimentation. Riparian zones have a moderate abundance of alien vegetation and increasing anthropogenic activities have resulted in vegetation removal. The instream and riparian habitats are also affected by canalisation, low water crossings, numerous farm dams, and to a lesser degree, inundation. All these impacts will have seriously modified the macro-invertebrate and fish communities in the Leragane River (DWS, 2014).

Table 16: PES, EI and ES of the Leragane River (NSS, 2015)

Quaternary Catchment	Water Resource	PES[48]	EI[49]	ES[50]	Current Impacts
A22F	Leragane River	E	Moderate	High	SERIOUS: Bed and channel disturbances, erosion, overgrazing and trampling LARGELY: Algal growth, mining, runoff and effluent from mining and urban areas, cattle grazing, urbanisation MODERATE: Canalisation, low water crossings, small (farm) dams, alien aquatic macrophytes, alien vegetation, sedimentation and vegetation removal SMALL: Inundation

[48] Present Ecological State
[49] Ecological Importance
[50] Ecological Sensitivity

7.4.1.9 Chapter I: Groundwater

The information contained in this section of this report has been obtained from the following sources:

- The report titled: "*Xstrata Alloys Environmental Management Programme Reports Update*" (EMPr, 2009), dated July 2009 (approved in November 2010). and compiled by CHEMC Environmental;
- The report titled: "*Geohydrological investigation of proposed new site for Xstrata Rietvly Tailings Facility"*, dated August 2006, compiled by the Institute for Groundwater Studies at the University of the Free State;
- The report titled: "*Glencore – Western Chrome Mines – Rietvly Mine, Quarterly Groundwater Quality Report*", for the period January to March 2016, compiled by Aquatico Scientific (Annexure H6; and
- The report titled: "*Glencore – Western Chrome Mines – Rietvly Mine, Quarterly Groundwater Quality Report"*, for the period April to June 2016, compiled by Aquatico Scientific (Annexure H6).

Regional Geohydrology

The geo-hydrology within the area can be subdivided into two aquifer types, namely the Rustenburg layered Suite to the north of the Magaliesberg (intergranular and fractured aquifer), and the Magaliesberg Formation (fractured aquifer) to the south.

Rustenburg Layered Suite

The rocks of the Rustenburg Layered Suite (Bushveld Complex) are characterized by a well-developed igneous layering (NWDACE, 2002). The mainly mafic rocks include norite, gabbro, magnetite gabbro, anorthosite and pyroxenite. Groundwater occurrence is associated mainly with deeply weathered and fractured mafic rocks. More than 80% of the boreholes yield less than 2 l/s. This is a result of the low permeability of the clay rich soils (i.e. black turf soils) that reduce recharge to underlying aquifers. The mean water quality for this aquifer type shows that salinity can be a problem in these aquifers (average EC values of 105 mS/m).

Magaliesberg Formation

The groundwater occurrence is most often associated with fractures and with the contact zones of diabase sills located at the foot of the northern slopes of the Magaliesberg. Groundwater also occurs in faults and associated shear zones. Approximately 76% of the boreholes yield less than 2 l/s with the groundwater depth ranging from 10 to 40 m below the surface. Numerous springs emanate from this unit. The groundwater quality from this aquifer is rated to be good (EC values of 48 mS/m) (NWDACE, 2002). At Rietvly the water table in all monitored boreholes are between 14 – 40 m below surface. There are 11 boreholes on the property of which only five have been equipped. Yields are approximately between 0.5 and 0.8 l/s (Eco Rehab, 2005).

Local Geohydrology

Boreholes and Groundwater Levels

From discussions held by IGS with farmers and employees, it was evident that the occurrence of groundwater on the mine and surrounding farms was poor. Water strikes are generally deep (90 to 120 mbgl) and yields are low. During the investigation associated with the new TSF (now operational), four boreholes were used for water supply. All water from the boreholes are used for domestic purposes, at the workshops, office and ablution blocks as well as to supplement the water used at the plant.

Numerous boreholes have been drilled throughout the study area. The positions of these boreholes are shown in Figure 25 below. However, many of them have been destroyed, dry, or are not currently monitored. The average groundwater depth below surface is 36.6 mbgl, with the minimum depth being 13.97 mbgl and the maximum being 64.2 mbgl. The five new boreholes that were drilled for the TSF study, were all dry.

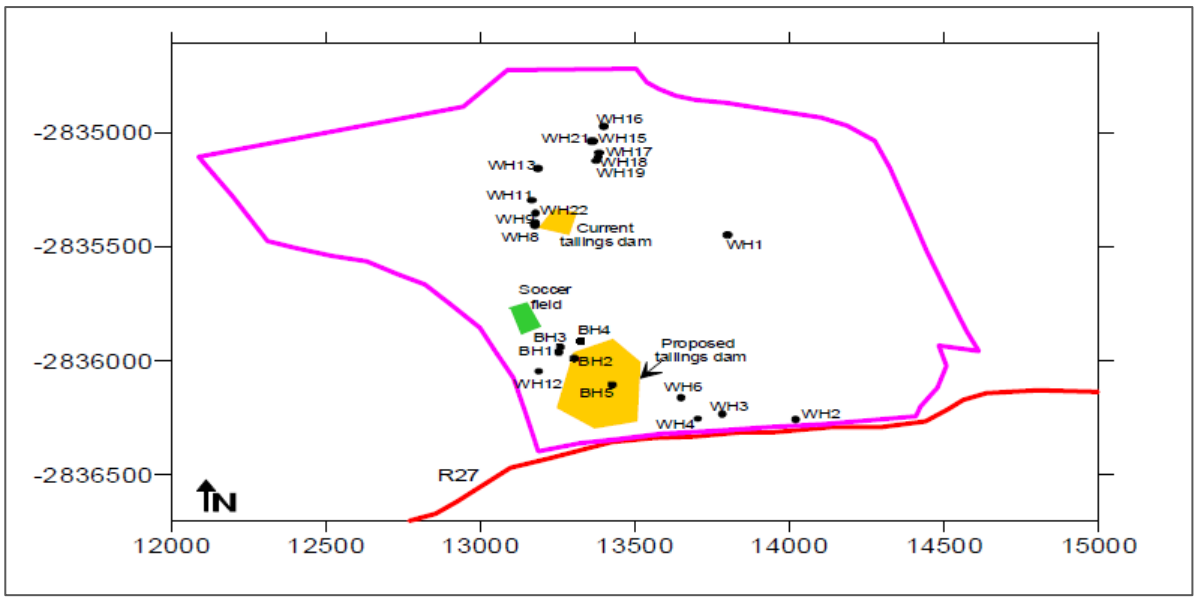

Figure 25: Positions of all boreholes (past and present) at Rietvly Mine (IGS, 2006)

Groundwater Quality

Aquatico Scientific was commissioned by Glencore Alloys Western Mines to conduct quarterly groundwater quality evaluations on its sites (including Rietvly Mine). The quarterly groundwater monitoring reports for the periods January – March 2016 and April – June 2016 are attached in Annexure H5. A summary of the results is provided below.

Table 17: Groundwater Average Water Quality - Rietvly a Mine (Aquatico, Jan – March 2016 and April – June 2016)[51]

Variable	Unit	Assessm 1[52]	Assessm 2[53]	Monitoring localities (Jan – March 2016)						Monitoring localities (April – Jun 2016)					
				WH03	WH10	WH11	WH12	WH13	WH15	WH03	WH10	WH11	WH12	WH13	WH15
pH @ 25°C		4.5 / 10.00	5.5 / 9.5		7.33	7.28	7.48	7.19	7.25		7.88	7.71	7.77	7.34	7.88
EC[54]	mS/m	150.0	150.0		79.4	79.9	70	114	47		77.5	49.1	78.1	154	56.5
TDS[55]	mg/l	1000			510	524	472	583	308		533	316	527	763	370
Total hardness	mg/l	300.00			398	417	376	83	219		394	246	421	87	328
Calcium (Ca)	mg/l	150.0			55	51.5	65	16.3	32.5		54.2	31.6	64.1	16	58.7
Magnesium (Mg)	mg/l	100.0			63.4	70.1	51.9	10.2	33.5		62.8	40.6	63.5	11.4	44.1
Sodium (Na)	mg/l	200.0			34.4	30.8	23.7	10.9	19.2		33	18	27.5	16.2	7.56
Potassium (K)	mg/l	50.00			1.97	2.08	3.97	19.1	1.58		2.3	2.45	4.36	27.8	0.734
Total alkalinity	mg/l				384	499	419	566	266		434	295	468	746	320
Variable	**Unit**	**Assessm 1**	**Assessm 2**	**Monitoring localities (Jan – March 2016)**						**Monitoring localities (April – Jun 2016**					
				WH03	WH10	WH11	WH12	WH13	WH15	WH03	WH10	WH11	WH12	WH13	WH15
Chloride (Cl)	mg/l	200.0			26.2	6.91	1.25	12.6	11.4		25	4.21	2.31	22.3	4.08
Sulphate (SO_4)	mg/l	400.0			22.8	13.5	23.2	0.498	1.77		23.9	7.25	26.1	0.27	18.9

[51] Value exceeds Assessment Set 1 Guideline (Red)
[52] Quality of Domestic Water Supplies: Drinking Class 1 Upper range
[53] General Limit, Section 21f and h, 2013
[54] Electrical Conductivity
[55] Total Dissolved Solids

Fluoride (F)	mg/l	1	1		0.236	0.236	0.236	0.826	0.236		0.236	0.236	0.236	0.236	0.546
Aluminum (Al)	mg/l				0.003	0.003	0.003	0.003	0.003		0.003	0.003	0.003	0.003	0.003
Iron (Fe)	mg/l	1	0.3		0.005	0.005	0.005	2.28	0.005		0.005	0.005	0.005	3.52	0.005
Manganese (Mn)	mg/l	0.4	0.1		0.001	0.317	0.026	0.001	0.367		0.001	0.538	0.001	0.013	0.001
Nit rate (NO_3) as N	mg/l	10.00	15.00		3.77	0.47	0.601	0.534	0.535		2.74	0.208	0.208	0.208	0.208
Ammonium (NH_4) as N	mg/l		6		0.045	0.392	0.375	112	1.64		0.008	0.199	0.644	152	0.578
Orthophosphate (PO_4) as P	mg/l		10.00		0.005	0.005	0.005	0.005	0.005		0.06	0.044	0.052	0.004	0.041
Boron (B)	mg/l		1		0.004	0.004	0.026	0.004	0.004		0.004	0.004	0.004	0.004	0.004
Chromium (Cr)	mg/l				0.004	0.004	0.004	0.004	0.004		0.004	0.004	0.004	0.004	0.004
Copper (Cu)	mg/l mg/l	1.3	0.01		0.003	0.003	0.003	0.003	0.003		0.003	0.003	0.003	0.003	0.003
Variable	**Unit**	**Assessm 1**	**Assessm 2**	**Monitoring localities (Jan – March 2016)**						**Monitoring localities (April – Jun 2016**					
				WH03	**WH10**	**WH11**	**WH12**	**WH13**	**WH15**	**WH03**	**WH10**	**WH11**	**WH12**	**WH13**	**WH15**
Lead (Pb)	mg/l		0.01		0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005
Zinc (Zn)	mg/l	5	0.1		0.003	0.003	0.003	0.003	0.003		0.003	0.076	0.003	0.003	0.003
Sodium Adsorption Ratio	SAR				0.75	0.66	0.53	0.52	0.57		0.72	0.5	0.58	0.76	0.18
Suspended solids (SS)	mg/l		25		7	272	1	68	64		1	274	1	88	157
Nickel (Ni)	mg/l										0.003	0.003	0.003	0.003	0.003
Temp	°C										22.2	22.1	22.1	22.2	22.1

7.4.1.10 Chapter J: Air Quality

Existing sources of dust within and surrounding the Rietvly mining area, include:

- Surface mining operations;
- Agricultural activities;
- Wind erosion of open areas; and
- Vehicle entrainment of dust along un-surfaced roads (EMPr, 2009).

Potential receptors located within approximately a 2 km radius of Rietvly Mine include:

- Surrounding landowners and/or farmers;
- Nearest section of the Phokeng communities; and
- Magaliesberg.

National Occupational Health and Safety Consultants (NOHS) conducts fall-out dust monitoring at Rietvly Mine monthly. The June 2016 fall-out dust monitoring report is attached in Annexure H6. [56]

Dust monitoring points were established to be sufficient in number to establish the contribution of the mine to dust-fall in residential and non-residential areas near the premises, to monitor identified or likely sensitive receptor locations, and to establish the baseline dust-fall for the district.
The following aspects were taken in consideration:

- The prevailing winds of that specific area – light to moderate and from the north-east direction in summer and from the north-east to north-west direction in winter.
- The windy season – August – October.
- The locality of the site.
- The size of the site – ha.
- Areas where the most dust is visible – Crushing plant, quarry etc.

After reviewing all the aspects and information obtained from Weather Services South Africa as well as information gathered from Science Direct and the studying of maps from the specific area, recommendation was that the monitors be placed on those specific positions with regards to the most effective way of capturing the fall-out dust.

Table 18 and Figure 26 below provide the fall-out dust monitoring localities. All monitoring points are in non-residential areas.

Table 18: Location of fall-out dust monitoring localities

Position	Locality	Coordinates
1	Multidirectional South Pot	S25°37’23.1” E027°07’45.8”
2	Multidirectional East Pot	S25°37’23.1” E027°07’45.8”
3	Multidirectional North Pot	S25°37’23.1” E027°07’45.8”

[56] No $PM_{2.5}$ and PM_{10} monitoring is currently conducted at Rietvly Mine.

4	Multidirectional West Pot	S25°37’23.1” E027°07’45.8”
5	At Multidirectional	S25°38’03.8” E027°08’16.5”
6	West Border at N4	S25°37’52.6” E027°07’45.8”
7	Behind new Slimes dam	S25°37’23.1” E027°07’45.8”
8	Soccer Field	S25°37’23.1” E027°07’45.8”
9	Around the Mountain	S25°37’23.1” E027°07’45.8”

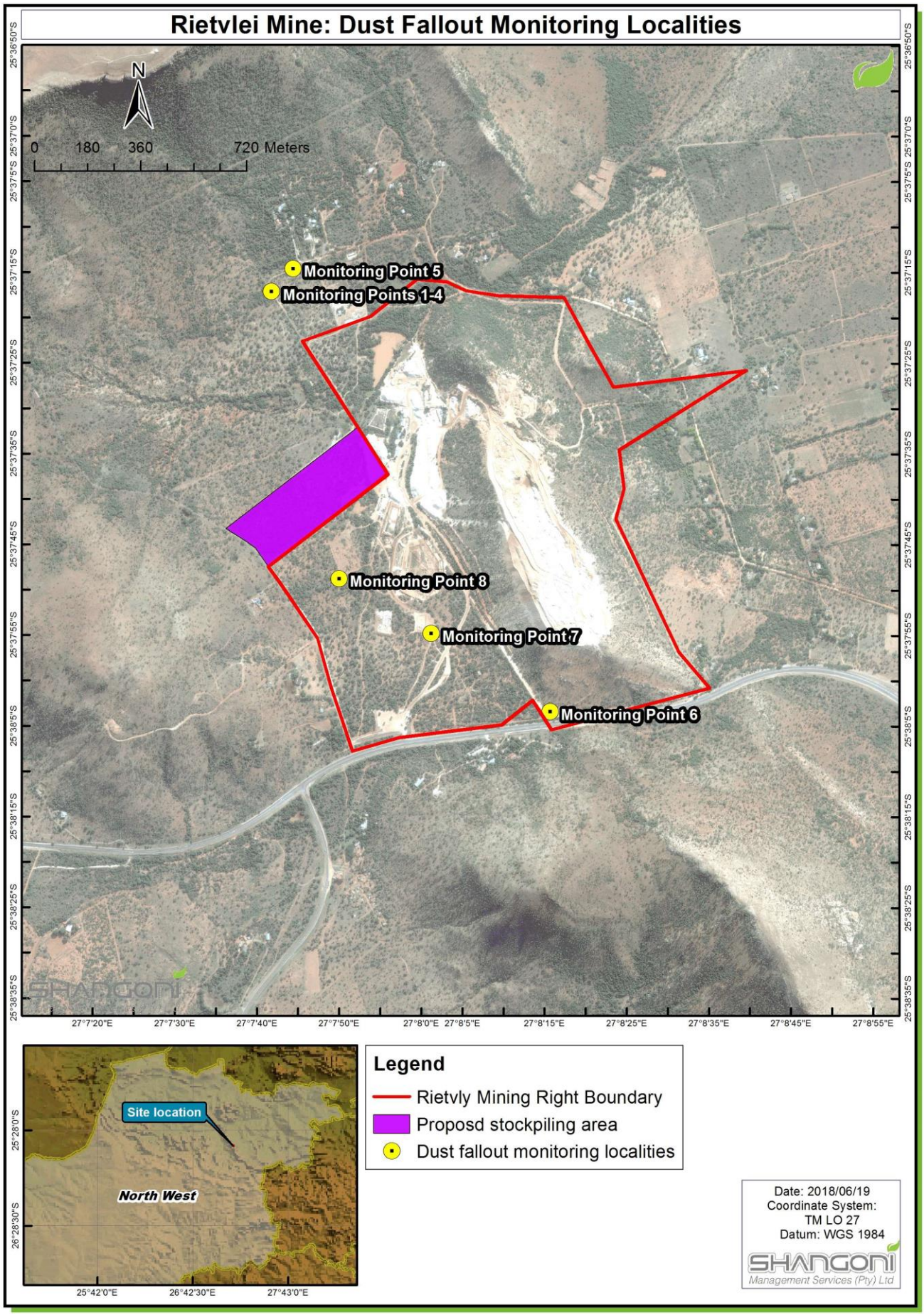

Figure 26: Fall-out dust monitoring localities

7.4.1.11 Chapter K: Noise

Potential noise generators in the area associated with the location of Rietvly Mine, include existing operations (mining, crusher plant, vehicles) at Rietvly Mine, as well as the N4 Highway between Rustenburg and Swartruggens. Noise sensitive receptors include the landowners and/or farmers surrounding Rietvly Mine (EMPr, 2009).

National Occupational Health and Safety Consultants (NOHS) conducts environmental noise monitoring at Rietvly Mine monthly.

Background information

The requirements as stipulated in the National Environmental Management Act 107 of 1998 and SANS 10103: 2008 – "The measurement and rating of environmental noise with respect to annoyance and to speech communication" were observed.

Ambient noise was measured during normal operations during day time as well as night time at the mine's perimeter. Measurements were done while the plant/mine was in full operation. Possible noise sources that were identified, includes trucks on the roads, forklifts and mining activities.

Statutory Requirements

According to SANS 10103:2008 (Edition 6.0) – "The measurement and rating of environmental noise with respect to annoyance and to speech communication" the recommended noise levels for Industrial districts is 70 dBA at day and day-night time; and 60 dBA at night time, for Suburban districts 50 dBA at day and day-night time; and 40 dBA at night time, and for Rural districts 45 dBA at day and day-night time; and 35 dBA at night time.

Ambient noise is defined as the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far. This will include the noise from the noise source under investigation.

Annoyance is defined as the general negative reaction of the community or person to a condition which threatens the general health of the community, either by creating displeasure, interference with specific activities or creating a general threat to the wellbeing of the community.

Instrumentation and Method

Noise was measured in accordance with SANS 10103:2008 – The measurement and rating of environmental noise with respect to annoyance and to speech communication.

The following guidelines were also considered:

- SANS 10328:2008 – Methods for environmental noise impact assessments; and
- National Environmental Management Act. Act no. 107 of 1998.

A sound level meter, QUEST model 1200 serial no DKD010001 that complies with the requirements for accuracy of Type 1 instruments, was used to determine the ambient noise.

Results

The ambient noise survey results for Rietvly Mine for the period April - June 2016 is provided below.

Table 19: Ambient Noise survey results (NOHS, April – June 2016)

Position	Location	Day Time Noise (70Dba)			Remarks
		April 2016	May 2016	June 2016	
1	Multidirectional South Pot	50.7	51.2	48.8	Ambient noise
2	Multidirectional East Pot	51.4	53.0	50.5	Ambient noise
3	Multidirectional North Pot	48.3	50.1	48.2	Ambient noise
4	Multidirectional West Pot	45.5	47.6	44.0	Ambient noise
5	At Multidirectional	44.4	45.2	45.0	Ambient noise
6	West Border at N4	53.1	50.1	52.7	Noise from N4
7	Behind new Slimes dam	51.2	48.6	44.4	Ambient noise
8	Soccer Field	52.5	48.5	46.5	Ambient noise
9	Around the Mountain	50.4	49.1	44.1	Ambient noise

7.4.1.12 Chapter L: Visual

A visual assessment was conducted for Rietvly Mine by Cave Klapwijk and Associates. The report titled: "*Rietvly Silica Mine, Rustenburg, Visual Scoping Report*", dated April 2008.

The Mine Site

The mine is situated in a valley between two ridges that form part of the Magaliesberg's western edge. The Mine property is approximately 10 km west of Rustenburg and just west of the junction of the N4 and the old Rustenburg - Swartruggens road.

The land use prior to mining was undisturbed bushveld on the quartzite ridge of the Magaliesberg and probably cattle grazing in the bushveld valley floor. The topography of the local area comprises of an eastern and western ridge of quartzite which provides relatively steep valley sides to the short valley which trends north-west to south-east. The northern edge of the valley terminates against a hill of quartzite. The entire landform north of the N4 at this point can be considered to be the end of the Magaliesberg Mountain Range. This topography is the result of the intrusion of the Bushveld Igneous Complex and associated dolerite dykes into the Transvaal system of sediments. These ridges assist in visually screening the mine's crushing and washing plant from the N4. The entire ridge which is to be mined is visible from the northern and southern plains. The mine plan involves the removal of silica rich quartzite in one slot that has its long axis along the ridge line of the hill. Mining started on the highest point and has progressively moved downward. Earth screen berms of spoil rock are placed around the perimeter of the mine's top edge. This helps to screen the mining activity of drilling, loading and hauling of the ore. The berm height is maintained at a level higher than the working level and is moved downwards as the mining of the highest level is completed and the next lower level is commenced.

Local context

The land use to the east and west comprises of small holdings while to the North there is undeveloped bushveld. South of the N4 the Magaliesberg Protected Area extends eastwards along the mountain range. Further to the east and to the north east is the town of Rustenburg and Phokeng respectively.

The receiving environment

The receiving environment related to the visibility of the mine will be the properties that are on high ground to the west and south of the mine. One residence is located on the lower slope of the hill and has direct line of site onto the mine offices, crushing, screening and hauling of material at the site. Views onto the old and new TSF's are direct. The small resort "Bietjie Berg" which has its access from the N4 has a direct view north onto the hill that is mined.

Figure 27: Northern direction from the "Bietjie Berg" Resort (Cave Klapwijk, 2008)

Regional context

The mine is at the western end of the Magaliesberg Mountain Range and adjacent to the western boundary of the Magaliesberg Protected Area. The mine is just south of the Royal Bafokeng Nations boundary. The Rietvly Mine together with 3 other mines in the region are owned and operated by Glencore (then Xstrata) to supply silica to the Platinum Refineries in the Rustenburg region. These mines are Horizon, Kroondal and Waterval Mines.

Visibility from the mine

There are two aspects that result from the existing configuration of the landform. One is positive and the other negative. The ancillary works, crushing and screening, and TSF's will be effectively screened from views from the N4 by the surrounding hills. On the other hand, the views onto the top edge of the mine from areas to the north and from the N4 are both close and distant. This alters the scenic value of the Magatasnek area of the Magaliesberg during the life of the mine.

This may downgrade the visual outdoor experience of tourists utilising any lodges and hiking trails in the nearby Magaliesberg Protected Area.

Views from the N4

The mine is identified by the disturbed ridge of the hill and the scar of the old quarry in the views from the west and east bound traffic. Both are noticeable due to the colour contrast with the surrounding vegetation.

Figure 28: North-western direction from the N4 Toll Road (Cave Klapwijk, 2008)

Views from the Phokeng and old Rustenburg – Swartruggens Road

Distant views are possible from the Phokeng road in both northerly and southerly directions. The views of the top edge of the mine are both distant and close up from the west bound traffic along the Old Rustenburg – Swartruggens road because the hill will be in the field of view of passers-by until the Magatasnek is passed. The mine and associated equipment and buildings are visible from the higher ground on the hills to the south west and north.

Figure 29: North-western direction from Old Rustenburg – Swartruggens Road (Cave Klapwijk, 2008)

Views from Rustenburg and Phokeng

The mine is not visible from Rustenburg because of a hill to the east of the mine which screens views towards the mine. The southern suburbs of Phokeng have views of the top edge of the mine. The crusher and screening plant and new TSF will not be visible as these are west of the hill on which the excavations are taking place.

Critical view points

Critical viewpoints are those positions where direct views of the mine are in the field of view of persons in that location or are moving towards the mine along roads. The view of the mine from these points is prominent due to the change in landform, a colour contrast or a large structure.

The following critical view-points have been identified[57]:

- The house on the adjacent property to the west of the mine site;
- The position along the east bound carriage way of the N4 where the mine is first seen;
- The "Bietjie Berg" Resort to the south of the N4;
- The position along the west bound carriage way of the N4 where the mine is visible;
- The small holdings within 1km of the eastern boundary of the mine;
- The views from the ridges and higher landforms that surround the main mine site, and in particular from the Magaliesberg Protected Area to the south.

7.4.1.13 Chapter M: Protected Areas and Conservation Planning

Biosphere Reserves

UNESCO's Man and the Biosphere Programme (MaB) was established in 1971 to promote interdisciplinary approaches to management, research and education in ecosystem conservation and sustainable use of natural resources. The Programme's primary achievement is the (growing) World Network of Biosphere Reserves, which includes 651 biosphere reserves in 120 countries, including 15 transboundary sites. South Africa currently has eight recognised biosphere reserves: Kogelberg (proclaimed in 1998), Cape West Coast Extension (2003), Waterberg (2001), Kruger to Canyons (2001), Cape Winelands (2007), Vhembe (2009), and the Gouritz Cluster and Magaliesberg biosphere reserves (both proclaimed in June 2015).

"Biospheres are not the object of a binding international convention or treaty but are governed by a "soft law" -- the Statutory Framework for Biosphere Reserves -- adopted by the UNESCO General Conference and which all countries are committed to apply." "Benefits gained from being part of the network include access to a shared base of knowledge and incentives to integrate conservation, development and scientific research on sustainably manage ecosystems." Each biosphere is typically zoned into three areas: a protected "Core Area"; a partially-protected "Buffer Area"; and a surrounding unprotected "Transitional Area."

The Magaliesberg Protected Environment comprises the "Core Area" of the Magaliesberg Biosphere Reserve. The Cradle of Humankind World Heritage Site, and the Vulture Valley, Buffelspoort Valley, Hartebeesfontein, Renosterspruit, Peglerae and Francolin conservancies collectively comprise a patchy "Buffer Area" adjoining the core Protected Environment. Surrounding the Magaliesberg biosphere Core and Buffer areas is the "Transitional Area" wherein Rietvly Mine is situated.

[57] The visual intrusion of the mine on views from the higher landforms will have greater significance if the affected properties operate tourist-based activities. This aspect has however not been investigated (Cave Klapwijk, 2008)

Within a biosphere Transitional Area, sustainable resource use should be promoted "without negatively impacting on sensitive ecological habitats, species and ecological processes." "Aesthetic implications of possible developments should be carefully considered" (http://magaliesbergbiosphere.org.za).

Important Bird Areas

Over one hundred partner organisations of BirdLife International used standard assessment criteria to identify global priority areas for bird conservation called Important Bird Areas (IBAs).

IBA status does not offer formal protection to an area, but any proposed changes to established land-use patterns within an IBA will be closely scrutinised by BirdLife South Africa and other conservation NGOs.

The closest IBA to Rietvly Mine is the Magaliesberg IBA ZA018, which largely coincides with the Magaliesberg Biosphere Reserve, and which flanks the southern boundary of Rietvly Mine on the opposite (southern) side of the N4 (Figure 51). The most important trigger species in the [Magaliesberg] IBA is the globally threatened Cape Vulture. The number of breeding pairs in the Skeerpoort colony seems to be stable at 200–250. Cape Vulture breeding also occurs at Nooitgedacht, but no breeding activity was recorded at a third colony (Roberts' Farm) in 2014. Secretary bird is the other globally threatened species in the IBA. Regionally threatened species are Lanner Falcon, Half-collared Kingfisher, African Grass Owl, African Finfoot and Verreauxs' Eagle. The most important threat to the trigger species in this IBA is the expansion of commercial, recreational and housing developments, which have decreased the area of land available for wild ungulates and domestic livestock, and hence the availability of food for vultures.

It is generally accepted that without the supplementary food provided by the five vulture feeding areas in the IBA, the Cape Vulture colonies would have declined. The use of poisons by small-stock farmers in the area to combat mammalian predators such as black-backed jackal, caracal and domestic dogs has declined, and rehabilitation centres like VULPRO report fewer of these cases than when the IBA was designated in 1998. Collision with man-made structures such as power lines is a concern. A considerable number of birds that have either flown into a power line or have been electrocuted are brought to VULPRO each year" (BirdLife International 2015).

The Pilanesberg Game Reserve, which is situated approximately 30km north of Rietvly Mine, is also a recognized IBA (ZA017).

National Terrestrial Priority Areas (NPAs)

The NPA assessment was based on integrating data on species, habitats and ecological processes to identify areas of greatest biodiversity significance. This resulted in the identification of nine spatial priority areas for terrestrial biodiversity (Driver et al. 2004). These priority areas represent areas with high concentrations of biodiversity features and/or areas where there are few options for meeting biodiversity targets (Rouget et al. 2004). Rietvly Mine is situated in the Bushveld-Bankenveld Priority Area, which faces the highest pressure of the nine identified national Priority Areas (NBI, 2004).

NEM: BA National Threatened Terrestrial Ecosystems

A list of Threatened Ecosystems within each Priority Area was gazetted on 9 December 2011 under the NEM: BA (Act 10 of 2004). The Threatened Ecosystems occupy 9.5% of South Africa and were selected according to six criteria which included: (1) irreversible habitat loss; (2) ecosystem degradation; (3) rate of habitat loss; (4) limited habitat extent and imminent threat; (5) threatened plant species associations, and (6) threatened animal species associations. Rietvly Mine is not situated in a national Threatened Ecosystem.

Mining and Biodiversity Guidelines

The Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector (DEA et al. 2013), interprets the best available Biodiversity knowledge and science in terms of the implications and risks for mining in a practical and user-friendly guideline for integrating relevant biodiversity information into decision making. The development of this guideline was initiated by the Chamber of Mines and the SAMBF, in partnership with the DEA, the Department of Mineral Resources (DMR), and with technical input and co-ordination by the SANBI Grasslands Programme.

A portion of the northern half of Rietvly Mine is classified by the MBG as having High biodiversity importance and risk for mining, with the remainder of the site classified as having Highest biodiversity importance and risk for mining (Figure 42). In addition, the MBG recognizes that the southern boundary of Rietvly Mine closely flanks a Protected Area viz. Magaliesberg Protected Natural Environment.

MBG areas of Highest Biodiversity Importance include:

- Ramsar sites;
- Critically Endangered and Endangered Ecosystems;
- River and wetland FEPAs and a 1 km buffer around these; and
- Critical Biodiversity Areas from provincial spatial biodiversity plans.

MBG areas of High Biodiversity Importance include:

- Buffers around World Heritage sites and other protected areas;
- High water yield areas; and
- Other identified priorities from provincial spatial biodiversity plans.

North West C Plan

The North West Conservation Plan (NW: C Plan) is based on a provincial Biodiversity Assessment (Desmet et al. 2009) and provides important guidance for biodiversity conservation and sustainable development in the province. Among other things, the C-Plan will be used to inform the development of provincial biodiversity Sector Plans, bioregional plans, Spatial Development Frameworks (SDFs), Environmental Management Frameworks (EMFs), Strategic Environmental Assessments (SEAs) and the Environmental Impact Assessment (EIA) process in the province.

CBAs are areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems, and the delivery of ecosystem services. If these

areas are not maintained in a natural or near-natural state, then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

Ecological support areas (ESA's) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas (North West Province Biodiversity Conservation Assessment Technical Report, March 2009).

The land management objectives (as per the North West Province Biodiversity Conservation Assessment Technical Report, March 2009) are as follows:

Protected Areas and CBA 1: Natural landscapes

- Ecosystems and species fully intact and undisturbed
- These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost, then targets will not be met.
- These are landscapes that are at or past their limits of acceptable change

CBA 2: Near-natural landscapes

- Ecosystems and species largely intact and undisturbed.
- Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these
- landscapes without compromising our ability to achieve targets.
- These are landscapes that are approaching but have not passed their limits of acceptable change.

ESAs: Functional landscapes

- Ecosystems moderately to significantly disturbed but still able to maintain basic functionality.
- Individual species or other biodiversity indicators may be severely disturbed or reduced.
- These are areas with low irreplaceability with respect to biodiversity pattern targets only.

Other Natural Areas (ONA) and Transformed: Production landscapes

- Manage land to optimise sustainable utilisation of natural resources.

According to the latest NW:C Plan (SANBI database), Rietvly Mine is situated in a Category 2 Critical Biodiversity Area (CBA 2) and Ecological Support Area 1 (ESA 1) (refer to Figure 30 below).

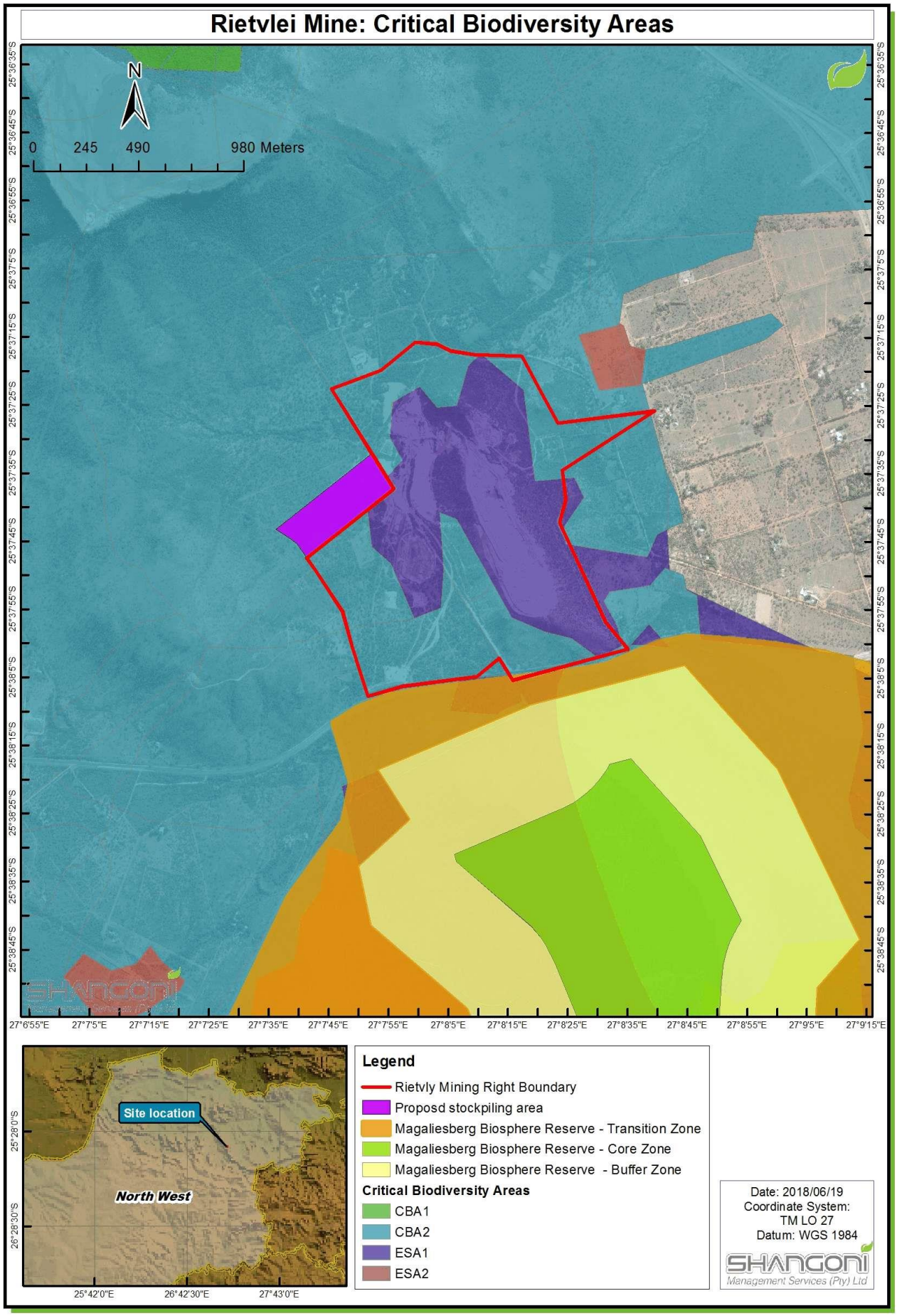

Figure 30: Rietvly Mine in relation to the Critical Biodiversity Areas and Ecological Support Areas (SANBI, as at August 2016)

7.4.1.14 Chapter N: Cultural Heritage

Sidney Miller was contracted by Glencore Alloys (then Xstrata Alloys) to conduct a heritage assessment for Rietvly Mine. The resultant report titled: "*1st Phase Heritage Impact Assessment for the client, Glencore Alloys South Africa – Rietvlei Silica Mine on Portion 103 of the farm Shylock 256 1*", dated December 2018, is attached in Annexure H7.

Although there are a number of well known Stone Age sites in the area, such as the cradle of mankind only some 40 kilometres to the southeast, there appear to be no Stone Age industry present on the site.

Similarly there are indications of Early Iron Age remains recorded at Broederstroom near the Hartebeestpoort dam, and an intense habitation of Later Iron Age Peoples between Zeerust and Cullinan on the rim of the Bushveld Igneous Complex, but again there is no indication of Iron Age impact on the site.

Lastly, the pioneers that entered the Transvaal post 1836, and their continuous interaction with the local inhabitants, mainly the people of chief's Mogale and Magata , are well documented, especially the occupation of the Magaliesberg range by the followers of Commandant Andries Hendrik Potgieter between 1840 and 1845, well described by Rex (1975), in his history of the Zeerust Hervormde Kerk. There is no footprint of historical occupation of local Africans or European pioneer settlement on this site.

The Magaliesberg, on which portion 103 of the farm shylock 256 is located, are the result of the uplifting of the ancient Transvaal sediments through the event of the massive magma-flow that formed the Bushveld Igneous Complex some 800 million years ago. The erosion of these uplifted portions gave rise to the sedimentary formations containing the silica on the property, while to the north of the Magaliesberg mainly black turf soils are encountered. This erosion of the sedimentary formations created sandy loam soils, and with the prevailing topography and precipitation then gave rise to the flora generally known as Sourish Mixed Bushveld. The geological and vegetative impact of the proposed stockpiling activity is very low.

It is clear from both the desktop study as well as the field-work that Portion 103 of the farm Shylock 256 was not used for any historical or pre-historical purposes except for the small labourer's dwelling encountered that is not protected by the heritage Act of 1999.

7.4.1.15 Chapter O: Regional socio-economic structure

The Information contained in this section has been sourced from the following documents:

- Rustenburg Local Municipality. Integrated Development Plan Review 2014 – 2015. Approved per item 122 of 30 May 2014 (hereafter referred to as 'Rustenburg LM IDP, 2014-2015');
- Final Version: Bojanala Platinum District Municipality IDP. 2012/17 (hereafter referred to as 'Bojanala DM IDP, 2012/17'); and
- Social and Labour Plan for Glencore Operations South Africa (Pty) Ltd. Rietvly Mine. 2014 - 2018 (Annexure E).

Rustenburg Local Municipality is one of five municipalities within the Bojanala District Municipality in the North West Province and is divided into 38 wards. The significant growth in Rustenburg is largely attributed to the impact of the world's four largest mines in the immediate vicinity of the town, namely, Anglo Platinum, Impala Platinum, Xstrata (Glencore) and Lonmin. Approximately 97% of the total platinum production occurs in Rustenburg, with the mining sector providing around 50% of all formal employment.

Population

The total population for the Rustenburg Local Municipality is 549 575 people, comprising of 54% males and 46% females. This phenomenon could be attributed to labour migration to Rustenburg due to more males migrating to the city to obtain job opportunities. Table 20 below illustrates the distribution of the various racial groups in the Rustenburg Local Municipality for 2010 and 2011. Between 2010 and 2011, the overall population growth was 86.47% with Africans being the majority population group at 52.23%. The Asians were the highest in % growth by 71% followed by the Coloured at 58%. The White race had decreased by 11%.

Table 20: Population distribution by race

Population group	2010	2011	% Growth / decrease
African	410 762	486 411	52.23
White	58 623	51 839	-11
Coloured	2 824	4 862	58
Asian	3 022	4 214	71
Others		2 249	100
Total	475 232	549 575	86.47

Table 21 below shows the ethnic group, gender and age distribution

Table 21: Age in completed years by population group and gender (Rustenburg LM IDP, 2014-2015) as per Census, 2011

ETHNIC GROUPS	Black African			Coloured			Indian or Asian			White			Other			Total		
AGE	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0 - 4	26211	25543	**51754**	268	270	538	201	182	**383**	2062	2001	**4063**	119	102	**221**	28861	28098	**56959**
5 - 9	18136	17830	**35966**	196	215	412	179	156	**336**	1778	1656	**3433**	47	54	**101**	20335	19911	**40247**
10 - 14	15836	15415	**31251**	185	165	350	136	147	**283**	1706	1613	**3318**	28	25	**53**	17891	17364	**35256**
15 - 19	17973	17461	**35434**	190	171	362	131	131	**262**	1892	1742	**3634**	49	38	**87**	20234	19543	**39777**
20 - 24	28927	24614	**53541**	277	250	527	245	150	**394**	2008	1983	**3991**	240	110	**350**	31696	27107	**58803**
25 - 29	34514	26292	**60806**	290	236	526	341	172	**513**	2221	2253	**4473**	299	128	**427**	37664	29081	**66745**
30 - 34	31373	20857	**52230**	249	254	503	245	159	**405**	2064	1925	**3989**	232	97	**329**	34163	23293	**57455**
35 - 39	24477	16870	**41347**	197	175	372	215	121	**336**	2011	2007	**4018**	138	73	**211**	27039	19246	**46284**
40 - 44	19851	14156	**34007**	187	145	332	151	125	**276**	2047	2090	**4138**	104	66	**170**	22340	16582	**38923**
45 - 49	18878	11456	**30334**	164	137	301	128	97	**224**	2155	1885	**4040**	77	22	**99**	21401	13598	**34999**
50 - 54	14225	8515	**22740**	115	110	225	93	82	**175**	1973	1755	**3727**	60	26	**85**	16465	10488	**26953**
55 - 59	8981	5706	**14687**	84	74	158	94	80	**175**	1466	1395	**2862**	46	19	**65**	10672	7274	**17946**
60 - 64	4374	3993	**8367**	43	60	103	78	84	**162**	1011	1060	**2070**	10	5	**15**	5517	5202	**10718**
65 - 69	2324	2774	**5098**	25	37	63	56	74	**130**	727	852	**1579**	9	8	**17**	3141	3746	**6887**
70 - 74	1397	2095	**3492**	14	24	38	40	46	**86**	485	644	**1129**	4	5	**9**	1941	2814	**4755**
75 - 79	951	1473	**2424**	7	16	23	17	24	**41**	276	428	**704**	1	2	**4**	1252	1944	**3196**
80 - 84	500	1004	**1504**	7	5	12	8	13	**21**	164	263	**427**	1	-	**1**	680	1285	**1965**
85 +	423	1006	**1429**	5	12	17	4	8	**12**	67	177	**244**	5	-	**5**	503	1204	**1707**
Total	**269351**	**217060**	**486411**	**2503**	**2356**	**4862**	**2362**	**1851**	**4214**	**26113**	**25729**	**51839**	**1469**	**780**	**2249**	**301795**	**247780**	**549575**

Education

Table 22 illustrates the level of education between the various racial groups. It is interesting to take note that overall the level of education has increased, with less individuals that have no schooling to Grade 6. Table 33 shows the highest level of education by gender.

Table 22: Highest level of education by race (Rustenburg LM IDP, 2014-2015)

Level of Education	Africans	Whites	Asian
	2010	2010	2010
No schooling	18 853	264	20
Grade 0-2	4 394	34	10
Grade 3-6	36 405	340	130
Grade 7-9	77 160	4 244	312
Grade 10-11	71 998	9 602	426
Certificate / diploma without matric	1 911	603	12
Matric only	76 163	20 786	857
Matric & certificate / diploma	14 884	5 310	395
Matric & bachelor's degree	2 613	2 491	132
Matric & Postgrad degree	873	1 200	89
Total	**305 254**	**44 874**	**2 383**

Table 23: Highest level of education by gender (Rustenburg LM IDP, 2014-2015)

Highest level of education by Gender			
	Male	**Female**	**Total**
No schooling	11679	9063	20742
Some Primary	38952	26444	65396
Completed Primary	15820	12329	28149
Some Secondary	60202	45357	105559
Matric	60643	51780	112423
Higher	14515	15658	30173
Educational institution			
Pre-school including day care; crèche; Grade R and Pre-Grade R in an ECD centre			1539
Ordinary school including Grade R learners who attend a formal school; Grade 1-12 learners & learners in special class			94883
Special school			933
Further Education and Training College FET			2935
Other College			957
Higher Educational Institution University/University of Technology			1636
Adult Basic Education and Training Centre ABET Centre			210
Literacy classes e.g. Kha Ri Gude; SANLI			5
Home based education/ home schooling			574

Employment Profile

Illustrated below is Figure 31, which indicates that there has been a steady increase in the labour force participation rate between 1996 and 2010.

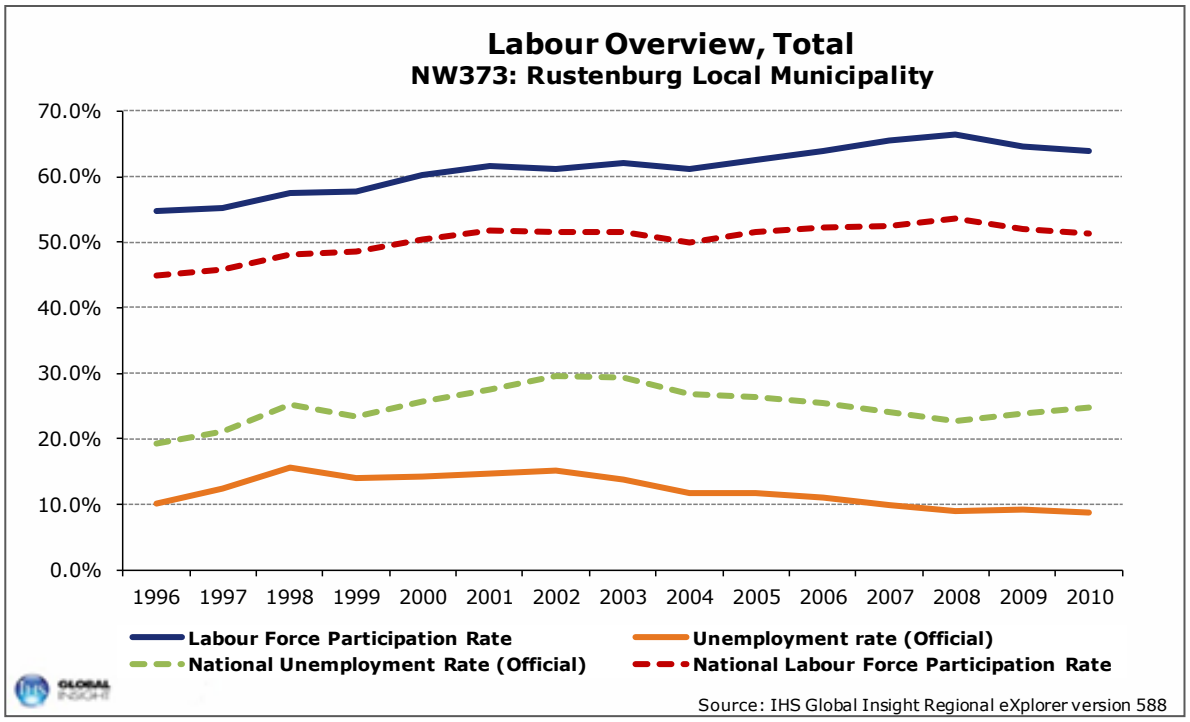

Figure 31: Economically active population, 1996 to 2010 (Rustenburg LM IDP, 2014-2015)

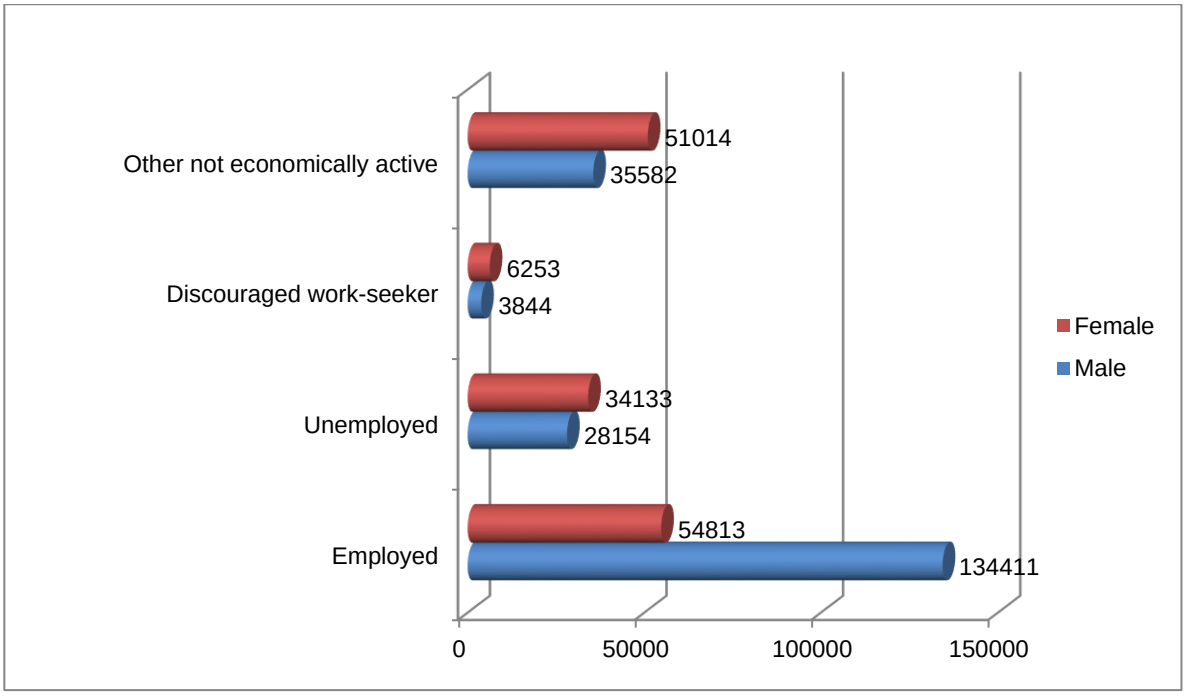

Figure 32: Employment statistics per gender (Rustenburg LM IDP, 2014-2015)

Figure 33 provides the formal employment by the Standards Industrial Classification (SIC) sectors. Half of the people are employed in the mining sector (98 956 individuals), followed by trade (28 075) and community services (15 190). Apart from the mining sector, the Rustenburg Local Municipality is quite diversified in terms of the other sectors found in the area.

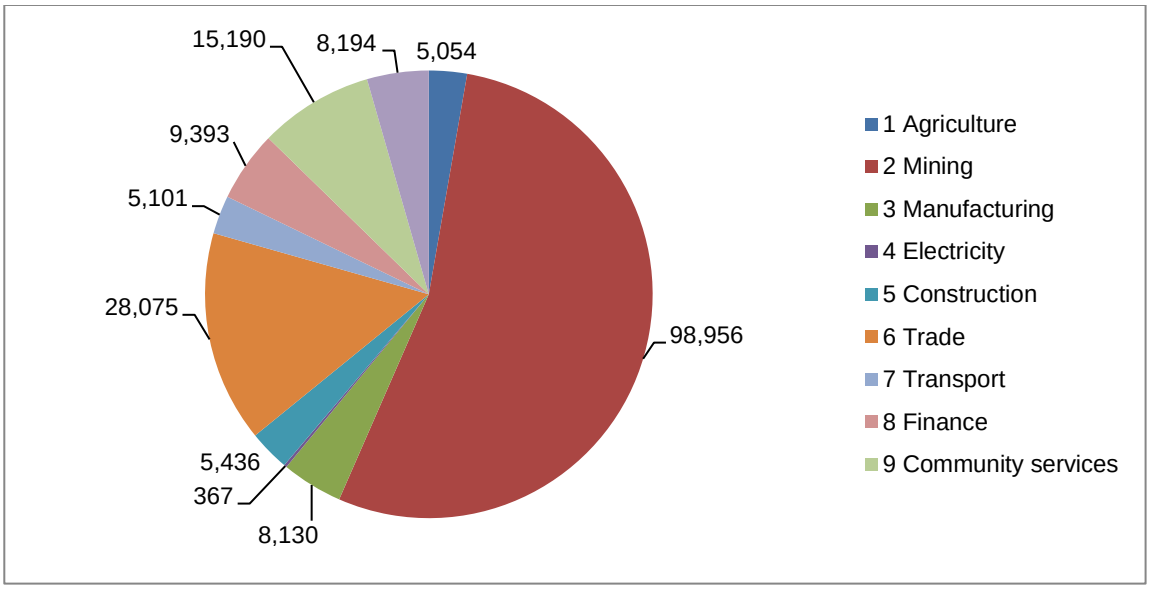

Figure 33: Employment by sectors (Rustenburg LM IDP, 2014-2015)

Basic Services

Housing

The census statistics stated that the proportion of households living in formal houses on separate stands in proportional terms declined somewhat from 47.4% in 2001 to 42% in 2007. This does not imply that the actual number of households residing in formal structures on separate stands have declined, the actual number increased from 55 146 in 2001 to 61 477 in 2007. It does however indicate that other categories have increased at a faster rate than formal housing in formal settlements, hence the resulting proportional decrease.

A further notable feature is the large proportional increase in the number of households residing in informal structures in backyards that increased from 13.4% in 2001 to 21% in 2007. According to Stats SA data, the total number of households residing in informal structures in backyards has doubled between 2001 and 2007 (from 15 540 to 30 685 households). A positive feature is the decrease in the number of households residing in informal structures, that declined from 30 094 in 2001 to 23 922 in 2007. This also represents a proportional decrease from 25.9% in 2001 to 16.3% in 2007.

Water

Rustenburg Local Municipality as the Water Services Authority provides services in all 38 wards and shared services with the Royal Bafokeng Administration in some of the wards. The municipality receives water from Rand Water and Magalies Water as well as the Rustenburg Water Services Trust. Services provided include provision of new water and sewer services, operation and maintenance thereof. The unit is responsible for the operation of 27 potable water reservoirs that service an area with 16 pump stations as well as Savanna Falls, Marikana and Freedom Park Sewer Pump stations; three borehole water scheme systems in Rankelenyane, Molote City and Mathopestad and treated effluent system for irrigation in the Central Business District.

Electricity

The Unit Electrical Engineering Services is one of seven interdependent and interacting units that comprise the Directorate of Infrastructure Development and Management of the Rustenburg Local Municipality. The Unit

Electrical Engineering Services is operating as the organ of the Rustenburg Local Municipality and of the Directorate of Infrastructure Development and Management for the supply and distribution of electricity in the demarcated area.

The client base of the Rustenburg Local Municipality is provided in Table 24 below.

Table 24: Client-base of the Rustenburg Local Municipality (Rustenburg LM IDP, 2014-2015)

CONSUMER	QUANTITY
Chrome furnaces	2
Residential 1	37 535
Residential 2-4	10 468
Government	9
Industrial	106
Commercial	1725
Mines	8
Agricultural	2063
Pre-paid	43 978

Refuse removal

The Rustenburg Local Municipality currently renders the following waste removal services:

- Domestic waste removal
- Business/Industrial waste removal
- Street cleansing and litter picking service
- Garden refuse removal services
- Waste Transfer
- Waste Treatment
- Landfill operation services
- Contracted services.
- Education and Awareness

The greater Rustenburg area has approximately 120 000 service points of which approximately 70 000 as well as the CBD area is serviced by contractors. Service providers were appointed from the first of December 2012 to render services to 50 000 household. This has reduced backlog of areas not receiving basic waste Management services:

- RDP houses – Newly developed houses are not yet receiving services (+ 1 000 houses)
- Informal Settlements (+ 5 000 houses)
- Rural areas (6000 settlements).

The Waste Management Unit is in the process of the review of the integrated waste management and alternative service delivery mechanism in a form of a municipal waste entity.

7.4.2 Description of the current land uses

7.4.2.1 Land use and development at the site

Rietvly Mine comprises of an opencast (bench mining) pit area, stockpiling activities, processing activities, water management facilities, tailings storage facilities (TSF), an explosives bays, an office block and a small parking area near the gate. The site is fenced (electrified game fence), with some natural bushveld remaining amongst the workings. The site is also stocked with some game (NSS, 2015).

According to SANBI's land cover data, Rietvly Mine's land use is classified as "Mining" (Figure 35).

Land surrounding Rietvly Mine is being used by private individuals for residential, agricultural or tourism use. Further away from the mine, land is occupied by the Magaliesberg or sections of Phokeng community. There are several private individuals (landowners/farmers) located on properties to the west, north and east of the mine. Some of the properties are used for residential purposes, grazing livestock and small – scale farming.

To the south of Rietvly Mine lies the Magaliesberg Natural Protected Environment, approximately 1km south of the proposed mining areas.

To the North-west and west lie the foothills of the Magaliesberg comprising of eight hills near Rietvly Mine. The foothills range in altitude from 1 300m amsl (at the base) to 1 593m amsl (highest point). The side slopes of two of the hills are currently being mined by the mine (EMPr, 2009).

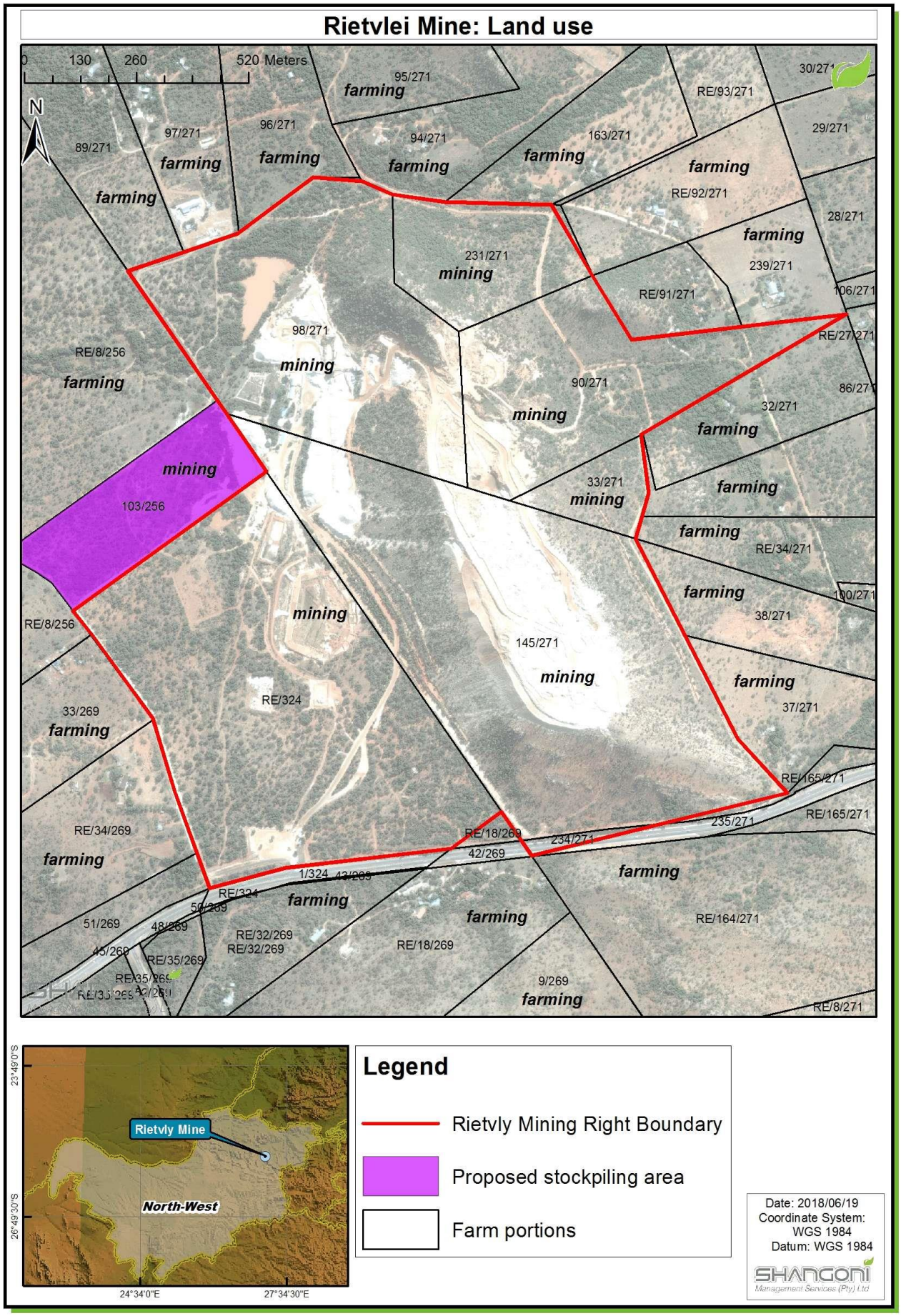

Figure 34: Land use map for Rietvly Mine and the surrounding areas.

7.4.2.2 Land Capability

Since 1991, no official agricultural activities have taken place at Rietvly Silica Mine (Metago, 2006). Previously, the lower lying areas were used for grazing. No agricultural activities took place higher up the slopes due to the rocky terrain and the steep gradient of the mountain slope. The mine has established a game farm area on the mine property. The area is managed by mine management. (EMPr, 2009)

In a soil survey conducted in 2006, land capability of each soil type was assessed in terms of arable land, grazing land, wilderness land and wetlands, as defined by the MEM Guideline for planning and authorization (Department of Minerals and Energy, 2000).

The land capability classes for soils in the area are summarized in Table 25 below (EMPr, 2009).

Table 25: Summary of land capability of soil units at Rietvly Mine (EMPr, 2009)

Map Unit(s)	Area (ha)	% of total	Land Capability Class
Sd	1.55 ha	12.8%	Arable, moderate
Hu/R	10.55 ha	82.7%	Wilderness

The shallow, rocky soils of the Hu/R map unit are too steep and stony to be of any value to agriculture. The narrow strip of deeper Sd soils has an arable capability, but their restricted area, as well as the relative steepness and occasional stoniness of the foot slope position, mean that they cannot viably be used for agriculture (EMPr, 2009).

7.4.2.3 Landscape Functional Analysis (LFA)

Natural Scientific Services cc conducted a Landscape Function Analysis for Rietvly Mine (dated April 2015). The resultant report is attached in Annexure H3.

The Landscape Function Analysis (LFA) seeks to assess the conservation or loss of vital resources such as soil, water, and nutrients from a landscape. Functional landscapes essentially conserve their resources and are self-sustainable. They typically support many vegetated patches, such as grass tufts, in an arrangement that allows for the effective trapping and infiltration of resources that are moving though the system, while dysfunctional landscapes are typically those characterised by numerous bare soil patches that provide little obstruction to the overland movement of water and soil resources which are thus effectively lost from the system (Tongway & Hindley, 2003; 2004).

Any changes to the composition, structure or appearance of a landscape will alter its functionality from that moment onwards. The Landscape Function Assessment used in the study provides a tool for monitoring the consequences of land management practices and the effects of mining activities on the functionality of landscapes. The LFA report seeks to draw comparisons and establish trends between the past (NSS, 2011a) and current landscape functionality of natural areas at Rietvly Mine.

Sampling was kept as far as possible to the same location and season as that of the previous (2010) NSS LFA. Standardised photographs were taken at each sampling site and species composition, abundance and vegetation structure was documented. Transect position was recorded using hand held GPS. The LFA sampling points are provided in Table 26 below.

Table 26: Location and date of LFA sampling points at Rietvly Mine (NSS, LFA, 2015)

Sampling Point	Location	Date	Sampling Point	Location	Date
Rietvly-1 (Natural)	25.62943S; 27.12899E	11 Oct 2010	Rietvly-1 (Natural)	25.62943S; 27.12899E	15 Oct 2014
Rietvly-2 (Natural)	25.62360S; 27.13059E	11 Oct 2010	Rietvly-2 (Natural)	25.62360S; 27.13059E	15 Oct 2014
Rietvly-3 (Natural)	25.62818S; 27.13961E	11 Oct 2010	Rietvly-3 (Natural)	25.62818S; 27.13961E	15 Oct 2014
Rietvly-4 (Natural)	25.63392S; 27.13924E	11 Oct 2010	Rietvly-4 (Natural)	25.63392S; 27.13924E	15 Oct 2014

The geographic setting of each transect within the landscape was recorded so that the nature and magnitude of water run-off processes can be gauged. This classification is important for assessment of differential soil water storage and erosion potential at landscape scale. A South African based system introduced by McVicar et al. (1977) was used to define the terrain units that are used for classifying the geographic setting of a site while McVicar et al. (1977) provided insight on soil type.

At all four Rietvly Mine's transects both soil surface functionality and patch / inter-patch dynamics have decreased since 2010. Generally veld patchiness and the proportion of bare ground have increased while patch area and the landscape's ability to attenuate rain water have decreased.

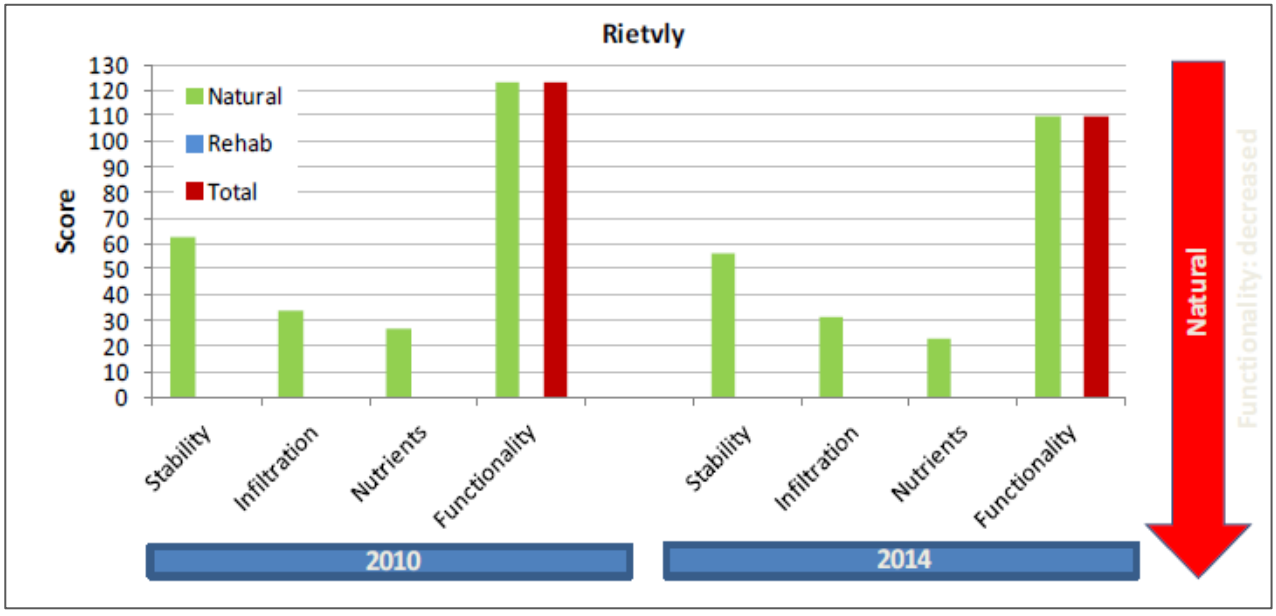

Figure 35: Changes in soil surface functionality at Rietvly between sampling periods (NSS, LFA, 2015)

Overall the grass sward has thinned considerably at Rietvly Mine since 2010 resulting in lower rainsplash protection, cryptogram cover and per. basal canopy cover. The likely cause for the decreased grass cover and soil functionality is over-utilisation by grazing game but inappropriate burning regimes may also play a role.

From the below historical Google Earth images (Figure 36), the effect of overgrazing becomes apparent, particularly so for the woody component, which like the grass sward, has thinned considerably since 2010. The images also show the rapid expansion of the opencast mining and its sedimentation effects on the eastern side of the ridge.

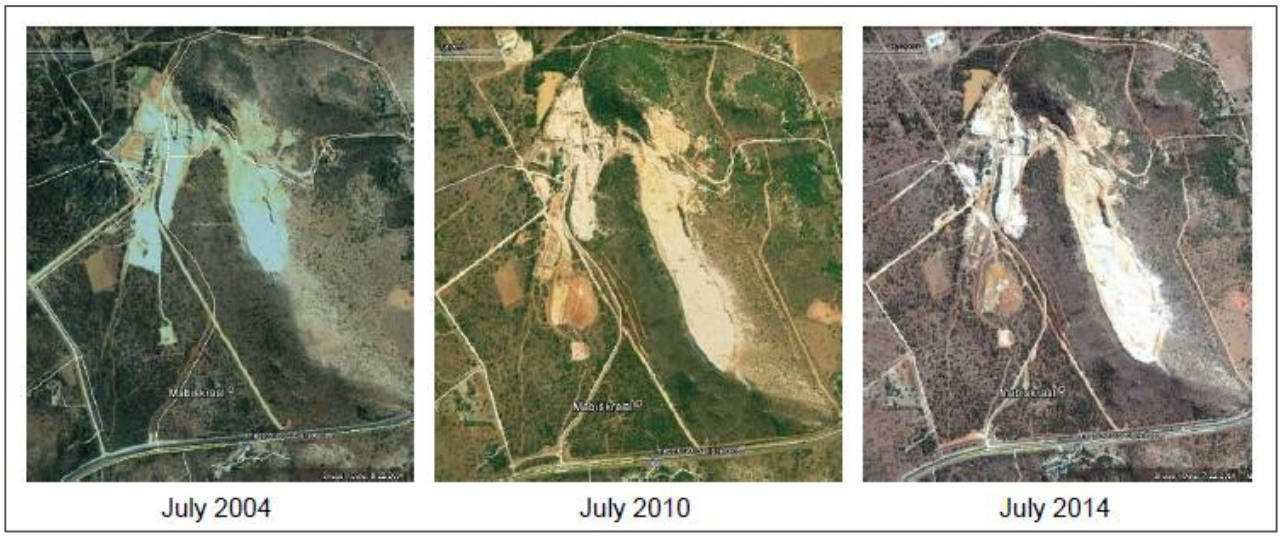

Figure 36: Historical Google Earth imagery for Rietvly Mine (NSS LFA, 2015)

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

Refer to Section 7.4.2 above. Refer also to Figure 3 (Site Layout Plan), Figure 34 (Land use map) and Figure 35 (Environmental features and current land use map) below that show the existing activities and infrastructure and facilities on-site.

7.4.4 Environmental and current land use map.

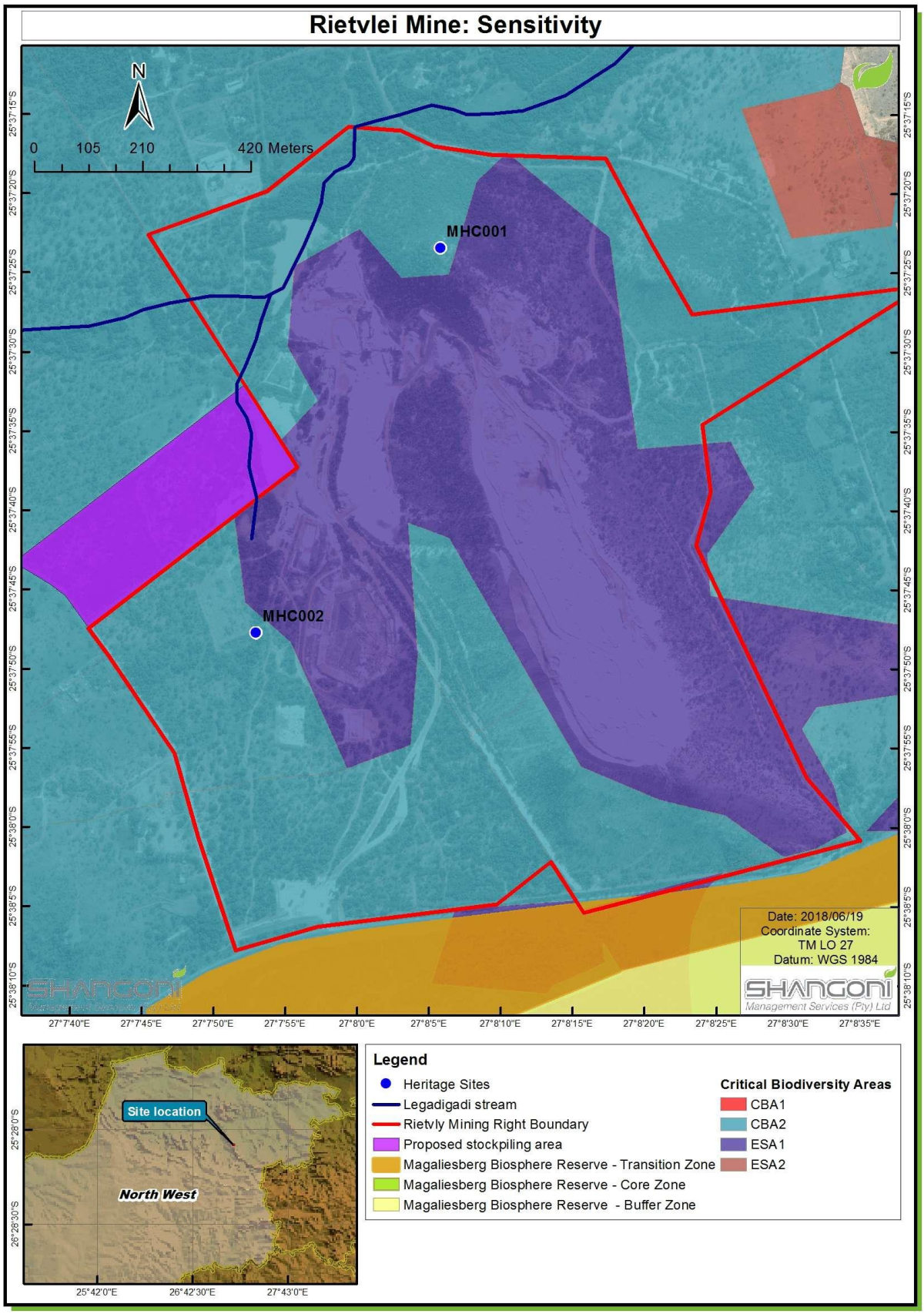

Figure 37: Environmental and current land use map (Sensitivity map)

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

A detailed risk assessment has been undertaken, as contained in Annexure C. The following table contains all the potential impacts identified for the activities described in the initial site layout.

Environmental component	Activity	Impact description	Duration	Pre-mitigation[58]			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
Topography	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to the change in topography.	Long-Term	5	3	H	No	Yes	Manage
	Stockpiling of silica product Maintenance of stockpiles	Stockpiling activities, including the maintenance of stockpiles, will alter the topography and lead to a change in drainage patterns.	Operational	5	2	H	Yes	No	Mitigate; Manage
	Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Operational	4	3	H	Yes	No	Manage
Soil	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to an increase in exposed areas which can lead to erosion.	Operational	5	3	H	Yes	Yes	Mitigate; Manage
	Possible on-site maintenance activities	The potential for soil contamination from the leaking of equipment or vehicles or spillages of hydrocarbons always exists but would be considered very site specific. Incorrectly managed and controlled maintenance activities may result in soil contamination.	Operational	3	3	M	Yes	No	Avoided
	Stockpiling of silica product	Stockpiling of product may lead to soil compaction and erosion, if not managed appropriately.	Operational	3	3	M	Yes	No	Manage
	Waste management activities	The incorrect handling and disposal of general waste, scrap metal and industrial waste (e.g. waste tyres) will have a long-term impact on the local area. Impact will not only effect soil but could also impact on the habitat of fauna and impact of fauna, surface water and groundwater. In addition, the visual character of the area will be impacted on. The incorrect handling and disposal of hazardous waste can also have a permanent negative impact on the local area. Soil, water sources and fauna habitats can be adversely affected, and human health can be impacted on.	Long Term	3	3	M	Yes	No	Avoided
	Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Operational	4	3	H	Yes	No	Manage
Land Use and Land Capability	Stockpiling of silica product Hauling activities	Extensions to the mining area (as per the relevant mining rights granted to Rietvly Mine) will result in a continuation of the impact on land use and land capability. The Rietvly site is also stocked with some game species. As per the Biodiversity Assessment (NSS, 2015), it appears that game densities are high, and likely exceed the carrying capacity of the property. This was evidenced by the high levels of overgrazing.	Long Term	4	3	H	Yes	No	Managed

[58] VH = Very High; H = High; M = Medium; L = Low

Environmental component	Activity	Impact description	Duration	Pre-mitigation[58]			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
	The construction of the stockpile area not taking place.	Not constructing the stockpile area would mean that there would be no change to the topography of the area as there will be no clearing and grubbing activities. This in turn will lead to erosion not taking place and no loss in biodiversity.	The positive impact will be long-term to permanent.	Positive			Yes	No	Enhanced
Flora	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Floral implications:** The main impact from a Biodiversity perspective at Rietvly Mine is habitat loss / degradation. The restricted communities that will be impacted on in any type of mining expansion are the: • Dense Slope Thicket • *Loudetia -Tristachya* Exposed Outcrops • *Combretum-Cymbopogon* East Slope	Long Term	5	4	H	Yes	No	Mitigate
		Loss / Destruction / Removal of Conservation Important Species: Through the biodiversity study conducted by NSS (2015), a few Red Listed and Protected species have been detected. These included: The Near Threatened (NT) *Adromischus umbraticola subsp. umbraticola*; *Boophone disticha* (P and TSP Listed as Dec) and *Hypoxis hemerocallidea* (Dec). These species fall within the Very High, High and Medium-High Areas of Significance categories.	Long Term	5	4	H	Yes	No	Mitigate
		Alien invasive flora: NSS compiled an Alien invasive plan in 2009 for Xstrata Alloys mines. There are at least 39 alien species (combined 2009 and 2015 studies) that have been recorded within Rietvly area, and of these species, 21 are now listed under NEMBA as Category 1b species and 15 as Category 1 under CARA legislation. To date, from investigations in 2009 and 2015 no further advancement in the clearing and control of these species has been conducted. In addition, species category listings from 2011 to date have drastically changed. Category 2 species on site are not been used for any wind row or a pollution control/uptake function and, therefore, these will not form part of permit applications to remain on site and must be eradicated along with all Category 1/1b species.	Long Term	4	3	M	Yes	No	Mitigate
Fauna	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Faunal implications**: The main impact from a biodiversity perspective at Rietvly Mine is habitat loss / degradation. Habitat loss, degradation and fragmentation together with improper veld management practices such as overgrazing (and potentially inappropriate burning regimes) have decreased the capacity of the site to support fauna. The results of the NSS LFA (update conducted in 2015) revealed that overutilisation of the grass sward by grazers and mix feeder game has thinned the grass sward considerably since 2010 resulting in lower rain splash protection, cryptogram cover and per. basal canopy cover while at the same time increasing the prevalence of bare ground. This hardening of the soil surface has the effect of	Long Term	4	3	M	Yes	No	

Environmental component	Activity	Impact description	Duration	Pre-mitigation[58]			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
		decreasing rainfall absorption while increasing runoff which in turn results in erosion and loss of soil, increased soil aridity and decreased soil fertility which all together lowers the grazing capacity of the veld. An improper burning regime may also be a contributing factor. Overgrazing is considered one of the most important land-related environmental problems in the North West province. Continued impoverishment of the veld at Rietvly may also lead to bush encroachment and the increased prevalence of alien/invasive species.							
		Loss / Destruction / Removal of Conservation Important species NSS fieldwork at Rietvly since 2007 has revealed that the site does not have any species of significant conservation importance. To the East of the site the assessment confirmed that there is a presence of CI carnivores. These include Brown Hyaena (NT[59]), Leopard (VU[60]), Serval (NT) and Honey Badger (NT). The abundance of prey on site together with the heterogeneous nature of the habitat and its connectivity to extensive tracts of bushveld to the west and along the Magaliesberg likely facilitate this dense concentration of small to medium sized predators. Changes to any of these aspects are likely to reduce carnivore populations on site, the most pertinent of which being the continued loss/degradation of habitat (through improper veld management) and subsequent decrease in the herbivore carrying capacity of the property.	Long-term	3	2	L	Yes	No	Mitigate; Manage
		High anthropogenic activity levels: Mortality of fauna The high levels of mining activity, traffic and people are inevitably going to result in faunal losses at Rietvly through roadkill's, excavation or persecution/poaching. Wildlife most likely to be affected include those that are small, slow-moving and ground-dwelling, such as frogs, moles and mole-rats, rodents, snakes, lizards and numerous ground-dwelling invertebrates. Rietvly must enforce stringent speed control which aids in reducing roadkill incidents.	Long Term	3	3	M	Yes	No	Mitigate; Manage
		High anthropogenic activity levels: Sensory disturbance of fauna Noise, vibrations and light pollution have been shown to have negative disturbance effects on a wide spectrum of fauna. Highly-sensitive animals are often frightened or disorientated by loud noises and bright lights, and many feel threatened by humans. Such disturbances may also impair animal communication or other behavioural displays and interactions between conspecifics. It is likely that the local fauna has grown accustomed to the existing disturbances. Light pollution is an aspect that needs to be taken into consideration at Rietvly. Nocturnal insects, particularly those that fly, are attracted to artificial light sources, often from considerable distances (several kilometres), to their detriment. Lighting e.g. at the offices and guard house on site, is likely to lead to the loss of many insects every month, which over time results in a depletion zone.	Long Term	3	3	M	Yes	No	Mitigate; Manage

[59] Near Threatened
[60] Vulnerable

Environmental component	Activity	Impact description	Duration	Pre-mitigation[58]			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
		Encroachment of non-native species: Alien invasive, domestic and feral fauns No feral dogs or cats were observed at Rietvly, nor were they recorded at any of the baited motion camera stations. Feral dogs and cats can have a significant deleterious impact on a wide range of indigenous fauna through predation and disease transmission. Feral cats also pose a serious threat to the potentially occurring African Wild Cat and Black-footed Cat (VU), through hybridisation, loss of genetic diversity, and eventually population extirpation.	Long Term	3	3	M	Yes	No	Mitigate; Manage
Surface Water	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping may lead to siltation of water resources causing deterioration of water quality affecting the use of surface water as a natural resource. <u>Surface water quality:</u> There may be a decrease in surface water quality when any surface water comes into contact with dust, eroded soil, or other pollutants generated during the preparation phase of the new stockpiling area. The sediment load within surface water runoff may increase if not prevented or mitigated, or the chemistry of surface water may be altered.	Operational	3	2	M	Yes	No	Mitigate; Manage
	Stockpiling of silica Product	The silica product will be stockpiled on the newly purchased property. There is a non-perennial drainage line running through the eastern portions of the property. <u>Surface water quantity:</u> If the silica stockpile encroaches on the drainage line it could impede the flow of surface water and result in a decreased volume of clean water available for the catchment. The use of the area for stockpiling will also decrease the catchment area through the containment of affected water in the paddock. <u>Surface water quality:</u> Dirty runoff water generated at the stockpiling area could enter the drainage line resulting in an increased sediment load that will decrease the quality of the clean water resource.	Operational	5	2	H	Yes	No	Mitigate; Manage
	Conveyance of surface water within dirty water areas	Due to the sandy characteristics of the silica product, siltation will be a challenge within the storm water conveying and containment infrastructure. If not managed in a proper manner, the integrity of the berm and containment facility (paddock) might get compromised due to siltation. Silted storm water infrastructure may overflow during heavy rainfall events. <u>Surface water quality:</u> Deterioration of surface water quality is expected should affected water overflow from the dirty water system into the adjacent clean water environment.	Operational	3	2	M	Yes	No	Mitigate; Manage

Environmental component	Activity	Impact description	Duration	Pre-mitigation[58]			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
	Operation of access roads	Roads used to access the property have been compacted which decreases the permeability of the road and could result in increased surface runoff, which could result in the erosion of the access roads. <u>Surface water quality:</u> Increased erosion could increase the sediment load of surface runoff leading to a deterioration of the clean water environment.	Operational	4	2	M	Yes	No	Mitigate; Manage
Air Quality	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	The use placement of product on stockpiles, clearing and hauling activities may result in dust pollution. Emissions from vehicles and machinery may also have a minor impact on the localised air quality.	Operational	3	3	M	Yes	No	Mitigate; Manage
Noise Vibration and Shock	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Noise will be created during the clearing and grading of vegetation and during the operational phase. Noise associated with graders and trucks will be minimal as compared to the existing operations as the noise levels currently at Rietvly Mine is generated mainly by processing activities (crushing), vehicles within the mining areas and on the roads.	Operational	3	2	M	Yes	No	Mitigate; Manage
Visual Aspects	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Key issues associated with the visibility of the mine is that it will negatively affect the scenic value and sense of place of the existing setting. These have been identified as the following: • The product stockpiles will be visible from the N4 as it becomes higher; and • The visual impact of the end use. The following critical view-point has been identified: • The house on the adjacent property to the west of the mine site;	Operational	5	3	H	Yes	No	Mitigate; Manage
Ground Water	Stockpiling of silica product	Silica is also known as quartz and is highly resistant to weathering and the chances of mobilising to groundwater is low. Silica does not pose any real threat in terms of human health as it is not a hazardous substance.	Operational	2	2	L	Yes	No	Mitigate; Manage
	• Maintenance of silica stockpiles • Hauling and conveying activities	Potential spillages of hazardous substances (hydrocarbons or chemicals) resulting in potential surface water contamination may also lead to groundwater contamination. Sources may include: vehicle and machinery maintenance and vehicles travelling on roads.	Operational	3	3	M	Yes	No	Mitigate; Manage
Site of archaeological and cultural importance	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	No sites of archaeological and cultural importance were identified on the proposed new product stockpiling area.	Operational	1	1	L	Yes	No	Manage
Socio-economic aspects	Employment and economic benefit	The construction of a product stockpile area will ensure the continuation of operations at Rietvly Mine and this will ensure continued job security for the mine's current employees and contractors, along with the continued and long-term benefits for the local community arising from the Social and Labour Plan (SLP).	Operational	Positive			Yes	No	Enhanced

Environmental component	Activity	Impact description	Duration	Pre-mitigation[58]			Reversible (Yes/No)	Irreplaceable loss (Yes/No)	Avoided/ Managed/ Mitigated
				Probability	Magnitude	Significance			
		Through the SLP, Rietvly Mine aims on developing and implementing comprehensive Human Resources Development Programmes, a Mine Community Development Plan, a Housing and Living Conditions Plan, an Employment Equity Plan, and Processes to save jobs and manage downscaling and/or closure. The above programmes are aimed at promoting employment and advancement of the social and economic welfare of all South Africans whilst ensuring economic growth and socio-economic development.							
	Impacts on I&APs and surrounding community	Silica mined at Rietvly Mine is transported to the end user(s) via road. Therefore, Rietvly Mine makes use of trucks for transportation purposes. This poses a hazard to the community and local residents as the number of mine vehicles increase on the roads which are also used by the local community and residents.	Operational	3	3	M	Yes	No	Manage; Mitigate

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

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

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

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

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

The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to Figure 38 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – Impact Prediction).

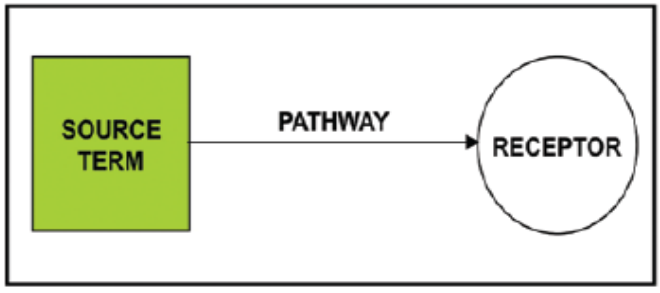

Figure 38: Impact prediction model

Table 27 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 28**Error! Reference source not found.** provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

Table 27: Determination of Probability of impact

SCORE	FREQUENCY OF ASPECT / UNWANTED EVENT	AVAILABILITY OF PATHWAY FROM THE SOURCE TO THE RECEPTOR	AVAILABILITY OF RECEPTOR
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

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

Table 28: Determination of Magnitude of impact

Score	SOURCE				RECEPTOR	
	Duration of impact	**Extent**	**Volume / Quantity / Intensity**	**Toxicity / Destruction Effect**	**Reversibility**	**Sensitivity of environmental component**
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes will remain unaltered.	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.
3	Lasting 1 – 5 years	Impacts on extended area beyond site boundary (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km's)	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).
5	Beyond life of Organisation / Permanent impacts	Extends widely (nationally or globally)	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	Highly toxic (e.g. arsenic or TCE)	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)

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

Table 29: Determination of Severity of impact

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

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

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

Due to a non-perrennial drainage line that runs through the eastern portions of the property, two layout options were considered for the stockpile. The first option would be to stockpile the product on the land and maintain a buffer (at least outside the 1:100 year flood line) between the stockpile area and the drainage line. This will be done through the construction of a diversion berm between the stockpile and the drainage line. The berm will extend around the property in order to separate affected and clean water. It is proposed to construct a paddock at the lowest point to collect and contain the dirty water runoff from the proposed berm. This paddock will be designed and constructed to contain at least a 1:50 year flood event. This option will decrease the amount of land available for the stockpile areas but will be cheaper to establish. This is the preferred option for the Rietvly Operations.

The second option would be to stockpile the product on the entire portion of land whch will impede the non-perrinnial drainage line. This option will increase stockpiling footprint, however, the non-perrennial drainage line will have to be diverted by constructing an engineered clean water diversion channel to the east of the new property. Although this will increase the stockpiling footprint, this will be a costly option and is, therefore, not the preferable option.

The option of not implementing the activity would mean that the mine cannot expand its operations. As per the MWP, the life of mine is more than 30 years, hence the expansion. The collateral effect of not implementing the activity would mean that employees of the mine would have to be retrenched leading to job loss.

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

The table below provides a summary of the issues and concerns as raised by affected parties and an assessment 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.

CONCERNS AS RAISED BY AFFECTED PARTIES	MITIGATION MEASURES OR SITE ALTERNATIVE	IMPACT POST MITIGATION		
		PROBABILITY	MAGNITUDE	SEVERITY

7.9 Motivation where no alternative sites were considered.

This section is not applicable as alternative sites were considered as per Section 7.7 above

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

Evaluating the alternatives, through evaluating the risks pertaining to the various options, and the concerns as raised by the affected parties and the mitigation measures or site alternatives, there is only one preferred option for the location of the proposed silica stockpile area.

As mentioned previously, Glencore: Rietvly Mine is an existing operational mine and a location for the proposed silica stockpile had to be close to the existing operations to have the lowest impact on the receiving environment. The proposed location of the silica stockpile is the preferred option due to the following reasons:

The Northern and Eastern boundaries of the mine have unfavourable topography to stockpile product. The topography has a steep slope and this will create problems in terms of erosion during high rainfall periods. The N4 borders the mine to the South and constructing a product stockpile on the opposite side of the freeway will create increased traffic in the area as well as the potential of motor vehicle accidents. The Northern Western boundary of the mine is the preferred option as the topography in gentle. Although there is a non-perennial drainage line that runs through the property, with the implementation of storm water management measures, clean and dirty water will be separated efficiently. The proposed location is also favourable in terms of traffic impacts as there will be minimal traffic impacts to the surrounding communities as the mine will use existing haul roads from the mine to the stockpile area.

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

All impacts and risks as identified are contained within Section 7.5 Impacts and risks identified. As further provided is an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures. The methodology applied in assessing and ranking the impacts and risks on the preferred site and associated preferred alternatives is described in Section 7.6 Methodology used in determining and ranking potential environmental impacts and risks.

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

9. Assessment of each identified potentially significant impact and risk

Environmental component (Aspects affected)	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
Topography	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to the change in topography.	Construction	H	Control	H
	Stockpiling of silica product Maintenance of stockpiles	Stockpiling activities, including the maintenance of stockpiles, will alter the topography and lead to a change in drainage patterns.	Operational	H	Control	H
	Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Operational	H	Control	M
Soil	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to an increase in exposed areas which can lead to erosion.	Construction	H	Control	M
	Possible on-site maintenance activities	The potential for soil contamination from the leaking of equipment or vehicles or spillages of hydrocarbons always exists but would be considered very site specific. Incorrectly managed and controlled maintenance activities may result in soil contamination.	Operational	M	Control; Stop	L
	Stockpiling of silica product	Stockpiling of product may lead to soil compaction and erosion, if not managed appropriately.	Operational	M	Control	L
	Waste management activities	The incorrect handling and disposal of general waste, scrap metal and industrial waste (e.g. waste tyres) will have a long-term impact on the local area. Impact will not only effect soil but could also impact on the habitat of fauna and impact of fauna, surface water and groundwater. In addition, the visual character of the area will be impacted on. The incorrect handling and disposal of hazardous waste can also have a permanent negative impact on the local area. Soil, water sources and fauna habitats can be adversely affected, and human health can be impacted on.	Construction; Operational	M	Control; Stop	L
	Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Operational	H	Control	M
Land Use and Land Capability	Stockpiling of silica product Hauling activities	Extensions to the mining area (as per the relevant mining rights granted to Rietvly Mine) will result in a continuation of the impact on land use and land capability. The Rietvly site is also stocked with some game species. As per the Biodiversity Assessment (NSS, 2015), it appears that game densities are high, and likely exceed the carrying capacity of the property. This was evidenced by the high levels of overgrazing.	Operational	H	Control	M

Environmental component (Aspects affected)	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
	The construction of the stockpile area not taking place.	Not constructing the stockpile area would mean that there would be no change to the topography of the area as there will be no clearing and grubbing activities. This in turn will lead to erosion not taking place and no loss in biodiversity.	Positive		Positive	
Flora	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Floral implications:** The main impact from a Biodiversity perspective at Rietvly Mine is habitat loss / degradation. The restricted communities that will be impacted on in any type of mining expansion are the: • Dense Slope Thicket • *Loudetia -Tristachya* Exposed Outcrops • *Combretum-Cymbopogon* East Slope	Construction; Operational	H	Control; Remedy	M
		Loss / Destruction / Removal of Conservation Important Species: Through the biodiversity study conducted by NSS (2015), a few Red Listed and Protected species have been detected. These included: The Near Threatened (NT) *Adromischus umbraticola subsp. umbraticola*; *Boophone disticha* (P and TSP Listed as Dec) and *Hypoxis hemerocallidea* (Dec). These species fall within the Very High, High and Medium-High Areas of Significance categories.	Construction; Operational	H	Control; Remedy	M
		Alien invasive flora: NSS compiled an Alien invasive plan in 2009 for Xstrata Alloys mines. There are at least 39 alien species (combined 2009 and 2015 studies) that have been recorded within Rietvly area, and of these species, 21 are now listed under NEMBA as Category 1b species and 15 as Category 1 under CARA legislation. To date, from investigations in 2009 and 2015 no further advancement in the clearing and control of these species has been conducted. In addition, species category listings from 2011 to date have drastically changed. Category 2 species on site are not been used for any wind row or a pollution control/uptake function and, therefore, these will not form part of permit applications to remain on site and must be eradicated along with all Category 1/1b species.	Construction; Operational	M	Control; Remedy	L
Fauna	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Faunal implications**: The main impact from a biodiversity perspective at Rietvly Mine is habitat loss / degradation. Habitat loss, degradation and fragmentation together with improper veld management practices such as overgrazing (and potentially inappropriate burning regimes) have decreased the capacity of the site to support fauna. The results of the NSS LFA (update conducted in 2015) revealed that overutilisation of the grass sward by grazers and mix feeder game has thinned the grass sward considerably since 2010 resulting in lower rain splash protection,	Construction; Operational	M	Control	M

Environmental component (Aspects affected)	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
		cryptogram cover and per. basal canopy cover while at the same time increasing the prevalence of bare ground. This hardening of the soil surface has the effect of decreasing rainfall absorption while increasing runoff which in turn results in erosion and loss of soil, increased soil aridity and decreased soil fertility which all together lowers the grazing capacity of the veld. An improper burning regime may also be a contributing factor. Overgrazing is considered one of the most important land-related environmental problems in the North West province. Continued impoverishment of the veld at Rietvly may also lead to bush encroachment and the increased prevalence of alien/invasive species.				
		Loss / Destruction / Removal of Conservation Important species NSS fieldwork at Rietvly since 2007 has revealed that the site does not have any species of significant conservation importance. To the East of the site the assessment confirmed that there is a presence of CI carnivores. These include Brown Hyaena (NT[61]), Leopard (VU[62]), Serval (NT) and Honey Badger (NT). The abundance of prey on site together with the heterogeneous nature of the habitat and its connectivity to extensive tracts of bushveld to the west and along the Magaliesberg likely facilitate this dense concentration of small to medium sized predators. Changes to any of these aspects are likely to reduce carnivore populations on site, the most pertinent of which being the continued loss/degradation of habitat (through improper veld management) and subsequent decrease in the herbivore carrying capacity of the property.	Construction; Operational	L	Control	L
		High anthropogenic activity levels: Mortality of fauna The high levels of mining activity, traffic and people are inevitably going to result in faunal losses at Rietvly through roadkill's, excavation or persecution/poaching. Wildlife most likely to be affected include those that are small, slow-moving and ground-dwelling, such as frogs, moles and mole-rats, rodents, snakes, lizards and numerous ground-dwelling invertebrates. Rietvly must enforce stringent speed control which aids in reducing roadkill incidents.	Construction; Operational	M	Control	L
		High anthropogenic activity levels: Sensory disturbance of fauna Noise, vibrations and light pollution have been shown to have negative disturbance effects on a wide spectrum of fauna. Highly-sensitive animals are often frightened or disorientated by loud noises and bright lights, and many feel threatened by humans. Such disturbances may also impair animal communication or other behavioural displays and interactions between conspecifics. It is likely that the local fauna has grown accustomed to the existing disturbances. Light pollution is an aspect that needs to be taken into consideration at Rietvly. Nocturnal insects, particularly those that fly, are attracted to artificial light	Construction; Operational	M	Control	L

[61] Near Threatened
[62] Vulnerable

Environmental component (Aspects affected)	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
		sources, often from considerable distances (several kilometres), to their detriment. Lighting e.g. at the offices and guard house on site, is likely to lead to the loss of many insects every month, which over time results in a depletion zone.				
		Encroachment of non-native species: Alien invasive, domestic and feral fauns No feral dogs or cats were observed at Rietvly, nor were they recorded at any of the baited motion camera stations. Feral dogs and cats can have a significant deleterious impact on a wide range of indigenous fauna through predation and disease transmission. Feral cats also pose a serious threat to the potentially occurring African Wild Cat and Black-footed Cat (VU), through hybridisation, loss of genetic diversity, and eventually population extirpation.	Construction; Operational	M	Control	L
Surface Water	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping may lead to siltation of water resources causing deterioration of water quality affecting the use of surface water as a natural resource. <u>Surface water quality:</u> There may be a decrease in surface water quality when any surface water comes into contact with dust, eroded soil, or other pollutants generated during the preparation phase of the new stockpiling area. The sediment load within surface water runoff may increase if not prevented or mitigated, or the chemistry of surface water may be altered.	Construction	M	Control	L
	Stockpiling of silica product	The silica product will be stockpiled on the newly purchased property. There is a non-perennial drainage line running through the eastern portions of the property. <u>Surface water quantity:</u> If the silica stockpile encroaches on the drainage line it could impede the flow of surface water and result in a decreased volume of clean water available for the catchment. The use of the area for stockpiling will also decrease the catchment area through the containment of affected water in the paddock. <u>Surface water quality:</u> Dirty runoff water generated at the stockpiling area could enter the drainage line resulting in an increased sediment load that will decrease the quality of the clean water resource.	Operational	H	Control	L
	Conveyance of surface water within dirty water areas	Due to the sandy characteristics of the silica product, siltation will be a challenge within the storm water conveying and containment infrastructure. If not managed in a proper manner, the integrity of the berm and containment	Operational	M	Control	L

Environmental component (Aspects affected)	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
		facility (paddock) might get compromised due to siltation. Silted storm water infrastructure may overflow during heavy rainfall events. <u>Surface water quality:</u> Deterioration of surface water quality is expected should affected water overflow from the dirty water system into the adjacent clean water environment.				
	Operation of access roads	Roads used to access the property have been compacted which decreases the permeability of the road and could result in increased surface runoff, which could result in the erosion of the access roads. <u>Surface water quality:</u> Increased erosion could increase the sediment load of surface runoff leading to a deterioration of the clean water environment.	Construction	M	Control	L
Air Quality	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Dust will be generated from the clearing of vegetation. The placement of product on stockpiles, clearing and hauling activities may result in dust pollution. Emissions from vehicles and machinery may also have a minor impact on the localised air quality.	Construction; Operational	M	Control	L
Noise Vibration and Shock	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Noise will be created during the clearing and grading of vegetation and during the operational phase. Noise associated with graders and trucks will be minimal as compared to the existing operations as the noise levels currently at Rietvly Mine is generated mainly by processing activities (crushing), vehicles within the mining areas and on the roads.	Construction; Operational	M	Control	L
Visual Aspects	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Key issues associated with the visibility of the mine is that it will negatively affect the scenic value and sense of place of the existing setting. These have been identified as the following: • The product stockpiles will be visible from the N4 as it becomes higher; and • The visual impact of the end use. The following critical view-point has been identified: The house on the adjacent property to the west of the mine site;	Operational	H	Control	H
Ground Water	Stockpiling of silica product	Silica is also known as quartz and is highly resistant to weathering and the chances of mobilising to groundwater is low. Silica does not pose any real threat in terms of human health as it is not a hazardous substance.	Operational	L	Control	L
	• Maintenance of silica stockpiles • Hauling and conveying activities	Potential spillages of hazardous substances (hydrocarbons or chemicals) resulting in potential surface water contamination may also lead to groundwater contamination. Sources may include: vehicle and machinery maintenance and vehicles travelling on roads.	Operational	M	Control	L
Site of archaeological	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles	No Sites of archaeological and cultural importance were identified on the proposed new product stockpiling area.	Construction; Operational	L	Control	L

Environmental component (Aspects affected)	Activity	Impact description	Phase (Construction/ Commissioning/ Operational/ Decommissioning/ Closure/Post-Closure)	Pre-mitigation Significance	Mitigation type Modify/Remedy/Control/Stop	Post-mitigation Significance
and cultural importance	• Hauling and conveying activities					
Socio-economic aspects	Employment and economic benefit	The construction of a product stockpile area will ensure the continuation of operations at Rietvly Mine and this will ensure continued job security for the mine's current employees and contractors, along with the continued and long-term benefits for the local community arising from the Social and Labour Plan (SLP). Through the SLP, Rietvly Mine aims on developing and implementing comprehensive Human Resources Development Programmes, a Mine Community Development Plan, a Housing and Living Conditions Plan, an Employment Equity Plan, and Processes to save jobs and manage downscaling and/or closure. The above programmes are aimed at promoting employment and advancement of the social and economic welfare of all South Africans whilst ensuring economic growth and socio-economic development.	Positive		Positive	
	Impacts on I&APs and surrounding community	Silica mined at Rietvly Mine is transported to the end user(s) via road. Therefore, Rietvly Mine makes use of trucks for transportation purposes. This poses a hazard to the community and local residents as the number of mine vehicles increase on the roads which are also used by the local community and residents.	Operational	M	Control	M

10. Summary of specialist reports.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Storm Water Management Plan. 2017 Shangoni Management Services Annexure H3	The following impact mitigation measures and recommendations are proposed in the Conceptual Storm Water Management Plan: • A buffer (at least outside the 1:100-year flood line) should be maintained between the stockpile area and the drainage line. This must be done through the construction of a diversion berm between the stockpile and the drainage line. The berm should extend around the property to separate affected and clean water. • It is proposed to construct a paddock at the lowest point to collect and contain the dirty water runoff from the proposed berm. This paddock should be designed and constructed to contain at least a 1:50 year flood event. • All channels, trenches and containment facilities should be inspected and serviced regularly to ensure the design capacity and integrity are maintained. Storm water control measures should be kept clear of obstructions by objects as well as siltation especially where the velocity of the runoff is induced to ensure sufficient capacity in case of a 1:50 year flood event • Affected runoff water should be controlled and not contaminate the natural clean habitat in the immediate vicinity of the stockpiling area at Rietvlei Silica Mine.	**X**	Part B – 1.4.9

	Erosion prevention measures (e.g. grass, cement or rock) should be in place at all concentration points. These areas include roads, trenches, channel outlets and other infrastructure that may increase surface runoff.		
Biodiversity Assessment. 2015. Natural Scientific Services cc. Annexure H4	The following impact mitigation measures and recommendations are proposed in the Biodiversity Assessment Report: • Minimise habitat loss and fragmentation by: ➢ Restricting operations and other disturbances within Rietvly's perimeter fence. ➢ A buffer zone (50 m) along the ephemeral system to the north-west should be established to assist in the system's protection. In addition, measures upstream at the dams should be put in place to reduce the sedimentation that is occurring along the system downstream. ➢ Protecting the remaining natural habitat by clearing and preventing the establishment of alien and invasive species. Category 1 infestations need to be removed first. ➢ Maintaining a clean and tidy operation and ensuring that there are enough refuse bins (including relevant recycling bins). Redundant equipment, fencing and rubbish on site presents potential hazards to wildlife, which may be ingest rubbish or be injured by the fencing and equipment. ➢ Implementing adequate erosion control through slope stabilization and by vegetation. • Comply with legislation regarding the loss, capture or translocation of plants and wildlife. This includes but is not limited to the Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983), of the former Province Transvaal that stipulates (amongst others), subject to the provisions/exemptions of the Ordinance that: ➢ A permit is required for game capture. ➢ A permit is required for the trapping of wild animals ➢ A permit is required for hunting of specially protected and protected game and wild animals as specified in the ordinance	**X**	

	➢ A permit is required for hunting ordinary game unless an open-season is gazetted. In which case the persons or category of persons referred to in the notice may, subject to the provisions of the Ordinance, hunt the species and sex of ordinary game referred to therein in the area defined therein. ➢ A permit is required to collect, catch, kill, keep, purchase, sell, donate or receive as a donation, convey, import into the Province or export or remove there from any protected invertebrate referred to in Schedule 7 or of the Ordinance. ➢ A permit is required for the import into, conveyance within or export/removal of protected plants from the province, additionally no person is allowed to pick protected plants without a permit, “pick" includes to gather, to cut off, to chop off, to uproot, to damage or to destroy. • Effectively rehabilitate after mining by: ➢ Levelling and landscaping all previously disturbed areas Thereafter, the area is to be covered with 300mm[63] of topsoil and seeded. Alien invasive monitoring must be performed during rehabilitation. ➢ Utilising only locally indigenous seed mixes tailored for the biome during future rehabilitation efforts. The recommended seed mix for Rietvly should include species such as: Eragrostis superba, Eragrostis curvula (small proportion of species mix), Digitaria eriantha, Hyparrhenia hirta, and Themeda triandra. Seed suppliers that do not genetically enhance or manipulate their seed, and which collect their seed within the Savanna Biome of South Africa should be opted for, as opposed to a number of other suppliers who import hybridised, enhanced seed. A recommended option is Biomosome® Eco-Matched Veld Seed which is now available directly from MayFord Seeds. The recommended product to use is Sweet and Mixed Bushveld Reclamation Mix at 8kg/ha. Contact details for this supplier and others recommended by NSS, are provided below. For more		

[63] Limited topsoil is available. Alternative growth medium to be sourced during rehabilitation

	information, contact Mike Zingel (mike@zingel.co.za) at Biomosome® Eco- Matched Veld Seed, MayFord, Sakata Seed Southern Africa (Pty) Ltd (www.sakata.co.za). Topsoil could be brought in to stimulate growth on site. • Eradicate alien and invasive floral species by: ➢ Updating Glencore's current Alien Control Plan for Rietvly, Waterval, Kroondal, and Horizon (NSS, 2009). Preventing the introduction of alien invasive species is the cheapest, most effective and most preferred option, and warrants the highest priority. Until an updated ACP is compiled active implementation of the existing plan is urged. Furthermore, the following is recommended: o Raising/Maintaining awareness. The EO and staff in general should be made aware of existing and potentially occurring alien species on site. If and when any alien species are seen, the EO on site must be able to identify and remove these. o Minimising the re-introduction of aliens. The intentional introduction of an alien plant species should not be considered for any screening effects or for stabilising the tailings, rehabilitation etc. Indigenous alternatives should be considered suitable for the purposes for which the introduction is required. o Rehabilitation materials should be sourced from reliable suppliers, who can certify the absence of weeds in their materials (although this is extremely difficult to manage, it does influence introductions into the area). • Eradicate alien or feral faunal species by: ➢ Implementing effective yet environmentally friendly pest control techniques. Although no major pest infestation was evident on site, and the use of pesticides was not confirmed, the apparent absence of Red-billed Oxpeckers is a concern. Natural pest control alternatives should always be		

	thoroughly investigated and given preference over the use of harmful chemical pesticides and herbicides. ➢ Implementing a control programme for the eradication and / or sterilization of feral cats. • Minimise faunal mortality and overall loss of biodiversity and Conservation Important (CI) species by: ➢ Reducing roadkill by continuing to enforce speed limiting measures. ➢ Not killing and rather re-locating snakes and other wildlife. Mine staff and contractors should be well informed and have a positive outlook towards snakes through increased awareness using (updated) posters and pamphlets, and even courses. Snakes that are encountered on site should be safely captured and relocated away from working areas, by staff members who are appropriately trained and qualified to do so (for more information see www.africanreptiles-venom.co.za). NSS can assist in orchestrating this. ➢ Remembering that all Protected floral and faunal species will require permits for destruction/translocation. A CI Management Plan for the NT and other listed Red Data (Declining) plant species should be compiled and implemented. ➢ Raising/Maintaining awareness of biodiversity. Currently Rietvly has both a Snake and a Red Data Plant sign. Rietvly must maintain this proactive approach to conservation by continuing to make all staff and contractors aware of the importance of local biodiversity. This should be orchestrated by the Environmental Officer (EO), and could be achieved during inductions, training courses and with additional posters, pamphlets and presentations. • Minimise sensory disturbance of fauna by: ➢ Minimising noise as far as possible. Constant maintenance of all machinery is essential.		

	➢ Minimising external lighting wherever possible. Where external lighting is unavoidable, long-wavelength light sources should be used (i.e. red and yellow lights) as insects are most strongly attracted to lights of short wavelength (i.e. those towards the ultraviolet side of the spectrum). Additionally, lights should be angled downward, and preferably be hooded to avoid undue escape of light into the surrounding environment. ➢ Standard dust control measures must be implemented to minimise dust deposition and reduce sedimentation on the river system, which should include the periodic spraying of roads with water, or an environmentally-friendly dust inhibitor. The frequency and intensity of dust control measures will vary between seasons and must be adjusted accordingly. ➢ Trucks transporting resource material to and from the site must be covered to prevent widespread dust transmission. ➢ Night time activities and traffic should be minimized as far as possible.		
Land Function Analysis. April 2015. Natural Scientific Services cc. Annexure H5	Alien and invasive vegetation is not yet a major concern at Rietvly, but their establishment and spread should be prevented wherever possible by following the Invasive plant species management plan (NSS, 2009).	**X**	
Visual Scoping Report. April 2008. Cave Klapwijk and Associates Annexure H10	• **Site Lighting** ➢ Lighting for working, safety and security will be visually intrusive at night in that setting. Awareness and sensitive selection and positioning of lights can significantly reduce light spill. The following actions are recommended: o Select light fittings that direct light downward and limit side spill. o All light should be directed inward and towards the area to be illuminated. o No lights should be directed upward.		
Heritage Assessment. April 2008 Matakoma – ARM Heritage Contracts Unit	• **General** ➢ If during construction any possible finds are made, the operations must be stopped, and a qualified archaeologist be contacted to assess the site.	**X**	

Annexure H11	A heritage resources management plan must be developed for managing the heritage resources in the study area during construction and operation of the development. This includes basic training for construction staff on possible finds, action steps for mitigation measures, surface collections, excavations and communication routes to follow in the case of a discovery.		

11. Environmental impact statement

11.1 Summary of the key findings of the environmental impact assessment

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

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

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

11.2 Final Site Map

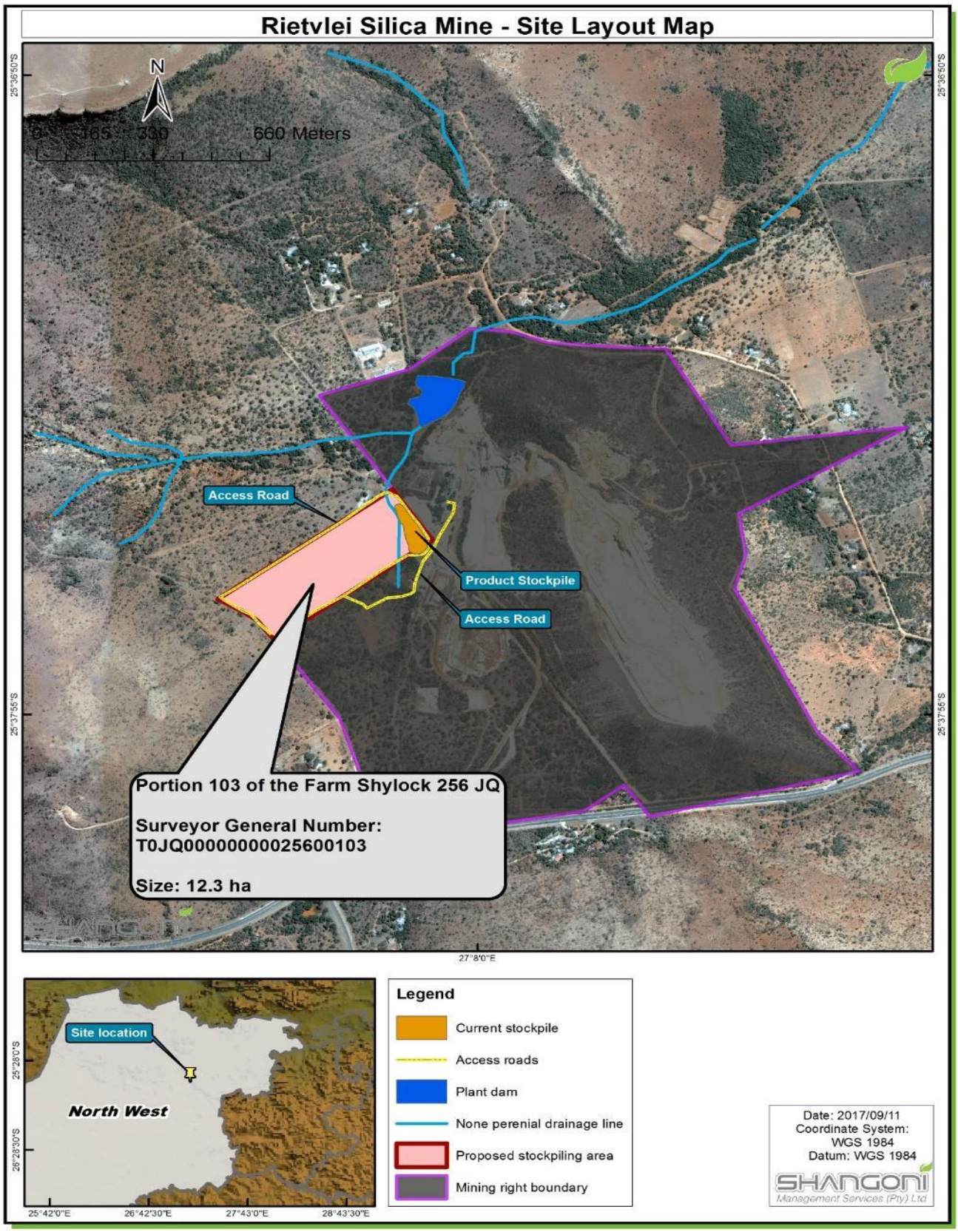

Figure 39: Site Layout Map for new stockpile area

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

Table 30: Summary of significant environmental impacts (negative), after mitigation.

TOPOGRAPHY	
Clearing and grading of vegetation: Grading, vegetation clearing and soil stripping will lead to the change in topography.	H
Stockpiling of silica product and maintenance of product stockpiles: Stockpiling activities, including the maintenance of stockpiles, will alter the topography and lead to a change in drainage patterns.	H
Hauling activities: During high rainfall events, runoff from the internal road network can also lead to erosion	M
SOIL	
Clearing and grading of vegetation: Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to an increase in exposed areas which can lead to erosion.	M
Possible on-site maintenance activities: The potential for soil contamination from the leaking of equipment or vehicles or spillages of hydrocarbons always exists but would be considered very site specific. Incorrectly managed and controlled maintenance activities may result in soil contamination.	L
Stockpiling of silica product: Stockpiling of product may lead to soil compaction and erosion, if not managed appropriately.	L
Waste management activities: The incorrect handling and disposal of general waste, scrap metal and industrial waste (e.g. waste tyres) will have a long-term impact on the local area. Impact will not only effect soil but could also impact on the habitat of fauna and impact of fauna, surface water and groundwater. In addition, the visual character of the area will be impacted on. The incorrect handling and disposal of hazardous waste can also have a permanent negative impact on the local area. Soil, water sources and fauna habitats can be adversely affected, and human health can be impacted on.	L
Hauling activities: During high rainfall events, runoff from the internal road network can also lead to erosion	M
LAND USE AND LAND CAPABILITY	
Stockpiling of silica product and hauling activities Extensions to the mining area (as per the relevant mining rights granted to Rietvly Mine) will result in a continuation of the impact on land use and land capability. The Rietvly site is also stocked with some game species. As per the Biodiversity Assessment (NSS, 2015), it appears that game densities are high, and likely exceed the carrying capacity of the property. This was evidenced by the high levels of overgrazing.	M
FLORA	
Clearing and grading of vegetation, stockpiling of silica product, hauling activities and operation and maintenance of storm water and dirty water management measures: **Habitat loss and fragmentation: Floral implications:**	M

The main impact from a Biodiversity perspective at Rietvly Mine is habitat loss / degradation. The restricted communities that will be impacted on in any type of mining expansion are the: • Dense Slope Thicket • *Loudetia -Tristachya* Exposed Outcrops • *Combretum-Cymbopogon* East Slope **Loss / Destruction / Removal of Conservation Important Species:** Through the biodiversity study conducted by NSS (2015), a few Red Listed and Protected species have been detected. These included: The Near Threatened (NT) *Adromischus umbraticola subsp. umbraticola*; *Boophone disticha* (P and TSP Listed as Dec) and *Hypoxis hemerocallidea* (Dec). These species fall within the Very High, High and Medium-High Areas of Significance categories.	
Clearing and grading of vegetation, stockpiling of silica product, hauling activities and operation and maintenance of storm water and dirty water management measures: **Alien invasive flora:** NSS compiled an Alien invasive plan in 2009 for Xstrata Alloys mines. There are at least 39 alien species (combined 2009 and 2015 studies) that have been recorded within Rietvly area, and of these species, 21 are now listed under NEMBA as Category 1b species and 15 as Category 1 under CARA legislation. To date, from investigations in 2009 and 2015 no further advancement in the clearing and control of these species has been conducted. In addition, species category listings from 2011 to date have drastically changed. Category 2 species on site are not been used for any wind row or a pollution control/uptake function and, therefore, these will not form part of permit applications to remain on site and must be eradicated along with all Category 1/1b species.	L
FAUNA	
Clearing and grading of vegetation, stockpiling of silica product, hauling activities and operation and maintenance of storm water and dirty water management measures: **Habitat loss and fragmentation: Faunal implications**: The main impact from a biodiversity perspective at Rietvly Mine is habitat loss / degradation. Habitat loss, degradation and fragmentation together with improper veld management practices such as overgrazing (and potentially inappropriate burning regimes) have decreased the capacity of the site to support fauna. The results of the NSS LFA (update conducted in 2015) revealed that overutilisation of the grass sward by grazers and mix feeder game has thinned the grass sward considerably since 2010 resulting in lower rain splash protection, cryptogram cover and per. basal canopy cover while at the same time increasing the prevalence of bare ground. This hardening of the soil surface has the effect of decreasing rainfall absorption while increasing runoff which in turn results in erosion and loss of soil, increased soil aridity and decreased soil fertility which all together lowers the grazing capacity of the veld. An improper burning regime may also be a contributing factor. Overgrazing is considered one of the most important land-related environmental problems in the North West province. Continued impoverishment of the veld at Rietvly may also lead to bush encroachment and the increased prevalence of alien/invasive species.	M
Clearing and grading of vegetation, stockpiling of silica product, hauling activities and operation and maintenance of storm water and dirty water management measures: **Loss / Destruction / Removal of Conservation Important species**	L

NSS fieldwork at Rietvly since 2007 has revealed that the site does not have any species of significant conservation importance. To the East of the site the assessment confirmed that there is a presence of CI carnivores. These include Brown Hyaena (NT[64]), Leopard (VU[65]), Serval (NT) and Honey Badger (NT). The abundance of prey on site together with the heterogeneous nature of the habitat and its connectivity to extensive tracts of bushveld to the west and along the Magaliesberg likely facilitate this dense concentration of small to medium sized predators. Changes to any of these aspects are likely to reduce carnivore populations on site, the most pertinent of which being the continued loss/degradation of habitat (through improper veld management) and subsequent decrease in the herbivore carrying capacity of the property. **High anthropogenic activity levels: Mortality of fauna** The high levels of mining activity, traffic and people are inevitably going to result in faunal losses at Rietvly through roadkill's, excavation or persecution/poaching. Wildlife most likely to be affected include those that are small, slow-moving and ground-dwelling, such as frogs, moles and mole-rats, rodents, snakes, lizards and numerous ground-dwelling invertebrates. Rietvly must enforce stringent speed control which aids in reducing roadkill incidents. **High anthropogenic activity levels: Sensory disturbance of fauna** Noise, vibrations and light pollution have been shown to have negative disturbance effects on a wide spectrum of fauna. Highly-sensitive animals are often frightened or disorientated by loud noises and bright lights, and many feel threatened by humans. Such disturbances may also impair animal communication or other behavioural displays and interactions between conspecifics. It is likely that the local fauna has grown accustomed to the existing disturbances. Light pollution is an aspect that needs to be taken into consideration at Rietvly. Nocturnal insects, particularly those that fly, are attracted to artificial light sources, often from considerable distances (several kilometres), to their detriment. Lighting e.g. at the offices and guard house on site, is likely to lead to the loss of many insects every month, which over time results in a depletion zone. **Encroachment of non-native species: Alien invasive, domestic and feral fauns** No feral dogs or cats were observed at Rietvly, nor were they recorded at any of the baited motion camera stations. Feral dogs and cats can have a significant deleterious impact on a wide range of indigenous fauna through predation and disease transmission. Feral cats also pose a serious threat to the potentially occurring African Wild Cat and Black-footed Cat (VU), through hybridisation, loss of genetic diversity, and eventually population extirpation.	
SURFACE WATER	
Clearing and grading of vegetation: Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping may lead to siltation of water resources causing deterioration of water quality affecting the use of surface water as a natural resource. <u>Surface water quality:</u> There may be a decrease in surface water quality when any surface water comes into contact with dust, eroded soil, or other pollutants generated during the preparation phase of the new stockpiling area. The sediment load within surface water runoff may increase if not prevented or mitigated, or the chemistry of surface water may be altered.	L

[64] Near Threatened
[65] Vulnerable

Stockpiling of silica product: The silica product will be stockpiled on the newly purchased property. There is a non-perennial drainage line running through the eastern portions of the property. <u>Surface water quantity:</u> If the silica stockpile encroaches on the drainage line it could impede the flow of surface water and result in a decreased volume of clean water available for the catchment. The use of the area for stockpiling will also decrease the catchment area through the containment of affected water in the paddock. <u>Surface water quality:</u> Dirty runoff water generated at the stockpiling area could enter the drainage line resulting in an increased sediment load that will decrease the quality of the clean water resource.	L
Conveyance of surface water in dirty water areas: Due to the sandy characteristics of the silica product, siltation will be a challenge within the storm water conveying and containment infrastructure. If not managed in a proper manner, the integrity of the berm and containment facility (paddock) might get compromised due to siltation. Silted storm water infrastructure may overflow during heavy rainfall events. <u>Surface water quality:</u> Deterioration of surface water quality is expected should affected water overflow from the dirty water system into the adjacent clean water environment.	L
Operation of access roads: Roads used to access the property have been compacted which decreases the permeability of the road and could result in increased surface runoff, which could result in the erosion of the access roads. <u>Surface water quality:</u> Increased erosion could increase the sediment load of surface runoff leading to a deterioration of the clean water environment.	L
AIR QUALITY	
Clearing and grading of vegetation, stockpiling of silica product and hauling and conveying activities: Dust will be generated from the clearing of vegetation. The placement of product on stockpiles, clearing and hauling activities may result in dust pollution. Emissions from vehicles and machinery may also have a minor impact on the localised air quality.	L
NOISE VIBRATION AND SHOCK	
Clearing and grading of vegetation, stockpiling of silica product and hauling and conveying activities: Noise will be created during the clearing and grading of vegetation and during the operational phase. Noise associated with graders and trucks will be minimal as compared to the existing operations as the noise levels currently at Rietvly Mine is generated mainly by processing activities (crushing), vehicles within the mining areas and on the roads.	L
VISUAL	
Clearing and grading of vegetation, stockpiling of silica product, maintenance of stockpiles and hauling and conveying activities: Key issues associated with the visibility of the mine is that it will negatively affect the scenic value and sense of place of the existing setting. These have been identified as the following: • The product stockpiles will be visible from the N4 as it becomes higher; and	H

• The visual impact of the end use. The following critical view-point has been identified: The house on the adjacent property to the west of the mine site.	
GROUND WATER	
Stockpiling of silica product: Silica is also known as quartz and is highly resistant to weathering and the chances of mobilising to groundwater is low. Silica does not pose any real threat in terms of human health as it is not a hazardous substance.	L
Maintenance of silica stockpiles and hauling and conveying activities: Potential spillages of hazardous substances (hydrocarbons or chemicals) resulting in potential surface water contamination may also lead to groundwater contamination. Sources may include: vehicle and machinery maintenance and vehicles travelling on roads.	L
SITES OF ARCHAELOGICAL IMPORTANCE	
Clearing and grading of vegetation, stockpiling of silica product, maintenance of silica stockpiles and hauling and conveying activities: No sites of archaeological and cultural importance were identified on the proposed new product stockpiling area.	L
SOCIO-ECONOMIC IMPACTS	
Impacts on I&APs and surrounding community: Silica mined at Rietvly Mine is transported to the end user(s) via road. Therefore, Rietvly Mine makes use of trucks for transportation purposes. This poses a hazard to the community and local residents as the number of mine vehicles increase on the roads which are also used by the local community and residents.	M

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

Table 31: Summary of significant environmental impacts (positive), after mitigation.

LAND USE AND LAND CAPABILITY	
Construction of stockpiling activity not taking place (not preferred alternative) Not constructing the stockpile area would mean that there would be no change to the topography of the area as there will be no clearing and grubbing activities. This in turn will lead to erosion not taking place and no loss in biodiversity.	Absolutely Positive
SOCIO-ECONOMIC	
Employment and economic benefit The construction of a product stockpile area will ensure the continuation of operations at Rietvly Mine and this will ensure continued job security for the mine's current employees and contractors, along with the continued and long-term benefits for the local community arising from the Social and Labour Plan (SLP). Through the SLP, Rietvly Mine aims on developing and implementing comprehensive Human Resources Development Programmes, a Mine Community Development Plan, a Housing and Living Conditions Plan, an Employment Equity Plan, and Processes to save jobs and manage downscaling and/or closure. The above programmes are aimed at promoting employment and advancement of the social and economic welfare of all South Africans whilst ensuring economic growth and socio-economic development.	Absolutely Positive

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

Based on the assessment and where applicable the recommendations form specialist reports, the table below summarises the impact management objectives and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

Table 32: Impact management objectives and the impact management outcomes

Environmental aspect	Objective	Summary of impact management outcome
Soil	To prevent the loss of soil and soil fertility during stockpiling and hauling activities.	Site inspections, rehabilitation and monitoring programmes
Air Quality	Prevent the deterioration of air quality.	Air quality monitoring programme
Land use and capability	To restore the land use and land capability to the agreed upon end land use, taking the recommendations of the DMR and municipalities into account.	Soil (and topsoil) management, rehabilitation and monitoring programmes.
Flora	Prevent the destruction of vegetation and subsequent impacts species of conservation concern and protected species.	Implementation of a declared weed and invader plant species management programme.
Fauna	To minimise the destruction of faunal habitat and prevent fragmentation as far as possible.	Site inspections and monitoring programmes. Implementation of and training programmes. Implementation of biodiversity specialist recommendations.
Surface water	To prevent quality deterioration of surface water quality and prevent impact on catchment yield	Storm water management plan; monitoring programmes; site inspections; spill management; incident reporting; management of water balance and salt balance; preventive maintenance plan(s); rehabilitation.
Noise; vibration and shock	Prevent and mitigate against the effects of noise on sensitive receptors (including employees and surrounding communities and towns).	Monitoring programmes; maintenance activities.
Visual aspects	Prevent visual intrusions on sensitive receptors	Monitoring programmes; rehabilitation; implementation of specialist recommendations.
Sites of archaeological and cultural importance	Prevent the destruction of and loss of sites of cultural and archaeological importance.	Obtaining of appropriate authorisations and permits (where and if applicable); site inspections; protection of heritage

Environmental aspect	Objective	Summary of impact management outcome
		resources (access control and implementing the necessary measures to ensure its protection); training programmes.
Socio-economic aspects	Enhance the positive impact on the socio-economic aspects.	Sourcing of employees from the local community and surrounding areas. Implementation of SLP.
	Minimise impacts on sense of place	Implementation of visual management / mitigation measures; rehabilitation.
	To prevent and / or limit impacts on I&APs and the surrounding community	Implementation of measures for all other environmental aspects (above).
	To mitigate against the effects of job loss.	Implementation of measures to train employees to ensure future employment opportunities. Implementation of SLP.

13. Aspects for inclusion as conditions of Authorisation.

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

- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements; and
- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the BAR and the EMPr. Such persons must be issued with a written mandate by mine management to provide guidance and instructions to employees and contractors; and
- Stakeholder engagement must be maintained during the phases of the mining operation.

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

In terms of the EIA Regulations GN R982 Appendix 1(3)(o), the Environmental Impact Assessment Practitioner (EAP) must provide a description of any assumptions, uncertainties and gaps in knowledge upon which the impact assessment has been based. The table below provides the assumptions and limitations applicable to the various specialist assessments.

Table 33: Specialist assumptions and limitations

Specialist	Assumptions and limitations
Design report for the new tailings facility. January 2007.	• None

Specialist	Assumptions and limitations
Fraser Alexander Tailings.	
Basic Salt Balance Report. 2015. Aquatico Scientific	• The water balance study was not performed through Aquatico. At least 3 months' data are needed to be able to give an accurate salt balance. The data used in this study only relates to one month's (May 2015) once off sampling, whereas the water balance is based on 2014 averages. • Implications in the study exist because of the discrepancies highlighted in this report. As stated ideally, a salt balance study is to be conducted over a time that includes at least 3 current data sets and with the associated monthly water meter readings. The implication thus of using an annual water balance (from the previous annual period) and only one set of data (May 2015) is not ideal and decreases the precision of the final salt balance study. Also stated is that two boreholes (WH21 and WH9) were indicated in the annual water balance study to contribute to the incoming water to the mine but were indicated as not being currently in use during the time the salt balance monitoring occurred. • The storm water dam and return water dam was also recorded as being dry during the monitoring of the salt balance study. The implication of this is that the final salt load being returned from the return water dam to Erickson Dam 3 (from where the water is recycled through the plant and various processes) cannot be calculated and no comment can be made as to the contribution of the mining processes to the final salt load before the water is recycled back to Erickson Dam 3.
Storm Water Management Plan 2017 Shangoni Management Services	• It is assumed that the Client provided all information to Shangoni that is relevant to the scope of work included in the report and that no important information has been withheld and relevant information received from the Client during this project will be deemed true and correct. • Flood peak calculations assume rainfall intensity is uniform throughout the duration of the storm. Analysis does not account for runoff retention or artificial acceleration within the catchment. • Calculations are done for complete catchment areas and should be distributed where there is more than one drainage point within the same built up catchment. • Storm water control recommendations are based on industry experience and best practice. Final designs for construction should be authorised by an approved engineer. • Contour and elevation data as provided during the analysis are assumed to be accurate and representative of the site and catchment areas. • Upstream catchment activities are interpreted according to common practices and no detailed insight is available on possible storm water measures beyond the site. The assessment does not guarantee the integrity of downstream infrastructure in the event of release or discharge from site. • The measures proposed as part of the storm water management section of the report do not impose preference as this is an operational document to assist in the complete management of clean and dirty surface water near the operation. • The measures proposed in the storm water management plan section of the report do not specifically cover considerations relevant to storm water management for the purpose of safety, like mine flooding and loss of life, the primary focus being environmental management and the identification of potential environmental concerns. • Recommendations represented in this report apply to the site conditions and features as they existed at the time of Shangoni's investigations, and those reasonable foreseeable. The recommendations do not necessarily apply to conditions and features that may arise after the date

Specialist	Assumptions and limitations
	of this storm water management plan, for which Shangoni had no prior knowledge nor had the opportunity to evaluate
Biodiversity Assessment. 2015. Natural Scientific Services cc.	It is important to note that species, which were not detected, are not necessarily absent from the site. Reasons for not finding certain species during the field surveys include: The small, fragmented and degraded nature of the site. • Disturbance of fauna from the silica mining operation. • The limited cumulative duration of fieldwork. • The lack of significant rainfall during the fieldwork periods. • The cryptic nature of certain faunal species. Some animal species, which are uncommon, small, migratory, secretive or otherwise difficult to find, may not have been detected even though they were potentially present on site. • Some plant species with short flowering times, or which are small, rare or otherwise difficult to detect, may not have been detected even though they were potentially present on site. • Mapping the study area was based on Aerial Imagery and ground truthing. NSS has extensive knowledge in mapping vegetation via aerial imagery, however, inaccuracies can occur due to: ➢ The scale at which the mapping was performed; ➢ The date and season of the aerial imagery (NSS utilised June 2015 imagery); and ➢ The interpretation of habitat/communities by the capturer. • Influences such as the game grazing, have affected plant species identification (on emergences, a number of these species are grazed) in a large portion of the study area. • As an alternative to other vegetation cover methods (such as the Domin method), the Braun-Blanquette cover-abundance scale was used to analyse vegetation. It is reported that the Braun-Blanquette method requires only one third to one fifth the field time required to other similar methods (Wikum & Shanholtzer, 1978). Furthermore, cover-abundance ratings are better suited than density values to elucidate graphically species-environment relationships. For extensive surveys this method provides sufficiently accurate baseline data to allow environmental impact assessment as required by regulatory agencies. However, there are a couple of problems that have been detected with such sampling methods (Hurford & Schneider, 2007). These are as follows: ➢ It can be seen as subjective and dependent upon the experience and knowledge of the vegetation type by the surveyor. The cover estimate may vary from observer to observer. ➢ There also may be a problem when the cover estimate is very close to two different classes (on the border so to speak) and then it is for the observer to decide which class it should be allocated to. In Hurford & Schneider's (2007) experience, in marginal situations, where the cover of a species is close to a boundary between two classes, the chance of two observers allocating the species to the same cover class is no better than 50:50. However, when comparing to other sampling methods such as Domin, Braun-Blanquette scale is better adapted for monitoring (less cover classes and fewer boundaries).
Land Function Analysis. April 2015. Natural Scientific Services cc.	• None

Specialist	Assumptions and limitations
Fall-out dust and perimeter noise monitoring reports. January – June 2016. NOHS Consultants	• None
Heritage Assessment. April 2008 MATAKOMA – ARM Heritage Contracts Unit	• Due to the nature of cultural remains that occur, in most cases, below surface, the possibility remains that some cultural remains may not have been discovered during the survey. Although MATAKOMA-ARM surveyed the area as thorough as possible, it is incumbent upon the developer to inform the relevant heritage agency should further cultural remains be unearthed or laid open during the process of development.

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

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

15.1 Reasons why the activity should be authorized or not.

In accordance with the EIA Regulations GN R982 (3)(l), the Environmental Impact Assessment Practitioner (EAP) must provide an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation must be stated.

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

In terms of collectively considering ecological, social and economic impacts it is important to remember that while there might be some trade-offs between the considerations, in South Africa all development must in terms of Section 24 of the Constitution be ecologically sustainable, while economic and social development must be justifiable. There are, therefore, specific "trade-off" rules that apply. Environmental integrity may never be

compromised and the social and economic development must take a certain form and meet certain specific objectives in order for it to be considered justifiable.[66]

The EAP is of opinion that economic benefit will be derived from the Rietvly Mine Silica Stockpile project in terms of continuation of mining and associated activities and resultant retainment of jobs. As described above, a few "High" negative impacts were identified that will transpire during the life span of the mine. Such impacts relate to topography and visual aspects. These "High" negative impacts that were identified are considered reversible and may not lead to irreplaceable loss if the recommended mitigation measures are effectively implemented.

Taking into consideration the results of the impact assessment, the fact that Rietvly Mine is an existing mine undertaking activities that have already been authorised as part of the approved EMPr (dated 2009) and the new activities proposed is for stockpiling of silica product only, the EAP is of the opinion that the existing mining operation be allowed to continue with the inclusion of the new activities, provided that the management objectives and management measures as presented in this BAR/EMPr (and the associated Risk Assessment Report) be implemented to effectively manage, prevent, control and / or stop environmental impacts from occurring.

15.2 Conditions that must be included in the authorisation

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

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

- The project should remain in full compliance with the requirements of the EMPr and with all regulatory requirements;
- The EMPr should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the EMPr. Such persons must be issued with a written mandate by Rietvly Mine management to provide guidance and instructions to employees and contractors; and
- Stakeholder engagement must be maintained during the construction, operational and closure/rehabilitation phases of the project, with the emphasis on the continuing provision of information.

15.2.2 Rehabilitation requirements

A separate closure and rehabilitation plan will be compiled and submitted for approval prior to closure and decommissioning phases.

16. Period for which the Environmental Authorisation is required.

The total period for which authorisation is required, is equal to the remaining Life of Mine (LOM) for Rietvly Mine, which is in excess of 30 years. Refer also to Table 34 below.

[66] Guideline on need and desirability in terms of the Environmental Impact Assessment (EIA) Regulations, 2010 (GN 891 of 20 October 2014);

Table 34: Period for which authorisation is required

Stages of operation	Timeframe (Years)
Planning	N/A
Construction	N/A
Commissioning (for new product stockpile area)	< 1 year
Operation (ongoing)	> 30 years
Decommissioning and Closure	± 8 years
TOTAL Period	**± 39 years**

17. Undertaking

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

18. Financial Provision

18.1 Explain how the aforesaid amount was derived.

This information can be included if Rehabilitation and Closure related information is made available

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

This information can be included if Rehabilitation and Closure related information is made available

19. Specific Information required by the competent Authority

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

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

Results of investigation, assessment and evaluation of impact on any directly affected person	Reference to where mitigation is reflected
Should this BAR be approved and the operations at Rietvly Mine continue, mining of the available reserves can continue. This will ensure continued job security for the mine's current employees and contractors, along with the continued and long-term benefits for the local community arising from the Social and Labour Plan (SLP).	Part A Section 11

The SLP Annual Report for 2015 also provides more information regarding the progress made in terms of programmes forming part of the SLP and the overall benefit arising from the implementation of such. Refer to Annexure E. Potential negative socio-economic impacts relate to: • An indirect impact on local communities in terms of the change in sense of place and visual aspects. • Closure (downscaling and retrenchment)	

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

Results of investigation, assessment and evaluation of impact on any national estate	**Reference to where mitigation is reflected**
No impacts on any national estate referred to in section 3(2) of the National Heritage Resources Act are foreseen as a result of the activities.	Not Applicable

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

An impact assessment for the proposed project has been undertaken and will incorporate extensive consultation with and participation of interested and affected parties. Applying the hierarchical approach to impact management were firstly considered to avoid negative impacts, but where avoidance was not possible, to better mitigate and manage negative impacts. Where impacts were found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed. Furthermore, the environmental impact statement (Part A Section 7.5) summarises the key findings of the environmental impact assessment and negative implications of the project.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. Draft environmental management programme.

1.1 Details of the EAP

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

1.2 Description of the Aspects of the Activity

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, Section 4.

1.3 Composite Map

Refer to the figure below for a map that superimposes the proposed activity, its associated structures and infrastructures on the Rietvly Mine site.

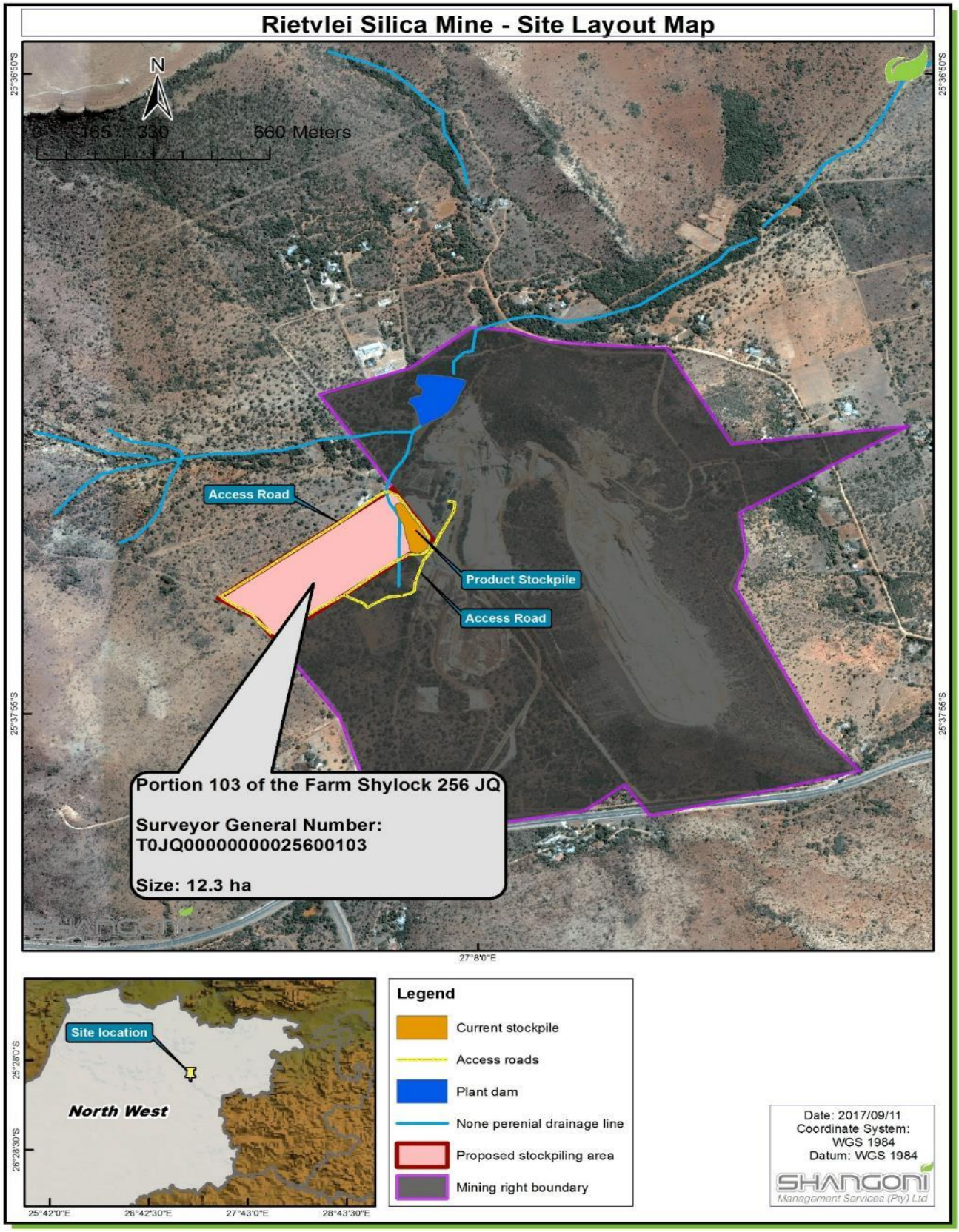

Figure 40: Site Layout Map for new stockpile area

1.4 Description of Impact management objectives including management statements

1.4.1 Determination of closure objectives.

This information will be included if rehabilitation and closure related information is made available

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

The Rietvly Mine has boreholes on site where water is sourced from. Any water requirements for the project will be sourced from the boreholes on site. Water may be required for the flushing of sewer and water pipelines. It is unknown at this stage the volume of water needed.

1.4.3 Has a water use licence has been applied for?

A licence is required in terms of Section 21 of the NWA (No. 36 of 1998). The Section 21 water uses that will be triggered are the following:

- Section 21 (c) and (i): The proposed stockpile area will be within 500m of the Penzhorn Dam as well as the non-perennial drainage line that runs through Portion 103 of the Farm Shylock 256 JQ.

A Section 21 (g) may or may not require a water use licence. The proposed stockpile area will be regarded as a dirty water area, however, Silica does not pose a serious environmental threat as the risks associated with it are low. As per the Storm Water Management Plan compiled by Shangoni, dated 2017, it is proposed that a paddock be constructed to contain runoff from the Silica Stockpile. The water which will be contained in the paddock can be regarded as water that contains waste which can detrimentally impact on a water resource.

It is proposed that a waste characterisation assessment will be conducted of the Silica Stockpiles to ensure that the “waste water” proposed to be stored in the paddock is characterised and quantified to prevent environmental pollution. Should the waste characterisation assessment results indicate that there are high levels of waste, a Section 21 (g) water use will need to be applied for.
However, should the waste characterisation assessment results indicate that the waste levels in the water are negligible, it is recommended that the water be attenuated to control the silt and then allow the water to be released into the Penzhorn Dam. This option would require Rietvly Mine to apply for a GN R704 exemption.

Rietvly Mine has not applied for a water use licence yet, however, a water use licence will be applied for prior to the construction of the Silica Stockpile.

1.4.4 Impacts to be mitigated in their respective phases

Table 35: Measures to rehabilitate the environment affected by the undertaking of any listed activity

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Topography	Clearing and grading of vegetation	Construction	12.3 ha	Ensure that the Rehabilitation, Decommissioning- and Closure plans that will be compiled in terms of Government Gazette 39425. Government Notice R.1147 dated 2015, is adhered to, kept up to date and submitted to the DMR on an annual basis.	In terms of Government Gazette 39425. Government Notice R.1147 dated 2015 (Financial Provision Regulations) and any amendments thereto	Operational; Decommissioning (Closure); Post-closure
				Ensure that the financial provision (as per the above-mentioned plan(s) / reports is kept up to date on an annual basis and comply with GN R 1147 (and amendments thereto).		Operational; Decommissioning (Closure); Post-closure
	• Stockpiling of silica product • Maintenance of stockpiles	Operational	12.3 ha	Special care should be taken to ensure appropriate rehabilitation (and remediation) of areas where Product stockpiles were located. This includes soil analysis and remediation (where necessary), as well as ensuring a free-draining surface.	In compliance with principles contained in the MPRDA, 2002, NEMA, 1998, Regulations there under and amendments thereto.	Decommissioning (Closure); Post-closure
				All disturbed areas, post-closure, will be seeded and re-vegetated.		Decommissioning (Closure); Post-closure
	Hauling activities	Operational	12.3 ha	Equipment movement will be limited, so as to minimise compaction of the soil.	System and Operational Procedures and training programme in compliance with ISO14001.	Operational; Decommissioning (Closure); Post-closure
				All soils compacted as a result of activities should be ripped, profiled and monitored to ensure establishment of natural vegetation.		Operational; Decommissioning (Closure); Post-closure
Soil	• Clearing and grading of vegetation • Possible on-site maintenance activities • Stockpiling of silica product • Waste management activities • Hauling activities	Operational	12.3 ha	All development footprint areas should remain as small as possible and should not encroach onto surrounding more sensitive open veld areas.	**Soil management:** In compliance with principles contained in the MPRDA, 2002, NEMA, 1998, NEM: WA, 2008, Regulations there under and amendments thereto. In Compliance with the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GNR.331 of 2014), thereunder.	Operational; Decommissioning (Closure)
				All previously disturbed areas are to be rehabilitated and re-vegetated.		Operational; Decommissioning (Closure)
				All redundant infrastructure is to be removed at closure.		Decommissioning (Closure)
				Rip all compacted areas during rehabilitation.		Decommissioning (Closure)
				Topsoil is to be replaced on all disturbed areas during the Decommissioning Phase. Where topsoil is not available, topsoil / growth medium (as determined by a qualified soil specialist) should be sourced and brought in during the rehabilitation and closure phase.		Decommissioning (Closure)
				All stockpile areas must be clearly demarcated and sufficient storm water controls need to be implemented. The stockpile areas must be managed in accordance with GN 704.		Operational
				Equipment movement will be limited, so as to minimise compaction of the soil.		Operational
				The necessary storm water management measures (as per the storm water management plan compiled by Shangoni Management Services, 2017), will be implemented on the mine in order to manage runoff conditions and prevent erosion.		Operational; Decommissioning (Closure)

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				Rehabilitated areas must make use of adequate water management canals and cut off trenches to prevent erosion.		Decommissioning (Closure)
				All rehabilitated areas should be monitored on a regular basis to ensure that no erosion is occurring, until such a time that rehabilitation is complete and the agreed upon end land use achieved.		Decommissioning (Closure); Post-closure
				In the event of a spill or leak, the activity causing such spill should be ceased as soon as safely possible to do so. The spill should be contained as soon as possible and reported to the relevant sectional heads including the mines environmental department. The spill should be cleaned in accordance to the mines internal procedure for the handling of spillages. All contaminated material should be disposed of as hazardous waste, in accordance to the mines internal procedure for the handling of spillages and waste management.		Operational; Decommissioning (Closure)
				Incidents or emergencies related to soil contamination should be reported as per the mine's internal incident reporting and / or emergency procedure(s). Should the nature / scale of the incident be significant in terms of the relevant definitions and requirements contained in the NWA, 1998 and NEMA, 1998 (as well as regulations there under), incidents / emergencies will be reported to the relevant government authorities and the necessary soil contamination and remediation protocols will be followed.		Operational; Decommissioning (Closure)
Land Use and Land Capacity	• Stockpiling of silica product • Hauling activities • The construction of the stockpile area not taking place.	Operational	12.3 ha	Ensure that the Rehabilitation, Decommissioning- and Closure plans that will be compiled in terms of Government Gazette 39425. Government Notice R.1147 dated 2015, is adhered to, kept up to date and submitted to the DMR on an annual basis.	In terms of Government Gazette 39425. Government Notice R.1147 dated 2015 (Financial Provision Regulations) and any amendments thereto In compliance with the Rehabilitation, Decommissioning- and Closure plans and Closure Objectives. In compliance with principles contained in the MPRDA, 2002, Mine Health and Safety Act, 1996, NEMA, 1998, NEM: WA, 2008, Regulations there under and amendments thereto.	Operational; Decommissioning (Closure); Post-closure
				Final land forms should be free draining.		Operational; Decommissioning (Closure); Post-closure
				Continuous investigations should be undertaken to determine areas that are no longer required for the continuation of mining related activities.		Operational; Decommissioning (Closure)
				All previously disturbed areas are to be rehabilitated and re-vegetated		Operational; Decommissioning (Closure)
				All redundant infrastructure is to be removed at closure.		Decommissioning (Closure)
				Rip all compacted areas during rehabilitation.		Decommissioning (Closure)
				Topsoil is to be replaced on all disturbed areas during the Decommissioning Phase. Where topsoil is not available, topsoil / growth medium (as determined by a qualified soil specialist) should be sourced and brought in during the rehabilitation and closure phase.		Decommissioning (Closure)

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				Future areas requiring soil stripping will be delineated. Stripping may only occur where soils are to be disturbed, and an end-use for the stripped soil needs to be identified.	Implementation also to be in compliance with the mine's internal procedures. Procedures to be in line with the latest legislation.	Operational; Decommissioning (Closure)
				All rehabilitated areas should be monitored on a regular basis to ensure that no erosion is occurring, until such a time that rehabilitation is complete and the agreed upon end land use achieved.		Decommissioning (Closure); Post-closure
				Final topsoil placement on a rehabilitated area should, where possible, be done in the winter to early spring, to allow time for proper fertilization and seeding prior to the season's first rains. This will maximize seed growth throughout the summer and reduce long term erosion.		Decommissioning (Closure)
				All newly top-soiled areas must be analysed for nutrient deficiencies and this corrected prior to seeding to maximise plant growth.		Decommissioning (Closure); Post-Closure
				The spread of alien and invasive vegetation should be prevented wherever possible by following the mine's latest invasive plant species management plan.		Operational; Decommissioning (Closure)
				A post-closure monitoring programme will be instituted for a minimum period of 5 years to ensure that the area has been successfully rehabilitated and there are no latent impacts.		Post-Closure
				The positive impact should be enhanced by rehabilitating as much of the disturbed surface area as possible, depending on the agreed upon end land use and taking the requirements of the DMR and other authorities and municipalities into account.		Decommissioning (Closure)
Flora	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	Operational	12.3 ha	**Minimise habitat loss and fragmentation by:**		
				Restricting operations and other disturbances within Rietvly Mine's perimeter fence.	In compliance with biodiversity specialist recommendations	Operational
				Protecting the remaining natural habitat by clearing and preventing the establishment of alien and invasive species. Category 1 infestations need to be removed first.	**Biodiversity management:** The continued implementation of requirements contained in: The NEM:BA (2004) and the regulations thereunder, the Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector, Environmental Conservation Act, 1989 (Act No 73 of 1989), National Forests Act, 1998 (Act No 84 of 1998), National Veld and Forest Fire Act, 1998 (Act No 101 of 1998), National Environmental Management: Protected Areas Act (NEM:PAA)	Operational
				Suitably disposing of waste material either by using it for rehabilitation or by selling it off.		Operational; Decommissioning (Closure)
				Commissioning the compilation of an updated Biodiversity Management and Action Plan (BMAP) including an updated Alien Invasive Plan as with the new NEMBA 2014 regulations, category listings and priorities have changed.		Operational
				Implementing adequate erosion control through slope stabilisation and vegetation.		Operational; Decommissioning (Closure)
				Mine to conduct regular ecological evaluations of the site to be used to monitor impacts on biodiversity.		Operational; Decommissioning (Closure)

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
					(Act No 57 of 2003), North West Parks and Tourism Board Act, 1997 (Act No 3 of 1997), North West Province Environmental Implementation, North West Conservation Plan.	
				Comply with legislation regarding the loss, capture or translocation of plants and wildlife. This includes but is not limited to the Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983), of the former Province Transvaal that stipulates (amongst others), subject to the provisions/exemptions of the Ordinance that:		
				A permit is required for the import into, conveyance within or export/removal of protected plants from the province, additionally no person is allowed to pick protected plants without a permit, “pick" includes to gather, to cut off, to chop off, to uproot, to damage or to destroy.	Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983). Refer also to the above requirements.	Operational; Decommissioning (Closure)
				Effectively rehabilitate after stockpiling by:		
				Levelling and landscaping all previously disturbed areas. Thereafter, the area is to be covered with available topsoil and seeded. Alien invasive monitoring must be performed during rehabilitation.	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above. Rehabilitation in accordance with the principles contained in the MPRDA, 2002 and NEMA, 1998, Regulations there under and amendments thereto.	Decommissioning (Closure)
				Utilising only locally indigenous seed mixes tailored for the biome during future rehabilitation efforts. The recommended seed mix for Rietvly should include species such as: *Eragrostis superba*, *Eragrostis curvula* (small proportion of species mix), *Digitaria eriantha*, *Hyparrhenia hirta*, and *Themeda triandra*. Seed suppliers that do not genetically enhance or manipulate their seed, and which collect their seed within the Savanna Biome of South Africa should be opted for, as opposed to a few other suppliers who import hybridised, enhanced seed.		Decommissioning (Closure)
				Topsoil could be brought in to stimulate growth on site.		Decommissioning (Closure)
				Eradicate alien and invasive floral species by:		
				Updating Glencore’s current Alien Control Plan (ACP) for Rietvly, Waterval, Kroondal, and Horizon (NSS, 2009). Preventing the introduction of alien invasive species is the cheapest, most effective and most preferred option, and warrants the highest priority. Until an updated ACP is compiled, active implementation of the existing plan is urged.	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above.	Operational
				Furthermore, the following is recommended:		
				Raising/Maintaining awareness. The Environmental Department and staff in general should be made aware of existing and potentially occurring alien species on site. If and when any alien species are seen, the Environmental Department on site must be able to identify and remove these	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above.	Operational; Decommissioning (Closure)
				Minimising the re-introduction of aliens. The intentional introduction of an alien plant species should not be considered for any screening effects or for stabilising the tailings,		Operational; Decommissioning (Closure)

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				rehabilitation etc. Indigenous alternatives should be considered suitable for the purposes for which the introduction is required		
				Rehabilitation materials should be sourced from reliable suppliers, who can certify the absence of weeds in their materials (although this is extremely difficult to manage, it does influence introductions into the area).		Decommissioning (Closure)
Fauna	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	Operational	12.3 ha	**Minimise habitat loss and fragmentation by:**		
				Restricting operations and other disturbances within Rietvly Mine's perimeter fence.	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above	Operational
				Suitably disposing of waste material either by using it for rehabilitation or by selling it off	**Biodiversity management:** The continued implementation of requirements contained in: The NEM:BA (2004) and the regulations thereunder, the Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector, Environmental Conservation Act, 1989 (Act No 73 of 1989), National Forests Act, 1998 (Act No 84 of 1998), National Veld and Forest Fire Act, 1998 (Act No 101 of 1998), National Environmental Management: Protected Areas Act (NEM:PAA) (Act No 57 of 2003), North West Parks and Tourism Board Act, 1997 (Act No 3 of 1997), North West Province Environmental Implementation, North West Conservation Plan. Compliance with the biodiversity specialist recommendations	Operational; Decommissioning (Closure)
				Commissioning the compilation of an updated Biodiversity Management and Action Plan (BMAP)		Operational
				Implementing adequate erosion control through slope stabilisation and vegetation.		Operational; Decommissioning (Closure)
				Mine to conduct regular ecological evaluations of the site to be used to monitor impacts on biodiversity.		Operational; Decommissioning (Closure)
				Establishing contacts with the provincial nature conservation authorities (e.g. North West Conservation Authority). Any game related actions taken must be checked and authorised by Provincial Conservation Authorities and relevant permits and licences, where applicable, obtained. Currently refer to the Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983) for the various protection categories assigned to both indigenous and alien fauna and flora in the various appended schedules.		Operational; Decommissioning (Closure)
				Comply with legislation regarding the loss, capture or translocation of plants and wildlife. This includes but is not limited to the Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983), of the former Province Transvaal that stipulates (amongst others), subject to the provisions/exemptions of the Ordinance that:		
				• A permit is required for game capture. • A permit is required for the trapping of wild animals	Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983).	Operational; Decommissioning (Closure)

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				• A permit is required for hunting of specially protected and protected game and wild animals as specified in the ordinance • A permit is required for hunting ordinary game unless an open-season is gazetted. In which case the persons or category of persons referred to in the notice may, subject to the provisions of the Ordinance, hunt the species and sex of ordinary game referred to therein in the area defined therein • A permit is required to collect, catch, kill, keep, purchase, sell, donate or receive as a donation, convey, import into the Province or export or remove there from any protected invertebrate referred to in Schedule 7 or of the Ordinance	Refer also to the above requirements.	
				Eradicate alien or feral faunal species by:		
				Implementing effective yet environmentally friendly pest control techniques. Although no major pest infestation was evident on site, and the use of pesticides was not confirmed, the apparent absence of Red-billed Oxpeckers is a concern. Natural pest control alternatives should always be thoroughly investigated and given preference over the use of harmful chemical pesticides and herbicides	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above.	Operational; Decommissioning (Closure)
				Implementing a control programme for the eradication and / or sterilization of feral cats.		
				Minimize faunal mortality and overall loss of biodiversity and CI species by:		
				Reducing roadkill by continuing to enforce speed limiting measures.	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above.	Operational; Decommissioning (Closure)
				Not killing and rather re-locating snakes and other wildlife. Mine staff and contractors should be well informed and have a positive outlook towards snakes through increased awareness using (updated) posters and pamphlets, and even courses. Snakes that are encountered on site should be safely captured and relocated away from working areas, by staff members who are appropriately trained and qualified to do so (for more information see www.africanreptiles-venom.co.za).		
				Remembering that all Protected floral and faunal species will require permits for destruction/translocation. A CI Management Plan for the NT and other listed Red Data (Declining) plant species should be compiled and implemented.		
				Raising/Maintaining awareness of biodiversity. Currently Rietvly has both a Snake and a Red Data Plant sign. Rietvly must maintain this proactive approach to conservation by continuing to make all staff and contractors aware of the importance of local biodiversity. This should be orchestrated by the Environmental Officer (EO), and could be achieved during inductions, training courses and with additional posters, pamphlets and presentations.		
				Minimise sensory disturbance of fauna by:		
				Minimising noise as far as possible. Constant maintenance of all machinery is essential.	In compliance with biodiversity specialist recommendations and biodiversity management standards and legislation mentioned above.	Operational; Decommissioning (Closure)
				Minimising external lighting wherever possible. Where external lighting is unavoidable, long-wavelength light sources should be used (i.e. red and yellow lights) as insects are most strongly attracted to lights of short wavelength (i.e. those towards the ultraviolet side		

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				of the spectrum). Additionally, lights should be angled downward, and preferably be hooded to avoid undue escape of light into the surrounding environment.		
				Standard dust control measures must be implemented to minimise dust deposition and reduce sedimentation on the river system, which should include the periodic spraying of roads with water, or an environmentally-friendly dust inhibitor. The frequency and intensity of dust control measures will vary between seasons and must be adjusted accordingly.		
				Trucks transporting resource material to and from the plant must be covered to prevent widespread dust transmission.		Operational
				Night time activities and traffic should be minimised as far as possible.		Operational; Decommissioning (Closure)
Surface Water	• Clearing and grading of vegetation • Stockpiling of silica product • Conveyance of surface water within dirty water areas • Operation of access roads			Implement the storm water management measures as proposed by the Storm Water Management Plan, dated 2017 (Annexure H3).	**Surface water management:** In line with the DWS Best Practice Guidelines, to prevent and minimise impacts and to ensure the separation of clean and dirty water management areas; GN704, dated 1999; the NWA (1998) and Regulations there under and amendments thereto; the storm water management plan (GCS) and / or amendments thereto; specialist recommendations; and the IWUL conditions (once issued). Implementation also to be compliant with the mine's internal procedures. Procedures to be in line with the latest legislation.	Operational; Decommissioning (Closure)
				Implement regular inspections and a maintenance schedule to ensure storm water infrastructure is maintained at all times to ensure capacity of infrastructure and to prevent overflow		Operational; Decommissioning (Closure)
				Ensure compliance to GN704, dated 1999 and the National Water Act, 1998 (Act 36 of 1998).		Operational; Decommissioning (Closure)
				Undertake GN704 audits biennially (every two years) to assess compliance to the regulation and to assess the adequacy of storm water management measures at Rietvly Mine. Recommended actions to be implemented based on the outcome of the audit reports.		Operational; Decommissioning (Closure)
				It is recommended that a storm water system maintenance programme be implemented as a standard operating procedure. As a minimum, the sediment generated from the surface water runoff should be removed from the channels and silt traps during the dry season and at least once during the wet season. This maintenance programme would improve the efficiency of the proposed system by reducing the probability of spills as well as maintaining compliance with GN 704		Operational; Decommissioning (Closure)
				Ensure that the affected water dams can support the appropriate storage capacity. Obtain proof thereof and keep on record.		Operational
				Malfunctions or concerns to be reported as incidents for the appropriate measures to be implemented.		Operational
				Rehabilitation should be planned to promote free drainage and to minimise or eliminate ponding of storm water. On-going rehabilitation as mining operations progress (in areas where this is possible) will be undertaken.		Operational; Decommissioning (Closure)
Air Quality		Operational	12.3 ha	Vehicles should be regularly serviced to minimise atmospheric emissions.	Dust suppressing methods to reduce dust to comply with the	
				The Air quality monitoring programme will be continued with.		

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities			Dust suppression of roads at regular intervals or during windy period.	Dust Control Regulation GNR 827 of 2013 and NEM: AQA, 2004.	Operational; Decommissioning (Closure)
				Ensure adequate dust level monitoring is put in place, where applicable.		
Noise Vibration and Shock	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Operational	12.3 ha	Continue implementing the current noise monitoring programme	In accordance with relevant sections of the National Environmental Management: Air Quality Act (Act No 39 of 2004); Regulations there under and amendments thereto SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication. SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments	Operational; Decommissioning (Closure)
				Effective maintenance of the vehicle engines and exhaust systems.		
				Hearing conservation programme as per DMR guidelines on Noise Control.		
				Incorporate sound attenuation measures to any equipment that could generate noise levels in excess of the statutory limits		
				All noise and blasting related complaints received will dealt with through the complaints register process.		
Visual Aspects	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Operational	12.3 ha	Select light fittings that direct light downward and limit side spill.	Guidelines for Involving Visual and Aesthetic Specialists in terms of NEMA, 1998 (and any amendments or addendums thereto), will be taken into consideration during the life of mine and during additional assessments.	Operational
				All light should be directed inward and towards the area to be illuminated. No lights should be directed upward.		Operational
				Appoint a suitably qualified specialist to conduct follow-up visual assessments (once recommendations during phases have been implemented) to determine if an improvement is evident with regards to the visual aesthetics of the area, and / or to recommend additional mitigation / management measures (if possible)		Operational; Decommissioning (Closure); Post-closure
Ground Water	• Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Operational	12.3 ha	Continue to implement the groundwater monitoring plan for Rietvly Mine. The groundwater monitoring plan must be reviewed and updated on a regular basis by a groundwater specialist	Mine residue classification and characterisation in compliance with GNR 635 of August 2013, “National Norms and Standards for the Assessment of waste for landfill disposal” and GNR 636 of August 2013, “National Norms and Standards for disposal of waste to landfill”, in terms of NEMWA, 2008	Operational; Decommissioning (Closure); Post-closure
				Product and ore stockpile footprints must be kept as small as possible to limit the impact on the groundwater resource.		Operational
				Waste classification and characterisation of mine residue should be undertaken in terms of GNR 635 of August 2013, “National Norms and Standards for the Assessment of waste for landfill disposal” and GNR 636 of August 2013, “National Norms and Standards for disposal of waste to landfill”, in terms of NEMWA, 2008.		Operational

ENVIRONMENTAL ASPECT	ACTIVITIES	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	SIZE AND SCALE OF DISTURBANCE (volumes, tonnages and hectares or m²)	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Sites of Heritage and Cultural Importance	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Operational	12.3 ha	In the event that any other sites of cultural and archaeological importance are uncovered during the undertaking of mining and mining related activities, that the activity within the vicinity of the discovery is ceased, the relevant authority notified, and suitable qualified specialists appointed to assess the discovery.	**The management of heritage resources:** In compliance with the National Heritage Resources Act (Act No. 25 of 1999), and amendments thereto.	Operational; Decommissioning (Closure)
Socio-Economic Aspects	• Employment and economic benefit • Impacts on I&APs and surrounding community	Operational	12.3 ha	As many skilled and unskilled workers, as possible, should be sourced from the local communities, towns and surrounding areas The various plans and programmes as contained in the SLP should continue to be implemented. Stakeholders and affected parties should be kept informed of activities at Rietvly Mine. Proactive engagement with local and environmental authorities to should be undertaken. A complaints register will be made available at the mine security offices for I&APs and stakeholders to voice their concerns and raise any complaints. All complaints received will be recorded and kept record along with: • The way they were received. • Time and date of complaint. • The I&APs details. • All correspondence with the complainant. • The way and the date the complaint was dealt with. Continue implementing the various plans and programmes in the SLP. Through the SLP, Rietvly Mine aims on developing and implementing comprehensive Human Resources Development Programmes, a Mine Community Development Plan, a Housing and Living Conditions Plan, an Employment Equity Plan, and Processes to save jobs and manage downscaling and/or closure.	Continued implementation in compliance with the DMR Guideline for Consultation with communities and Interested and Affected Parties. As required in terms of Sections 16(4)(b) or 27(5)(b) of the Mineral and Petroleum Resources Development Act (Act 28 of 2002), and in accordance with the standard directive for the compilation thereof as published on the official website of the DMR. Continued compliance with the Mine Health and Safety Regulations under the Mine Health and Safety Act (1996); MPRDA, 2002; National Road Traffic Act; Regulations there under and amendments thereto. Implementation also to comply with the mine's internal procedures. Procedures to be in line with the latest legislation.	Operational Operational; Decommissioning (Closure)

1.5 Impact Management Outcomes

Table 36: Impact management outcomes, identifying the stand of impact management required for the identified aspects

ASPECTS AFFECTED	ACTIVITY	POTENTIAL IMPACT	PHASE Planning and design, Pre-Construction, Construction, Operational, Rehabilitation, Closure, Post closure.	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Topography	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to the change in topography.	Construction	Control	To limit the impact on topography.
	• Stockpiling of silica product • Maintenance of stockpiles	Stockpiling activities, including the maintenance of stockpiles, will alter the topography and lead to a change in drainage patterns.	Operational	Control	
	Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Operational	Control	
Soil	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to an increase in exposed areas which can lead to erosion.	Construction	Control	To limit the impact on soil and prevent the compaction of soil.
	Possible on-site maintenance activities	The potential for soil contamination from the leaking of equipment or vehicles or spillages of hydrocarbons always exists but would be considered very site specific. Incorrectly managed and controlled maintenance activities may result in soil contamination.	Operational	Control	
	Stockpiling of silica product	Stockpiling of product may lead to soil compaction and erosion, if not managed appropriately.	Operational	Control; Stop	
	Waste management activities	The incorrect handling and disposal of general waste, scrap metal and industrial waste (e.g. waste tyres) will have a long-term impact on the local area. Impact will not only effect soil but could also impact on the habitat of fauna and impact of fauna, surface water and groundwater. In addition, the visual character of the area will be impacted on. The incorrect handling and disposal of hazardous waste can also have a permanent negative impact on the local area. Soil, water sources and fauna habitats can be adversely affected, and human health can be impacted on.	Construction; Operational	Control	
	Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Operational	Control; Stop	
Land Use and Land Capability	• Stockpiling of silica product • Hauling activities	Extensions to the mining area (as per the relevant mining rights granted to Rietvly Mine) will result in a continuation of the impact on land use and land capability. The Rietvly site is also stocked with some game species. As per the Biodiversity Assessment (NSS, 2015), it appears that game densities are high, and likely exceed the carrying capacity of the property. This was evidenced by the high levels of overgrazing.	Operational	Control	To restore the land use and land capability to the agreed upon end land use, taking the recommendations of the DMR and municipalities into account.
	The construction of the stockpile area not taking place.	Not constructing the stockpile area would mean that there would be no change to the topography of the area as there will be no clearing and grubbing activities. This in turn will lead to erosion not taking place and no loss in biodiversity.	Operational	Control	
Flora	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities	**Habitat loss and fragmentation: Floral implications:** The main impact from a Biodiversity perspective at Rietvly Mine is habitat loss / degradation. The restricted communities that will be impacted on in any type of mining expansion are the: • Dense Slope Thicket	Construction; Operational	Control	Prevent the destruction of vegetation and subsequent impacts

	• Operation and maintenance of storm water and dirty water management measures	• *Loudetia -Tristachya* Exposed Outcrops *Combretum-Cymbopogon* East Slope			species of conservation concern and protected species.
		Loss / Destruction / Removal of Conservation Important Species: Through the biodiversity study conducted by NSS (2015), a few Red Listed and Protected species have been detected. These included: The Near Threatened (NT) *Adromischus umbraticola subsp. umbraticola*; *Boophone disticha* (P and TSP Listed as Dec) and *Hypoxis hemerocallidea* (Dec). These species fall within the Very High, High and Medium-High Areas of Significance categories.	Construction; Operational	Enhance	
		Alien invasive flora: NSS compiled an Alien invasive plan in 2009 for Xstrata Alloys mines. There are at least 39 alien species (combined 2009 and 2015 studies) that have been recorded within Rietvly area, and of these species, 21 are now listed under NEMBA as Category 1b species and 15 as Category 1 under CARA legislation. To date, from investigations in 2009 and 2015 no further advancement in the clearing and control of these species has been conducted. In addition, species category listings from 2011 to date have drastically changed. Category 2 species on site are not been used for any wind row or a pollution control/uptake function and, therefore, these will not form part of permit applications to remain on site and must be eradicated along with all Category 1/1b species.	Construction; Operational	Control; Remedy	Minimise the loss of species diversity
Fauna	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Faunal implications**: The main impact from a biodiversity perspective at Rietvly Mine is habitat loss / degradation. Habitat loss, degradation and fragmentation together with improper veld management practices such as overgrazing (and potentially inappropriate burning regimes) have decreased the capacity of the site to support fauna. The results of the NSS LFA (update conducted in 2015) revealed that overutilisation of the grass sward by grazers and mix feeder game has thinned the grass sward considerably since 2010 resulting in lower rain splash protection, cryptogram cover and per. basal canopy cover while at the same time increasing the prevalence of bare ground. This hardening of the soil surface has the effect of decreasing rainfall absorption while increasing runoff which in turn results in erosion and loss of soil, increased soil aridity and decreased soil fertility which all together lowers the grazing capacity of the veld. An improper burning regime may also be a contributing factor. Overgrazing is considered one of the most important land-related environmental problems in the North West province. Continued impoverishment of the veld at Rietvly may also lead to bush encroachment and the increased prevalence of alien/invasive species.	Construction; Operational	Control; Remedy	Prevent the destruction of habitats and subsequent impacts on faunal species
		Loss / Destruction / Removal of Conservation Important species NSS fieldwork at Rietvly since 2007 has revealed that the site does not have any species of significant conservation importance. To the East of the site the assessment confirmed that there is a presence of CI carnivores. These include Brown Hyaena (NT[67]), Leopard (VU[68]), Serval (NT) and Honey Badger (NT). The abundance of prey on site together with the heterogeneous nature of the habitat and its connectivity to extensive tracts of bushveld to the west and along the Magaliesberg likely facilitate this dense concentration of small to medium sized predators. Changes to any of these aspects are likely to reduce carnivore populations on site, the most pertinent of which being the continued loss/degradation of habitat (through improper veld management) and subsequent decrease in the herbivore carrying capacity of the property.	Construction; Operational	Control; Remedy	
		High anthropogenic activity levels: Mortality of fauna	Construction; Operational	Control	

[67] Near Threatened
[68] Vulnerable

		The high levels of mining activity, traffic and people are inevitably going to result in faunal losses at Rietvly through roadkill's, excavation or persecution/poaching. Wildlife most likely to be affected include those that are small, slow-moving and ground-dwelling, such as frogs, moles and mole-rats, rodents, snakes, lizards and numerous ground-dwelling invertebrates. Rietvly must enforce stringent speed control which aids in reducing roadkill incidents.			
		High anthropogenic activity levels: Sensory disturbance of fauna Noise, vibrations and light pollution have been shown to have negative disturbance effects on a wide spectrum of fauna. Highly-sensitive animals are often frightened or disorientated by loud noises and bright lights, and many feel threatened by humans. Such disturbances may also impair animal communication or other behavioural displays and interactions between conspecifics. It is likely that the local fauna has grown accustomed to the existing disturbances. Light pollution is an aspect that needs to be taken into consideration at Rietvly. Nocturnal insects, particularly those that fly, are attracted to artificial light sources, often from considerable distances (several kilometres), to their detriment. Lighting e.g. at the offices and guard house on site, is likely to lead to the loss of many insects every month, which over time results in a depletion zone.	Construction; Operational	Control	
		Encroachment of non-native species: Alien invasive, domestic and feral fauns No feral dogs or cats were observed at Rietvly, nor were they recorded at any of the baited motion camera stations. Feral dogs and cats can have a significant deleterious impact on a wide range of indigenous fauna through predation and disease transmission. Feral cats also pose a serious threat to the potentially occurring African Wild Cat and Black-footed Cat (VU), through hybridisation, loss of genetic diversity, and eventually population extirpation.	Construction; Operational	Control	
Surface Water	Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping may lead to siltation of water resources causing deterioration of water quality affecting the use of surface water as a natural resource. <u>Surface water quality:</u> There may be a decrease in surface water quality when any surface water comes into contact with dust, eroded soil, or other pollutants generated during the preparation phase of the new stockpiling area. The sediment load within surface water runoff may increase if not prevented or mitigated, or the chemistry of surface water may be altered.	Construction	Control	To prevent quality deterioration of surface water quality and prevent impact on catchment yield
	Stockpiling of silica product	The silica product will be stockpiled on the newly purchased property. There is a non-perennial drainage line running through the eastern portions of the property. <u>Surface water quantity:</u> If the silica stockpile encroaches on the drainage line it could impede the flow of surface water and result in a decreased volume of clean water available for the catchment. The use of the area for stockpiling will also decrease the catchment area through the containment of affected water in the paddock. <u>Surface water quality:</u> Dirty runoff water generated at the stockpiling area could enter the drainage line resulting in an increased sediment load that will decrease the quality of the clean water resource.	Operational	Control	
	Conveyance of surface water within dirty water areas	Due to the sandy characteristics of the silica product, siltation will be a challenge within the storm water conveying and containment infrastructure. If not managed in a proper manner, the integrity of the berm and containment facility (paddock) might get compromised due to siltation. Silted storm water infrastructure may overflow during heavy rainfall events.	Operational	Control	

		Surface water quality: Deterioration of surface water quality is expected should affected water overflow from the dirty water system into the adjacent clean water environment.			
	Operation of access roads	Roads used to access the property have been compacted which decreases the permeability of the road and could result in increased surface runoff, which could result in the erosion of the access roads. Surface water quality: Increased erosion could increase the sediment load of surface runoff leading to a deterioration of the clean water environment.	Construction	Control	
Air Quality	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Dust will be generated from the clearing of vegetation. The placement of product on stockpiles, clearing and hauling activities may result in dust pollution. Emissions from vehicles and machinery may also have a minor impact on the localised air quality.	Construction; Operational	Control	Prevent the deterioration of air quality and indirect effects on floral, faunal and human health
Noise Vibration and Shock	• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Noise will be created during the clearing and grading of vegetation and during the operational phase. Noise associated with graders and trucks will be minimal as compared to the existing operations as the noise levels currently at Rietvly Mine is generated mainly by processing activities (crushing), vehicles within the mining areas and on the roads.	Construction; Operational	Control	Prevent and mitigate against the effects of noise on sensitive receptors (including employees and surrounding communities and towns).
Visual Aspects	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Key issues associated with the visibility of the mine is that it will negatively affect the scenic value and sense of place of the existing setting. These have been identified as the following: • The product stockpiles will be visible from the N4 as it becomes higher; and • The visual impact of the end use. The following critical view-point has been identified: • The house on the adjacent property to the west of the mine site;	Operational	Control	Prevent / minimise visual intrusions on sensitive receptors
Ground Water	Stockpiling of silica product	Silica is also known as quartz and is highly resistant to weathering and the chances of mobilising to groundwater is low. Silica does not pose any real threat in terms of human health as it is not a hazardous substance.	Operational	Control	To minimise the extent of disturbance of the aquifer and to prevent quality deterioration of groundwater resource.
	• Maintenance of silica stockpiles • Hauling and conveying activities	Potential spillages of hazardous substances (hydrocarbons or chemicals) resulting in potential surface water contamination may also lead to groundwater contamination. Sources may include: vehicle and machinery maintenance and vehicles travelling on roads.	Operational	Control	
Site of archaeological and cultural importance	• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	No Sites of archaeological and cultural importance were identified on the proposed new product stockpiling area.	Construction; Operational	Control	Prevent the destruction of and loss of sites of cultural and archaeological importance.
Socio-economic aspects	Employment and economic benefit	The construction of a product stockpile area will ensure the continuation of operations at Rietvly Mine and this will ensure continued job security for the mine's current employees and contractors,	Operational	Enhance	Enhance the positive impact on the socio-economic aspects.

		along with the continued and long-term benefits for the local community arising from the Social and Labour Plan (SLP). Through the SLP, Rietvly Mine aims on developing and implementing comprehensive Human Resources Development Programmes, a Mine Community Development Plan, a Housing and Living Conditions Plan, an Employment Equity Plan, and Processes to save jobs and manage downscaling and/or closure. The above programmes are aimed at promoting employment and advancement of the social and economic welfare of all South Africans whilst ensuring economic growth and socio-economic development.			
	Impacts on I&APs and surrounding community	Silica mined at Rietvly Mine is transported to the end user(s) via road. Therefore, Rietvly Mine makes use of trucks for transportation purposes. This poses a hazard to the community and local residents as the number of mine vehicles increase on the roads which are also used by the local community and residents.	Operational	Control	To prevent and / or limit impacts on I&APs and the surrounding community

1.6 Impact Management Actions

Table 37: Impact management actions, identifying the manner in which the impact management objectives and outcomes will be achieved.

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Topography				
Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to the change in topography.	Control	Construction	In terms of Government Gazette 39425. Government Notice R.1147 dated 2015 (Financial Provision Regulations) and any amendments thereto. In compliance with principles contained in the MPRDA, 2002, NEMA, 1998, Regulations there under and amendments thereto
• Stockpiling of silica product • Maintenance of stockpiles	Stockpiling activities, including the maintenance of stockpiles, will alter the topography and lead to a change in drainage patterns.	Control	Operational	
Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Control	Operational	
Soil				
Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping will lead to an increase in exposed areas which can lead to erosion.	Control	Construction	**Soil management:** In compliance with principles contained in the MPRDA, 2002, NEMA, 1998, NEM: WA, 2008, Regulations there under and amendments thereto. In Compliance with the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GNR.331 of 2014), thereunder. Implementation also to comply with the mine's internal procedures. Procedures to be in line with the latest legislation
Possible on-site maintenance activities	The potential for soil contamination from the leaking of equipment or vehicles or spillages of hydrocarbons always exists but would be considered very site specific. Incorrectly managed and controlled maintenance activities may result in soil contamination.	Control	Operational	
Stockpiling of silica product	Stockpiling of product may lead to soil compaction and erosion, if not managed appropriately.	Control; Stop	Operational	
Waste management activities	The incorrect handling and disposal of general waste, scrap metal and industrial waste (e.g. waste tyres) will have a long-term impact on the local area. Impact will not only effect soil but could also impact on the habitat of fauna and impact of fauna, surface water and groundwater. In addition, the visual character of the area will be impacted on. The incorrect handling and disposal of hazardous waste can also have a permanent negative impact on the local area. Soil, water sources and fauna habitats can be adversely affected, and human health can be impacted on.	Control	Construction; Operational	
Hauling activities	During high rainfall events, runoff from the internal road network can also lead to erosion	Control; Stop	Operational	
Land Use and Land Capability				
• Stockpiling of silica product • Hauling activities	Extensions to the mining area (as per the relevant mining rights granted to Rietvly Mine) will result in a continuation of the impact on land use and land capability. The Rietvly site is also stocked with some game species. As per the Biodiversity Assessment (NSS, 2015), it appears that game densities are high, and likely exceed the carrying capacity of the property. This was evidenced by the high levels of overgrazing.	Control	Operational	In terms of Government Gazette 39425. Government Notice R.1147 dated 2015 (Financial Provision Regulations) and any amendments thereto In compliance with principles contained in the MPRDA, 2002, Mine Health and Safety Act, 1996, NEMA, 1998, NEM: WA, 2008, Regulations there under and amendments thereto. Implementation also to comply with the mine's internal procedures.
The construction of the stockpile area not taking place.	Not constructing the stockpile area would mean that there would be no change to the topography of the area as there will be no clearing and grubbing activities. This in turn will lead to erosion not taking place and no loss in biodiversity.	Control	Operational	

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
				Procedures to be in line with the latest legislation. The continued implementation of requirements contained in the NEM:BA (2004) and the regulations thereunder.
Flora				
• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Floral implications:** The main impact from a Biodiversity perspective at Rietvly Mine is habitat loss / degradation. The restricted communities that will be impacted on in any type of mining expansion are the: • Dense Slope Thicket • *Loudetia -Tristachya* Exposed Outcrops • *Combretum-Cymbopogon* East Slope	Control	Construction; Operational	**Biodiversity management:** The continued implementation of requirements contained in: The NEM:BA (2004) and the regulations thereunder, the Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector, Environmental Conservation Act, 1989 (Act No 73 of 1989), National Forests Act, 1998 (Act No 84 of 1998), National Veld and Forest Fire Act, 1998 (Act No 101 of 1998), National Environmental Management: Protected Areas Act (NEM:PAA) (Act No 57 of 2003), North West Parks and Tourism Board Act, 1997 (Act No 3 of 1997), North West Province Environmental Implementation, North West Conservation Plan; Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983). In compliance with biodiversity specialist recommendations Rehabilitation in accordance with the principles contained in the MPRDA, 2002 and NEMA, 1998, Regulations there under and amendments thereto.
	Loss / Destruction / Removal of Conservation Important Species: Through the biodiversity study conducted by NSS (2015), a few Red Listed and Protected species have been detected. These included: The Near Threatened (NT) *Adromischus umbraticola subsp. umbraticola*; *Boophone disticha* (P and TSP Listed as Dec) and *Hypoxis hemerocallidea* (Dec). These species fall within the Very High, High and Medium-High Areas of Significance categories.	Enhance	Construction; Operational	
	Alien invasive flora: NSS compiled an Alien invasive plan in 2009 for Xstrata Alloys mines. There are at least 39 alien species (combined 2009 and 2015 studies) that have been recorded within Rietvly area, and of these species, 21 are now listed under NEMBA as Category 1b species and 15 as Category 1 under CARA legislation. To date, from investigations in 2009 and 2015 no further advancement in the clearing and control of these species has been conducted. In addition, species category listings from 2011 to date have drastically changed. Category 2 species on site are not been used for any wind row or a pollution control/uptake function and, therefore, these will not form part of permit applications to remain on site and must be eradicated along with all Category 1/1b species.	Control; Remedy	Construction; Operational	
Fauna				
• Clearing and grading of vegetation • Stockpiling of silica product • Hauling activities • Operation and maintenance of storm water and dirty water management measures	**Habitat loss and fragmentation: Faunal implications**: The main impact from a biodiversity perspective at Rietvly Mine is habitat loss / degradation. Habitat loss, degradation and fragmentation together with improper veld management practices such as overgrazing (and potentially inappropriate burning regimes) have decreased the capacity of the site to support fauna. The results of the NSS LFA (update conducted in 2015) revealed that overutilisation of the grass sward by grazers and mix feeder game has thinned the grass sward considerably since 2010 resulting in lower rain splash protection, cryptogram cover and per. basal canopy cover while at the same time increasing the prevalence of bare ground. This hardening of the soil surface has the effect of decreasing rainfall absorption while increasing runoff which in turn results in erosion and loss of soil, increased soil aridity and decreased soil fertility which all together lowers the grazing capacity of the veld. An improper burning regime may also be a contributing factor. Overgrazing is considered one of the most important land-related environmental problems in the North West province.	Control; Remedy	Construction; Operational	**Biodiversity management:** The continued implementation of requirements contained in: The NEM:BA (2004) and the regulations thereunder, the Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector, Environmental Conservation Act, 1989 (Act No 73 of 1989), National Forests Act, 1998 (Act No 84 of 1998), National Veld and Forest Fire Act, 1998 (Act No 101 of 1998), National Environmental Management:

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
	Continued impoverishment of the veld at Rietvly may also lead to bush encroachment and the increased prevalence of alien/invasive species.			Protected Areas Act (NEM:PAA) (Act No 57 of 2003), North West Parks and Tourism Board Act, 1997 (Act No 3 of 1997), North West Province Environmental Implementation, North West Conservation Plan; Nature Conservation Ordinance, 1983, (Ordinance No. 12 of 1983). In compliance with biodiversity specialist recommendations Rehabilitation in accordance with the principles contained in the MPRDA, 2002 and NEMA, 1998, Regulations there under and amendments thereto.
	Loss / Destruction / Removal of Conservation Important species NSS fieldwork at Rietvly since 2007 has revealed that the site does not have any species of significant conservation importance. To the East of the site the assessment confirmed that there is a presence of CI carnivores. These include Brown Hyaena (NT), Leopard (VU), Serval (NT) and Honey Badger (NT). The abundance of prey on site together with the heterogeneous nature of the habitat and its connectivity to extensive tracts of bushveld to the west and along the Magaliesberg likely facilitate this dense concentration of small to medium sized predators. Changes to any of these aspects are likely to reduce carnivore populations on site, the most pertinent of which being the continued loss/degradation of habitat (through improper veld management) and subsequent decrease in the herbivore carrying capacity of the property.	Control; Remedy	Construction; Operational	
	High anthropogenic activity levels: Mortality of fauna The high levels of mining activity, traffic and people are inevitably going to result in faunal losses at Rietvly through roadkill's, excavation or persecution/poaching. Wildlife most likely to be affected include those that are small, slow-moving and ground-dwelling, such as frogs, moles and mole-rats, rodents, snakes, lizards and numerous ground-dwelling invertebrates. Rietvly must enforce stringent speed control which aids in reducing roadkill incidents.	Control	Construction; Operational	
	High anthropogenic activity levels: Sensory disturbance of fauna Noise, vibrations and light pollution have been shown to have negative disturbance effects on a wide spectrum of fauna. Highly-sensitive animals are often frightened or disorientated by loud noises and bright lights, and many feel threatened by humans. Such disturbances may also impair animal communication or other behavioural displays and interactions between conspecifics. It is likely that the local fauna has grown accustomed to the existing disturbances. Light pollution is an aspect that needs to be taken into consideration at Rietvly. Nocturnal insects, particularly those that fly, are attracted to artificial light sources, often from considerable distances (several kilometres), to their detriment. Lighting e.g. at the offices and guard house on site, is likely to lead to the loss of many insects every month, which over time results in a depletion zone.	Control	Construction; Operational	
	Encroachment of non-native species: Alien invasive, domestic and feral fauns No feral dogs or cats were observed at Rietvly, nor were they recorded at any of the baited motion camera stations. Feral dogs and cats can have a significant deleterious impact on a wide range of indigenous fauna through predation and disease transmission. Feral cats also pose a serious threat to the potentially occurring African Wild Cat and Black-footed Cat (VU), through hybridisation, loss of genetic diversity, and eventually population extirpation.	Control	Construction; Operational	
Surface Water				
Clearing and grading of vegetation	Before the silica product can be stockpiled on the new property, the area must be prepared. Grading, vegetation clearing and soil stripping may lead to siltation of water resources causing deterioration of water quality affecting the use of surface water as a natural resource. <u>Surface water quality:</u> There may be a decrease in surface water quality when any surface water comes into contact with dust, eroded soil, or other pollutants generated during the preparation phase of the new stockpiling area. The sediment load within surface water runoff may increase if not prevented or mitigated, or the chemistry of surface water may be altered.	Control	Construction	**Surface water management:** In line with the DWS Best Practice Guidelines, to prevent and minimise impacts and to ensure the separation of clean and dirty water management areas; GN704, dated 1999; the NWA (1998) and Regulations there under and amendments thereto; the storm water management plan (GCS) and / or amendments thereto; specialist recommendations; and the IWUL conditions (once issued). Implementation also to comply with the mine's internal procedures.
Stockpiling of silica product	The silica product will be stockpiled on the newly purchased property. There is a non-perennial drainage line running through the eastern portions of the property. <u>Surface water quantity:</u> If the silica stockpile encroaches on the drainage line it could impede the flow of surface water and result in a decreased volume of clean water available for the catchment. The use of the area for stockpiling will also decrease the catchment area through the containment of affected water in the paddock.	Control	Operational	

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
	Surface water quality: Dirty runoff water generated at the stockpiling area could enter the drainage line resulting in an increased sediment load that will decrease the quality of the clean water resource.			Procedures to be in line with the latest legislation.
Conveyance of surface water within dirty water areas	Due to the sandy characteristics of the silica product, siltation will be a challenge within the storm water conveying and containment infrastructure. If not managed in a proper manner, the integrity of the berm and containment facility (paddock) might get compromised due to siltation. Silted storm water infrastructure may overflow during heavy rainfall events. Surface water quality: Deterioration of surface water quality is expected should affected water overflow from the dirty water system into the adjacent clean water environment.	Control	Operational	
Operation of access roads	Roads used to access the property have been compacted which decreases the permeability of the road and could result in increased surface runoff, which could result in the erosion of the access roads. Surface water quality: Increased erosion could increase the sediment load of surface runoff leading to a deterioration of the clean water environment.	Control	Construction; Operational	
Air Quality				
• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Dust will be generated from the clearing of vegetation. The placement of product on stockpiles, clearing and hauling activities may result in dust pollution. Emissions from vehicles and machinery may also have a minor impact on the localised air quality.	Control	Construction; Operational	Air quality management in accordance with the National Environmental Management: Air Quality Act (Act No 39 of 2004); Regulations there under and amendments thereto. Consideration of and compliance with the Waterberg-Bojanala National Priority Area' Air Quality Management Plan; Provincial Air Quality Management Plan and Municipal Air Quality Management Plans. Emergency preparedness and response in compliance with the compliance with the Mine Health and Safety Regulations under the Mine Health and Safety Act (1996); MPRDA, 2002; NEMA; 1998 and NWA; 1998 and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998), (and regulations there under), and amendments thereto. Implementation also to comply with the mine's internal procedures. Procedures to be in line with the latest legislation.
Noise Vibration and Shock				

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
• Clearing and grading of vegetation • Stockpiling of silica product • Hauling and conveying activities	Noise will be created during the clearing and grading of vegetation and during the operational phase. Noise associated with graders and trucks will be minimal as compared to the existing operations as the noise levels currently at Rietvly Mine is generated mainly by processing activities (crushing), vehicles within the mining areas and on the roads.	Control	Construction; Operational	In accordance with relevant sections of the National Environmental Management: Air Quality Act (Act No 39 of 2004); Regulations there under and amendments thereto SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication. SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments
Visual Aspects				
• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	Key issues associated with the visibility of the mine is that it will negatively affect the scenic value and sense of place of the existing setting. These have been identified as the following: • The product stockpiles will be visible from the N4 as it becomes higher; and • The visual impact of the end use. The following critical view-point has been identified: • The house on the adjacent property to the west of the mine site;	Control	Operational	System and Operational Procedures and training programme in compliance with ISO14001. In Compliance with the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GNR.331 of 2014), thereunder. In compliance with principles contained in the MPRDA, 2002, Mine Health and Safety Act, 1996, NEMA, 1998, NEM: WA, 2008, Regulations there under and amendments thereto. The continued implementation of requirements contained in the NEM:BA (2004) and the regulations thereunder.
Ground Water				
Stockpiling of silica product	Silica is also known as quartz and is highly resistant to weathering and the chances of mobilising to groundwater is low. Silica does not pose any real threat in terms of human health as it is not a hazardous substance.	Control	Operational	**Groundwater management:** In line with the DWS Best Practice Guidelines, to prevent and minimise impacts and to ensure the separation of clean and dirty water management areas; specialist recommendations; and the IWUL conditions (once issued). Implementation also to comply with the mine's internal procedures. Procedures to be in line with the latest legislation.
• Maintenance of silica stockpiles • Hauling and conveying activities	Potential spillages of hazardous substances (hydrocarbons or chemicals) resulting in potential surface water contamination may also lead to groundwater contamination. Sources may include: vehicle and machinery maintenance and vehicles travelling on roads.	Control	Operational	

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
				Mine residue classification and characterisation in compliance with GNR 635 of August 2013, "National Norms and Standards for the Assessment of waste for landfill disposal" and GNR 636 of August 2013, "National Norms and Standards for disposal of waste to landfill", in terms of NEMWA, 2008
Sites of Archaeological and Cultural Importance				
• Clearing and grading of vegetation • Stockpiling of silica product • Maintenance of silica stockpiles • Hauling and conveying activities	No Sites of archaeological and cultural importance were identified on the proposed new product stockpiling area.	Control	Construction; Operational	**The management of heritage resources:** In compliance with the National Heritage Resources Act (Act No. 25 of 1999), and amendments thereto.
Socio-Economic Aspects				
Employment and economic benefit	The construction of a product stockpile area will ensure the continuation of operations at Rietvly Mine and this will ensure continued job security for the mine's current employees and contractors, along with the continued and long-term benefits for the local community arising from the Social and Labour Plan (SLP). Through the SLP, Rietvly Mine aims on developing and implementing comprehensive Human Resources Development Programmes, a Mine Community Development Plan, a Housing and Living Conditions Plan, an Employment Equity Plan, and Processes to save jobs and manage downscaling and/or closure. The above programmes are aimed at promoting employment and advancement of the social and economic welfare of all South Africans whilst ensuring economic growth and socio-economic development.	Enhance	Construction; Operational	Continued implementation in compliance with the DMR Guideline for Consultation with communities and Interested and Affected Parties. As required in terms of Sections 16(4)(b) or 27(5)(b) of the Mineral and Petroleum Resources Development Act (Act 28 of 2002), and in accordance with the standard directive for the compilation thereof as published on the official website of the DMR. Continued compliance with the Mine Health and Safety Regulations under the Mine Health and Safety Act (1996); MPRDA, 2002; National Road Traffic Act; Regulations there under and amendments thereto. Implementation also to comply with the mine's internal procedures. Procedures to be in line with the latest legislation.
Impacts on I&APs and surrounding community	Silica mined at Rietvly Mine is transported to the end user(s) via road. Therefore, Rietvly Mine makes use of trucks for transportation purposes. This poses a hazard to the community and local residents as the number of mine vehicles increase on the roads which are also used by the local community and residents.	Control	Operational	

1.7 Financial Provision

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

This information will be included if the rehabilitation and closure related information is made available

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

This BAR / EMPr is being made available to the public for review for a period thirty (30) days. The public is also encouraged to comment on sections of this report (with specific reference to the closure objectives as presented in Section 1.7.1 above), any aspect of the mining operation, and raise any concerns and / or issues they may have. Comments, concerns and / or issues received from I&APs, will be addressed and responded to (and will be taken into consideration) as part of the final BAR / EMPr and accompanying Public Participation Report.

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

The rehabilitation of the project area as a whole will be done as part of the mining operations.

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

This information will be included if the rehabilitation and closure related information is made available

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

This information will be included if the rehabilitation and closure related information is made available

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

This information will be included if the rehabilitation and closure related information is made available

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

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

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

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of The Monitoring Programmes)	Monitoring and Reporting Frequency and Time Periods For Implementing Impact Management Actions
Stockpiling and related activities	Surface water may become impacted upon as result of stockpiling and related activities.	Implement the surface water monitoring programme to determine if there are any impacts on surface water quality.	The Environmental Department is to ensure that surface water monitoring and Water Use Licence Audits are taking place. The resultant monitoring reports and audit reports need to be submitted to the DWS and kept on record.	Surface water quality monitoring to be conducted monthly. The reports will be submitted to the DWS on an annual basis.
		WUL Audits are to be conducted to evaluate compliance thereto.		WUL Audits to be conducted as per the WUL conditions.
Activities that may result in the generation of waste.	Waste will be generated at the various areas on the mine which may result in the contamination of surface water runoff, groundwater resources, and soil and may impact on fauna, flora and visual aspects.	A waste monitoring programme is to be developed and implemented as per Regulation GNR 634 of 23 August 2013 under the NEM: WA (2008). Sub-regulation 10 of GNR 634 requires the following: 1) Waste generators must keep accurate and up to date records of the management of the waste they	The Environmental Department is to ensure that all departments at the mine are keeping accurate and up to date records of the waste generated. The Environmental Manager will ensure that all waste reports are combined and kept on record.	As specified by the Environmental Department

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of The Monitoring Programmes)	Monitoring and Reporting Frequency and Time Periods For Implementing Impact Management Actions
		generate, which records must reflect- a) the classification of the wastes. b) the quantity of each waste generated, expressed in tons or cubic metres per month. c) the quantities of each waste that has either been re-used, recycled, recovered, treated or disposed of. d) by whom the waste was managed. 2) The records contemplated above must be- retained for a period of at least five (5) years and made available to the Department upon request.		
Stockpiling and related activities	Potential environmental impacts resulting from the non-compliance with legislation.	Environmental legal compliance audits are to be conducted to ensure compliance against all applicable environmental legislation and policies.	The Environmental Department is to ensure that the Environmental Legal Compliance audit is conducted by a suitably qualified individual.	The Environmental Legal Compliance audit is to be conducted on a biennial basis.
		Environmental Audits on the EMPr compliance (as per the EIA Regulations, 2014 (or amendments thereto) are to be conducted.	The Environmental Manager is to ensure that the Environmental audits are conducted by an independent and suitably qualified individual.	The Environmental audit is to be conducted as per frequency specified in the environmental authorisation, kept on record and submitted to the DMR as required.

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of The Monitoring Programmes)	Monitoring and Reporting Frequency and Time Periods For Implementing Impact Management Actions
The conveyance of silica product	Dust may be generated as a result of stockpiling and related activities conducted.	The dust fallout and air quality monitoring plan will be continued throughout the Life of Mine to determine potential impacts and sources of dust.	The Environmental Department is to ensure that the dust fallout and air quality monitoring is conducted by a suitably qualified individual.	Records of reports to be kept, and if required by the DMR, submitted as per required frequency
Decommissioning and rehabilitation activities.	Impacts such as soil erosion, deterioration of vegetation and dust may result if the rehabilitation techniques were incorrectly implemented	The rehabilitation monitoring programme will be implemented to ensure that the rehabilitation techniques are sufficient for the rehabilitation of Rietvly Mine and that no significant impacts are occurring on the rehabilitated areas.	The Environmental Department will ensure that the rehabilitation monitoring programme is being implemented, the monitoring techniques were implemented correctly and that no impacts occurring on the rehabilitated areas.	Monitoring of the rehabilitation success will take place for at least 5 years and will include corrective follow-up action.

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

An environmental audit should be conducted annually and submitted to the DMR annually.

1.10 Environmental Awareness Plan

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

The following Environmental Awareness Training will be implemented by Rietvly Mine in order to inform employees and contractors of the environmental risk that may result from their work, or the risk of their interaction with the sensitive environment. The training will be conducted as part of the induction process for all new employees (including contractors) that will perform work in terms of the proposed activities. Proof of all training provided must be kept on-site.

The Environmental Awareness Training will, as a minimum cover the following topics:

- Air Quality
  - Activities that may result or mitigate impact on air quality; speeding on roads, the requirements for dust suppression, etc.
  - Negative impacts on the receiving environment if mitigation measures are not implemented.
- Surface and groundwater
  - Risks to surface and groundwater, e.g. fuel and chemical handling and further risks of erosion or damage to riparian vegetation.
  - How incidents should be reported, and emergency requirements.
  - The importance of storm water control, maintenance of pollution control infrastructure.
  - The importance to reuse water and to prevent spillages.
- Cultural Heritage
  - The cultural significance of the area.
  - To respect all cultures and believes.
  - To remain within working areas and not to enter or interfere with any cultural heritage.
  - How to report any sightings as identified during operation activities (e.g. fossils).
- Fauna
  - Overview of the fauna found on site and the uniqueness thereof.
  - Mitigation measures that all contractors and employees need to abide by.
  - No contractor or personnel allowed to catch or kill any species, and how any sightings should be reported if further actions are required (e.g. to catch and release).
- Flora
  - Overview of the flora diversity on site, and the rare and endangered nature thereof.
  - Measures taken by the mine to protect species.
  - No contractor or personnel allowed to remove, harvest or destroy any flora species unless clearly instructed based on the construction and operational plans.

- Waste management
  - The correct segregation of general and hazardous waste.
  - Do's and don'ts with respect to waste disposal.
  - Measures to avoid waste generation and to participate in waste minimisation/reduction strategies.
- Traffic
  - Abide by traffic rules, no speeding allowed.
  - To stay on designated roads (and not to drive on areas that are not fit and designed for this purpose).
  - To be aware of the fauna species and to be on the lookout and avoid collisions.
- Natural Resource Consumption
  - Optimise utilisation of mining and plant equipment, travelling routes etc.
- Emergency Preparedness and Response
  - Designated smoking areas.
  - How to report any emergency or incident.
  - Incident and emergency reporting requirements
- General rules and conduct
  - Respect for the sensitive environment.
  - Do not litter.
  - HIV/AIDS awareness.
  - Respect for each other and for different cultures.
  - Safety and health requirements.

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

Identification of Environmental Aspects

Environmental aspects for the operation are identified through the following process:

The following structure forms the basis for the aspect register and organises all environmental information relevant to the Environmental Management Programmes of the System:

- Department;
- Section;
- Area;
- Activity Description;
- Aspect; and
- Impact.

Each aspect is described in detail adding information regarding volumes, current mitigation and potential emergency conditions. The relevant Section Head / Mine Overseer is present when the aspects are described to ensure accuracy and reliability.

The environmental aspects are identified or updated based on:

- The description of the activities in each area;
- The known impacts of the activities;
- Information contained in the EMP(r);
- EIA's and risk assessments conducted for a new process;
- Legal requirements obtained from the legal register;
- Re-occurrence of incidents or non-conformances relating to an area, activity or product; and
- Known environmental factors such as neighbouring environmental hotspots.

The environmental aspects associated with activities, products and services are documented in the aspect register. The potential impacts arising from the environmental aspect are also captured in the aspect register. An aspect may lead to more than one impact.

Prioritisation of Environmental Aspects

In order to determine the significance rating of the environmental aspects, the following criteria are used:

Likelihood (Negative Impacts)

DESCRIPTION	DEFINITION
Definite	It is certain that the impact will materialize regardless of any preventive measure
Probable	The likelihood that the impact will materialize exceeds 10%
Possible	The likelihood of the impact materializing < 10%
Low	Possibility of impact materializing is very low either because of design or historic experience (likelihood < 1%)

Likelihood (Positive Impacts)

DESCRIPTION	DEFINITION
Definite	It is certain that the impact will materialize under current practise and controls
Probable	The likelihood that the impact will materialize exceeds 10%
Possible	The likelihood of the impact materializing < 10%
Low	Possibility of impact materializing is very low due to the circumstances occurring on an ADHOC basis.

Extent (Negative Impacts)

DESCRIPTION	DEFINITION
International	Impact on a scale beyond country boundaries
National	Impact on a scale within country boundaries
Regional	Impact on a regional scale
Local	Impact extends locally: the site and its surroundings

Site	Impact is confined to the site only
Immediate	Impact is confined to the immediate vicinity of the activity itself

Extent (Positive Impacts)

DESCRIPTION	DEFINITION
International	Impact on a scale beyond country boundaries
National	Impact on a scale within country boundaries
Regional	Impact on a regional scale
Local	Impact extends locally: the site and its surroundings
Site	Impact is confined to the site only
Immediate	Impact is confined to the immediate vicinity of the activity itself

Severity (Negative Impacts)

DESCRIPTION	DEFINITION
Very High	Environment: There is a total disruption of natural, social and cultural functions or processes to the extent that these functions would permanently cease. Risk: Workforce fatality, Complete disruption of operational integrity, Loss of company credibility, with key stakeholders, Non-compliance with likelihood of prosecution, Premature close of operations
High	Environment: There is a total disruption of natural, social and cultural functions or processes to the extent that these cease functioning for the duration of the activity but resume functioning after the operation has been terminated. Risk: Workforce reportable or disabling injury or illness, Substantial disruption of operational integrity, Negative public perception, Non-compliance with low likelihood of prosecution, required to position operation for imminent closure, could have wider corporate implications
Moderate	Environment: The natural, social and cultural functions or processes are notably altered but continue (albeit in a modified way). The effect is reversible within the lifetime of the operation. Risk: Minor injury, required to position the operation for closure, required to position the operation for impending legislation
Low	Environment: The natural, social and cultural functions or processes are minimally affected (often only just measurable). Such effects are felt only during the life of the operation. Risk: Incident
No Effect	No effect e.g. a small oil spill in a bund wall

Severity (Positive Impacts)

DESCRIPTION	DEFINITION
Very High	All Products; Services and Activities will function independently with long-term sustainability.
High	All Products; Services and Activities will function with sustainability after closure of the mine with limited company controls.
Moderate	All Products; Services and Activities is sustainable during the life of the mine under controlled conditions with increased resource investment.

Low	The natural, social and cultural functions or processes are minimally improved (only just measurable). Such effects are felt only during the life of the operation. Risk: Limited investment of resources.
No Effect	No positive effect.

Compliance (Negative Impact)

DESCRIPTION	DEFINITION
Not Compliant	Operation is currently not compliant under normal operating conditions
Occasionally Not Compliant	Operation is generally compliant but there is occasional non-compliance under normal operating conditions
Potentially Not Compliant	Operation is generally compliant but there is potential non-compliance under abnormal operating conditions
Compliant / n/a	Operation is compliant under normal AND abnormal operating conditions OR Compliance is NOT APPLICABLE to this impact
Positive	The Operation adds value by leading by example

Compliance (Positive Impact)

DESCRIPTION	DEFINITION
Not Compliant	Operation is currently not compliant under normal operating conditions
Occasionally Not Compliant	Operation is generally compliant but there is occasional non-compliance under normal operating conditions
Potentially Not Compliant	Operation is generally compliant but there is potential non-compliance under abnormal operating conditions
Compliant / n/a	Operation is compliant under normal AND abnormal operating conditions OR Compliance is NOT APPLICABLE to this impact
Positive	The Operation adds value by leading by example

Improvement (Negative Impact)

DESCRIPTION	DEFINITION
High	Strong opportunity to improve management to reduce or eliminate impact.
Medium	Management measures are in place to manage impact. Improved management could further reduce or eliminate impact.
Low	The activity/ aspect is currently well managed. There is little or no scope for improving current management to further reduce impact.
Not Required	No management is required

Improvement (Positive Impact)

DESCRIPTION	DEFINITION
High	Strong opportunity to improve management to enhance the positive impact.

Medium	Management measures are in place to sustain the positive the positive improvement. Improved management could enhance the positive impact.
Low	The Activity, Products and Services are currently well managed. There is little or no scope for father improvement.
Not Required	No management is required

Training Required (Negative Impact)

DESCRIPTION	DEFINITION
Yes	Training is required for the aspect under review. Training will mitigate the severity of the Impact.
No	Training is not required for the aspect.

Training Required (Positive Impact)

DESCRIPTION	DEFINITION
Yes	Training is required for further improvement
No	Training is not required for the aspect.

Potential Emergency (Negative Impact)

DESCRIPTION	DEFINITION
Yes	The activity and related aspects could lead to an environmental emergency taking place.
No	The activity and aspect cannot lead to an environmental emergency situation.

Potential Emergency (Positive Impact)

DESCRIPTION	DEFINITION
Yes	The activity and related aspects could lead to an environmental emergency taking place.
No	The activity and aspect cannot lead to an environmental emergency situation.

Every aspect is evaluated according to the criteria listed above. Only the most suitable class of each criterion will be selected taking note of normal, abnormal and emergency situations. All aspects are rated taking into consideration current mitigation in place in the area under investigation i.e. the residual risk will be determined.

The type and effectiveness of mitigation that should be considered are, amongst others:

- Suitably competent personnel;
- Monitoring and management process and procedures in place;
- Physical barriers and controls to prevent or minimize the impacts;
- Emergency procedures and systems in place where applicable. The rating of aspects will be done in conjunction with the responsible person of the area under investigation.

After all seven criteria had been selected on IsoMetrix, the calculation button will be used to reveal the calculated risk class as well as recommended management priority. The calculation is done automatically by the electronic system.

The responsible person of the area, taking note of both the risk class as well as the recommended management priority, allocates final priority to the aspect under investigation. The responsible person may choose to agree with recommended priority or to override the recommendation to a higher class.

The responsible person will not be allowed to override the recommendation to a lower priority.

For all HIGH Final Management Priorities, the mine will implement, either individually or in combination, any of the following controls:

a) Monitoring and measurement (including inspections);
b) Engineering controls with the development of Environmental Management Programmes (EMPs); and
c) Administrative control (including operational procedures and training)

MEDIUM rated aspects will as a minimum have operational procedures in place to prevent the impact from becoming worse. See Objectives and Targets procedures.

ALARP aspects will be so indicated in the User Defined Fields of IsoMetrix. These aspects must contain detailed descriptions of the control measures already implemented. When an aspect is indicated as ALARP, no further control will be implemented unless new technological options became available that is practicable for the mine to implement.

It is not mandatory for the POSITIVE IMPACTS to be assigned with Objectives (EMP's).

The Aspects register of each area must be communicated to all employees working in that specific area. They must be aware of the significant impacts caused by their activities. Record of this communication must be kept as prove of training.

Revision

The aspects register will be reviewed during December and January before budget review to ensure that adequate budget is allocated to management plans:

- At least annually;
- After significant changes; and
- After the completion of Environmental Management Programmes that would change an aspect's significance rating.

In terms of minerals and labour legislation, contractors performing work on a mine are regarded as employees. Therefore, the mine has the same legal responsibility in respect of contractors as to its own employees.

No Contractor will be allowed to commence any work on the mine unless the agreement between the mine and the contractor has been finalised.

Contractors working on the mine's premises for longer than 5 (consecutive) days are required to undergo the mine's full medical, safety, environmental, fire and security induction programme.

Contractors working on the mine's premises for less than 5 days shall receive general SHE Induction from the Security Reception Clerk.

Contractors working for more than 5 days will be issued with a temporary card for five days (window period) to enable them to enter the mine in order to undergo all the relevant induction programmes.

Should the contract term be longer than one year, the contract holders will ensure that their employees go for medical surveillance (to make appropriate arrangements) exactly one year after commencing work.

The Security official capturing the data to open a contractor's access card will ensure that the card is valid for 12 (twelve) months.

Should the contract term be less than one year, the Security official capturing the data to open a contractor's access card will ensure that it is only valid for the duration of the contract. Should it be required that the contract be extended, the contract holder must liaise with the relevant company official in that regard.

Contractors working on mine for a period of more than 5 consecutive days must be appointed under the applicable Legal Appointment indicated in the Mine Health and Safety Act 29 of 1996. No contractor may commence working on the mine before the legal appointment has been signed.

Legal Appointments are not required for contractors who are on the mine for less than 5 days.

The responsibility for the legal appointment of contractors lies with the company official, who is also responsible for the day to day monitoring of the contractor.

The relevant appointed mine official to whom the contractor reports will ensure that the contract holder or his duly appointed representative receive a copy of the SHE Contractors Manual.

The relevant appointed mine official to whom the contractor reports will ensure that the relevant training prior to the appointment has been done.

In addition to the requirements set out in the General Conditions of Contract, Contractors will be required to perform their work in accordance with the mine policies and procedures as set out in the contractors Manual, which will be included with the Contract documentation and is obtainable from the Mine Store.

All Contractors shall submit a monthly report to the Chief Safety Officer to enable him/her to report on the current strength of all contractor workers per contractor and per department.

Should a Contractor be required to work over weekends, they must attend the weekly Weekend Labour Planning meeting. The appropriate weekend overtime labour lists must be authorised by the weekend overtime duty manager and a copy forwarded to the Security Control Room.

The Contractor's site supervisor shall attend all relevant departmental safety, health and environmental meetings convened by mine management.

The Contractor shall furthermore hold monthly safety, health and environmental meetings for its own employees and keep record of such meetings. Alternatively, the Contractor shall arrange that its employees attend safety, health and environmental meetings convened by the relevant department, and will be required to maintain record of attendance by its employees.

1.11 Specific information required by the Competent Authority

The following information will be required by the competent authority.

Information	Frequency of submission
Quantum of Financial Provision	Annually
Annual Rehabilitation Plan	Annually
Environmental Audit Report on approved EIAR / EMPr and other environmental autthorisations	Annually or as per auditing timeframe indicated in authorisation(s)
Fall-out Dust Monitoring	As per the National Dust Control Regulations (GN827, 2013)
WUL Audit Report	As per IWUL Conditions
Rehabilitation Monitoring Report	Annually (during Decommissioning / Closure Phase)

2. UNDERTAKING

The EAP herewith confirms

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

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

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

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

Signature of the environmental assessment practitioner:

Shangoni Management Services (Pty) Ltd

Name of company:

14 January 2019

Date:

-END-